

# INTRO TO THE CLARK COUNTY STORMWATER MANUAL 2015

Design Engineering Overview  
February 4, 2016

Download presentation at  
[clark.wa.gov/environmental-services/low-impact-development](http://clark.wa.gov/environmental-services/low-impact-development)



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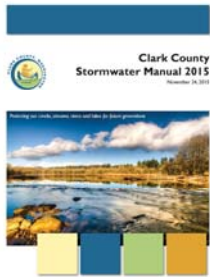
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## Introductions

- Clark County
  - Dean Boening, Clean Water Div. Mgr
  - Rod Swanson, NPDES Manager
  - Jane Tesner Kleiner, Manual PM
  - Ali Safayi, Development Engineering
- Department of Ecology
  - Rian Sallee
- Presenters from Otak
  - Tim Kraft, PE
  - Trista Kobluskie, Stormwater Planner



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## Agenda

- Codes & Web Locations
- Policy Highlights
- Organization and Use of Manual
- Questions

Download presentation at  
[clark.wa.gov/environmental-services/low-impact-development](http://clark.wa.gov/environmental-services/low-impact-development)



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## Background

- NPDES Phase I Municipal Stormwater Permit
- Developed Manual 2012 – 2015
- Designed to be Equivalent to SWMMWW
  - Is re-organized SWMMWW
- Technical Advisory Committee
- DEAB
- Planning Commission
- County Council




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## Acronyms in Presentation

Abbreviation	English
BMP	Best Management Practice
CCC	Clark County Code
CCSM	Clark County Stormwater Manual 2015
LID	Low Impact Development
MR	Minimum Requirement
PCHB	Pollution Control Hearings Board
PGHS	Pollution Generating Hard Surface
ROW	Right of Way
SWPPP	Stormwater Pollution Prevention Plan
SWMMWW	Stormwater Management Manual for Western Washington
Important for Manual Use: Be Aware of Definitions!	




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## CODES & WEB LOCATIONS

In Case You Want to Read Up




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### Code Numbers

40.385	40.386
<ul style="list-style-type: none"><li>• Replaced by 40.386</li><li>• Use if Fully Complete Application Submitted Prior to January 8, 2016</li><li>• New: Vesting Rule Status</li></ul>	<ul style="list-style-type: none"><li>• Replaces 40.385</li><li>• Use if Fully Complete Application Submitted on January 8, 2016 or Later</li></ul>



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### Find It

- Clark County Codes at [codepublishing.com/WA/ClarkCounty/](http://codepublishing.com/WA/ClarkCounty/)
- CCSM at [clark.wa.gov/environmental-services/stormwater-code-and-manual](http://clark.wa.gov/environmental-services/stormwater-code-and-manual)
  - Or look for "Stormwater Manual" under home page A-Z index
  - Online versions are hyperlinked internally and between books
- Manual not available in print
- November 24, 2015 is Manual Date



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## POLICY HIGHLIGHTS

Seven Things You Want to Know



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## Seven Policy Highlights

- CCSM Replaces 2009 Manual and Code
- Applicability Thresholds
- Low Impact Development is Mandated
- Strong Relationship Between Site Civil and Individual Lots
- Two New Short Forms for Small(er) Projects
- Timing of Construction SWPPP
- Minimum Requirements: Basin/Watershed Planning Removed



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## Code vs. Manual

- 2009 Manual
  - Technical Content in Code 40.385
  - Need both County Manual and SWMMWW for Design
- CCSM 2015
  - Code 40.386 Administrative and Legal Requirements Only
  - Need only CCSM 2015 for Design
  - CCSM Equivalent to SWMMWW



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## Applicability Thresholds

- No Change to Threshold Areas (Acres/Sq Ft)
- “Hard Surface” Replaces “Impervious Surface”
  - Impermeable surface, permeable pavement, vegetated roof
- 2009 Manual Rural Thresholds Eliminated



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### Mandatory Low Impact Development

- CCC Title 40 Development Codes and Road Standards
  - Remove barriers to LID in development standards
  - Allow LID BMPs in ROW
- Projects Over 2,000 SF Trigger MR #5 - LID
- LID Required Where Feasible
- LID BMPs on Lots, ROW, Tracts
- 2 Options to Meet MR #5



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### Relate Site Civil to Individual Lots

- Engineered Plans for Each Subdivision Lot
- Construction of Some LID BMPs by Home-builders
- Covenants & Easements for Each Subdivision Lot with Bioretention, Permeable Pavement
  - Related to MR #6 & #7 Compliance



