WATER QUALITY EQUIVALENCY (WQE) PHASE 2 UPDATES

PUBLIC SEMINAR

April 9 2018

Welcome

- Sign-In
- Handouts
- Refreshments
- Q&A

2

Introduction and Opening Remarks

Charles Mohrlock - County of San Diego

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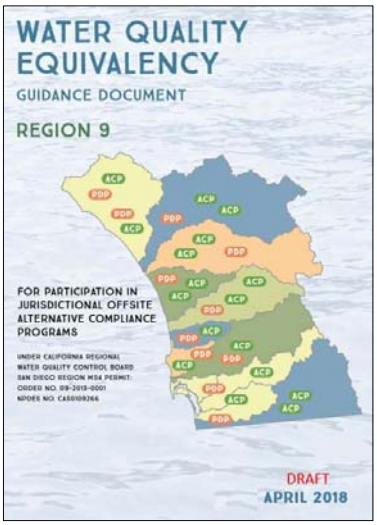
Introduction

- **Original WQE Guidance**
  - Approved December 2015
- **WQE Phase 2 Update**
  - Onsite Alternative Compliance
  - Partial Hydromodification Management Flow Control
  - Pollutant Removal Efficiencies for Flow-thru Treatment Control BMPs
  - Miscellaneous Smaller Updates



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Timeline for Public Review of WQE Phase 2 Update

Milestone	Date
Updated WQE Guidance Posted for Review	April 2, 2018
Public Seminar	April 9, 2018
Written Comments Due	**May 2, 2018**
WQE Guidance Submitted to Regional Board	~June 2018
Final WQE Guidance Posted for Public Use	~Sept 2018

- Redline version of updated WQE guidance available at:
  http://www.projectcleanwater.org/water-quality-equivalency-guidance/
- Submit comments via email to:
  Charles.Mohrlock@sdcounty.ca.gov

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Onsite Alternative Compliance

Charles Mohrlock - County of San Diego

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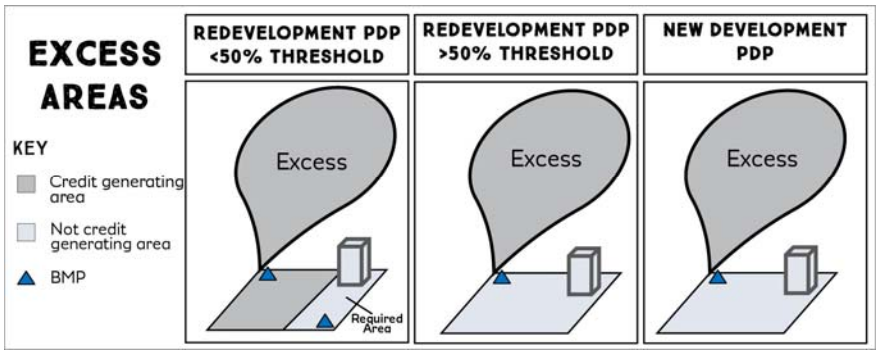
Onsite Alternative Compliance



Section 4.1

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Onsite Alternative Compliance

- Bypass Option
- Treatment Scenarios for Separate BMPs
  - Compliance Objective
  - Credit Objective
- Treatment Scenarios for Comingled BMPs
  - Compliance Objective
  - Credit Objective

Sections 4.2/4.3/4.4

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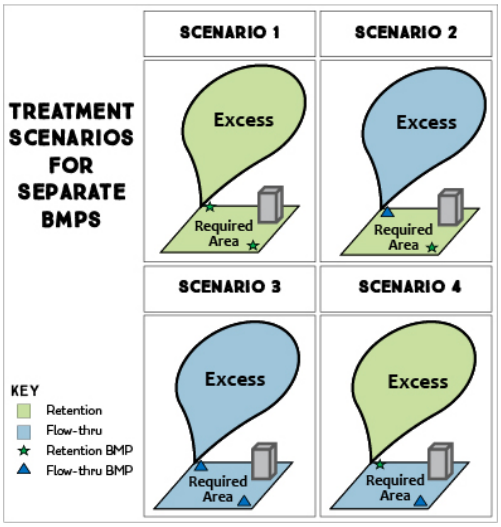
Treatment Scenarios for Separate BMPs



- WQE Calculations will be necessary if:
  - Project seeks to generate credit or
  - Project seeks to offset onsite impacts by treating excess areas of different land use
- Submittal Requirements
  - May vary by jurisdiction

