NASECA 21th Annual Conference
February 2024

WinSLAMM v 10.5 Updates and Guidance

Using WinSLAMM v10.5 to Meet Urban Stormwater Management Goals

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AECOM, Middleton, WI

WISCONSIN DEPT. OF NATURAL RESOURCES

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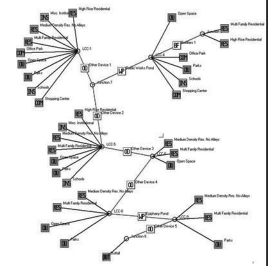
We will cover . . .

Eric

1. **Draft DNR Modeling Guidance**
2. **Modeling Issues**

John

3. **PVA Operations Changes**
4. **Overview of v 10.5 updates and changes**
5. **Biofilter Changes**
6. **Outfall Median Particle Sizes**
7. **Street Source Area Parameter Data Entry**
8. **Linking Files**
9. **Pollutant Strength Outfall Calculations**



1. Draft DNR Modeling Guidance

Draft DNR Stormwater Guidance

Current version shown below

WISCONSIN DEPT. OF NATURAL RESOURCES

BUREAU OF WATERSHED MANAGEMANT PROGRAM GUIDANCE

Watershed Management Team
Storm Water Runoff Program

Wisconsin Department of Natural Resources
101 S. Webster Street, P.O. Box 7921
Madison, WI 53707-7921

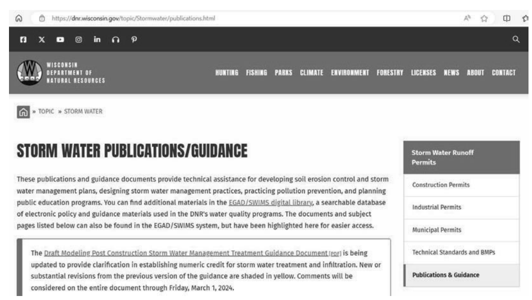
Modeling Post-Construction Storm Water Management Treatment

Updated February 2020
EGAD #: 3800-2020-01
WT-19-0023

1. Draft DNR Modeling Guidance

DNR Modeling Guidance Update

- 48 current sections expands to 62
- Several sections added to address WinSLAMM version 10.5
- Public comments on this draft guidance due Friday, March 1



1. Draft DNR Modeling Guidance

DNR Modeling Guidance Update

<u>Biofilter Issues</u>

- WinSLAMM **'Media data' button** is used to enter the 'Soil , Media Mixtures and Components Table'. 'Composite soil mixtures properties' values for **porosity, field capacity and wilting point** may be applied for DNR engineered soil mixture. However, **maximum infiltration rate of 3.6 in/hr** shall be used for engineered soil media.
- '**Percent solids reduction due to Engineered Media' value of 80%** manually entered for DNR engineered soil
- WinSLAMM Output Summary will give '**A biofilter will clog' warning** if the model predicts that biofilter will clog in less than 10 years – increase filter area to reduce maintenance
- **Monthly average ET rates** in inches/day of 0.10 (Apr), 0.14 (May), 0.15 (June), 0.15 (July), 0.12 (Aug), 0.09 (Sept), 0.07 (Oct), and 0.03 (Nov) may be used

1. Draft DNR Modeling Guidance

Updates to DNR Guidance

<u>Misc. Issues</u>

- **Percent of Tree Canopy Cover** may be added for parking lots. Street runoff already includes the effects of average tree canopy cover.
- 'Freeway' land use file has Freeway Areas, Paved Lane/Shoulder Areas (sources areas 1-10) and Urban Highways, High Traffic Urban (source areas 11-18). **High Traffic Urban (source areas 11-18) should be used for urban highways.**
  - HTU source areas based on the latest USGS monitoring of runoff

1. Draft DNR Modeling Guidance

Updates to DNR Guidance

Infiltration Draw Down Times

- Infiltration device should be designed to draw down within **24 hours (surface)** and within **72 hours (subsurface)** from the end of a single rainfall event such as a 1-yr/24-hr event
  - Design should account for an extended period of release from an upgradient detention facility
- For infiltration devices that are within an internally drained watershed, surface device should be designed to draw down within **72 hours** from the end of a 100-yr/24-hr rainfall event
- Models analyzing an annual rainfall series might not be designed to measure draw down from the end of a rainfall event or may include the effect of back-to-back rainfalls on its calculated draw down time

1. Draft DNR Modeling Guidance

Updates to DNR Guidance

Misc. Issues

- NR 151 infiltration standard should be evaluated based on the **same area from existing to proposed conditions**
- **Permeable pavement** is a **treatment device**, which may allow for infiltration depending on the site-specific conditions. Permeable pavement should be modeled as an impervious source area and given infiltration credit as an infiltration device

1. Draft DNR Modeling Guidance

Updates to DNR Guidance

Filter Strips

- Runoff from an impervious area to a vegetated buffer can be **modeled as either disconnected or as a filter strip** but should not be modeled as both. SLAMM model may overestimate pollutant reduction and/or infiltration when modeling both in series.
- Filter strip treatment may be modeled in WinSLAMM, but only for treating sheet flow runoff traveling less than 100 feet in the direction of flow. Sheet flow length is typically between 50 and 100 feet; however, based on Manning's n and slope, shallow concentrated flow can occur in less than 100 feet. The total length of contributing flow plus the length of the filter strip should be no more than 100 ft. to ensure that sheet flow conditions will be maintained.