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### Short(er) Forms for Small(er) Projects

- Stormwater Site Plan Short Form
  - Projects Only Triggering MRs # 1-5 and No Engineering
- Abbreviated Construction SWPPP
  - Sites Disturbing Less Than 1 Acre
  - Includes Engineered Projects
  - Simplified Submittals



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### Construction SWPPP Submittal

- Due No Later Than Two Weeks Prior to Pre-Con
- If Submitted After Final Engineering
  - Condition of Approval
  - May Still Require PE Stamp
- Recommend Submit with Final Engineering



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### Minimum Requirements List

2009	CCSM 2015
1. Site Plan	1. Site Plan
2. Erosion Control	2. Erosion Control
3. Source Control	3. Source Control
4. Discharge Location	4. Discharge Location
5. LID	5. LID
6. WQ Treatment	6. WQ Treatment
7. Flow Control	7. Flow Control
8. Wetlands	8. Wetlands
9. Basin/Watershed Planning	9. Operation & Maintenance
10. Operation & Maintenance	



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## ORGANIZATION AND USE

SWMMWW - Revised



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**Four Books**

- Book 1: Applicability, BMP Selection, and Submittal
  - Minimum Requirements
  - County Requirements
  - Submittal
- Book 2: BMP Design
  - Design Criteria
- Book 3: Source Control
- Book 4: Stormwater Facility Operations and Maintenance

Intent: Lead Designers Through Process Logically



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Book 1 – Applicability, BMP Selection, Submittal

**Book 1 – Purpose & Audience**

- Help Meet MR #s 1 – 9
- Determine Applicable Requirements Ch 1
- How to Select Appropriate BMPs Ch 2 – 4
  - Includes Geotechnical Investigation
- Off-site Analysis Ch 5
- Prepare for Construction (SWPPP) Ch 6
- Figure out the Paperwork Back to Ch 1
- Appendices

Audience: Planners, Engineers, Contractors



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Book 1 – Applicability, BMP Selection, Submittal

**Chapter 1 – MRs & Submittals**

- Exemptions
  - Highway Runoff Manual for Public Linear Projects
- Applicability/Thresholds
  - Same Thresholds, but Substitute “Hard Surface”
- Minimum Requirement #8 Volumetric Standard
- Submittals
  - Soils Report required more often
  - SWPPP can be submitted later
  - Stricter Requirements for Plats, Easements, Covenants for Facility Maintenance



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Book 1 – Applicability, BMP Selection, Submittal

### Select LID Facilities – Ch 2

- Soils / Geotechnical Investigations
  - MR #5 LID (Ch 2)
    - Soil Description (stop here for some BMPs)
    - Soil Stratigraphy (MRs 1-9)
    - Infiltration Rate (Bioretention, Permeable Pavements)
      - Correction Factors
    - Groundwater Assessment
  - MR # 7 Flow Control (see Ch 4)



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Book 1 – Applicability, BMP Selection, Submittal

### Select LID Facilities – Ch 2, Con't

- Two Ways to Meet MR #5
- LID Performance Standard
- List Approach



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Book 1 – Applicability, BMP Selection, Submittal

### Select LID Facilities – Ch 2, Con't

- LID Performance Standard
  - Required outside UGA on > 5 ac
  - 8% of the 2-year to 50% of the 2-year
  - Flexible, Allows Creativity



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Book 1 – Applicability, BMP Selection, Submittal

## Select LID Facilities – Ch 2, Con't

- List Approach
  - Lists #1 & #2
  - Ranked List of BMPs by Surface
  - Use Infeasibility Criteria to Reject BMPs

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Book 1 – Applicability, BMP Selection, Submittal

**Table 2.1: Required Table of LID BMPs for Projects Subject only to Minimum Requirements #1 – #5**

This table is equivalent to List #1 in Minimum Requirement #5.

For each surface, consider BMPs in the sequence indicated for that type of surface. If a sequence number appears on more than one BMP for a surface, then the BMPs labeled with that sequence number may be considered in any order before moving on to the next number in the sequence.  
Use the first BMP that is considered feasible. No other On-site Stormwater Management BMP is necessary for that surface.

