Lessons Learned from Program Effectiveness Assessment Development and Implementation

CASQA Webinar
November 2, 2016

Hosted by:
Karen Ashby – Larry Walker Associates
Nora Jans – Michael Baker International
Instructions for Today

- Participants will be muted
- Pause for questions after each speaker
- Ask questions via the Q&A box on the WebEx webinar panel
  - Please send to “Host and Presenter”
Agenda

- Stormwater Program Effectiveness Assessment for the City of Paso Robles
  - David LaCaro, City of Paso Robles (17 min)
- LPR Model for Pollutant Load Reduction
  - Cathleen Garnand, County of Santa Barbara (17 min)
- Year 3: Program Effectiveness Assessment Results
  - Lisa Moretti, UC Davis (25 min)
- Orange County Stormwater Program’s Headline Environmental Indicators
  - Richard Boon, County of Orange (25 min)
- Non-Structural BMPs - How do they Measure Up?
  - Paul Hartman, LWA (25 min)
https://www.casqa.org/effectiveness_assessment
CASQA Guidance Document

- One approach
- Terms and key concepts
- Assessment strategy
- Assessment methods
- Identifies applicability to program elements/minimum control measures
- Provides examples
Education and Outreach

Program Effectiveness Assessment and Improvement Plan (PEAIP) Framework

Program Effectiveness Assessment and Improvement Plan

Prepared by PERMITTEE DEPARTMENT/DIVISION

This cover is an example that could be customized for your agency.

An Introduction to Strategically Planning and Assessing Stormwater Programs

CASQA Webinar
June 22, 2015

Jon Van Rhyn – County of San Diego
David Pohl – ESA, San Diego, CA
Karen Ashby - Larry Walker Associates, Davis, CA
Stormwater Program Effectiveness Assessment for the City of Paso Robles

David LeCaro, Paso Robles
Presentation Outline

- Permit Requirements (E.14.)
- PEA implementation (necessary steps)
  - Mapping
  - BMP RAM
  - TELR (tool to estimate load reduction)
- Permit Linkage
- Benefits to TELR, BMP RAM, Parcel RAM
- Long-Term Tracking and Reporting
General Permit Requirements

- Program Effectiveness Assessment and Improvement (E.14.)
  - Develop a Plan
  - Assess BMPs and Program Effectiveness (i.e., Outcome Levels)
  - Assess Privately Owned BMP
  - Quantitatively Assess BMP Performance and Load Reduction
  - Answer Management Questions
  - Assess Available Water Quality Monitoring Data

- Central Coast Water Board Clarification
  - July 25, 2014 Letter (plan development, mapping, BMP inventory and effectiveness assessment, load reduction quantification)
PEA Steps for Improvement

- Program Modification and Improvements
- MS4 Catchment Mapping
- Program Implementation (Source and Treatment BMP)
- Effectiveness Assessment (TELR Modeling and BMP RAM)
Mapping Process

- MS4 Catchment Delineation
  - Catchment Routing/Connectivity
  - Field mapping
- Attributes
  - Catchment attributes (slope, soils)
  - Land use attributes (% LUs per catchment, roads)
- Final MS4 Maps and Catchment Attributes
Tool to Estimate Load Reduction

- Standard data set inputs (precipitation, soil type, % impervious surface, land use types, hydrologic connectivity)
- Evaluates Total Suspended Solids and Runoff Volume
  - Particulate - Specific Pollutant and Proxy
  - Runoff Volume - Loading
- Prioritizes catchments
- Easy user-friendly interface and spatial output for easy communication
BMP Assessment

- Inventory BMPs
- Set Thresholds and Benchmarks
- Record Visual Observations
- Track BMP Effectiveness over time
- Prioritize Maintenance Needs
- Focus funding for CIPs/O&M
- Communicates with TELR
Field Observation Datasheet

GENERAL INFORMATION

<table>
<thead>
<tr>
<th>BMP ID</th>
<th>BMP Type</th>
<th>Date</th>
<th>Personnel</th>
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<td>Dry Basin</td>
<td>2015-04-16</td>
<td>Parks</td>
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</table>

VEGETATION COVER

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<th>Grass</th>
<th>Trees</th>
<th>None</th>
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<td>Grass</td>
<td>Trees</td>
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INfiltration Observation

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<tr>
<th>Measurement Type</th>
<th>Rate</th>
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<td>CHP</td>
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MATERIAL ACCUMULATION