1. Draft DNR Modeling Guidance

Updates to DNR Guidance

Filter Strips (cont.)

- SLAMM filter strip device designed to estimate pollutant control, version **10.5.0 and earlier do not assess both infiltration and pollutant correctly in the same model run**. Keep in mind that an effective infiltration area should be modeled as source area 70 (Water Body Area) to eliminate double counting of infiltration. However, if effective infiltration area of a filter strip is modeled as a waterbody area (source area 70), then the TSS load from the vegetated area is eliminated and pollutant calculation is incorrect.

  Recommendation: When calculating TSS control in SLAMM, modeling as a filter strip will give appropriate TSS control with the filter strip coded as a pervious source area. If modeling to show infiltration reduction (not TSS control), then model as a disconnected source area if the disconnection criteria are met. If necessary to model with filter strip for infiltration, then code its effective infiltration area of filter strip as source area 70 (Water Body Area) to eliminate double counting of infiltration.

2. Modeling Issues

Modeling Issues

Municipal Issues

1. Credit from private treatment practices allowable if municipalities have authority to require maintenance
2. DNR allows Dry Ponds in WinSLAMM, with reduced performance as determined by the model, so long as:
   1. Inlet energy dissipated
   2. Outlet protected by sediment barrier
   3. No low flow pilot channel
   4. Basin well vegetated
   5. Maximum water surface rise less than 5 ft for 1-yr, 24-hr storm
   6. Basin draws down within 24-hrs for 1-yr, 24-hr storm
   7. SOC Team developing new standard

2. Modeling Issues

Site Level Issues

1. Connected vs Disconnectedness. See Post-Construction Modeling Guidance, Items 39 - 43: http://dnr.wi.gov/topic/stormwater/documents/Modeling_Post-Construction_Guidance.pdf
2. Permanent pool of wet detention ponds and effective infiltration areas must be included as a Water Body Area.
3. Source area soil types: A: Sandy, B: Silty, C/D: Clayey.
4. Hard copy submittals should include:
   a. Input (use File/Print Input Data menu option)
   b. Output Summary (use Print Output Summary button on Outfall Output Summary tab)
   c. Control Practice Summary Tab
   d. Drainage system diagram

Site Level Issues

5. Use Infiltration Rates from SOC Standard 1002, not default values in WinSLAMM.
6. Filter strips are for sheet flow, not concentrated flow.
7. Enter Dynamic, not Static, Infiltration rates for swales and filter strips.
8. Typically enter the wet pond initial elevation equal to the lowest outlet invert elevation.
9. A corollary – the datum is zero and all subsequent elevations use the zero datum. No negative elevations allowed.

Site Level Issues

10. Infiltration rate for biofilters with engineered media but no underdrain should use **lower infiltration rate between native soil and engineered media for both**.
11. Don't enter an underdrain invert elevation above datum depth that exceeds the 72 hour subsurface drain time for bioretention, stone trench, and permeable pavement systems.
12. For any back-to-back rainfall events that extend the 24 hour surface drawdown time, verify that the depth from the lowest surface outlet to the basin surface can draw down, by design, within 24 hours.
13. Verify that long-term drainage from upstream facility does not consistently/significantly increase above- or below-ground drawdown time.

Site Level Issues

14. Enter "80" for the biofilter percent solids reduction due to engineered media.
15. Enter "65" for the permeable pavement underdrain discharge percent TSS reduction.
16. Proper use of 'Other Device' including Tools-Program Options-Default Model Options check box.
17. Reality check your model, including a review of the 'Control Practice' summary tab for realistic volume and load reductions.

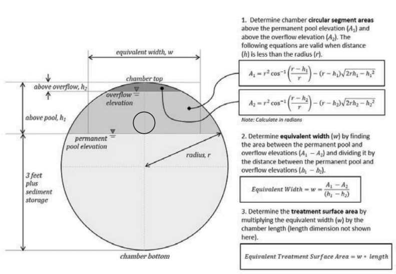
Site Level Issues

18. When using the 'Other Outlet' discharge option in Wet Ponds or Biofilters, show how you got the discharge rates.
19. The Isolator Row performance is based upon settling in the entire footprint of the device, not just the area of the isolator row chamber.
20. Back up files regularly. Take advantage of the file re-name option when upgrading from v 10.4 to v 10.5

Site Level Issues

22. Modeling underground storage. Use DNR Post Construction Modeling Guidance to convert a circular pipe detention area into a vertical wall detention area.

