Stormwater Management Update

Jay Hoskins, P.E.

June 19, 2012

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  - Pervious Pavement
  - Landscape Seeding Guide
  - Green Infrastructure CSO Pilot Program
  - Next (2013-2018) Phase II Permit Planning
- Activities at the State Level
  - Missouri Guide to Green Infrastructure
  - Stormwater (Bacteria) TMDLs
- Activities at the National Level
  - Proposed Rulemaking

Activities at MSD: MEP Spreadsheets

- Updated 5/18/12
- Changes
  - Annual Runoff
  - Pre-development runoff factor
  - Design & Site Specific Modeling
  - Instructions

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Calculation and Report Preparation Tools

Stormwater Management Facilities Report

All development and redevelopment projects with BMPs are required to provide a Stormwater Management Facilities Report (SMFR). An outline of **items that the SMFR should address** is available.

Calculation Spreadsheets

MSD developed the Maximum Extent Practicable (MEP) tool, sometimes referred to as the "**MEP Spreadsheets**." Instructions on how to use the MEP Spreadsheets are provided **here**. (Spreadsheets were updated on May 18, 2012.)

Annual Runoff

- Local Water Balance Assessment
  - Continuous Simulation Modeling
  - Runoff volume as % of Annual Precip.
- Henceforth…
  - Runoff <u>volume</u> is evaluated on an annual basis

VIGNETTES

Locally Derived Water Balance Method To Evaluate Realistic Outcomes for Runoff Reduction in St. Louis, Missouri

Introduction

The Metropolitan St. Louis Sewer District (MSD) is the coordinating authority of a 61-permittee Phase II municipal separate storm sewer system (MS4) permit. MSD is carefully following the development of new national postconstruction stormwater regulations, which focus on maintaining or restoring the runoff component of the undeveloped (i.e., natural) water balance. If the Energy Independence and Security Act (EISA) Section 438 technical guidance is the "writing on the wall" for a national rule, then development projects would be required to implement postconstruction controls that capture and retain on-site (i.e., no discharge) the 95th percentile daily rainfall depth (3.8 cm in St. Louis).

Stormwater professionals may question whether a rule like this would be appropriate nationwide. MSD developed a water balance model to evaluate the potential runoff reduction that may be achieved in local watersheds in response to the targeted EISA rule. The predevelopment water balance in the St. Louis region has not previously been studied for this purpose. This vignette presents a "simple" approach to developing an annual estimate of runoff, and one that may be a useful tool for other stormwater managers whose watersheds' predevelopment hydrology has not been assessed.

Figure 1. Example of naturally vegetated Missouri prairie and sinkhole pond.

Methods

The water balance is the balance between the input of water from precipitation and the output of water by runoff, evapotranspiration, storage, and infiltration. Numerically, the runoff component of the water balance is expressed as $R = P - ET - N - S$, where R is runoff, P is precipitation, ET is evapotranspiration, N is infiltration or recharge, and S is the change in storage (in soil).

The one-dimensional Thornthwaite method is used to estimate components of the water balance on a daily time step. MSD used a modified version of this method, as described below.

Climate, Evapotranspiration, and Vegetation

MSD obtained 21 years of daily weather data from the National Weather Service[1] for Lambert St. Louis Airport for the period January 1989 to December 2009. We calculated daily potential evapotranspiration rates according to the American Society of Civil Engineers (ASCE) standardized reference evapotranspiration equation, thus replacing the Thornthwaite evapotranspiration rates with the ASCE rates. We then multiplied daily reference evapotranspiration rates by the landscape coefficient for a grass prairie (0.5), a reasonable approximation of an undeveloped, naturally vegetated condition in Metropolitan St. Louis and much of Missouri (see Figure 1). This prairie landscape coefficient is consistent with the US Geological Survey (USGS) rain garden report, *Evaluation of Turf-Grass and Prairie-Vegetated Rain Gardens in Clay and Sand Soil, Madison, Wisconsin, Water Years 2004–2008*, which estimates the landscape coefficient for a prairie-planted rain garden area to range from 0.2 to 0.7.