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CONVEYANCE

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<th># Inlets</th>
<th>Function?</th>
<th># Outlets</th>
<th>Function?</th>
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Add Observation | Obs History | Rolling_Hills_Basin

Rolling_Hills_Basin

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<th>Personnel</th>
<th>Score</th>
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<td>2015-04-09</td>
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<tr>
<td>2015-04-09</td>
<td></td>
<td>3.0</td>
</tr>
</tbody>
</table>

Add BMP | Upload BMP
- E.7. (Public Education)
- E.9.a (Outfall Mapping)
- E.9.b (IDDE)
- E.9.c (Outfall Inspections)
- E.13 (TMDL Monitoring)
- E.14 (PEA)
- E.15.d (BMP Reporting)

- E.11.e (Hot Spot Inspections)
- E.11.f (Storm Drain Assessment/Prioritization)
- E.11.g (Storm Drain Maint.)
- E.11.h (O&M)
- E.12 (PCRs)
- E.14 (PEA)
- E.15.d (BMP Reporting)

- E.7. (Public Education)
- E.9.a (Outfall Mapping)
- E.9.c (Outfall Inspections)
- E.13 (TMDL Monitoring)
- E.14 (PEA)
- E.15.d (BMP Reporting)
Benefits (ancillary and otherwise...)

- Grant Chasing
  - supporting information/data
  - Prop 1 development
- Public Outreach/Involvement Tracking
  - Focused messaging and target areas
- Future Planning Scenarios
  - Assessing future development
  - Identifying beneficial BMP areas
LPR Model for Pollutant Load Reduction

County of Santa Barbara
Cities of Buellton, Solvang, Goleta, Carpinteria

Cathleen Garnand, County of Santa Barbara
PEAIP (E.14) meets Monitoring (E.13)

- Spatially-based model
- Quantify pollutant loads
- BMP load reduction
- Monitoring data to support model
## Multiple Modeling Objectives

<table>
<thead>
<tr>
<th>Model Function</th>
<th>Ph II MS4 Permit</th>
<th>13267 Letter</th>
<th>TMDL Plans</th>
<th>SWRPs</th>
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<tr>
<td>Quantify Structural BMPs Reductions (pollutants)</td>
<td>X (vol/sed only)</td>
<td>X (vol/sed only)</td>
<td>X (TMDL pollutants)</td>
<td>X (pollutants, water supply)</td>
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<tr>
<td>Quantify Nonstructural BMPs Reductions (pollutants)</td>
<td>X (vol/sed only)</td>
<td>X (vol/sed only)</td>
<td>X (TMDL pollutants)</td>
<td></td>
</tr>
<tr>
<td>Prioritize Catchments (pre BMPs, post BMPs*)</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Incorporate WQ Monitoring Results</td>
<td></td>
<td>X</td>
<td>X</td>
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</tr>
<tr>
<td>Inventory Structural BMPs (where, what, maint. status)*</td>
<td></td>
<td>X</td>
<td></td>
<td></td>
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<tr>
<td>Retrofit Opportunities/Constraints Screening</td>
<td></td>
<td></td>
<td></td>
<td>X (GIS-based)</td>
</tr>
</tbody>
</table>
LPR Model Features

- Meet Water Board requirements
- Low Cost
- User-friendly
- Easily customized and adjusted
- Multiple water quality parameters
- Track BMP implementation
Quantify annual average wet weather pollutant loads and runoff volumes

Inputs: soils, land use (IMP), precip data
Jurisdiction Calculation Tabs

- Input data from GIS (catchments pre-populated, only change if needed)
- Input from “BMP Input” tab is transferred
- Calculates baseline loading and BMP load reductions (by catchment & land use)
# Pollutant Load – by land use