Note - Set the pipe datum at the top of the sediment storage elevation



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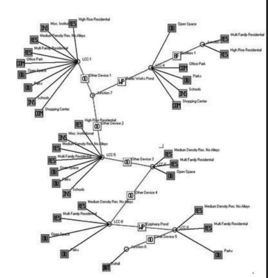
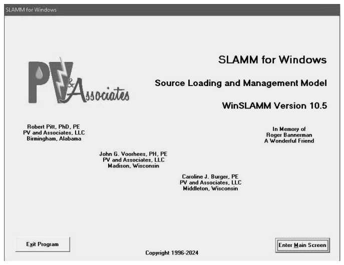


3. PVA Operations Changes

PVA Operations Changes

- Doug Joachim has resigned his PVA position – he provided technical support
- Caroline Burger is taking a long-term leave from PVA – she provided training and web site support
- We don't yet know how we will replace either of them
- Our response to queries will be slower



3. PVA Operations Changes

PVA Web Site Update

www.winslamm.net

3. PVA Operations Changes

PVA Web Site Update

Technical Report Table of Contents

Wet Weather Flow Literature Reviews
Monitoring Strategies For Stormwater
Surface Water Effects Due To Stormwater
Potential Gw Contamination By Sw
Stormwater Characteristics
- National Stormwater Quality Database
- Heavy Metals
- Microorganisms
- Pahs
- Emerging Contaminants
- Ssos
- Highway Runoff

Stormwater Pollutant Sources
Inappropriate Discharges To Stormwater Drainage Systems
Land Development Characteristics
Urban Hydrology
Compacted Urban Soils
Stormwater Treatment
- Street Cleaning
- Inlets And Catchbasins
- Grass Swales
- Detention Ponds
- Media Treatment
- Treatment Trains Including Upflow And Mctt
- Bioinfiltration And Infiltration
- Green Infrastructure And Csos
- Treatment Costs

Transportation Accidents And The Environment
Stormwater Management And Modeling
Sensors And Laser Fluorescence Analyses

Non-potable Beneficial Uses Of Stormwater
Construction Site Erosion And Sediment Control
Theses And Dissertations
Presentations
- Academic Seminars
- Asce Ewri Conferences
- Casqa Conferences
- Lid Conferences
- Other Stormwater Conferences
- Regional Conferences
- Shanghai Cso Conference
- Urban Water Modeling Conferences In Toronto
- Weftec Conferences
- Werf Forums
- Workshop Presentations
  - 2017 2021 Beijing Water Science And Technology Center
    - June 2017 Stormwater Characteristics And Monitoring
    - July 2017 Stormwaster Treatment With Media
    - Oct 2017 Stormwater Control Ponds And Public Works
    - Nov 2017 Stormwater Treatment And Winslamm
    - Satec Conv May 2018
    - May 2018 Erosion Planning
    - June 2018 Erosion Control
    - Aug 2018 Stat Basis Of Sw Sampling
    - Oct 2019 Specialized Sampling And Large Scale Case Studies
    - Nov 2019 Future Designs Vs Conventional Approaches
    - Nov 2021 Cso And Gi
  - 2023 Nov Wright Water Engineers Workshop

Navy Stormwater Monitoring And Modeling Reports 2010 To 2017
Serdp Stormwater Monitoring And Modeling Reports 2018 To 2023

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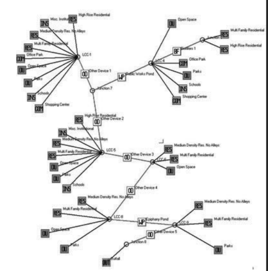

4. WinSLAMM v 10.5 Changes

Version 10.5 Updates, Changes, Issues

1. Tree Canopy source area adjustments
2. Biofilter Media Table update
3. Linking Files
4. Detention Pond area calcs
5. Control Practice database
6. Minor Isolator Row updates
7. Street Parameter presentation
8. Orifice Discharge Equations
9. Rainfall file creator updates
10. Pollutant Strength Calculation Option (v 10.5.1)

Will Not Affect Output Will Affect Output

Current Issues

- "ProShowCentered in Global_ProcessProcedures" error usually due to mis-matched monitors.
- Biofilter drain down time in v 10.5.0 in Control Practice Summary is incorrect
- Biofilter in v 10.5.0 does not work if there is only a stone storage layer and no media layer

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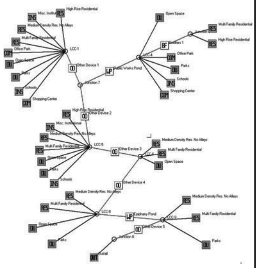


5. Biofilter Media

Biofilter Modifications

The new Data Components for Biofilter Media Types Include:

- Filterable Pollutant Retention by Particle Size Group
- Particulate (TSS) Retention by Particle Size Group
- Influent and Effluent Pollutant Concentration Regression Equations for Particle Size Ranges
- Data from Full Depth Column Tests and Field Tests
- Media Clogging
- Breakthrough Time (in upcoming release)

This New Data has Significantly Expanded the Data Table

5. Biofilter Media

Update Biofilter Media Data

Version 10.4 Biofilter Media Table

Detailed Media Characteristics

Soil Type Texture	Saturation Water Content % (Porosity)	Field Capacity (Percent)	Permanent Wilting Point (Percent)	Infiltration Rate (in/hr)	Fraction of Soil Type Texture in Engineered Soil (0-1)
User-Defined Soil Type	0.0	0.0	0.0	0.000	0.000
Gravel	32	4	0	40	0.000
Sands	38	8	2.5	13	0.000
Loamy Sands	39	13.5	4.5	2.5	0.000
Sandy Loams	40	19.5	6.5	1	0.000
Fine Sandy Loams	42	26.5	10.5	0.5	0.000
Loams & Silt Loams	43	34	14	0.15	0.000
Clay Loams/Silty Clay Loams	50	34.5	17	0.1	0.000
Silty Clays & Clays	55	33.5	18	0.015	0.000
Peat as Amendment	78	59	5	3	0.000
Compost as Amendment	61	55	5	3	0.000
Composite Soil Mixture Properties	0.0	0.0	0.0	0.000	**0.000**