Infiltration (Recharge)

The near-surface geology of much of St. Louis City and County consists of urbanized (e.g., cut, filled, and reworked) clayey silt soil over limestone bedrock. The thickness of urbanized fill over bedrock varies greatly. MSD used results for Southwest Missouri from the USGS report, *Groundwater-Flow Model and Effects of Projected Groundwater Use in the Ozark Plateaus Aquifer System in the Vicinity of Greene County, Missouri—1907–2030*, to estimate groundwater recharge as only limited research and modeling of groundwater has been conducted for Metropolitan St. Louis. The surficial geologic conditions (clay or silt soil over limestone bedrock) in Southwest Missouri and St. Louis are similar in many ways.

[1] National Oceanic and Atmospheric Administration's National Weather Service, "NWS Access of Historical Data," http://cdo.ncdc.noaa.gov/fabb/data/archived/index.html.

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QUALITY SERVICE ALWAYS

(Annual) Pre-Development Runoff Factor

- Silt or Clay Soil over Limestone Bedrock
  - $R_{v,pre}$ was 0.05
  - $R_{v,pre}$ is <u>0.42</u>
- Silt or Clay Soil over Alluvium (rivers)
  - $R_{v,pre}$ remains 0.05

Time Period	Annual Avg. Runoff (cm)	Runoff as % of Annual Precipitation	Runoff as % of Quarterly Precipitation
Total	42	42	
January–March	12	12	60
April–June	16	16	50
July–September	5	5	19
October–December	9	9	40





Design & Site Specific Modeling

For new and redevelopment sites, to be considered an effective stand-alone water quality BMP, BMP designs shall be capable of the following.[1]

1. Capture and treat the required water quality volume (WQ_v). (This is equivalent to capturing and treating 90% of annual rainfall.)
2. Remove 80% of the TSS.
3. Have an acceptable longevity rate in the field.

Additionally, on new development sites, BMPs performance includes "mimicking the pre-construction runoff condition", to the maximum extent practicable. One objective of this criterion is to utilize BMPs that help reduce runoff volume to its pre-development condition.[2]

And...

Designers will note that the worksheets that evaluated enhancing bioretention for volume reduction have been removed. BMPs may still be enhanced to achieve additional volume reduction; however, their assessment should be based on site specific continuous simulation modeling.

Design & Site Specific Modeling

- Helpful Links
  - Models
    - RECARGA
    - SWMM
  - Data Files
    - Natives
    - More coming…

RECARGA

Wisconsin DNR and the University of Wisconsin-Madison developed RECARGA, a rain garden and bioretention modeling tool that MSD frequently uses. A **data file** with representative area hourly rainfall and Missouri native plant evapotranspiration rates is available for use in developing annual runoff reduction estimates using continuous simulation modeling.

SWMM v.5

EPA's **SWMM (version 5)** can be used to model a variety of BMPs, including bioretention, pervious pavement, and rainwater harvesting.

Instructions & Examples
www.stlmsd.com

Metropolitan St. Louis Sewer District
2350 Market Street
St. Louis, MO 63103-2555
(314) 768-6200

May 18, 2012

RE: Notice of Updated Volume Reduction Calculator Spreadsheet an

To Whom It May Concern:

The purpose of this letter is to convey Metropolitan St. Louis Sewer District to use of the "MEP spreadsheets", which are used to assess volume red construction best management practice (BMP) performance. The changes re to these spreadsheets. Instructions on how to use the revised spreadsheets are

Change Summary

Effectively immediately, MSD will evaluate runoff volume reduction based o precipitation.

Also, for local vegetated areas located on silt or clay soil over limestone approximately 42% of annual precipitation results in discharge. (The basis the attached paper, *Locally Derived Water Balance Method to Evaluate Re Reduction in St. Louis, Missouri.*)[1] Where applicable, MSD will use this v runoff from vegetated areas (e.g., turf, native grasses, and urban forest).

The purpose of the MEP spreadsheets is to document expected BMP perform BMP runoff condition, and to determine if the BMP strategies utilized meet requirements. The revised MEP spreadsheets provide little information on E in BMP performance are proposed herein. Designers are referred to the BM performance requirements and design aids.[2] Additional information on the applicable to the reduction factors in the spreadsheets is available on t Network website.[3]

Revised MEP Spreadsheet Instructions

The revised MEP spreadsheets are available on the MSD website, at http://www.stlmsd.com/engineering/planreview/bmptoolbox/calctools. This t worksheets, which can be individually viewed by clicking on the tabs at the b all worksheets, spreadsheet input should be provided in the cells that are shad shaded gray make calculations, or are linked to other cells. The six worksheet

