Integrating Long Term Operation and Maintenance into BMP Design through Stakeholder Collaboration

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Outline

• The BMP Design Process
• Stakeholder Collaboration and Input Case Examples
  – Holland, MA
  – Windham, NH
  – Peabody, MA
• O&M Considerations and Lessons Learned
• Life Cycle Cost Analysis
BMP Design Process

- Watershed Assessment
- BMP Optimization/Modeling
- Site Reconnaissance
- Preliminary Design
- Final Design
BMP Design Process

Source: Caltrans: http://www.waterboards.ca.gov
Benefits

– Proactively educate stakeholders
– Opportunity to improve design
– Opportunity for innovative, collaborative solutions
– Balance cost and service
– Access local knowledge and expertise
– Create support and momentum
– Build long term success into demonstration projects
– ...
Challenges

– Identifying and Engaging Stakeholders
– Adds schedule and budget
– Balance opposing perspectives
– Integrate varied inputs
– ...
Starting early is the key to building a successful collaboration.
Holland, MA 319 Project

- 319 Grant Project to Build Awareness in Hamilton Reservoir Watershed
  - Holland Conservation Commission
  - Pioneer Valley Planning Commission
  - MA Department Environmental Protection
  - Department of Public Works
  - Private Landowners
Holland, MA 319 Project

Site SB-1 Steven’s Brook at Mashapaug Road Crossing

Site KH-1 Kimball Hill Road

Site BS-1 Brandon Street at Mashapaug Road Crossing
Holland, MA 319 Project

Site BS-1 Brandon Street at Mashapaug Road Crossing
Holland, MA 319 Project

• **Lessons Learned**
  – Thoroughly understand the contracting and implementation process before the design begins!
    • Who will be doing the construction
    • Develop a path for success
  – Engage DPW early in the process to gain input on preliminary designs and maintenance considerations:
    • Types of materials used in construction
    • Planting types (mowed vegetation versus perennial shrubs and plantings)
    • **Pretreatment structures and practices**
  – Develop an O&M Plan **in collaboration with** the DPW
    • Frequency of maintenance
    • Types of maintenance
    • Typical Costs and Level of Effort necessary
    • Adaptive Management
Lessons Learned (cont.)

- Build off *existing* public outreach efforts
  - Pioneer Valley Planning Commission and Holland Conservation Commission provided outreach to community to build awareness and engage stakeholders
  - Community outreach through public meetings

- Engage stakeholders to understand the level of effort and costs associated with long term O&M.
Cobbetts Pond 319 Project

• **319 Grant Project**
  – Collaboration with Cobbetts Pond Improvement Association
  – New Hampshire DES
  – Private Landowners
  – Department of Public Works
  – Private Contractors
Cobbetts Pond 319 Project

- Approximately 20 retrofit sites
- Public and Private Land
Set expectations with private property owners early in process and allow for adaptive management.
Consider public input on:
Public Safety
Winter Deicing Operations
Cobbetts Pond 319 Project

• **Lessons Learned**
  
  – Public safety considerations *must* be integrated into the design.

  – BMP cost estimates should include life cycle costs and not just capital costs for construction.

  – Set expectations with private property owners early in process and allow for adaptive management.

  – Develop O&M easements to facilitate long term operations on private property.
Crystal Lake 319 Project

• 319 Grant Project
  – Office of Community Planning and Community Development
  – Massachusetts DEP
  – Private Property Owners
  – Department of Public Works
Crystal Lake 319 Project

Site Location

Crystal Lake

Goodale Street

Lowell Street
Crystal Lake 319 Project

BEFORE
Crystal Lake 319 Project

AFTER
Crystal Lake 319 Project

- **Lessons Learned**
  - Identify the necessary stakeholders including but not limited to:
    - Property owners (for private AND public properties)
    - O&M personnel
    - City and Town officials such as DPW, Fire Department, Parks, etc.
  
  - Invite stakeholders to provide input on the design phase to build support in project.
Crystal Lake 319 Project

Russell and Lowell Street Bioretention Cell
Crystal Lake 319 Project

Water Quality Swale

Bioretention Cell

Lowell Street

Russell Street
• **Lessons Learned**
  – Private property commercial developments often subcontract O&M. Often necessary to provide these teams with copies of the O&M materials and plans necessary for properly functioning BMPs.
O&M Considerations

Lessons Learned

– Understand who the stakeholders are early in the process
– Engage stakeholders early
– Include time and budget for gathering and integrating input
  • Meetings
  • Design charrettes
  • Design Revisions
– Understand maintenance personnel capabilities (not limitations) during the design process
– Incorporate long term annual O&M in life cycle costs (minimum 5% of capital costs)
• **Planning for Future Success**
  – Life Cycle Costs are important for long term success

• **How much?**

• **Where does the funding come from?**
Life Cycle Cost Analysis

- Life-cycle cost: Feasibility, design, construction, operation and disposal costs:
## Life Cycle Cost Analysis

### Typical O&M Costs

<table>
<thead>
<tr>
<th>BMP Type</th>
<th>Annual Maintenance Costs (% capital)</th>
<th>Annual Maintenance Costs (USD)</th>
<th>Annual Maintenance Hours (hours)</th>
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</thead>
<tbody>
<tr>
<td>Retention Basin</td>
<td>5%</td>
<td>$2,400</td>
<td>20</td>
</tr>
<tr>
<td>Infiltration Trench</td>
<td>12%</td>
<td>$2,000</td>
<td>28</td>
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<tr>
<td>Sand Filter</td>
<td>12%</td>
<td>$2,000</td>
<td>28</td>
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<tr>
<td>Bioretention</td>
<td>6%</td>
<td>$1,900</td>
<td>22</td>
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<tr>
<td>Gravel Wetland</td>
<td>8%</td>
<td>$2,200</td>
<td>22</td>
</tr>
<tr>
<td>Porous Pavement</td>
<td>5%</td>
<td>$1,000 /acre</td>
<td>6</td>
</tr>
</tbody>
</table>