Apply Soil Mixture Values as a User Defined Soil Mixture | Apply Porosity | Apply Field Capacity | Apply Wilting Point | Apply Infiltration Rate | Apply All Values

Soil Texture Fraction in last column Less Than 1 | Cancel | Continue

Old Data Table

5. Biofilter Media

The new Data Table works the same way as the v 10.4 table, but with more media options

Soil – Typical soil types, not much different from previous version

Rhyolite Sand – Porous volcanic sand

Green Roof Light Media – Expanded slate, other light and porous materials

Zeolite – lightweight volcanic mineral that attracts heavy metals

Compost and Peat – Infiltration rate varies based on percent of organic matter

Wisconsin users should comply with DNR Infiltration Standard requirements

Soil, Media Mixtures and Components Table

Soil Type Texture	Saturation Water Content % (Porosity)	Field Capacity (Percent)	Permanent Wilting Point (Percent)	Infiltration Rate (in/hr)	Fraction of Soil Type Texture in Treatment Soil (0-1)
User-Defined Media Type					
Soil					
Well Graded Sand	38	8	2.5	13	
Loamy Sand	39	13.5	4.5	2.5	
Sandy Loam	40	19.5	6.5	1	
Loam	43	34	14	0.15	
Silt Loam	43	34	14	0.15	
Silt	42	30	12	0.3	
Sandy Clay Loam	42	26.5	10.5	0.5	
Clay Loam	50	34.5	17	0.1	
Silty Clay Loam	50	34.5	17	0.1	
Sandy Clay	40	34	17	0.05	
Silty Clay	55	33.5	18	0.015	
Clay	55	33.5	18	0.015	
Other Media					
Fine Rhyolite Sand	38	8	2.5	13	
Fine Sand	38	8	2.5	13	
Filter Sand	38	8	2.5	13	
Coarse Sand	32	4	0	40	
Gravel	32	4	0	40	
Light Media for Green Roofs	50	20	5	13	
Chemically Active Amendments					
Activated Carbon	32	4	0	40	
Fine Zeolite (SMZ)	32	4	0	40	
Coarse Zeolite	32	4	0	40	
Compost	61	55	5	Varies	
Peat Moss	78	59	5	Varies	
User Defined Amendments					
'BF Other Media Data Loamy Sand Inde	39	13.5	4.5	2.5	
Pre-Defined Media Mixtures					
Composite Media Mixture Properties	**0.0**	**0.0**	**0.0**	**0.000**	**0.000**

Apply Soil Mixture Values as a User Defined Soil Mixture | Apply Porosity | Apply Field Capacity | Apply Wilting Point | Apply Infiltration Rate | Apply All Values

Soil Texture Fraction in last column Less Than 1 | Cancel | Continue

5. Biofilter Media

Media Mixtures

These mixtures require that you enter a 1.0 as the fraction

To activate red square info, click on the cell with the square and hover over the red square

User defined data will be activated with a text file that allows the user to define all variables associated with pollutant removal.

Soil, Media Mixtures and Components Table

Soil Type Texture	Saturation Water Content % (Porosity)	Field Capacity (Percent)	Permanent Wilting Point (Percent)	Infiltration Rate (in/hr)	Fraction of Soil Type Texture in Treatment Soil (0-1)
Sandy Clay Loam	42	26.5	10.5	0.5	
Clay Loam	50	34.5	17	0.1	
Silty Clay Loam	50	34.5	17	0.1	
Sandy Clay	40	34	17	0.05	
Silty Clay	55	33.5	18	0.015	
Clay	55	33.5	18	0.015	
Other Media					
Fine Rhyolite Sand	38	8	2.5	13	
Fine Sand	38	8	2.5	13	
Filter Sand	38	8	2.5	13	
Coarse Sand	32	4	0	40	
Gravel	32	4	0	40	
Light Media for Green Roofs	50	20	5	13	
Chemically Active Amendments					
Activated Carbon	32	4	0	40	
Fine Zeolite (SMZ)	32	4	0	40	
Coarse Zeolite	32	4	0	40	
Compost	61	55	5	Varies	
Peat Moss	78	59	5	Varies	
User Defined Amendments					
Pre-Defined Media Mixtures					
Rhyolite Sand - SMZ	43	4	0	25	
Rhyolite Sand - SMZ-GAC	41	4	0	25	
Rhyolite Sand - SMZ-GAC-PM	43	10	0.5	25	
Iron Fillings (5%) / Sand	38	8	2.5	13	
Biofilter Media Mixtures					
Kansas City	40	12	10	.55	
Neenah 2	40	10	5	20.5	
North Carolina	40	7	5	18.7	
Composite Media Mixture Properties	**0.0**	**0.0**	**0.0**	**0.000**	**0.000**

Apply Soil Mixture Values as a User Defined Soil Mixture | Apply Porosity | Apply Field Capacity | Apply Wilting Point | Apply Infiltration Rate | Apply All Values

Soil Texture Fraction in last column Less Than 1 | Cancel | Continue

5. Biofilter Media

Two **User Defined Media** Options

1. Select the **User Defined Media Type** checkbox to enter the Percent Solids Reduction due to Treatment Media value as allowed by WDNR standards