Section 4.3

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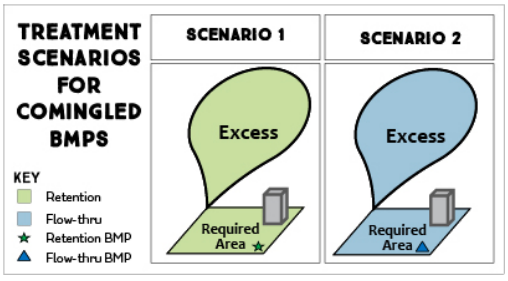
Treatment Scenarios for Comingled BMPs



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  - May vary by jurisdiction

Section 4.4

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Pollutant Control Formula

- **Pollutant Control Formula**

$$V_E = L\ (\Delta V + V_2 B_2 - V_1 B_1)$$

$$B = E \times C$$

Variables	Consideration
V_E: Earned Stormwater Pollutant Control Volume of ACP	Calculated Water Quality Credit
L: Land Use Factor	Pollutant Supply
V_2: Mitigated Condition Design Capture Volume at ACP	Pollutant Removal
B_2: Mitigated Condition BMP Efficacy Factor	Pollutant Removal
V_1: Impacted Condition Design Capture Volume at ACP	Change in Impacted Conditions
B_1: Impacted Condition BMP Efficacy Factor	Change in Impacted Conditions
ΔV: Change in Design Capture Volume (V_1-V_2) at ACP	Change in Impacted Conditions
E: Pollutant Removal Efficiency	Retention = 1; Biofiltration = 0.67
C: Provided Capture	

Section 2.3

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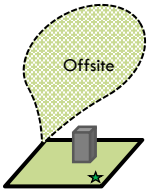
Comingled BMPs – Credit Objective

- **Credit Objective**
  - Onsite
    - PDP Area = 1 acre; 100% Impervious
    - 85th percentile 24-hour rainfall depth = 0.60 inches
    - DCV = 2,000 cubic feet
    - BMP Design Volume = 2,000 cubic feet
    - BMP Drawdown = 36 hours
  - Offsite
    - Offsite Area = 2 acres; 100% Impervious
    - Total Onsite and Offsite DCV = 6,000 cubic feet
    - Same Land Use



Combined retention of onsite and offsite flows.

Section 4.4.2

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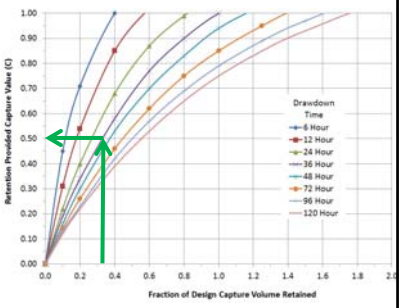
Comingled BMPs – Credit Objective

Credit Objective

- Fraction of DCV retained = $\frac{2000\ cf}{6000\ cf} = 0.33$
- BMP has a drawdown of 36 hours
- Capture (from nomograph) = 0.50
- **B_2 = 0.5 *1 = 0.5**

- **$V_E = L\ (\Delta V + V_2 B_2 - V_1 B_1)$**
- **$V_E = 1\ (0 + 6000 * 0.5 - 0)$**
- **V_E = 3000 cubic feet**

- Credit = 3,000 cubic feet – 2,000 cubic feet
- **Credit = 1,000 cubic feet**



Section 4.4.2

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Partial Hydromodification Management Flow Control

Max Dugan – Geosyntec Consultants

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Partial Hydromodification Management Flow Control

- Partial Hydromodification Management Flow Control
  - Method 1: Sizing Factor Approach
  - Method 2: Annual Retention Target
  - Method 3: Project Specific Modeling
- Other Considerations

Section 3.7

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Method 1: Sizing Factor Approach

- Updated sizing factors
  - From 2018 Model BMPDM update
  - Based on current flow control performance standard (2013 MS4 Permit)
  - Flow control provided by infiltration and/or one low flow orifice outlet
  - Unlimited overflow

Section 3.7.1.1

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Method 1: Sizing Factor Approach

- Sizing factors are based on 1 acre unit area models
- They are intended to scale up and down
- If 4,000 ft^2 BMP controls 1 acre, then
  - 8,000 ft^2 BMP controls 2 acres
  - 2,000 ft^2 BMP controls 0.5 acre

Section 3.7.1.1

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Method 1: Sizing Factor Approach

1. Identify a BMP to be implemented as ACP
2. Select appropriate sizing factor for BMP type
3. Calculate required size based on sizing factor
4. Compare to actual size implemented
5. Actual Size / Required Size = % of Available Credit Earned

Section 3.7.1.1

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Method 1: Sizing Factor Approach

