

Water Environmental Services

Sanitary and Stormwater Rules and Standards Workshop #3A – Sizing Tools

November 5 | 2018



Today's Plan

- Performance Standards Review
- Flow Duration Matching Tools
- Facility Sizing Tools Demos
- Wrap-Up Discussion

BMP Sizing Tool

MGS Flood

WWHM

TRUST

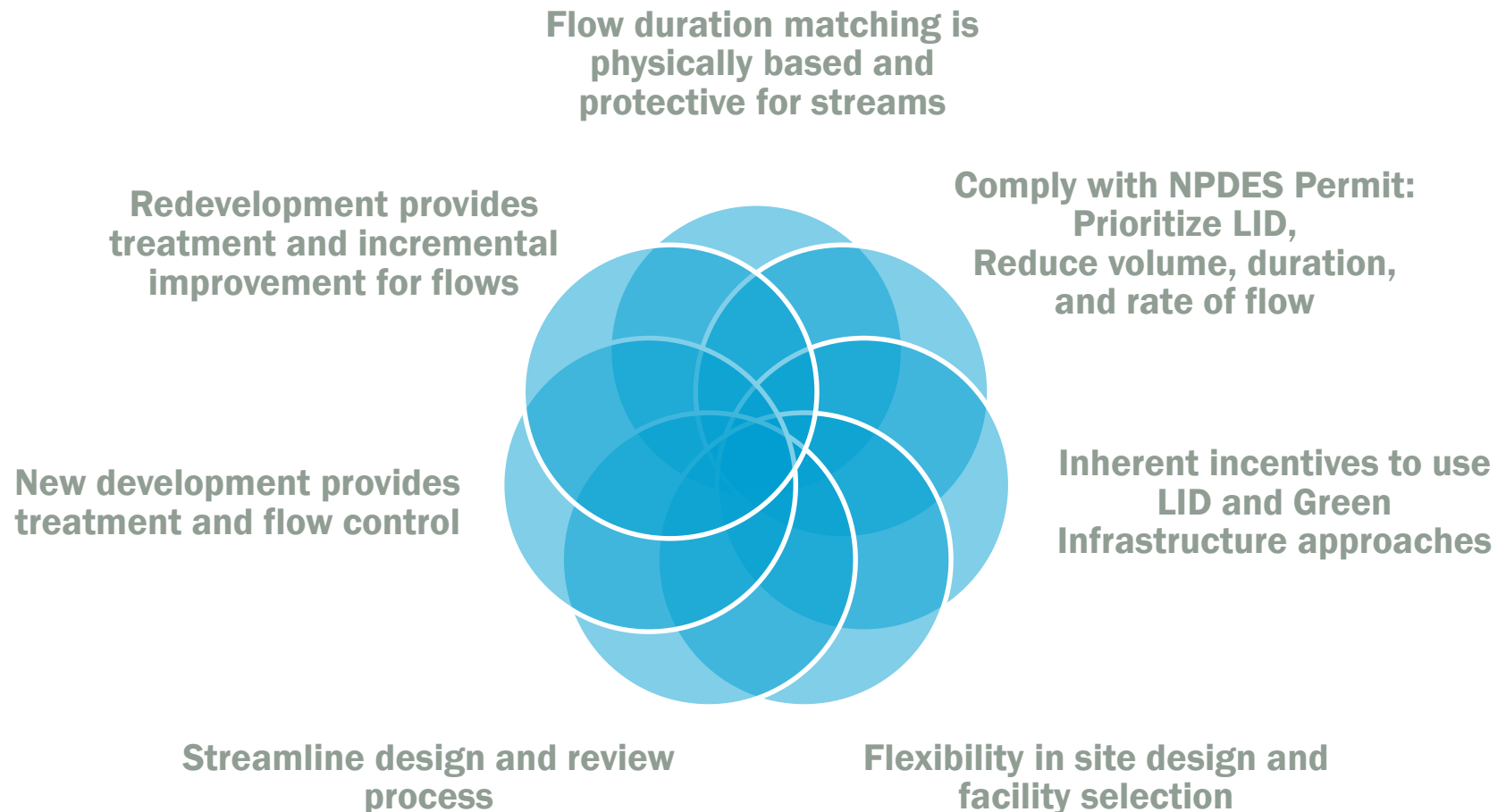
EPA National Stormwater
Calculator

Portland PAC Tool

Performance Standards

Review Proposal

Performance Standards Challenges and Issues



Performance Standards WES Proposal

Site Planning

- Allocate a percentage of the site to LID facilities or other green approaches (5-6% of impervious surface)
- or
- Demonstrate that WQ and flow control standards are met through LID facilities

Water Quality

- Capture and treat 80% of average annual runoff volume
- Size facilities for 1" 24-hour storm

Flow Control

- Match flow durations to immediate pre-development conditions
- *Infiltration can be used to meet performance standard*
- *Flow control exemptions for direct discharge to major water bodies*

Fee in lieu option TBD...

Water Quality

- Capture and treat 80% of average annual runoff volume
 - 1.0 inch, 24-hour storm is appropriate for Clackamas County
- Water quality facility calculation methods:
 - Volume calculations
 - Event-based modeling (SBUH, SCS, etc.)
 - Continuous simulation modeling
 - Prescriptive sizing tools



Flow Control

- Match flow durations to pre-development conditions
 - Pre-development is defined as the conditions of the site immediately prior to development
 - Infiltration can be used to meet performance standard
 - Flow control exemptions for discharge to major water bodies
 - Requires more complex calculation tools
- Questions:
 - What is the appropriate range of flows?
 - Can the flow-duration matching performance standard be approximated by a peak flow model?