Soil, Media Mixtures and Components Table

Soil Type Texture	Saturation Water Content % (Porosity)	Field Capacity (Percent)	Permanent Wilting Point (Percent)	Infiltration Rate (in/hr)	Fraction of Soil Type Texture in Treatment Soil (0-1)
User-Defined Media Type	0.0	0.0	0.0	0.000	**1.000**
Soil					
Well Graded Sand	38	8	2.5	13	
Loamy Sand	39	13.5	4.5	2.5	
Sandy Loam	40	19.5	6.5	1	
Loam	43	34	14	0.15	
Silt Loam	43	34	14	0.15	
Silt	42	30	12	0.3	

Biofiltration Control Device

Drainage System Control Practice

Device Properties **Biofilter Number 1**

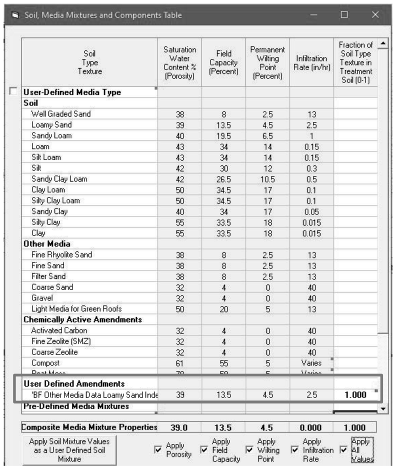
Top Area (sf)	0
Bottom Area (sf)	0
Total Depth (ft)	0.00
Typical Width (ft) (Cost est. only)	10.00
Native Soil Infiltration Rate (in/hr)	0.000
Native Soil Infiltration Rate COV	N/A
Infil. Rate Fraction-Bottom (0.001-1)	1.000
Infil. Rate Fraction-Sides (0.001-1)	1.000
Rock Filled Depth (ft)	0.00
Rock Fill Porosity (0-1)	0.00
Treatment Media Type	Media Data
Treatment Media Infiltration Rate (in/hr)	0.00
Treatment Media Infiltration Rate COV	N/A
Treatment Media Depth (ft)	0.00
Treatment Media Porosity (0-1)	0.00
Percent solids reduction due to Treatment Media (0 -100)	0
Number of Devices in Source Area or Upstream Drainage System	1

The clogging rate is matched to the soil type with an infiltration rate closest to that soil's rate

5. Biofilter Media

Or . . .

2. Select the **User Defined Amendment** option from the new Media Table



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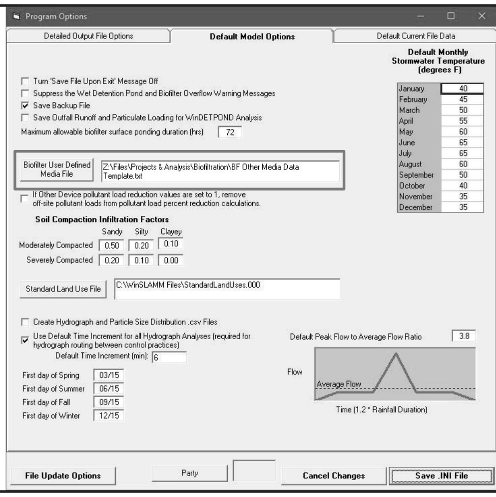
Coarse Zeolite	32	4	0	40	
Compost	61	55	5	Varies	
User Defined Amendments					
BF Other Media Data Loamy Sand Inde	39	13.5	4.5	2.5	1.000
Pre-Defined Media Mixtures					
Composite Media Mixture Properties	39.0	13.5	4.5	0.000	1.000

Apply Soil Mixture Values as a User Defined Soil Mixture | Apply Porosity | Apply Field Capacity | Apply Wilting Point | Apply Infiltration Rate | Apply All Values

5. Biofilter Media

User Defined Media Data Requirements

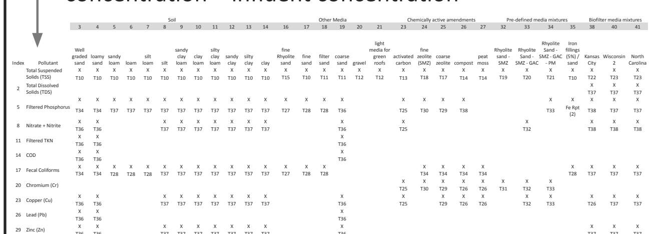
- Physical properties – Saturation water content, Field capacity, Permanent wilting point, Infiltration rate, D_{60}, D_{50}, D_{10}
- Clogging load
- TSS removal equations by particle size range – Linear equation format
- For each pollutant
  - Removal equation types – 1) Constant, 2) Linear, 3) Log-Log, 4) Fraction Reduction
  - Removal equation coefficients
  - Dataset minimum and maximum values for range



5. Biofilter Media

Data Summary Table for Pollutants and Media

- "Biofilter Media Performance Updates for WinSLAMM"
- Lists standard WinSLAMM pollutants and TSS
- Pollutants added in v 10.5
- Based upon available data – if no data, effluent concentration = influent concentration



5. Biofilter Media

Example Tables for Pollutants and Media, T10 and T26

T10 – TSS Removal for Typical Soil Types

Table 10. Low to High Concentrations (100 to 800 SSC mg/L), fine media (about 300 um) (data from Sileshi 2013)