BMP #	BMP Name	Lawn and Landscape Areas	Roofs	Other Hard Surfaces
T5.13	Post-Construction Soil Quality and Depth	1		
T5.30A/B	Full Dispersion		1	1
T5.10A/T5.10B	Downspout Full Infiltration		1	
T5.15	Permeable Pavement			2
T5.14A	Rain Garden		2	2
T5.14B	Bioretention		2	2
T5.10C	Downspout Dispersion		3	
T5.10D	Perforated Stub-out Connections		4	
T5.12	Sheet Flow Dispersion			3
T5.11	Concentrated Flow Dispersion			3

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Book 1 – Applicability, BMP Selection, Submittal

## Select LID Facilities – Ch 2, Con't

### Infeasibility Criteria with List Approach

- Unique for Each BMP
- No Criteria Met = Have to Use BMP
- Require Site Specific Info (No Mapping Indicators)
- May use BMP, Even if Don't Have To use BMP
- Feasibility Checklist in Appendix 1-E

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Book 1 – Applicability, BMP Selection, Submittal

## Select LID Facilities – Ch 2, Con't

Example List #2 for a New Residential Road  
1,000 ADT

- Option 1 = Full Dispersion, Not Feasible
- Option 2 = Permeable Pavement
  - Infeasible for Roads Over 400 ADT = Don't Have To Use It
  - May Use It, Evaluate for Applications & Limitations, e.g.  
PGHS needs a treatment soil
- Option 3 = Bioretention

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Book 1 – Applicability, BMP Selection, Submittal

## Select LID Facilities – Ch 2, Con't

### LID Feasibility Checklist, Appendix 1-E

FULL DISPERSION BMP 15.30A Feasibility Criteria and Setbacks	Roof		Surfaces	
	YES	NO	YES	NO
Will the project protect and maintain less than 65% of the TDA in a forested native condition?				
Does a professional geotechnical evaluation recommend dispersion not be used due to reasonable concerns about erosion, slope failure or down gradient flooding?				
Is the only location available for the discharge less than 100 feet upgradient of a septic system?				
Is the only area available for the required length of the BMP's flowpath on a slope greater than 20%?				
Is the only area available for the required length of the BMP's flowpath above an erosion hazard or toward a landslide hazard area?				
Is the only area available to place the dispersion device (not the flowpath) located in a critical area or critical area buffer?				
Is the only area available to place the dispersion device (not the flowpath) located on a slope greater than 20% or within 50 feet of a geohazard as defined in CCC 40.430?				
Is the only area available to place the dispersion device or required flowpath less than 10 feet from any structure, property line, or sensitive area?				
Determination: Is this BMP feasible?				

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Book 1 – Applicability, BMP Selection, Submittal

## Select Treatment Facilities – Ch 3

- No Big Changes
- Minor Change to Organization of Menus
- Accepted Proprietary BMPs Listed
- Emerging Technologies List Kept by County

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Book 1 – Applicability, BMP Selection, Submittal

### Select Flow Control Facilities – Ch 4

- Use Maximum LID to Reduce Flow Control Obligation
- Prefer Infiltration
- Geotechnical Investigations
- Alternative Flow Control Standard for Mill Creek, App. 1-B



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Book 1 – Applicability, BMP Selection, Submittal

### Erosion Control / SWPPP – Ch 6

- Can Submit 2 Weeks before Pre-Con
- Abbreviated SWPPP for Sites < 1 Acre
- CSWGP Described SWPPP Can be Used for Clark County
  - 13 Elements Included



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Book 1 – Applicability, BMP Selection, Submittal

### Appendices

- 1-A Glossary – Important!
- 1-B Alternative Flow Control Standards
  - Forested in 2002 Use Pre-Developed Forest
  - Impervious, Landscape, Pasture Use Pre-Developed Pasture
- 1-E LID Feasibility Checklist



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Book 2 – BMP Design

## Book 2 – Purpose & Audience

- Provides Design Standards to Meet MRs # 2, 4, 5, 6, 7, 8
- How to Design BMPs and Conveyance
- Organization:
  - Hydrologic Computation
  - LID
  - Treatment
  - Flow Control: Infiltration
  - Flow Control: Detention
  - Conveyance
  - Erosion Control

Audience: Engineers



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Book 2 – BMP Design

## Hydrologic Analysis

- Manual references “Approved Continuous Flow Model”
- See Definition on Page 10
- Approved models include:
  - WWHM
  - MGSFlood
- Status of Clark County Version of WWHM



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Book 2 – BMP Design

## Bioretention, BMP T5.14B

- Bioretention vs Rain Garden
- Liners & Non-Elevated Underdrains Do Not Meet MR #5
- Elevated Underdrain Allowed for List 2 in MR #5