- Retention, partial retention with biofiltration, and biofiltration size BMP based on area
- Cistern/vault size BMP based on volume
- **Credits apply to DCIA in units of area**

$$\frac{\text{Area Provided}}{\text{Area Required}} \times \text{DCIA (acres)} = \text{Credit Earned (acres)}$$

$$\frac{\text{Volume Provided}}{\text{Volume Required}} \times \text{DCIA (acres)} = \text{Credit Earned (acres)}$$

Section 3.7.1.1

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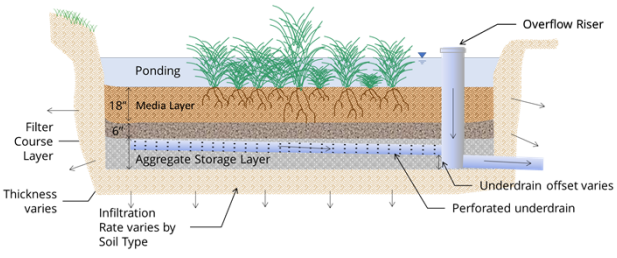
Method 1: Sizing Factor Approach

Example: Partial Retention with Biofiltration



- 0.5-acre lot available to install BMP
- 40 acre watershed, DCIA = 30 acres
- Partial retention with biofiltration can be installed per detail
- BMP footprint approximately 0.3 acres

Section 3.7.1.1

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Method 1: Sizing Factor Approach

- Updated sizing factor (area-based) = 0.050
  - Based on Lindbergh, D, Flat
- BMP area required = 30 acres x 0.050 = 1.5 acres

$$\frac{\text{Area Provided}}{\text{Area Required}} \times \text{DCIA (acres)} = \text{Credit Earned (acres)}$$

$$\frac{\text{0.3 acres provided}}{\text{1.5 acres required}} \times \text{30 acres} = \text{6 acres Credit Earned}$$

Note: Size low flow control orifice based on 6 acres controlled.
This example requires 2.125-inch low flow control orifice.

Section 3.7.1.1

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Method 2: Annual Retention Target

- Quantifies hydromodification flow control benefits for common retention elements
- Incentivizes retention (tree wells, dispersion, retention) and promotes site design

Section 3.7.1.2

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Method 2: Annual Retention Target

- Established retention targets through continuous simulation modeling that identified the percentage of annual retention required to reduce post development (impervious) runoff volumes to pre-development (pervious) runoff volumes

Rain Gauge	Soil	Slope	% Retention Required	Cutoff
Lindbergh	A	Low	99.3%	3%
Lindbergh	B	Moderate	97.6%	9%
Lindbergh	C	Moderate	93.0%	11%
Lindbergh	D	Steep	76.3%	13%

Section 3.7.1.2

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Method 2: Annual Retention Target

$$Partial\ Credit = \frac{[Provided\ Retention - Cutoff]}{[Required\ Retention - Cutoff]} \text{ x DCIA}$$

Example

- 3 - 20' tree wells combined are determined to retain 30% of annual runoff volume from 1 acre of impervious area.
- Pre-developed soil = D; Steep slope; Lindbergh rainfall gauge
  - Required Retention = 76.3%
  - Cutoff for D Soils = 13%
- Partial Credit = $\frac{[30\% - 13\%]}{[76.3\% - 13\%]} \times 1\ acre = \frac{17\%}{63.3\%} \times 1\ acre = 0.27\ acres$

Section 3.7.1.2

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Method 3: Project Specific Modeling

1. Identify a BMP to be implemented as ACP
2. Perform project specific modeling to calculate the size required to meet the performance standard
3. Compare to actual size implemented
4. Actual Size / Required Size = % of Available Credit Earned

Section 3.7.1.3

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Other Considerations

- BMP Inflow
- BMP Overflow
- Other BMP Features
- Maintenance Frequency

Appendix C.3.1

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Flow-Thru Treatment Efficiencies

Venkat Gummadi – Geosyntec Consultants

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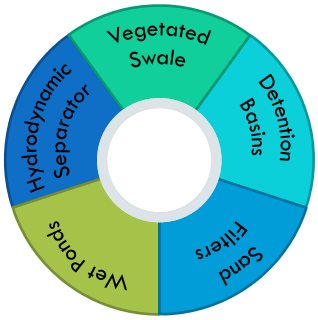
Flow-thru Treatment Control BMPs

- Data from International Stormwater BMP Database (http://bmpdatabase.org/) was used to develop default pollutant efficiency values for non-proprietary BMPs