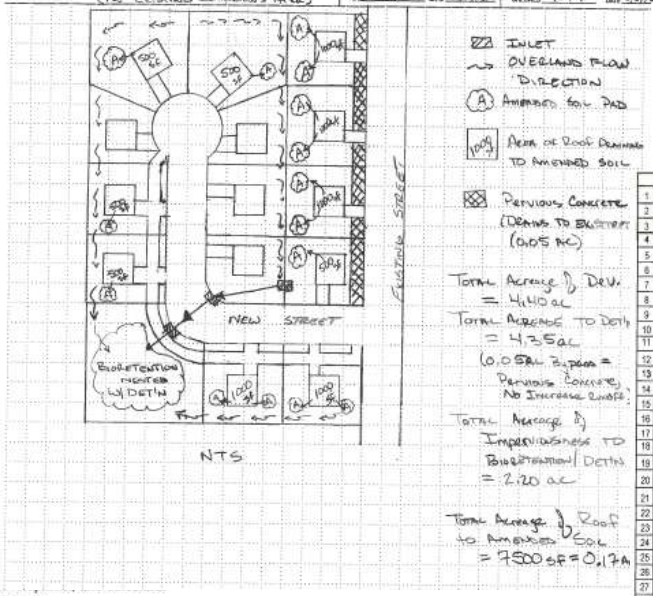
1. Pre-Construction Runoff.

   This worksheet determines whether the site is considered new or re the pre-development annual runoff volume ($V_{A,Pre}$) for the site's drainage area.

[1] Hoskins, 2012. Watershed Science Bulletin, Volume 3, Issue 1.
[2] The BMP Tool box website is located at http://www.stlmsd.com/engineering/planreview/bmptoolbox
[3] The Chesapeake Stormwater Network website is located at http://chesapeakestormwater.net/category/publications/design-specifications/

Metropolitan St. Louis Sewer District

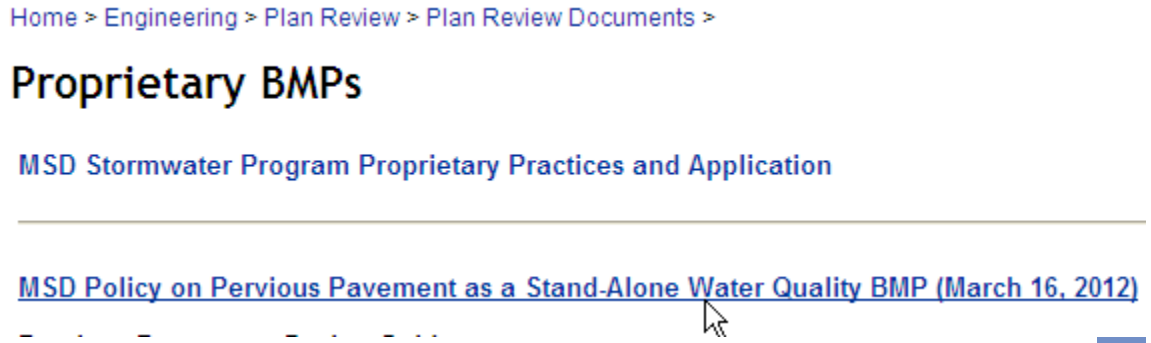
TITLE: MEP Spreadsheet Example
Residential New Dev.
(No Existing Impervious Area)
BY ABC DATE 5/9/12 CHECKED XYZ DATE 5/11/12



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	Project Name:			MEP Residential Example					Computed By:				ABC		Date:	5/16/12
2	MSD P#:			P#29xxx-xx					Checked By:				XYZ		Date:	5/16/12
3																
4	**Pre-Construction Development Input**															
5	Total Drainage Area (A) =					4.35	Ac.									
6	Impervious Area =					0.00	Ac.									
7	Vegetated Area =					4.35	Ac.									
8	THIS IS A NEW DEVELOPMENT SITE. POST-CONSTRUCTION RUNOFF SHALL MIMIC PRE-EXISTING RUNOFF TO MAXIMUM EXTENT PRACTICABLE.															
9																
10	$V_{A,Pre}$ =					261,360	CF									
11																
12	**Post-Construction Dev. Input**															
13	Total Drainage Area (A) =					4.35	Ac.									
14	Impervious Area =					2.20	Ac.									
15	Vegetated Area =					2.15	Ac.									
16																
17	$V_{A,Post}$ =					428,195	CF									
18																
19	**Runoff Reduction**															
20	BMP Group:			Volume (RR_V, cf)		Depth (RR_d, in.) *										
21	Volume Reduction, BMP 1			11549		0										
22	Volume Reduction, BMP 2			158052		0.3										
23	Volume Reduction, BMP 3			0		0										
24																
25	RR=Total BMP Volume Reduction Provided=					169601	CF									
26						0.3	in*									
27																
28	$V_{A,Post} - V_{A,Pre} - RR$ =					-2,766	CF									
29																
30	Total Additional Volume Reduction Needed=					0	CF									
31																
32	* For use in curve number modification spreadsheets, for sizing downstream detention basins.															
33																
34																