## Table 1: Baseline Loads by Catchment

<table>
<thead>
<tr>
<th>Catchment</th>
<th>Runoff (cu ft)</th>
<th>TSS (lb)</th>
<th>Tot P (lb)</th>
<th>Diss P (lb)</th>
<th>NH₃ (lb)</th>
<th>NO₃ (lb)</th>
<th>TKN (lb)</th>
<th>Diss Cu (lb)</th>
<th>Tot Cu (lb)</th>
<th>Tot Pb (lb)</th>
<th>Diss Zn (lb)</th>
<th>Tot Zn (lb)</th>
<th>Fecal Coliform (10^12 MPN/acre)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A001</td>
<td>156,372</td>
<td>749</td>
<td>4.9</td>
<td>3.8</td>
<td>8.6</td>
<td>6.2</td>
<td>28</td>
<td>0.19</td>
<td>0.38</td>
<td>0.11</td>
<td>1.8</td>
<td>2.6</td>
<td>0.20</td>
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<tr>
<td>A002</td>
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<td>161</td>
<td>0.29</td>
<td>0.19</td>
<td>0.44</td>
<td>0.64</td>
<td>2.1</td>
<td>0.011</td>
<td>0.025</td>
<td>0.012</td>
<td>0.31</td>
<td>0.39</td>
<td>0.062</td>
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<td>A003</td>
<td>54,135</td>
<td>741</td>
<td>1.3</td>
<td>0.88</td>
<td>2.0</td>
<td>2.9</td>
<td>9.7</td>
<td>0.051</td>
<td>0.12</td>
<td>0.055</td>
<td>1.4</td>
<td>1.8</td>
<td>0.29</td>
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<td>A004</td>
<td>134,075</td>
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<td>3.8</td>
<td>2.5</td>
<td>5.8</td>
<td>8.4</td>
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<td>A005</td>
<td>974,930</td>
<td>13,341</td>
<td>24</td>
<td>16</td>
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<td>A006</td>
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<td>A007</td>
<td>1,018,199</td>
<td>12,025</td>
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<td>17</td>
<td>45</td>
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<td>A009</td>
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<td>119</td>
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</tr>
</tbody>
</table>

**Dissolved Phosphorus (lb/acre):**
- Agriculture: 0.89
- Open Space: 0.14
- Multi-Family Residential: 0.52

**Dissolved Copper (lb/acre):**
- Agriculture: 0.011
- Transportaon: 0.12
- Multi-Family Residential: 0.14

**Dissolved Zinc (lb/acre):**
- Agriculture: 0.025
- Multi-Family Residential: 0.2

**Fecal Coliform (10^12 MPN/acre):**
- Agriculture: 0.019
- Open Space: 0.044
- Multi-Family Residential: 0.018
Watershed Loads

<table>
<thead>
<tr>
<th>Area</th>
<th>Runoff (cu ft)</th>
<th>TSS (lb)</th>
<th>Tot P (lb)</th>
<th>Diss P (lb)</th>
<th>NH3 (lb)</th>
<th>NO3 (lb)</th>
<th>TKN (lb)</th>
<th>Diss Cu (lb)</th>
<th>Tot Cu (lb)</th>
<th>Tot Pb (lb)</th>
<th>Diss Zn (lb)</th>
<th>Tot Zn (lb)</th>
<th>Fecal Col. (10^12 MPN)</th>
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<td>Goleta MS4 Area</td>
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<td>950,000</td>
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<td>2,000</td>
<td>4,300</td>
<td>7,800</td>
<td>18,000</td>
<td>87</td>
<td>190</td>
<td>72</td>
<td>1,100</td>
<td>1,500</td>
<td>320</td>
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<tr>
<td>Other MS4 Permit Areas</td>
<td>230,000,000</td>
<td>1,650,000</td>
<td>6,900</td>
<td>5,300</td>
<td>7,700</td>
<td>19,200</td>
<td>36,000</td>
<td>223</td>
<td>410</td>
<td>138</td>
<td>1,160</td>
<td>2,400</td>
<td>680</td>
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<td>Agriculture*</td>
<td>42,000,000</td>
<td>2,600,000</td>
<td>8,700</td>
<td>3,700</td>
<td>4,300</td>
<td>90,000</td>
<td>19,000</td>
<td>59</td>
<td>260</td>
<td>79</td>
<td>100</td>
<td>720</td>
<td>290</td>
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<td>Open Space*</td>
<td>100,000,000</td>
<td>1,400,000</td>
<td>760</td>
<td>570</td>
<td>700</td>
<td>7,400</td>
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<td>3.8</td>
<td>67</td>
<td>19</td>
<td>180</td>
<td>170</td>
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<td>Caltrans</td>
<td>17,000,000</td>
<td>81,000</td>
<td>710</td>
<td>580</td>
<td>380</td>
<td>770</td>
<td>1,900</td>
<td>34</td>
<td>54</td>
<td>9.6</td>
<td>230</td>
<td>300</td>
<td>7.9</td>
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<td>IGP Parcels</td>
<td>22,000,000</td>
<td>280,000</td>
<td>500</td>
<td>340</td>
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<td>1,200</td>
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<td>19</td>
<td>44</td>
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<td>Other*</td>
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<td>470,000</td>
<td>1,700</td>
<td>1,400</td>
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<td>110</td>
<td>38</td>
<td>470</td>
<td>680</td>
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<td>Total Watershed</td>
<td>578,000,000</td>
<td>7,331,000</td>
<td>21,970</td>
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<td>128,670</td>
<td>93,600</td>
<td>489</td>
<td>1,135</td>
<td>377</td>
<td>4,200</td>
<td>6,430</td>
<td>1,582</td>
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</tbody>
</table>

