Implementation Options and Case Studies for Addressing Bacteria Limits

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Agenda

1. Intro to Implementation Planning
2. Implementation Planning Case Studies
3. Special Study Options
4. Lessons Learned
Reference Watershed TMDL Approach

- Basis for most LA and SD region bacteria TMDLs
- Concept: WLAs, in form of allowable exceedance frequency (of REC1 single sample limits), set to lower of:
  1. reference beach, or
  2. existing (impaired) conditions
- Natural Source Exclusion alternative
  1. Demonstrate anthropogenic sources controlled
  2. Demonstrate risk levels acceptable
- TMDLs require MS4 Implementation Plans, including Quantitative Analysis component (to demonstrate that Plan will meet WLAs)

Reference Watershed TMDL Approach (cont’d)

Leo Carrillo Reference Beach

<table>
<thead>
<tr>
<th>TMDL WLAs</th>
<th>Leo Carrillo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet-Weather WLA</td>
<td>22%</td>
</tr>
<tr>
<td>Summer Dry-Weather WLA</td>
<td>0%</td>
</tr>
<tr>
<td>Winter Dry-Weather WLA</td>
<td>3%</td>
</tr>
</tbody>
</table>
Intro to Implementation Planning

Typical IP components:
- Watershed description
- Summary of TMDL
- Discussion of sources
- Implementation approach
  - Prioritized actions
  - Schedule
  - Cost
  - Monitoring & special studies
- Quantitative analysis of effectiveness

Intro to Implementation Planning (cont’d)

Other features:
- Phased implementation
- Adaptive management-based
- Consider multi-pollutant benefits
- Prioritize integrated water resources approaches
Structural BMP Prioritization and Analysis Tool (SBPAT)

GIS-based decision support tool that can be used to:
1. Identify and prioritize potential structural BMP projects, and
2. Estimate planning-level costs and pollutant concentration/load reductions associated with implementation of the prioritized projects.

See www.sbpat.net for more information

LA Region Land Use EMCs

- Highest – comm, res, ag
- Lowest – ind, trans, open
BMP Effluent Quality

Figure 11. Box Plot of BMP Study Geometric Means for Fecal Coliform by Selected BMP Category

- Bacteria data are limited
- Negative reduction – GS, MD
- No improvement – DB
- Reduction – MF, RP
- Best – infiltration & capture/reuse

Filtration processes are effective but infiltration and capture/reuse likely required to meet requirements.
IP Case Studies

Jurisdictions: Los Angeles, Beverly Hills, Santa Monica, West Hollywood, Inglewood, Culver City, and Caltrans

130 sq mi, 83% urban

Ballona Creek

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- **Nonstructural BMPs**
  - Enhanced Street Sweeping
  - Pet Waste Outreach
  - Downspout Retrofit Program

- **Structural BMPs**
  - Regional: Subsurface flow wetlands, detention, bioretention, infiltration
  - Distributed: Swales, pervious pavement, cisterns, bioretention green street medians
  - Estimated capital cost per treated acre: $68,000 (regional) and $23,000 (distributed)... $1.3B total
  - 12,000 acres treated (16% of total urban area)

- **Other Studies**
  - Source Characterization
  - Hotspot Monitoring

- **Schedule**
  - Structural implementation: 4 years
  - Final Compliance: 10 years

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Channel Islands Harbor Beaches

- Jurisdictions: County of Ventura
- ~5000 ac watershed, mostly res & comm
Channel Islands Harbor Beaches

Wet Weather (watershed based)
- Nonstructural BMPs
  - Downspout Disconnect Program
  - Pet Waste Education and Outreach
  - Catch basin cleaning
- Structural BMPs
  - Harbor redevelopment
  - Filtration-based retrofits
  - Estimated capital cost per imperv. acre: $19,000-$28,000 (redevelopment) and $31,000-$56,000 (retrofit)...
  - 74% of total jurisdictional area treated
- Other Studies
  - Wet-weather sources identification
- Schedule
  - Structural Implementation: 7 years
  - Final Compliance: 8 years

Dry Weather (beach based)
- Nonstructural BMPs
  - Ordinances (pet waste, bird feeding)
  - Feral cat programs
- Structural BMPs
  - Beach grooming
  - Bird filaments
  - Enhanced circulation device (pilot)
  - Estimated cost: $415,000
- Other Studies
  - Pilot enhances circulation devices
  - Bird exclusion devices
- Schedule
  - Final Compliance: 4 years

SMBBB J 1 & 4

Jurisdictions: City of Malibu, County of LA, Caltrans, other cities

LEGEND

Jurisdictions:
City of Malibu
Ventura County Line

Note:
- J1/4 Subwatershed
- City of Malibu
- Ventura County Line
SMBBB Jurisdictions 1 & 4

Integrated Water Resources Approach
- Distributed Structural
  - Residential cisterns
  - Onsite storage and reuse
  - Small-scale infiltration
  - Porous Pavements
  - Bioretention
  - Onsite wastewater alternatives
- Regional Structural
  - Pretreatment/System Upgrade (Paradise Cove)
  - Biofiltration and infiltration (Las Flores Canyon)
  - Dry flow disinfection (Marie Canyon Drain)
  - Subsurface flow wetlands (Latigo Shores)
- Other Studies
  - Pilot projects

Schedule
- Structural Implementation: 4 years
- Final Compliance: 12 years

Nonstructural BMPs
- Pet waste education and outreach
- Livestock and horse stables education and outreach
- Industrial/commercial outreach and enforcement
- Bacteria-based BMPs emphasized in new/re-development requirements