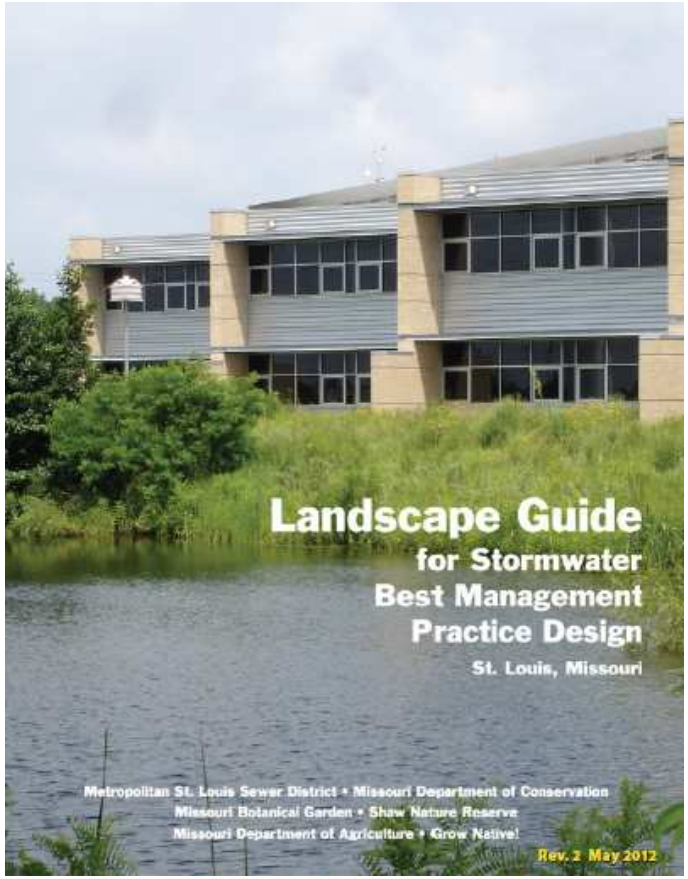
Activities at MSD: Pervious Pavement

- Updated 3/16/12
- Changes
  - Standalone BMP
  - CSM Based Performance Criteria
  - More from Jason…



Activities at MSD: Landscape Seeding Guide

- Updated 5/18/12
- Changes
  - Seeding Guide for Detention Basins and Buffer Areas
  - Bioretention Typical Section
  - Bioretention Soil Media
  - More from John…



Activities at MSD:
GI (CSO Reduction) Pilot Program

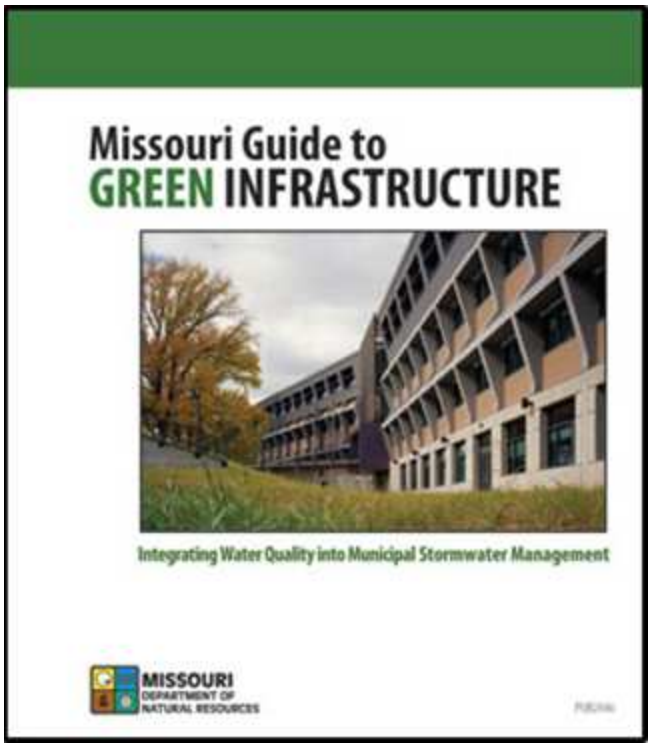
- $3M Green Infrastructure Pilot
  - $1.5M for demolition of impervious area
  - $1.5M for test sites
- Bioretention, Pervious Pavement, Amended Soil
- More from Sue…