**Land Use Types**
Can distinguish other permitted discharges i.e. ag, industrial (IGP) and Caltrans
Catchment Prioritization Index (CPI)

Fecal Coliform

TSS

Diss. P
“Multi-Pollutant”
Based on pollutant weighting
- TMDL
- 303(d) listings
- Pollutants expected to exceed WQOs
### BMP Reductions

**Table 7. BMP Reductions (Additional BMPs may be added to the next empty row)**

*Note: units shown under pollutants represent concentration. Unit reductions are in units specified in Table 2 and percent reductions are in %.*

<table>
<thead>
<tr>
<th>BMP Type</th>
<th>Reduction Method*</th>
<th>% Capture</th>
<th>Volume</th>
<th>TSS</th>
<th>Tot P</th>
<th>Diss P</th>
<th>NH3</th>
<th>NO3</th>
<th>TKN</th>
<th>Diss Cu</th>
<th>Tot Cu</th>
<th>Tot Pb</th>
<th>Diss Zn</th>
<th>Tot Zn</th>
<th>Fecal Col.</th>
<th>Pollutant</th>
<th>Pollutant</th>
<th>Pollutant</th>
</tr>
</thead>
<tbody>
<tr>
<td>85th – Redevelopment (100% Infiltration)</td>
<td>E</td>
<td>100%</td>
<td>18.1</td>
<td>0.14</td>
<td>0.07</td>
<td>0.18</td>
<td>0.37</td>
<td>0.98</td>
<td>8.3</td>
<td>8.8</td>
<td>4.2</td>
<td>34.7</td>
<td>37.6</td>
<td>5,890</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85th – Redevelopment (50% Infiltration)</td>
<td>E</td>
<td>50%</td>
<td>18.1</td>
<td>0.14</td>
<td>0.07</td>
<td>0.18</td>
<td>0.37</td>
<td>0.98</td>
<td>8.3</td>
<td>8.8</td>
<td>4.2</td>
<td>34.7</td>
<td>37.6</td>
<td>5,890</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>85th – Redevelopment (100% Treatment)</td>
<td>E</td>
<td>0%</td>
<td>18.1</td>
<td>0.14</td>
<td>0.07</td>
<td>0.18</td>
<td>0.37</td>
<td>0.98</td>
<td>8.3</td>
<td>8.8</td>
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<td>5,890</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>95th – Redevelopment (100% Infiltration)</td>
<td>E</td>
<td>100%</td>
<td>18.1</td>
<td>0.14</td>
<td>0.07</td>
<td>0.18</td>
<td>0.37</td>
<td>0.98</td>
<td>8.3</td>
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<td>37.6</td>
<td>5,890</td>
<td></td>
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</tr>
</tbody>
</table>

**Brake Pad Copper Phase-out Legislation**

**Other Non-structural BMPs** (CBSM)

**Other Non-structural BMPs** (WAAP BMPs - Tanglewood & Orcutt only)

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**Dissolved Phosphorus Annual Baseline & Current Loads**

**Load Reduction by BMP Type**

- Final Load Reduction (lb) = 710

- Infiltration Basin 8%
- Other Non-structural BMPs 44%
- Redevelopment 48%
Future LPR Model Uses

Existing/Planned

- Prioritize catchments (or land uses) for MS4 cleaning, street sweeping, outreach, structural BMP placement, etc.
- Support BMP inventory, including BMP assessment results to update catchment prioritization, to best inform BMP placement
- Use maps as communication tools for public, management, elected officials, etc.

Potential Future

- Prioritize BMPs – e.g. compare relative cost–benefit of different BMP options (requires incorporation of cost data)
- Support grant applications and/or Stormwater Resource Plans
  - Can be used to quantify water supply benefits of structural BMPs
- Use maps as educational tools for public, PW managers, and/or elected officials
- Forecast long–term cost of compliance (with TMDL WLAs, etc.)
Please send in your questions using the Q&A box in the webinar panel to “Host and Presenter”.