When:

- Native Soil Infiltration Rate 0.3 – 0.6 in/hr
- Elevated 6 in or more
- No Liner



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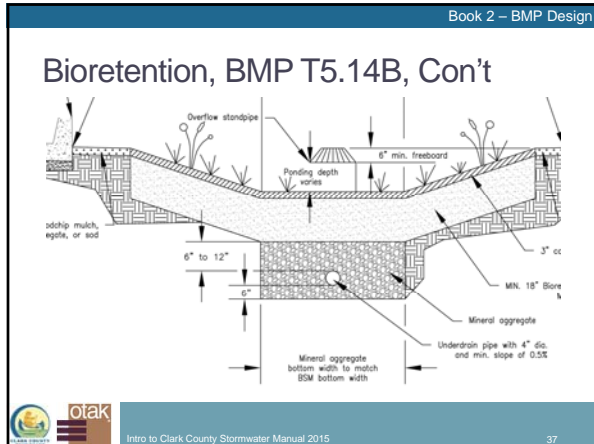
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- Book 2 – BMP Design
- ### Bioretention, BMP T5.14B, Con't
- Discharge within ¼ mi to Phosphorous-Sensitive = No Imported Compost, No Underdrain
  - Minimum Swale Bottom Width = 18"
  - Use Standard Bioretention Soil Mix; Avoid Infiltration Testing of Media
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- Book 2 – BMP Design
- ### Permeable Pavements, BMP T5.15
- Required in Lists 1 & 2 for Pedestrian, Bicycle Facilities, Driveways & Roads Under 400 ADT
  - Use for Pollution-Generating Surface Only if Soil Provides Treatment
- Intro to Clark County Stormwater Manual 2015 39

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Book 2 – BMP Design

### Permeable Pavements, BMP T5.15, Con't

- Non-Elevated Underdrains Do Not Meet MR #5
- Elevated Underdrain Allowed for MR #5

When

- Native Soil Infiltration Rate 0.3 – 0.6 in/hr
- Elevated 6 in or more



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Book 2 – BMP Design

### Permeable Pavements, BMP T5.15, Con't

- Geotextile on Sides of Open-graded Base, No Geotextile Between Pavement & Subgrade
- Subgrade Compaction 90-92% Standard Proctor, Firm & Unyielding
- Construction
  - Protect Vigorously from Sediment
  - Aggregate Installation Method to Protect Subgrade



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Book 2 – BMP Design

### Infiltration Facilities

- R5.10 Drywell, R5.11 Trench, R5.12 Basin
- Infiltration Sizing Criteria
- Groundwater Monitoring
- Closed Depressions
- New: May Waive Property Line Setback for Infiltration Trench in Common System
  - Maintenance Easement Required



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Book 2 – BMP Design

## Infiltration Facilities

- Book 2, Section 1.2 states:
  - Infiltration facilities designed for flow control shall be designed to effectively infiltrate the 100-year, 24-hour design storm event.
- Ecology will not allow single-event modeling even for 100% infiltration
- Must use continuous flow models to prove 100% infiltration
  - See Book 2, Section 5.1



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Book 2 – BMP Design

## Closed Depressions

- New Methodology for analyzing Closed Depressions (from Puget Sound agencies)
- See Book 2, Section 1.3.6
- Three different scenarios



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Book 2 – BMP Design

## Detention Facilities

- D6.10 Pond, D6.20 Tank, D6.30 Vault
- No Significant Changes



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Book 3 – Source Control

- Meet Minimum Requirement #3 (Commercial/Industrial)
- Select Structural Source Control BMPs (Design Engineer)
- Select Operational Source Control BMPs (Operator)
- SWMMWW Volume IV Almost Verbatim
- Dumpster/Compactor Storage Areas New Requirements
  - Covered
  - Route Drains to Sanitary

Audience: Engineers, Business Operators



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Book 4 – Stormwater Facility Operations and Maintenance

### Book 4 – O&M

- Meet Minimum Requirement #9
- Engineers: Use to Create Required O&M Submittal
- Describe BMP Look and Function
- Advise on Operation and Maintenance Considerations
- List Maintenance Triggers
- List Minimum Maintenance Performance Standards
- Includes Maintenance Standards for LID BMPs

Audience: Engineers, Stormwater Facility Operators



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## Questions

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## Thank You



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