Morro Bay

Jurisdictions: City of Morro Bay
- Nonstructural BMPs :
  - Targeted education and outreach
  - Illicit discharge program
  - Pet waste education and ordinance
  - Commercial/industrial outreach and enforcement

Structural BMPs: None

Studies:
- Water Quality Monitoring
- BMP Effectiveness Monitoring
Schedule:
- 5 years coinciding with MS4 permit renewal
- No quantitative analysis required
**Malibu Creek**

**Jurisdictions:** Unincorporated Ventura County

- **Nonstructural BMPs**
  - Pet waste, livestock, and horse ranch education and outreach
  - Golf course outreach/inspection
  - Downspout disconnect program
  - Enhanced IDDE program including camera installation
  - Enhanced septic inspection program
  - Residential fertilizer use and overwatering

- **Structural BMPs**
  - Distributed media filter installations in commercial and residential areas
  - Regional bioretention basin with underdrain

**Cost:** [TBD]

**Special Studies**
- Natural sources study
- Dry weather bacteria source tracking

**Schedule**
- Structural Implementation: 2 years
- Final Compliance: 5 years

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**Santa Monica Bay Beaches Jurisdictions 5 & 6**

**Jurisdictions:** Hermosa Beach, Manhattan Beach, Redondo Beach, Torrance, Caltrans

- **Human bacteroides** marker used to identify extent of dry weather human fecal contamination
- **Nonstructural BMPs**
  - Pet owner outreach
- **Structural BMPs**
  - Infiltration galleries/trenches (6)
  - Storage, use, and infiltration facility
  - Parking lot detention basin and beach infiltration
  - Estimated capital cost is $23,000 per impervious acre treated
Dry Weather Human Source ID

Need strategic IDDE program to address dry weather fecal sources to stormdrains... phased protocol recommended:

1. GIS evaluation of sewers-stormdrain intersections (need pipe age/type and elevation)
2. Observations of flow, odors, and field measurements (temp, NH3, optical brighteners)
3. Then lab test for surfactants (MBAS), fluoride, FIB
4. Then dye testing and advanced lab testing (human DNA markers, chemical indicators [caffeine])
5. Canine scent tracking also an option

Special Study Options

- Use attainability analysis (UAA)
  - Reduce REC use intensity
- High flow exclusions
  - Modify REC use during particular conditions
- Microbial source tracking
  - Many example uses of host-specific bacteroides marker
- Reference watershed studies
  - Especially needed for enclosed beaches
- Natural source exclusion
  - Allow exceedance rate once anthro. sources controlled
- Site specific criteria (SSC)
  - QMRA & epidemiological studies
What is QMRA?

Quantitative Microbial Risk Analysis (QMRA) is an EPA-approved means of determining site-specific indicator bacteria thresholds that are protective of EPA’s tolerable illness rates.

Site Specific Criteria Special Study

- Pathogen & FIB Monitoring
- Calculate Illness Risks Based on Measured Pathogen Concentrations
- Compare Risks vs EPA’s Tolerable Illness Levels (TILs)
- Either Existing FIB Levels are Acceptable, or Develop Site Specific Criteria to Match TILs

Particularly needed at urban runoff impacted waters where existing REC standards are likely overly protective.
CAW Microbial Risk Assessment

- Most extensive such QMRA ever performed in REC waters
- Risk results used to inform UAA & SSC assessments, select WWTP disinfection alternative

Tasks:
- Measure FIB & pathogen conc. during wet/dry weather
- Estimate inputs from various sources to river
- Estimate risk to public health
- Estimate change in public health if disinfection instituted

Risk For Dummies

\[
\text{Risk} = \text{Exposure} \times \text{Potency}
\]

We measured or estimated (based on literature) each of these terms. **Monte Carlo** probabilistic model used for exposure calculations.
Risk Assessment Results

- Risks greatest from viruses
- Risks greatest to people fishing (vs boating, canoeing) due to dose and duration
- Risks greatest during wet weather (when CSOs present)
- Disinfection shown to provide little risk reduction benefit
- QMRA shown to be a valuable tool for evaluating FIB control scenarios

QMRA also a Tool to Support Implementation Planning

- May be possible to model illness risks based on measured pathogen concentrations
- This information can be used to compare implementation scenarios and identify areas where BMPs may be prioritized
Implementation Planning Lessons Learned (1 of 3)

- Develop plan based on best available science
  - Understanding of FIB sources is evolving rapidly
  - New modeling tools available to evaluate BMP effectiveness & cost
- Structural BMP Retrofits – not cheap, so use strategically
  - First make use of all tools in toolbox – e.g., source controls, IDDE, redevelopment, disconnection requirements, etc.
  - Then allow cost-benefit analysis to guide BMP prioritization
  - Don’t ignore uncertainty!
    - Greater uncertainty with nonstructural BMPs since less effectiveness data available
    - Use available tools to quantify risks and allow decision-makers to make informed decisions

Implementation Planning Lessons Learned (2 of 3)

- Implementation Plans must be watershed-specific, not boiler plate
  - Each waterbody has unique sources, fate/transport processes, and impairment manifestations
  - Need understanding of watershed processes, pollutant sources, threatened uses, and stakeholder preferences
Successful implementation plans also:
- Secure participation by all responsible jurisdictions early
- Incorporate source identification and BMP pilot studies where both are true: (a) significant uncertainty exists and (b) implementation costs are significant
- Implement new BMPs in phases as TMDL schedules allow, with explicit interim milestones to ensure progress/action and adaptation based on new data
- Acknowledge future regulatory unknowns by including key milestones in schedule – evolving regulations & TMDL reopeners may result in moving targets

It may become apparent that implementation actions alone won’t achieve compliance, then consider alternative regulatory avenues
- Select special studies with greatest anticipated return on investment

THE END

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