All participants are muted throughout the webinar.

QUESTIONS
Year 3: Program Effectiveness Assessment Results
MS4 Non-Traditional Phase II Permittee

Lisa Moretti, P.E., QSD, QISP TOR
University of California, Davis
Environmental Health & Safety
Overview

• Requirements and Goals for Phase II MS4 Permittee Program Effectiveness Assessment and Improvement Plan (PEAIP)
• PEAIP Framework
• Education and Outreach Program Assessment
• Permitee Operations and Maintenance Activities Assessment
• Post-Construction Assessment
• Summary
Program Effectiveness Assessment Goals (F.5.h.1)

- Adaptively manage storm water program
- Improve program effectiveness
- Reduce pollutants of concern
- Achieve the Maximum Extent Practicable (MEP) standard
- Protect water quality
- Document the Permittee’s compliance with permit conditions
Program Effectiveness Assessment Framework

- Pollutant Sources
- Target Audience
- Program Element
- Priority BMPs
- Management Questions
- Data Collection
Non-Traditional Phase II
Program Effectiveness Assessment Timeline

<table>
<thead>
<tr>
<th>Year 1 &amp; 2</th>
<th>Year 3 &amp; 4</th>
<th>Year 5</th>
</tr>
</thead>
</table>
| • Develop PEAIP | • Track annual and long-term effectiveness of storm water program  
• Certify compliance with program element requirements | • Identify improvements for BMPs that did not accomplish goals  
• Continue and expand upon BMPs that proved to be effective  
• Identify new BMPs or modifications to existing BMPs designed to increase pollutant load reductions;  
• Discontinue BMPs that may no longer be productive and replacing with more effective BMPs;  
• Shift priorities to make more effective use of resources |
Program Effectiveness Assessment Framework

Low
- Outcome Level 1 results only
- Implemented, but no evidence that there was an impact

Medium
- Outcome Level 2 results
- Results in a change of awareness

High
- Outcome Level 3-4 results
- Results in a change in behaviors or reduction in pollutant load
## F.5.b Education and Outreach

### Management Questions:
- How effective is training at increasing staff awareness of pollutants of concern and BMPs to reduce storm water pollution?
- Is training effective at changing behaviors?
- Are trained staff reporting illicit discharges?

### Goals:
- Trained staff should be able to identify trash and sediment as pollutants (OL2)
- Trained staff should know that storm water is not treated prior to discharge (OL2)
- Trained staff should be able to identify illicit discharges, report illicit discharges, and prevent illicit discharges (OL2&3)
- Trained staff should be properly implementing BMPs (OL3)
Staff Survey Results

- % staff who identify sediment as a pollutant (OL2)
- % staff who know that storm water is not treated (OL2)

Non-Trained Staff
Trained Staff
Training Assessment for Grounds Keepers

- % correctly identified that storm water was not treated by the WWTP
- % aware that pressure washing is an illicit discharge
- % aware that irrigation overspray was an illicit discharge

Pre-Training

Post-Training
Training Assessment

• Training does result in an increase in awareness
• Training has resulted in an increase in reports of illicit discharges
• There were no repeat illicit discharges. One illicit discharge report was from a trained employee.

• **Overall: Medium Effectiveness**
  • Increase in awareness achieved (OL2)
  • Some evidence that there is change in behavior (OL3)
  • No evidence of reduction in pollutant loads (OL4) due to limits in data collection

• **Modifications:**
  • Collect data to document evidence of change in behavior and implementation of BMPs
F.5.f. 8 Permitee Operations and Maintenance Activities

“Permittee shall assess their O&M activities for potential to discharge pollutants in storm water and inspect all BMPs on a quarterly basis”

<table>
<thead>
<tr>
<th>Management Questions:</th>
<th>Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Is staff training resulting in effective implementation of BMPs?</td>
<td>• Trained staff should be properly implementing BMPs (OL3)</td>
</tr>
<tr>
<td>• Are BMP implementation resulting in decrease in pollutant loads?</td>
<td>• Reduction in required corrective actions in Quarterly BMP Assessment (OL4)</td>
</tr>
<tr>
<td></td>
<td>• 100% of corrective actions with identified follow-up actions (OL4)</td>
</tr>
<tr>
<td></td>
<td>• Reduction in illicit discharges from trained staff (OL4)</td>
</tr>
</tbody>
</table>
F.5.f. 8 Permitee Operations and Maintenance Activities