Pollutants of concern	TP, TN, Bacteria (FC will be used as surrogate), TSS, TZn, DZn, TCu, DCu, and TPb
Influent Conditions	Tributary land uses Influent conditions
BMP Parameters	Design Sizing Maintenance Activities
Storm Characteristics	Storm Duration Intensity Frequency



Section 2.3.1.3.1

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Flow-thru Treatment Control BMPs (13/13)

For Proprietary BMPs

- To be based on reciprocity with existing BMP Acceptance/Assessment Protocols or third party testing data
- Require jurisdictional approval

Section 2.3.1.3.1

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Flow-thru Treatment Control BMPs Formula for BMP Efficacy Factor

BMP Efficacy Factor (B)

$$B = C_R \times E_R + C_F \times E_F$$

$$C_{Retention} + C_{Filtration} + C_{Bypass} = 1$$

Variables	Consideration
$C_{Retention}$: Fraction of DCV retained in the BMP	Value between 0 to 1
$C_{Filtration}$: Fraction of DCV filtered by the BMP	Value between 0 to 1
C_{Bypass}: Fraction of DCV bypassing the BMP	Value between 0 to 1
E: Pollutant Removal Efficiency [(Influent – Effluent)/Influent]	E_R = 1; E_F based on formula
Influent: Concertation of pollutant load entering the BMP	Based on drainage area
Effluent: Concentration of pollutant load leaving the BMP If Effluent > Influent assume Effluent = Influent; so there will be no negative reductions; Filtration Reduction = 0	Based on BMP Type

Section 2.3.1.3

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BMP Data Inventory – Representative Influent Quality

	Vegetated Swales		Wet Ponds		Detention Basins		Sand Filters		Hydrodynamic Separators	
Pollutant	No. of Studies	Data Count	No. of Studies	Data Count	No. of Studies	Data Count	No. of Studies	Data Count	No. of Studies	Data Count
TP	22	329	62	752	39	372	23	328	3	45
TN	19	289	47	577	31	268	18	223	5	53
FC	14	84	15	122	19	126	14	137	1	8
TSS	23	325	65	808	42	393	27	357	7	108
TZn	21	274	53	673	26	231	24	335	5	63
DZn	16	135	19	251	12	143	12	176	0	0
TCu	19	243	45	575	23	212	21	309	5	62
DCu	16	135	16	221	12	142	12	179	0	0
TPb	18	217	47	626	20	199	19	264	4	28

- Only paired influent and effluent data was selected from the 2016 edition of the BMP Database.
  - Only data from studies with median influent concentrations representative of typical urban land use concentrations are included in the analysis

Concentration Reduction Analysis (March 2018)

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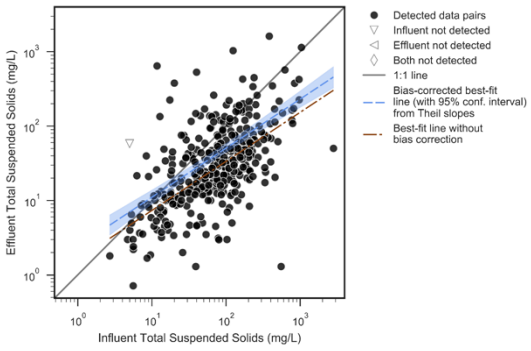
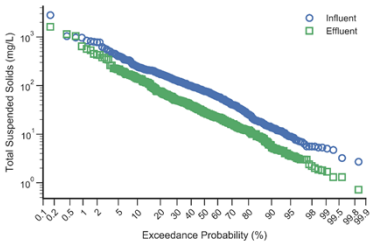
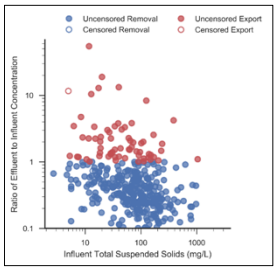
Detention Basins – TSS (mg/L) Plots







Concentration Reduction Analysis (March 2018)

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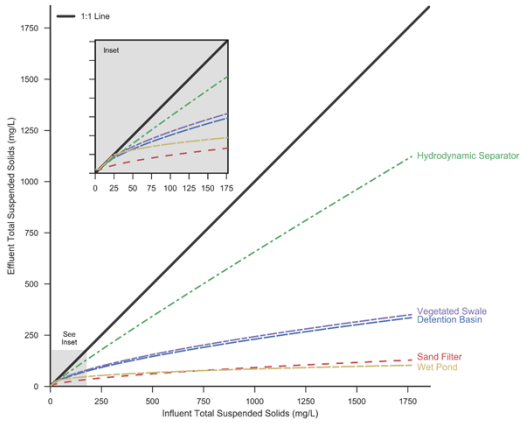
Performance Curves for Total Suspended Solids



$$C_{eff} = \min\left[C_{inf}, \max\left(A + B \cdot C_{inf} + C \cdot \ln\left(C_{inf}\right) + e_{1i} + \left(D \cdot {C_{inf}}^{E}\right) e_{2i}, DL\right)\right]$$