>1000 um		301 to 1000 um		101 to 300 um		31 to 100 um		11 to 30 um		4 to 10 um		1 to 3 um		total	
inf	efl	inf	efl	inf	efl	inf	efl	inf	efl	inf	efl	inf	efl	inf	efl
no sign regression		no sign regression		no sign regression		intercept sign		intercept sign		intercept sign		no likely removal		intercept sign	
mean	efl = 0	mean	efl = 0	mean	efl = 0.06	mean	efl = 0.30	mean	efl = 1.55	mean	efl = 2.43			mean	efl = 4.5
COV	n/a	COV	n/a	COV	1.33	COV	0.5	COV	0.66	COV	0.3			COV	0.39

sign == significant

T26 – Pollutant Removal for Peat Moss and Compost

Table 26. Removals for Peat Moss for Full-Depth Column Tests (50/50 mix with filter sand) (SSFL)

Constituent, mg/L unless noted otherwise	regression equation (or Y = constant, and COV also shown)**	Mean Influent Concentration (approximate range)***
pH	Y = X - 3.0	7.7 (7.3 to 8.2)
Chloride	Y = 33 (0.15)	18 (1 to 34)
Fluoride	Y = 0.67X	2.6 (1.7 to 3.1)
Aluminum, filtered, µg/L	Y = 778 (0.48)	73 (<LOD to 121)
Calcium, filtered, µg/L	Y = 0.40 X	30,400 (22,150 to 42,400)
Cadmium, filtered, µg/L	almost all effluent <LOD	28 (1 to 54)
Copper, filtered, µg/L	Y = 12.3 (0.26)	42 (23 to 69)
Manganese, filtered, µg/L	Y = 230 (0.64)	3.4 (<LOD to 13)
Nickel, filtered, µg/L	Y = 4.8 (0.62)	27 (7 to 68)
Chromium, filtered, µg/L	Y = 3.8 (0.9)	14 (7 to 19)
Thallium, filtered, µg/L	Y = 13 (0.63)	64 (27 to 94)
Antimony, filtered, µg/L	Y = 8.1 (1.7)	56 (39 to 86)

5. Biofilter Media

Why Vegetate the Media? **Clogging**

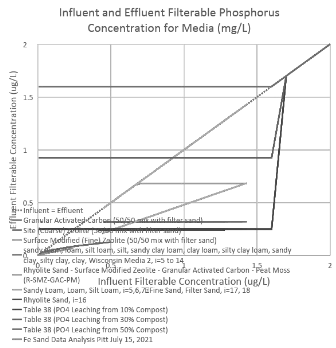
Defined Four Conditions

	Not Vegetated	Vegetated
<1/10 max clogging load in first year	Continue to decrease infiltration rate after each event and shut down when the maximum load is reached	Hold infiltration rate constant after the first year and do not decrease further
>1/10 max clogging load in first year	Continue to decrease infiltration rate after each event and shut down when the maximum load is reached	Continue to decrease infiltration rate after each event and shut down when the maximum load is reached

5. Biofilter Media

Example Performance Plot - Filterable Phosphorus Removal

- Many media options
- Some media effluent concentrations > influent concentrations
- Includes Fe media performance from SAFL



We will cover . . .

Eric

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2. **Modeling Issues**

John

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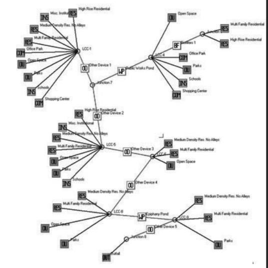
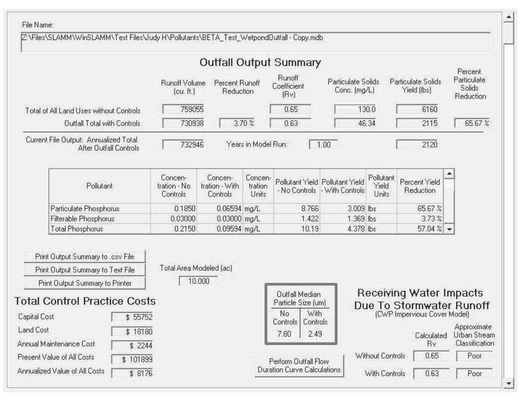
7. **Street Source Area Parameter Data Entry**
8. **Linking Files**
9. **Pollutant Strength Outfall Calculations**



6. Outfall Median Particle Size

Outfall Median Particle Size



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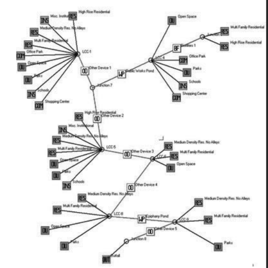


7. Street Source Area Parameter Changes

Different Street Source Area Data Entry Process

- Reconfigured this form due to confusion about street length and curb miles.
- The updated form requires an explicit selection of the number of street edges
- The form has units of edge-miles rather than curb-miles
- The default number of edges for a street is 2 - the same used in previously in WinSLAMM
- Enter either the <u>total street length</u> or the <u>paved street</u> <u>width</u>
- The form includes a graphic representation of the selected street edge option, dimensioned