### Quarterly Supervisor Assessments (2016 Q1 & Q2)

| Corrective Actions Related to Sediment | 6 |
| Corrective Actions Related to Trash    | 4 |
| % of Corrective Action Addressed*      | 100% |
| Decrease in corrective actions (Q1 to Q2) | 57% |

### Illicit Discharge Reports

| Authorized NSWD          | 45% |
| Illicit Discharges from Trained Employees | 1 of 6 reports |

* Corrective actions that require capital investment are excluded if items have been budgeted for and scheduled.
F.5.f. 8 Permitee Operations and Maintenance Activities

- Trained staff are implementing BMPs
- Corrective actions are focused on routine items (sediment collection, litter)
- Implementation of quarterly inspection resulted in decreases in corrective actions.

**Overall: High Effectiveness**
- Evidence of change in behavior (OL3)
- Implementation of corrective actions and BMPs indicates reduction in pollutant load (OL4)

**Modifications:**
- Continue to collect data on implementation of BMPs, evaluate by areas and departments.
F.5.g.4 O&M of Post Construction BMPs

“The Permittee shall ensure that systems and hydromodification controls installed at projects are properly operated and maintained for the life of the projects.”

<table>
<thead>
<tr>
<th>Management Questions:</th>
<th>Goals:</th>
</tr>
</thead>
<tbody>
<tr>
<td>How effective are treatment systems at preventing POCs from entering the storm sewer system?</td>
<td>100% of required O&amp;M of treatment systems conducted (OL4)</td>
</tr>
<tr>
<td></td>
<td>100% of treatment systems functioning as designed (OL4)</td>
</tr>
<tr>
<td></td>
<td>Reduction in hydromodification impacts due to post-construction BMPs (OL5/6)</td>
</tr>
</tbody>
</table>
F.5.g.4 O&M of Post Construction BMPs

- No regulated post-construction systems installed on campus
- Assessment of implemented post-construction systems have shown reduction in effectiveness over time
- Goals for Years 4 & 5:
  - Assessment of O&M protocols to improve effectiveness over time
Lessons Being Learned

- Difficulties of collection and interpretation of data
- Achieving Year 5 Goals:
  - Identifying which BMPs ineffective and why
  - Evaluation of resource allocation (e.g. storm drain labeling)
- Balancing quantitative and qualitative data
Contact Information

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CASQA Program
Effectiveness Webinar

Orange County Stormwater Program’s Headline
Environmental Indicators

Richard Boon, County Of Orange
Overview

- Background
  - Orange County
  - State Of The Environment Report

- Headline Environmental Indicators
  - Receiving Waters & MS4
  - Target Audiences

- Summary
Orange County
MS4 Permitting

Source: USEPA
Headline Environmental Indicators

The purpose of environmental headline indicators is to provide simple and clear information to decision-makers and the general public about progress in environmental policies and the key factors determining the state of the environment and whether we are moving towards environmental sustainability.

European Environment Agency, 2016
Beneficial Use Protection
Beneficial Use Protection
Receiving Waters: Water Quality Index

- The CCME WQI provides a mathematical framework for assessing ambient water quality conditions relative to water quality objectives.
- Index is based on a combination of three factors:
  - The numbers of variables whose objectives are not met (Scope)
  - The frequency with which the objectives are not met (Frequency)
  - The amount by which the objectives are not met (Amplitude)
- Provides ranking based upon score (1-100)
  - Excellent (95-100 – Conditions close to pristine)
  - Good (80-94 – Minor degree of threat)
  - Fair (65-79 – Occasional impairment)
  - Marginal (45-64 – Water quality is frequently threatened)
  - Poor (0-44 – Water quality is always impaired)

Source CCME, 2001
Receiving Waters

Overall exceedance index for core monitoring constituents at coastal discharge points (2003-2013)

Overall exceedance index for core monitoring constituents in inland Channels (2003-2013)
Urban Runoff Quality – Dry Weather
Surfzone – Dry Weather
Urban Runoff – Wet Weather
Source Contributions – ID/IC

[Bar chart and pie chart showing the number of complaints by year and category, with percentages for each category.]
Pollutant Generating Activities/BMPs

Please tell me if you have already done the following, or if you would be willing or not willing to do each of the following in order to help reduce water run-off pollution in Orange County.