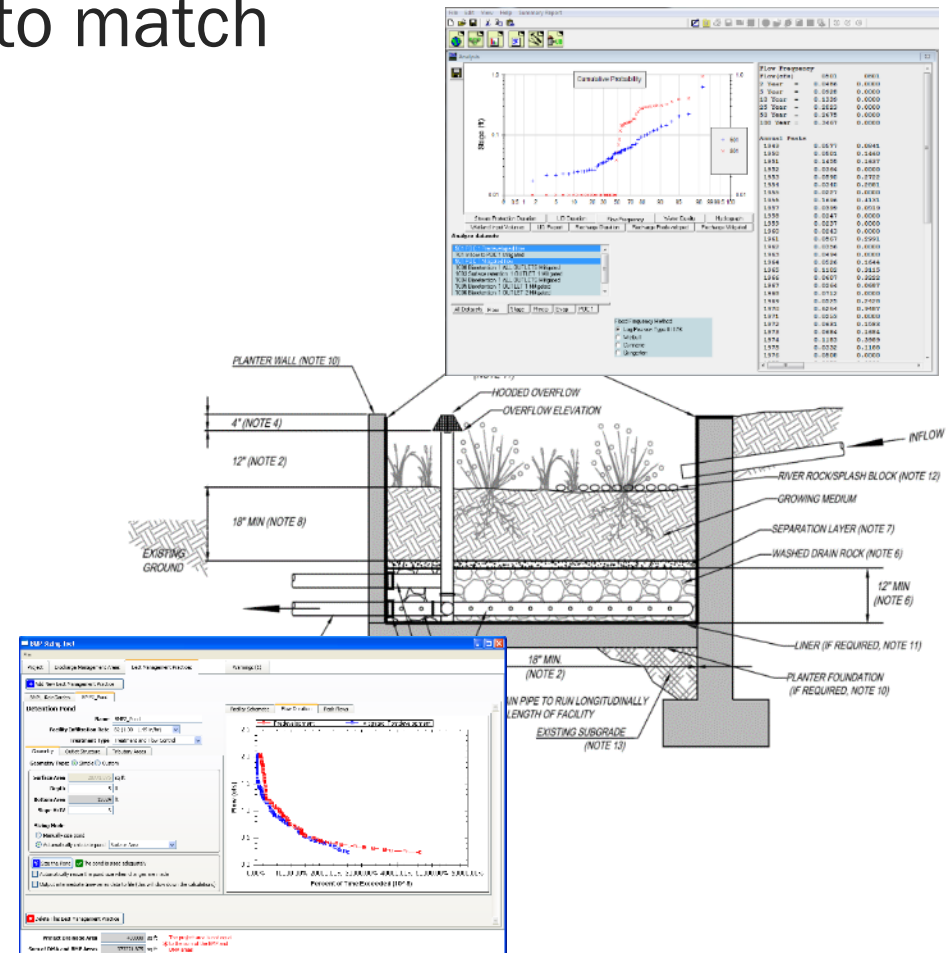
Flow Duration Matching

Computational Tools

Computational Tools

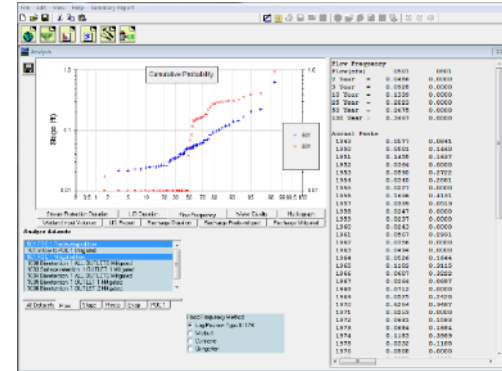
- Four types of computational tools to size stormwater facilities to match flow durations:

1. HSPF Modeling Tools
2. Runoff Time Series
3. BMP Sizing Factors
4. Prescriptive Sizing



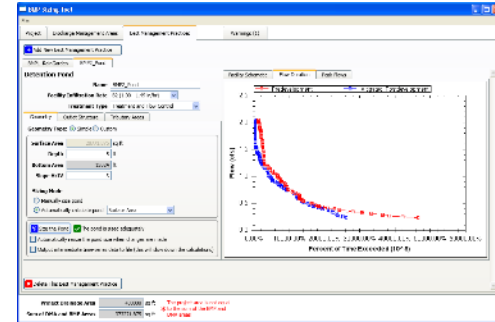
1. HSPF Modeling Tools

- Methodology
 - Tool built on HSPF modeling platform
 - Tool directly runs calibrated HSPF model to generate and route long term runoff time series through stormwater facilities.
- Features
 - Requires watershed specific rainfall, evaporation, and HSPF parameters
 - Allows full flexibility in facility design features
 - Allows facility design iteration and optimization
- Examples
 - Western Washington Continuous Simulation Hydrology Model (WWHM)
 - Tualatin River Urban Stormwater Tool (TRUST)
 - Bay Area Hydrology Model (BAHM)

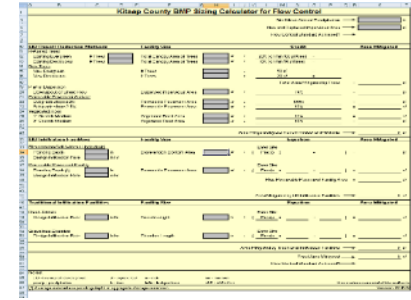


2. Runoff Time Series

- Methodology
 - Use HSPF model simulations to establish “unit runoff time series” for each soil and land use condition
 - Tool scales runoff time series based on actual area and land cover types
 - Tool uses level pool routing to analyze facility design
- Features
 - Flow duration sizing with less time/effort for the user
 - Allows full flexibility in facility design features
 - Allows facility design iteration and optimization
- Examples:
 - WES BMP Sizing Tool (pond sizing component)
 - King County Runoff Time Series (KCRTS)



3. BMP Sizing Factors



- Methodology
 - Use HSPF to generate long term runoff time series for a unit land use area for each combination of soil/land use/developed condition.
 - Use HSPF to size facilities by routing runoff time series through pre-defined facility types
 - Develop sizing factors for each facility type and land use change condition
 - Tool applies sizing factors to site-specific land use definitions
- Features
 - Flow duration sizing with less time/effort for the user
 - Facilities with set specifications are pre-sized using runoff time series.
 - Facility design parameters are fixed to match computational assumptions.
- Examples:
 - WES BMP Sizing Tool (planter, rain garden, and swale components)
 - Contra Costa, San Diego
 - Kitsap County spreadsheet tool

