

# Revised Draft Design Manual Outline v5

December 6, 2013

\*Note: This revision proposes several changes:

1. Divide manual into 4 separate books:
  - a. Policy, Process and Design Guidance
    - i. Include a matrix for each chapter that lists each desired purpose/outcome and possible BMPs on book 2 that can serve that purpose
  - b. BMPs Design Sheets and Standard Details
  - c. Source Control (previously Ch 4)
  - d. Operations and Maintenance (previously Ch 8)
2. Group and re-order the Activity Sheets in the Source Control book per SvR's suggestion
3. Create a new chapter for conveyance design and off-site analysis in Book 1.

## ***Introduction to the Manual***

0. Introduction
  - 0.1. Purpose
  - 0.2. How to Use This Manual
  - 0.3. Organization of This Manual
  - 0.4. Relationship to the 2012 Ecology Manual
1. Applicability of this manual
2. Municipal Stormwater Permittes
3. Construction projects regulated under the NPDES general construction permit
4. Description of Best Management Practices for Stormwater Management\
5. Relation to Other Regulations [*This could have many sub-sections taken from each of the chapters/Ecology volumes, TBD*]
6. Glossary
7. Acronyms

## ***Book 1 – Policy, Process and Design Guidance***

### ***Introduction***

0. Introduction
  - 0.1. Purpose
  - 0.2. How to Use This Book
  - 0.3. Organization of This Book

## **Chapter 1 Minimum Requirements for New Development and Redevelopment Projects and Submittal Requirements**

1. Chapter 1
  - 1.1. Introduction
    - 1.1.1. Purpose
    - 1.1.2. How to Use this Chapter
  - 1.2. Exemptions
  - 1.3. Definitions Related to the Minimum Requirements
  - 1.4. Applicability of the Minimum Requirements
    - 1.4.1. New Development
    - 1.4.2. Redevelopment
  - 1.5. Minimum Requirements
    - 1.5.1. MR #1 Preparation of Stormwater Site Plans
    - 1.5.2. MR #2 Construction Stormwater Pollution Prevention
    - 1.5.3. MR #3 Source Control of Pollution
    - 1.5.4. MR #4 Preservation of Natural Drainage Systems and Outfalls
    - 1.5.5. MR #5 On-Site Stormwater Management
    - 1.5.6. MR #6 Stormwater Runoff Treatment
    - 1.5.7. MR #7 Flow Control
    - 1.5.8. MR #8 Wetlands Protection
    - 1.5.9. MR #9 Operation and Maintenance
  - 1.6. Variances
  - 1.7. Stormwater Site Plan Submittals

## **Chapter 2 Runoff Treatment BMPs (formerly CCSDM Ch 5)**

2. Chapter 2
  - 2.1. Introduction
    - 2.1.1. Purpose
    - 2.1.2. How to Use this Chapter
  - 2.2. Description of Treatment Facilities
  - 2.3. Treatment Facility Selection Process
    - 2.3.1. Step-by Step Process
    - 2.3.2. Other Factors
    - 2.3.3. Oil Control BMP Selection
    - 2.3.4. Phosphorus Treatment BMP Selection
    - 2.3.5. Enhanced Treatment BMP Selection
    - 2.3.6. Basic Treatment BMP Selection
    - 2.3.7. General Requirements for Treatment Facilities
      - 2.3.7.1. Design Volume and Flow
      - 2.3.7.2. Sequence of Facilities
      - 2.3.7.3. Setbacks, Slopes, Embankments, and Walls
      - 2.3.7.4. Liners
      - 2.3.7.5. Hydraulic Structures