Activities at MSD:
Phase II Permit Planning

- Phase II Permit expires July 2013
- Exploring goals for 2013-2018 term
  - Permittees
  - Stakeholders
- Anticipate Draft SWMP Early 2013

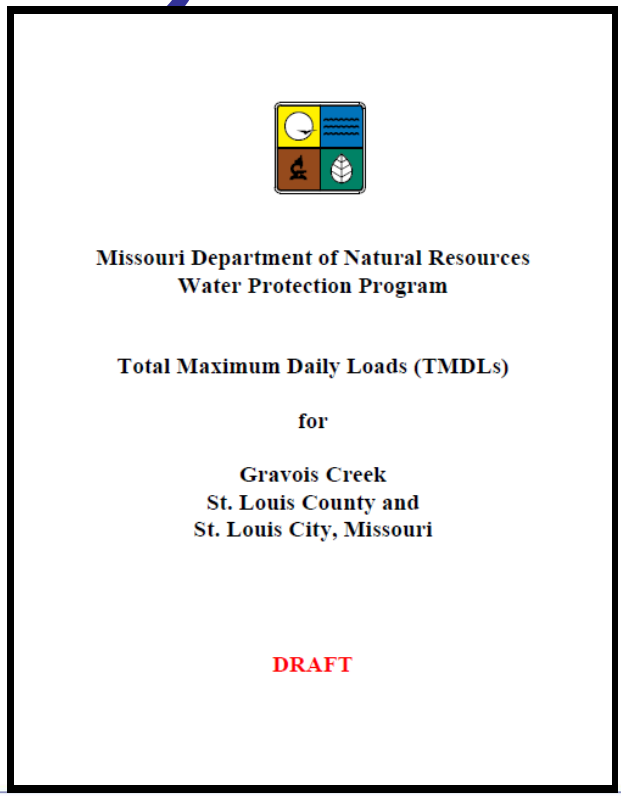
Activities at Missouri DNR: MO Guide to GI

- To find it, "Google" the title…
- A Guide, not a regulation…



Activities at Missouri DNR: Stormwater TMDLs (Bacteria)

- Draft TMDLs for Public Notice
  - Watkins
  - Gravois
  - Creve Coeur (?)
- Waste Load Allocation: all to MS4 stormwater



Missouri Department of Natural Resources
Water Protection Program

Total Maximum Daily Loads (TMDLs)

for

Gravois Creek
St. Louis County and
St. Louis City, Missouri

DRAFT

Activities at US EPA: Proposed Stormwater Rulemaking

Rulemaking Considerations

The proposed national rulemaking is considering the following key rulemaking actions:

- Develop performance standards from newly developed and redeveloped sites to better address stormwater management as projects are built;
- Explore options for expanding the protections of the municipal separate storm sewer systems (MS4) program;
- Evaluate options for establishing and implementing a municipal program to reduce discharges from existing development;
- Evaluate establishing a single set of minimum measures requirements for regulated MS4s. However, industrial requirements may only apply to regulated MS4s serving populations of 100,000 or more;
- Explore options for establishing specific requirements for transportation facilities; and
- Evaluating additional provisions specific to the Chesapeake Bay watershed.

Additional Rulemaking Activities

- Information Collection Request (ICR) for Proposed Rulemaking
- December 28, 2009 FRN: Stakeholder Input on Proposed Rulemaking and National Listening Sessions
- Stakeholder Input on Stormwater Rulemaking Related to the Chesapeake Bay

Rulemaking Schedule

December 2012?

A revised proposal date for the stormwater rulemaking and a final action deadline will be posted shortly.

Questions