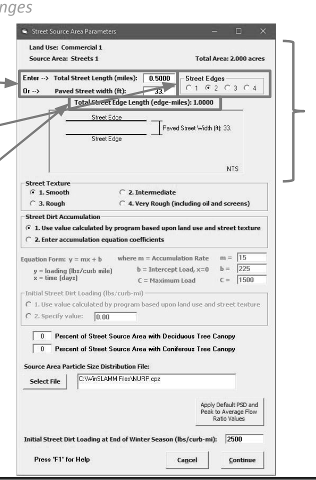
7. Street Source Area Parameter Changes

Enter either the Total Street Length (miles) or the Paved Street Width (ft)

Select the Number of Street Edges

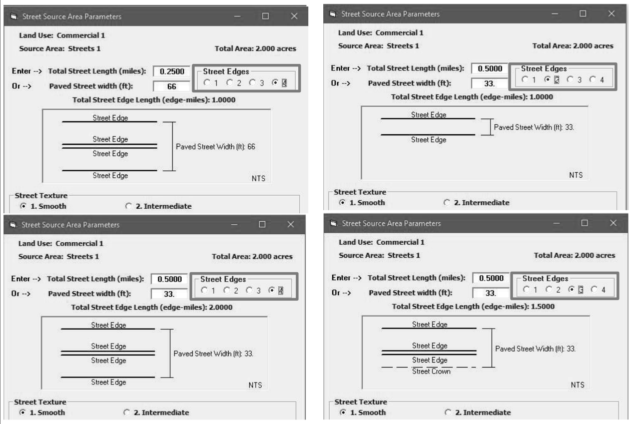
WinSLAMM calculates the Total Street Edge Length (edge-mi)

The graphic illustrates the selected condition



7. Street Source Area Parameter Changes

Examples



Street Dirt Accumulation and Washoff Considerations

As width and area get larger but the number of street edges stays the same, runoff volume increases but TSS stays the same

1 - Same Street Texture, Length, Edges, with Varying Width, Area

Street Area (ac)	Street Length (mi)	Street Width (ft)	Street Edges	Total Street Edge Length (mi)	Street Texture	Runoff Volume (cf)	Part. Solids Yield (lbs)	Concentra-tion (mg/L)
1.94	1.00	16	2	2.00	Intermediate	168659	3681	349
2.42	1.00	20	2	2.00	Intermediate	210836	3681	279
2.91	1.00	24	2	2.00	Intermediate	253017	3681	233
3.88	1.00	32	2	2.00	Intermediate	337393	3681	174

Street Dirt Accumulation and Washoff Considerations

If width and area stay the same but the number of street edges increases, runoff volume stays the same but TSS increases

2 - Same Street Area, Length, Width, with Varying Number of Street Edges

Street Area (ac)	Street Length (mi)	Street Width (ft)	Street Edges	Total Street Edge Length (mi)	Street Texture	Runoff Volume (cf)	Part. Solids Yield (lbs)	Concentra-tion (mg/L)
4.00	1.72	24	1	1.00	Intermediate	434887	3164	116
4.00	1.72	24	2	2.00	Intermediate	434887	6328	233
4.00	1.72	24	3	3.00	Intermediate	434887	9491	349
4.00	1.72	24	4	4.00	Intermediate	434887	12656	466

Street Dirt Accumulation and Washoff Considerations

If street length stays the same but width, street area and street edges increase, both volume and TSS increase

3 - Same Street Length, Texture, with Varying Number of Street Edges, Widths and Areas

Street Area (ac)	Street Length (mi)	Street Width (ft)	Street Edges	Total Street Edge Length (mi)	Street Texture	Runoff Volume (cf)	Part. Solids Yield (lbs)	Concentra-tion (mg/L)
1.94	1.00	16	1	1.00	Intermediate	168659	1840	174
2.42	1.00	20	2	2.00	Intermediate	210836	3681	279
2.91	1.00	24	3	3.00	Intermediate	253017	5522	349
3.88	1.00	32	4	4.00	Intermediate	339393	7364	349

Street Dirt Accumulation and Washoff Considerations

If only street texture changes, volume and TSS both change as a function of street texture but only between intermediate and rough textures

4 - Same Street Area, Length, Width, Edges, with Varying Street Texture

Street Area (ac)	Street Length (mi)	Street Width (ft)	Street Edges	Total Street Edge Length (mi)	Street Texture	Runoff Volume (cf)	Part. Solids Yield (lbs)	Concentra-tion (mg/L)
5.00	1.72	24	2	3.44	Smooth	434887	6328	233
5.00	1.72	24	2	3.44	Intermediate	434887	6328	233
5.00	1.72	24	2	3.44	Rough	350281	5867	268
5.00	1.72	24	2	3.44	Very Rough	350281	5875	268

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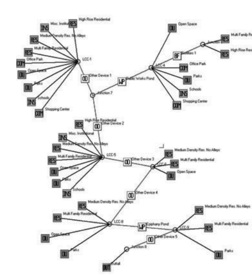

8. Model Linking

Using Output from One WinSLAMM Model as Input to Another

Allows users to link the Output from any WinSLAMM Model as Input to another Model

Two Step Process –

1. Create the Link Files
2. Insert the Link Files into the Model File

- Updates to the Help File should make the process easier to understand

We will cover . . .