4. Prescriptive Sizing

- Methodology
 - Same background work as Prescriptive Sizing Factors to establish set facility sizes for range of land use conditions
- Features
 - Flow duration sizing with less time/effort for the user
 - Regulating agency defines facility size, based on previous calculations.
 - Burden of technical analysis is transferred to regulating agency.
 - Requires prescriptive facility designs.
- Examples:
 - Lake Oswego (in development for small sites)

Selecting the Appropriate Tool

	HSPF Modeling Tools	Runoff Time Series	BMP Sizing Factors	Prescriptive Sizing
Flexibility in facility specs	X	X		
Design specifications provided			X	X
Evaluates facilities in series	X	X		
Results are easily reproduced		X	X	X
Specific to regional conditions	X	X	X	X
Requires technical sophistication	X	X		

Questions to Consider



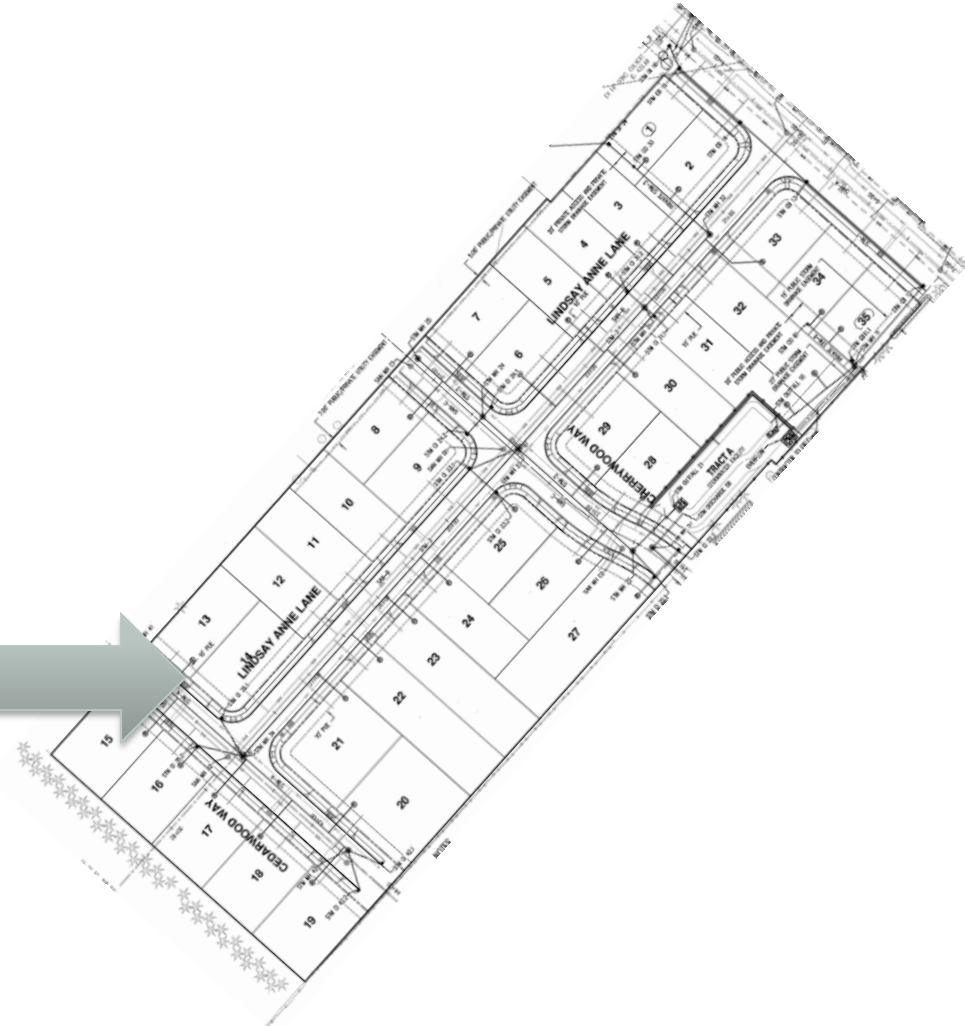
- Does the tool use the right calculation methods?
- What level of customization is required?
- How will WES (and others) review the results and compare to design plans?