- 2.4. Pretreatment BMPs
  - 2.4.1. Purpose and Description
  - 2.4.2. Application and Limitations
  - 2.4.3. List of BMPs for Pretreatment
- 2.5. Oil-Water Separators
  - 2.5.1. Purpose and Description
  - 2.5.2. Applications and Limitations
  - 2.5.3. Performance Objectives
  - 2.5.4. Site Suitability
  - 2.5.5. General Design Criteria
  - 2.5.6. List of BMPs for Oil and Water Separation
- 2.6. Filtration BMPs
  - 2.6.1. Purpose and Description
  - 2.6.2. Application and Limitations
  - 2.6.3. Performance Objectives
  - 2.6.4. Site Suitability
  - 2.6.5. List of BMPs for Filtration
- 2.7. Wetpool Facilities
  - 2.7.1. Purpose and Description
  - 2.7.2. Application and Limitations
  - 2.7.3. Performance Objectives
  - 2.7.4. List of Wetpool BMPs
- 2.8. Policy on Emerging Technologies Approved by Ecology  
DES management practice revised as manual policy

### ***Chapter 3 Hydrologic Analysis, Flow Reduction and Flow Control***

- 3. Chapter 3
  - 3.1. Introduction
    - 3.1.1. Purpose
    - 3.1.2. How to Use this Chapter
  - 3.2. Hydrology Analysis
    - 3.2.1. Use of the WWHM in Clark County for LID and Flow Control
      - 3.2.1.1. Use of Alternative Models
    - 3.2.2. Modeling Discharges to Wetlands
    - 3.2.3. Single Event Model Method
    - 3.2.4. Closed Depression Analysis (needs beefing up from the SWMMWW)
  - 3.3. Flow Reduction and Control Design using Infiltration, Dispersion and Detention
    - 3.3.1. Overall Approach
    - 3.3.2. General Requirements for Flow Control Facilities
      - 3.3.2.1. Design Volume and Flow
      - 3.3.2.2. Sequence of Facilities
      - 3.3.2.3. Setbacks, Slopes, Embankments, and Walls
      - 3.3.2.4. Liners

- 3.3.3. Hydraulic Structures Design
- 3.3.4. Infiltration and LID Design
  - 3.3.4.1. Design Steps
  - 3.3.4.2. Site Characterization (needs work)
    - Simple Method
    - Detailed Method
  - 3.3.4.3. List of Infiltration and LID BMPs
- 3.3.5. Detention Design
  - 3.3.5.1. List of Detention BMPs

## ***Chapter 4 Conveyance Design and Off-site Analysis (formerly part of CCSDM Ch 3)***

- 4. Chapter 4
  - 4.1. Introduction
    - 4.1.1. Purpose
    - 4.1.2. How to Use this Chapter
  - 4.2. Conveyance Design
    - 4.2.1. Purpose and Scope
    - 4.2.2. Down-Stream Conveyance Protection (9.3 in 2009 manual)
    - 4.2.3. Design and Construction Standards
    - 4.2.4. Design Storms
    - 4.2.5. Hydraulic Methods
    - 4.2.6. Flooding Standards for Roadways and Other Paved Areas
    - 4.2.7. Drainage System Outfall Requirements
    - 4.2.8. Stormwater Facility Inlet Requirements
    - 4.2.9. Conveyance System Easement Standards
  - 4.3. Off-site Analysis

## ***Chapter 5 Stormwater Pollution Prevention for Construction Projects (formerly CCSDM Chapter 2)***

- 5. Chapter 5
  - 5.1. Introduction
    - 5.1.1. Purpose
    - 5.1.2. How to Use this Chapter
  - 5.2. Thirteen Elements Listed
  - 5.3. Relationship to Regulatory Requirements
  - 5.4. Stormwater Pollution Prevention Plan Requirements
    - 5.4.1. Narrative
    - 5.4.2. Drawings
    - 5.4.3. Process
      - 5.4.3.1.1. Site Data Collection
      - 5.4.3.1.2. Data Analysis
      - 5.4.3.1.3. SWPPP Development and Implementation
  - 5.5. Resource Materials

## **Chapter 6 Administrative (formerly CCSDM Chapters 6 and 7)**

- 6. Chapter 6
  - 6.1. Introduction
    - 6.1.1. Purpose
    - 6.1.2. How to Use this Chapter
  - 6.2. Maintenance of Private Drainage and Stormwater Facilities
  - 6.3. County Acceptance of New Stormwater Facilities
  - 6.4. Deeds and Easements
  - 6.5. Covenants
  - 6.6. Construction Materials
  - 6.7. Stormwater Conveyance and Facility Labeling and Signage
  - 6.8. Stormwater Pipe Testing
  - 6.9. Infiltration Facility Testing
  - 6.10. Performance Security
  - 6.11. Maintenance Security