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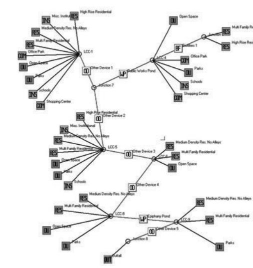


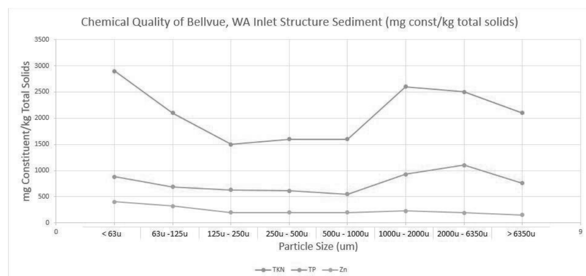
9. Outfall Particulate Pollutant Strength

Particulate Pollutant Strength Correction Factors

- WinSLAMM currently calculates particulate pollutant loadings based upon particulate solids loading as mg or ug pollutant per kg TSS
- However, concentration of particulate pollutants (eg, Particulate Phosphorus) <u>varies depending upon particle size</u>
- V 10.5.1 includes modifications to account for this variation at the outfall
- Based upon extensive sets of data collected over many years – See WinSLAMM Algorithm Description documentation on the PVA web site

9. Outfall Particulate Pollutant Strength

Particulate Pollutant Strength Variation Example



9. Outfall Particulate Pollutant Strength

Particulate Strength Correction Factors for Particle Sizes for Standard WinSLAMM Particulate Pollutants

									Example "Other Pollutants"					
bin#	range	Phosphorus	TKN	COD	Chromium	Copper	Lead	Zinc	Cadmium	Pyrene	Naphtha-lene	Fuorene	Phenanth-rene	Anthra-cene
1	0.45 to < 2	1.68	1	1.2	0.68	0.61	0.69	1.56	1.23	1.64	1.58	0.68	0.17	1.6
2	2 to < 3	0.71	1	0.66	0.68	0.61	0.69	1.56	1.23	1.64	1.58	0.68	0.17	1.6
3	3 to < 4	0.71	1	0.66	0.68	0.61	0.69	1.56	1.23	1.64	1.58	0.68	0.17	1.6
4	4 to < 5	0.71	1	0.66	0.68	0.61	0.69	1.56	1.23	1.64	1.58	0.68	0.17	1.6
5	5 to < 6	0.71	1	0.66	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
6	6 to < 7	0.71	1	0.66	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
7	7 to < 8	0.71	1	0.66	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
8	8 to < 9	0.71	1	0.66	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
9	9 to < 10	0.71	1	0.66	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
10	10 to < 11	0.81	1	0.67	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
11	11 to < 12	0.81	1	0.67	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
12	12 to < 13	0.81	1	0.67	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
13	13 to < 14	0.81	1	0.67	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
14	14 to < 15	0.81	1	0.67	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
15	15 to < 20	0.81	1	0.67	0.66	1.16	1.09	0.47	0.75	0.48	0.43	0.94	0.64	0.76
16	20 to < 25	0.81	1	0.67	0.73	0.7	0.75	0.56	0.79	0.43	1.14	0.69	0.87	0.64
17	25 to < 30	0.81	1	0.67	0.73	0.7	0.75	0.56	0.79	0.43	1.14	0.69	0.87	0.64
18	30 to < 35	0.81	1	0.67	0.73	0.7	0.75	0.56	0.79	0.43	1.14	0.69	0.87	0.64
19	35 to < 40	0.81	1	0.67	0.73	0.7	0.75	0.56	0.79	0.43	1.14	0.69	0.87	0.64
20	40 to < 50	0.78	1.29	1.15	0.73	0.7	0.75	0.56	0.79	0.43	1.14	0.69	0.87	0.64
21	50 to < 60	1	1.07	1.09	0.73	0.7	0.75	0.56	0.79	0.43	1.14	0.69	0.87	0.64
22	60 to < 80	1.16	0.89	1.2	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
23	80 to < 100	0.71	0.93	0.9	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
24	100 to < 150	0.68	0.93	0.96	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
25	150 to < 200	0.53	0.79	0.54	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
26	200 to < 300	0.52	0.49	0.66	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
27	300 to < 500	0.7	0.56	0.68	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
28	500 to < 800	0.7	0.56	0.7	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
29	800 to < 1000	0.69	0.83	0.86	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
30	1000 to < 2000	0.88	1.23	1.15	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
31	=> 2000	0.9	1.18	1.43	1.92	1.47	1.43	1.57	1.26	1.44	0.95	1.97	1.94	1.32
	source:	avg	avg	avg	SERDP 2022	SERDP 2022	SERDP 2022	SERDP 2022	SERDP 2022	SERDP 2022	SERDP 2022	SERDP 2022	SERDP 2022	SERDP 2022

9. Outfall Particulate Pollutant Strength

Particulate Strength Application Consequences

- Currently no guidelines or requirements for use in Wisconsin
- It is easy in WinSLAMM to turn off or turn on Particulate Strength calculations
- The only current TMDL pollutant affected is Total Phosphorus (TP)
- Model run with <u>one wet detention pond</u>:
  - TP reduction without Particulate Strength – 66.32%
  - TP reduction with Correction Factor – 63.03%

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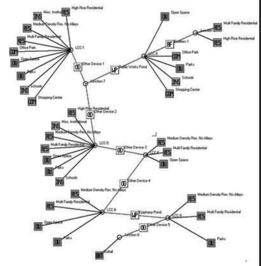

Questions?