Facility Sizing Tools

Demos

Example Project Background

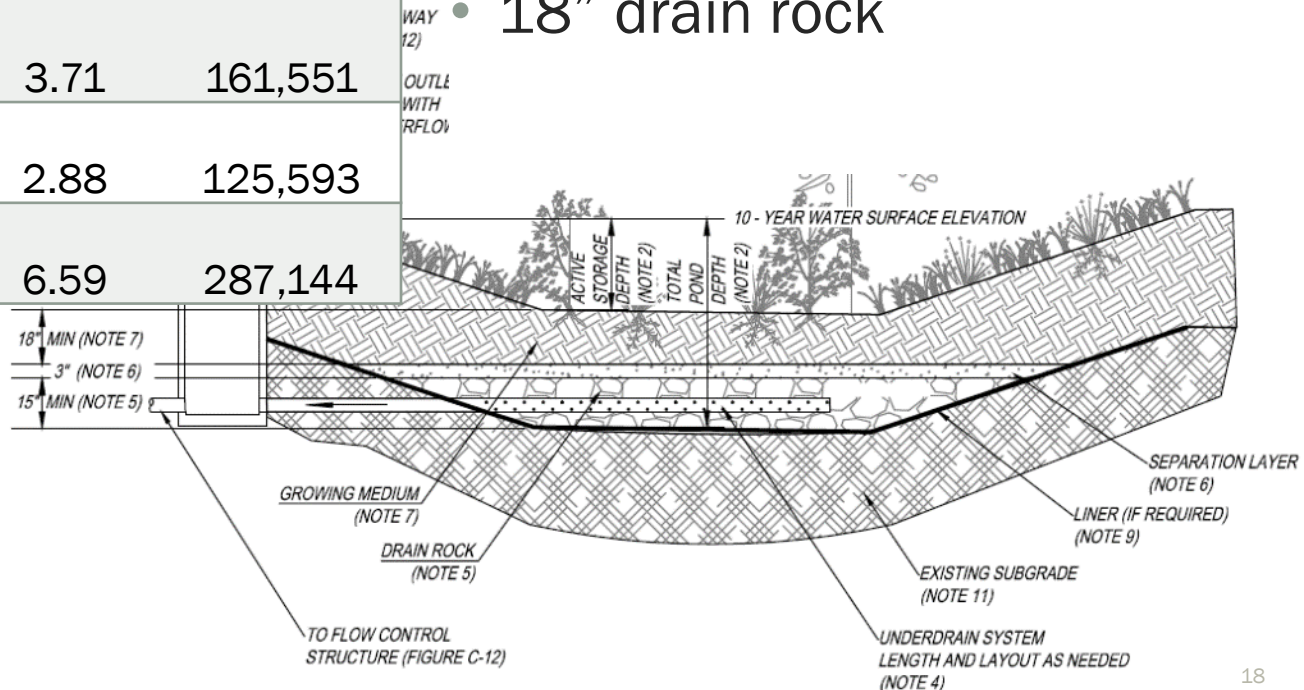
- Rural → Residential
- 6.59 Acres
- Proposed 35 lot subdivision
- Type C soils



Example Project Sizing Tool Input Data

	Area (acres)	Area (sq ft)
Pre-Developed Conditions		
Total Site Area (model as forest)	6.59	287,144
Developed Conditions		
Total Impervious (roofs and roads)	3.71	161,551
Total Pervious	2.88	125,593
Total Site Area:	6.59	287,144

- Bioretention/Rain Garden
- 12" surface storage
- 18" growing media
- 18" drain rock



Sizing Tool Demos

Wrap Up Discussion