## **Book 2 – BMP Design Sheets and Standard Details**

### **Introduction**

- 0. Introduction
  - 0.1. Purpose
  - 0.2. How to Use This Book

### **Chapter 1 BMP Design Sheets**

- 1. Chapter 1
  - 1.1. Introduction
    - 1.1.1. Purpose
    - 1.1.2. How to Use This Chapter
  - 1.2. BMPs for Construction Stormwater Pollution Prevention (MR 2)
    - 1.2.1. BMP C101 Preserving Native Vegetation
    - 1.2.2. BMP C102 Preserving Vegetated Buffer Zones
    - 1.2.3. BMP C103 High Visibility Fence
    - 1.2.4. BMP C105 Stabilized Construction Access Points
    - 1.2.5. BMP C106 Wheel Wash Systems
    - 1.2.6. BMP C107 Construction Road and Parking Area Stabilization
    - 1.2.7. BMP C120 Seeding Exposed Soils
    - 1.2.8. BMP C121 Mulching Exposed Soils
    - 1.2.9. BMP C122 Erosion Control Nets and Blankets

- 1.2.10. BMP C123 Plastic Covering
- 1.2.11. BMP C124 Sodding
- 1.2.12. BMP C125 Topsoil or Compost Application
- 1.2.13. BMP C126 Polyacrylamide for Soil Stabilization (requires Ecology approval)
- 1.2.14. BMP C130 Surface Roughing by Tracking
- 1.2.15. BMP C131 Gradient Terraces
- 1.2.16. BMP C140 Dust Control
- 1.2.17. BMP C150 Keep ESC Materials on Hand
- 1.2.18. BMP C151 Concrete Handling BMPs
- 1.2.19. BMP C152 Pavement Cutting BMPs
- 1.2.20. BMP C153 On-Site Material Delivery, Storage and Containment
- 1.2.21. BMP C154 Concrete Washout BMPs
- 1.2.22. BMP C160 Certified Erosion and Sediment Control Lead (CESCL)
- 1.2.23. BMP C162 Schedule Management
- 1.2.24. BMP C200 Interceptor dike and swale
- 1.2.25. BMP C201 Grass-Lined Channels
- 1.2.26. BMP C202 Channel Lining
- 1.2.27. BMP C203 Water Bars
- 1.2.28. BMP C204 Piped Slope Drainage
- 1.2.29. BMP C205 Subsurface Groundwater Drains
- 1.2.30. BMP C206 Level Spreader
- 1.2.31. BMP C207 Check Dams
- 1.2.32. BMP C208 Triangular Silt Dike (Geotextile-Encased Check Dam)
- 1.2.33. BMP C209 Outlet Protection BMPs
- 1.2.34. BMP C220 Storm Drain Inlet Protection
- 1.2.35. BMP C231 Brush Barriers for Coarse Sediment
- 1.2.36. BMP C232 Gravel Filter Berm
- 1.2.37. BMP C233 Silt Fence
- 1.2.38. BMP C234 Vegetated Filter Strip
- 1.2.39. BMP C235 Wattles
- 1.2.40. BMP C236 "Filtration Through Retained Vegetation"
- 1.2.41. BMP C240 Sediment Trap
- 1.2.42. BMP C241 Temporary Sediment Pond
- 1.2.43. BMP C250 Construction Stormwater Chemical Treatment
- 1.2.44. BMP C251 Construction Stormwater Sand Filtration
- 1.2.45. BMP C252 High pH Neutralization using Carbon Dioxide
- 1.2.46. BMP C253 pH Control for High pH Water
- 1.3. BMPs for Source Control (MR 3) [*Including these is tentative.*]
- 1.4. BMPs for On-site Stormwater Management (MRs 5, 6 and 7)
  - 1.4.1. BMP T5.10 C Perforated Stub-Out Connections
  - 1.4.2. BMP T5.10A Downspout Full Infiltration
  - 1.4.3. BMP T5.10B Downspout Dispersion Systems
  - 1.4.4. BMP T5.11 Concentrated Flow Dispersion
  - 1.4.5. BMP T5.12 Sheet Flow Dispersion
  - 1.4.6. BMP T5.13 Post-Construction Soil Quality and Depth