**LIST OF ACTIVITIES**
- Using a broom and trash bag, not a hose, to clean walkways and driveways
- Adjusting sprinklers to avoid over watering your lawn
- Eliminating washing your car at home and taking it to a car wash
- Keeping yard clippings out of the street by putting them in the trash, leaving them on your lawn or composting
- Properly using lawn and garden fertilizers and pesticides
- Picking up waste and droppings from your pet
- Disposing of household chemicals and automobile oil and other fluids properly by ensuring they go to a recycling or hazardous waste collection center

![Bar chart showing the percentage of people willing or not willing to perform each activity, categorized by the number of activities and the year.

- **Seven activities**
  - 2012: 13
  - 2009: 15
  - 2005: 11
  - 2003: 10

- **Six activities**
  - 2012: 25
  - 2009: 24
  - 2005: 22
  - 2003: 23

- **Five activities**
  - 2012: 20
  - 2009: 19
  - 2005: 22
  - 2003: 15

- **Four activities**
  - 2012: 9
  - 2009: 9
  - 2005: 11
  - 2003: 10

- **Three activities**
  - 2012: 8
  - 2009: 8
  - 2005: 8
  - 2003: 10

- **Two activities**
  - 2012: 5
  - 2009: 6
  - 2005: 5
  - 2003: 6

- **One activity**
  - 2012: 6
  - 2009: 9
  - 2005: 10
  - 2003: 7

- **None**
  - 2012: 11
  - 2009: 10
  - 2005: 7
  - 2003: 6

Legend:
- **2012**: Light blue
- **2009**: Blue
- **2005**: Orange
- **2003**: Dark blue

---

*Note: The above table and chart provide a visual representation of the data, showing the percentage of people willing or not willing to perform each activity, categorized by the number of activities and the year.*
Awareness Vs. Engagement

- **Behavior Change**
  - One-on-One Personal Contact
  - Group Discussion
  - Personalized media (feedback)
  - Impersonal direct contact (direct mail, email)

- **Reach**
  - Information / Awareness by mass media (TV, radio, billboard)

---

This diagram illustrates the relationship between awareness and engagement, showing how different communication methods affect behavior change and reach.
Public Engagement: Approach

Hi OC!

Follow OC’s spokesgnome on his adventure to help keep water in the yard, not the sidewalk.

OverwateringIsOut.org

Drought, Camera, Action!

OC’s Best Drought Resistant Photo!

These neighbors are helping to stop overwatering! Are you?

Put yourself on the map!

To help stop overwatering in my neighborhood, I have...

let my lawn go brown
Summary

Presented comprehensive picture of state of environment and management actions - Yes

Established basis for broadening participation and creating common purpose - Partially
For More Information

State Of The Environment:  http://ocwatersheds.com/

Overwatering Is Out:    http://www.overwateringisout.org/

Richard Boon:  richard.boon@ocpw.ocgov.com
Please send in your questions using the Q&A box in the webinar panel to “Host and Presenter”.
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QUESTIONS
Non-Structural BMPs
How do they Measure Up?

Paul Hartman, Larry Walker Associates

November 2, 2016
Background and Purpose

- TMDLs and other Regulatory Drivers
- Translate into Numeric Targets or Goals
- Management Approaches to meet the Targets/Goals
Why do we need to quantify?

- Watershed Plans – 10% reduction (assumed)
- Numeric Targets and Goals
- Non-structural BMPs might get us there!
Management Questions

- How far will NSBMPs get us?
- How can we quantify the benefits?
- Where should we put our efforts?
- What programs are most effective – from a load reduction and a cost standpoint?
Estimating the Effectiveness of NSBMPs

- Institutional Programs
  - Minimum of Six Elements
  - Multiple Strategies within Each

- Assuming 5-10% effectiveness for new programs

\[ \text{Overall \% Reduction for Element 1} = \text{\% Reduction Strategy 1} + \text{\% Reduction Strategy 2} + \text{\% Reduction Strategy 3} + \text{\% Reduction Strategy 4} \]
Approach

- New and Enhanced BMPs
- Effectiveness Ratings
- Apply Effectiveness Ratings to Modeled Loads (if available)
- Implementation Schedule and Cost Information
New and Enhanced BMPs

- Not “business as usual”
- Above the Normal Program Elements
- Quantify the Incremental Improvements
Effectiveness Rating =