Concentration Reduction Analysis (March 2018)

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Concentration Reduction

BMP Type	TSS	TP	TN	TCu	TPb	TZn	FC
Detention Basin	0.57	0.43	0.29	0.31	0.04	0.40	0.09
Hydrodynamic Separator	0.25	0.00	0.33	0.23	0.00	0.03	0.00
Sand Filter	0.70	0.58	0.30	0.41	0.67	0.67	0.12
Vegetated Swale	0.55	0.34	0.19	0.36	0.37	0.52	0.24
Wet Pond	0.69	0.50	0.49	0.45	0.54	0.60	0.00

$$Pollutant\ Removal\ Efficency = \left[\frac{C_{inf} - C_{eff}}{C_{inf}}\right] \times Factor\ of\ Safety$$

Used medians for developing concentration reduction metrics. A 20% factor of safety was used to account for the uncertainty in the results

Section 2.3.1.3.1

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Credit Calculation Example 1

- PDP Area = 1 acre; 100% Impervious
- 85th percentile 24-hour rainfall depth = 0.60 inches
- DCV = 2,000 cubic feet
- Land Use = Single Family Residential
- BMP = Sand Filter
- $C_{Retention}$ = 0.0
- $C_{Filtration}$ = 0.6
- C_{Bypass} = 0.4
- WQE Pollutants of Concern: Total Nitrogen; Total Phosphorus; Fecal Coliform (Bacteria)

$$V_E = V_2 B_2$$

WQE Pollutant of Concern	$C_{Retention}$	$C_{Filtration}$	Efficiency Factor	B	V_E
Total Nitrogen (mg/L)	0.0	0.6	0.30	0.18	360
Total Phosphorus (mg/L)	0.0	0.6	0.58	0.35	760
Fecal Coliform (col/100mL)	0.0	0.6	0.12	0.07	140

Section 2.3.1.3.1

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Credit Calculation Example 2

- PDP Area = 1 acre; 100% Impervious
- 85th percentile 24-hour rainfall depth = 0.60 inches
- DCV = 2,000 cubic feet
- Land Use = Single Family Residential
- BMP = Sand Filter
- $C_{Retention}$ = 0.1
- $C_{Filtration}$ = 0.6
- C_{Bypass} = 0.3
- WQE Pollutants of Concern: Total Nitrogen; Total Phosphorus; Fecal Coliform (Bacteria)

$$V_E = V_2 B_2$$

WQE Pollutant of Concern	$C_{Retention}$	$C_{Filtration}$	Efficiency Factor	B	V_E
Total Nitrogen (mg/L)	0.1	0.6	0.30	0.28	560
Total Phosphorus (mg/L)	0.1	0.6	0.58	0.45	960
Fecal Coliform (col/100mL)	0.1	0.6	0.12	0.17	340

Section 2.3.1.3.1

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Miscellaneous Smaller Updates

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Misc. Smaller Updates

- Land Restoration Calculations
- BMP Efficacy Factor
- Additional Copermittee Efforts

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Land Restoration

- Clarification on Land Restoration for undeveloped areas (Agriculture/Golf Course)
- WQE formula requires a change in VOLUME to work.
  - Manual Calculation: Use runoff factors from BMPDM. May increase by ~25% to reflect developed condition.
  - SWMM: Apply conductivity values from BMPDM. May decrease by 25% to reflect developed condition (already the practice).

Section 2.3.2.1

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BMP Efficacy Factor

- Added language allowing use of jurisdictional worksheets for calculating Design Capture Volumes, BMP Efficacy, and Land Use Factors provided they are consistent with the concepts in the original calculator.
  - Streamlined process (one worksheet, accommodates several DMAs)
  - Accommodate BMPDM updates (pore space values, drawdown times, site design elements, warning messages)

Appendix A

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Additional Copermittee Efforts/Formatting

- Incorporate information from Orange and Riverside Counties.
  - WQIP Pollutant of Concern Updates

Table 2-1

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Closing Statements & Final Questions

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Closing Statements & Final Questions

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THANK YOU

WATER QUALITY EQUIVALENCY (WQE) PHASE 2 UPDATES

PUBLIC SEMINAR

April 9 2018