- 1.4.7. BMP T5.14A Rain Gardens not included in facility design
- 1.4.8. BMP T5.14B Bioretention Rain Gardens included in facility design
- 1.4.9. BMP T5.15 Permeable Pavements
- 1.4.10. BMP T5.16 Tree Retention and Tree Planting
- 1.4.11. BMP T5.17 Vegetated Roofs
- 1.4.12. BMP T5.18 Reverse Slope Sidewalks
- 1.4.13. BMP T5.19 Minimal Excavation Foundations
- 1.4.14. BMP T5.20 Rainwater Harvesting
- 1.4.15. BMP T5.30 Full Dispersion
- 1.4.16. BMP T5.40 Preserving Native Vegetation
- 1.4.17. BMP T5.41 Flow Reduction through Site Planning
- 1.5. BMPs for Runoff Treatment (MR 6)
  - 1.5.1. BMP CC Filtera
  - 1.5.2. BMP CC Spill Control Manhole
  - 1.5.3. BMP CC Stormfilter
  - 1.5.4. BMP T10.10 Basic and Large Wetponds
  - 1.5.5. BMP T10.20 Wetvaults
  - 1.5.6. BMP T10.30 Stormwater Treatment Wetlands
  - 1.5.7. BMP T10.40 Combined Detention and Wetpool Facilities
  - 1.5.8. BMP T11.10 American Petroleum Institute Baffle Separator
  - 1.5.9. BMP T11.11 Coalescing Plate Separator
  - 1.5.10. BMP T6.10 Pre-settling Basin
  - 1.5.11. BMP T7.10 Infiltration Basins/Ponds
  - 1.5.12. BMP T7.20 Infiltration Trenches
  - 1.5.13. BMP T7.30 Bioretention Units
  - 1.5.14. BMP T7.40 Compost-Amended Vegetated Filter Strips
  - 1.5.15. BMP T8.10 Basic Sand Filter Basin
  - 1.5.16. BMP T8.11 Large Sand Filter Basin
  - 1.5.17. BMP T8.20 Sand Filter Vault (do we want to include this???)
  - 1.5.18. BMP T8.30 Linear Sand Filter
  - 1.5.19. BMP T8.40 Filter Media Drain
  - 1.5.20. BMP T9.10 Grassy Biofiltration Swale
  - 1.5.21. BMP T9.20 Wetland Biofiltration Swale
  - 1.5.22. BMP T9.30 Side Slope Inflow Swale
  - 1.5.23. BMP T9.40 Grassy Filter Strip
  - 1.5.24. Other GULD devices
  - 1.5.25. Proprietary Pretreatment BMPs
- 1.6. BMPs for Flow Control (MR 7)
  - 1.6.1. Detention Ponds
  - 1.6.2. Detention Tanks
  - 1.6.3. Detention Vaults
  - 1.6.4. Flow Control Outlet Structures
  - 1.6.5. Infiltration Basins
  - 1.6.6. Infiltration Trenches
  - 1.6.7. Manufactured Modular Detention Systems
  - 1.6.8. Other Detention Options

- 1.7. Design Criteria for Selected BMPs When Used to Serve Multiple Purposes
  - 1.7.1. Infiltration/Detention BMPs
  - 1.7.2. On-Site Stormwater Management BMPs

## **Chapter 2 Standard Details and Diagrams**

Index of Standard Details and Diagrams  
Erosion Control  
Collection and Conveyance System  
Treatment and Flow Control Facility  
Low Impact Development BMP

## **Book 3 – Source Control**

*Note – This will be an update of the current Water Quality BMP Manual for Businesses and Government Agencies to conform to style and appearance of the stormwater design manual*

### **Introduction**

- 0. Introduction
  - 0.1. Purpose
  - 0.2. How to Use This Book
  - 0.3. Organization of This Book