<table>
<thead>
<tr>
<th>Participation Factor</th>
<th>Loading Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amount of the target audience who would implement the BMP?</td>
<td>How much of the pollutant load would be reduced if 100% of the target audience changed their behavior?</td>
</tr>
<tr>
<td>Outreach to residents → 5-10% of them changing</td>
<td>Proper pesticide application → 50% vs. stopped applying, then the loading factor would be 100%</td>
</tr>
<tr>
<td>New policy requiring a change to municipal maintenance practices → closer to 100%</td>
<td></td>
</tr>
</tbody>
</table>

### Notes
- Proper pesticide application results in: 50% vs. stopped applying, the loading factor would be 100%.
Effectiveness Ratings

- Effectiveness Assessments
- Literature Information
- Best Professional Judgement
- Engage Staff
- Make Conservative Assumptions
Estimating the Effectiveness of NSBMPs

1. Evaluate Sources
2. Calculate/Estimate Loads
3. Develop Programs
4. Calculate Effectiveness Rating

Participation Factor \( \times \) Loading Factor
## Effectiveness Rating Example

\[ \text{Participation Factor} \times \text{Loading Factor} = \text{Effectiveness Rating} \]

<table>
<thead>
<tr>
<th>Program Element</th>
<th>Strategy</th>
<th>Participation Factor</th>
<th>Loading Factor</th>
<th>Effectiveness Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Inspections</td>
<td>Activity specific outreach to businesses.</td>
<td>10 – 20%</td>
<td>75%</td>
<td>7.5 – 15%</td>
</tr>
<tr>
<td></td>
<td>Target areas where frequent dry weather runoff is observed.</td>
<td>50%</td>
<td>25%</td>
<td>12.5%</td>
</tr>
<tr>
<td></td>
<td>Increase presence and enforcement at sites with violations.</td>
<td>60 - 80%</td>
<td>75%</td>
<td>45 – 60%</td>
</tr>
</tbody>
</table>
## Effectiveness Rating Example (cont’d)

Effectiveness Rating  $\times$ Source Load = Estimated Load Reduction

<table>
<thead>
<tr>
<th>Program Element</th>
<th>Strategy</th>
<th>Effectiveness Rating</th>
<th>Source Load</th>
<th>Estimated Load Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commercial Inspections</td>
<td>Activity specific outreach to businesses</td>
<td>7.5 – 15%</td>
<td>80%</td>
<td>9%</td>
</tr>
<tr>
<td></td>
<td>Target areas where frequent dry weather runoff is observed</td>
<td>12.5%</td>
<td>25%</td>
<td>3%</td>
</tr>
<tr>
<td></td>
<td>Increase presence and enforcement at sites with violations</td>
<td>45 – 60%</td>
<td>75%</td>
<td>39%</td>
</tr>
</tbody>
</table>

Load Reduction for Program Element: 51%
### Programmatic Results (examples)

<table>
<thead>
<tr>
<th>Program Element</th>
<th>Effectiveness Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outreach</td>
<td>2 - 20%</td>
</tr>
<tr>
<td>Industrial and Commercial</td>
<td>8 – 30%</td>
</tr>
<tr>
<td>Construction</td>
<td>20 – 72%</td>
</tr>
<tr>
<td>Municipal</td>
<td>2 – 72%</td>
</tr>
<tr>
<td>ICID</td>
<td>5 – 45%</td>
</tr>
</tbody>
</table>
Programmatic Results (examples)
# Overall Results (examples)

<table>
<thead>
<tr>
<th>Constituent</th>
<th>Condition</th>
<th>Estimated Range of Effectiveness</th>
<th>Average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flow (nutrients)</td>
<td>Dry</td>
<td>35 – 75%</td>
<td>55%</td>
</tr>
<tr>
<td>Bacteria</td>
<td>Wet</td>
<td>12 – 33%</td>
<td>22%</td>
</tr>
<tr>
<td>Zinc</td>
<td>Both</td>
<td>6 – 45%</td>
<td>25%</td>
</tr>
<tr>
<td>Sediment</td>
<td>Wet</td>
<td>5 – 55%</td>
<td>28%</td>
</tr>
</tbody>
</table>
Benefits and Costs (examples)
Conclusions

- Opportunities to focus programs exist, but are still evolving
- Effectiveness assessments are becoming more important (PEA, monitoring)
- Ideally, we will learn from this first step and provide:
  - More flexibility
  - More knowledge
  - Better, more evolved programs
Questions?

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QUESTIONS
Program Effectiveness Assessment
Thank you for Attending!

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