## **Chapter 1 Activities Requiring Source Control**

- 1.1 Overview
- 1.2 BMPs for All Commercial, Public Agency and Industrial Activities (Required and Suggested BMPs)
  - 1.2.1 Description of Suggested BMPs
  - 1.2.2 Description of Required BMPs
  - 1.2.3 BMP Activity Sheets
    - A1 Cleaning and Washing Activities
      - AS-11
      - AS-12
      - AS-13
      - AS-14
      - AS-15
    - A2 Transfer of Liquid Materials
      - AS-16
      - AS-17
      - AS-18
      - AS-43
    - A3 Production and Application Activities

- AS-19
- AS-20
- AS-21
- AS-22
- AS-23
- AS-24
- AS-25
- AS-47
- AS-49
- AS-50 (NEW)

A4 Storage and Stockpiling Activities

- AS-2
- AS-3
- AS-4
- AS-5
- AS-6
- AS-7
- AS-8
- AS-9
- AS-10
- AS-55 (NEW)

A5 Construction and Demolition Activities

- AS-26
- AS-27
- AS-28
- AS-29
- AS-30

A6 Dust Control Activities

- AS-45
- AS-48

A7 Miscellaneous Activities

- AS-31
- AS-32
- AS-33
- AS-34
- AS-35
- AS-36
- AS-37
- AS-38
- AS-39
- AS-40
- AS-41
- AS-42
- AS-44
- AS-46
- AS-51 (NEW)

- AS-52 (NEW)
- AS-53 (NEW)
- AS-54 (NEW)
- AS-56 (NEW)
- AS-57 (NEW)

## **Chapter 2 Source Control BMP Information Sheets**

### 2.1 Source Control BMP Information Sheets

Illicit Connections Removal  
 Disposal Options  
 Covering Options  
 Paved area to a Holding Tank  
 Containment and Elevation  
 Integrated Pest Management  
 Stormwater Drainage and Treatment System Cleaning

### 2.2 Stormwater Treatment and Spill Control BMPs

Introduction to Water Quality Treatment  
 Oil/Water Separator  
 Catch Basin Insert  
 Manufactured Media Filter  
 Wet Pond, Wet Vault, and Constructed Wetlands  
 Vegetated Biofilters  
 Sand Filters, Media Filter Drains and Bioretention with Underdrain.  
 Infiltration  
 Spills of Oil and Hazardous Substances

## **Chapter 3 Agencies and References**

### 3.1 Agency Requirements

### 3.2 Contacts List: Phone Numbers and Web Sites

## **Book 4 – Operations and Maintenance**

*Note: Include Onsite and LID BMPs*

*2009 Existing Stormwater Facility O and M Manual will be converted into this book.*

### **Introduction**

#### 0. Introduction

##### 0.1. Purpose

##### 0.2. How to Use This Book

##### 0.3. Organization of This Book

## **Chapter 1 Stormwater Facility Operation and Maintenance Standards**

Detention Pond  
Infiltration Basin  
Catch Basin  
Detention Vaults  
Detention Tanks  
Manufactured Modular Detention Systems  
Control Structure/Flow Restrictor  
Debris Barrier & Access Barrier (Trash Rack)  
Energy Dissipater  
Biofiltration Swale  
Wet Biofiltration Swale  
Bioretention Unit  
Permeable Pavement  
Vegetated Roof  
Treatment Wetland  
Filter Strip  
Wetpond  
Wetvault  
Sand Filter (Above Ground/Open)  
Sand Filter (Below Ground/Closed)  
Stormfilter<sup>®</sup> Systems  
Oil/Water Separator (API Type)  
Coalescing Plate Oil/Water Separator  
Catch Basin Insert  
Compost Amended Filter Strips  
Vorticechs<sup>®</sup> System  
Sediment Trap  
Drywell  
Infiltration Trench  
Field Inlet  
Access Road  
Fence, Gate, and Water Quality Sign  
Stormwater Conveyance Pipe  
Stormwater Facility Discharge Point  
Stormwater Pipe Outfall/Energy Dissipater  
Vegetation Management Policy