Stormwater BMP/Facility Inspections
Post-Construction Stormwater Management (PCSM)

Southwest Pennsylvania Commission
Fisher Hall at the Burrell Lake Park Facility
Lower Burrell, PA
October 28, 2016

Michael T. LaSala, CPMSM, CSI
Senior MS4 Program Manager/Analyst
Introduction - Agenda

Introduction and Background (10-15 minutes)
Permanent Facilities & BMPs (15-20 minutes)
O&M Requirements (10-15 minutes)
Ensuring long-term operations and maintenance (15-20 minutes)
PCSM Plan and implementation (30-40 minutes)
PCSM Plan support processes (10-15 minutes)
PCSM within the SWMP/MS4 Program (10-15 minutes)
Tailoring a program (10-15 minutes)
Documentation Considerations (through-out)
Additional Thoughts (10-15 minutes)
Discussion & Questions
Post-Construction Stormwater Management

Introduction & Background
Primary purpose of the CWA:
- Protect the beneficial uses of surface waters (recreational, drinking supply, habitat, etc.)...**Do not cause and/or contribute to an impairment of a receiving waterbody**.
- Purpose is carried out through NPDES Permits (e.g. MS4 Permit) that must adhere to specific requirements for water quality.

**CWA Requirements for Water Quality Standards:**
1. Designated Uses
2. Water Quality Criteria
3. Anti-degradation policy
Any facility that discharges wastewater directly to surface water must obtain an NPDES Permit (from the USEPA or state) – such as an MS4

Requirements generally found in an MS4 Permit:
• Limitations (mostly narrative) on certain pollutants discharged via the MS4
  • Why narrative? Intent was to allow local conditions dictate numeric considerations
• Monitoring Requirements
• Reporting & Recordkeeping
  • “Pollution Prevention Programs”

An open system and discharge concerns need to be defined when considering the waterways use, WQ criteria, and anti-degradation.
Authorization to Discharge

• “2013 PAG-13” – Limitations on Coverage (part 2.j)
• “2018 PAG-13 (draft)” – Discharges Not Authorized (item 6)

“The discharge is not, or will not, result in compliance with an applicable effluent limitation or water quality standard.”

The operator must, at a minimum, develop, implement, and enforce a SWMP designed to reduce the discharge of pollutants from the MS4:
• to the maximum extent practicable (MEP),
• to protect water quality, and
• to satisfy the appropriate water quality requirements of the Clean Water Act. [40 CFR 122.34(a)]
Stormwater Management for Small MS4s...are the following addressed?

- Applicability
- Limitations on Coverage
- Discharges to Water Quality Impaired Waters
- Stormwater Management Program (SWMP)
- Public Education and Outreach (MCM 1)
- Public Involvement/Participation (MCM 2)
- Illicit Discharge Detection & Elimination (MCM 3)
- Construction Site Stormwater Runoff Control (MCM 4)
- Post-Construction Stormwater Management in New Development and Redevelopment (MCM 5)
- Pollution Prevention/Good Housekeeping for Municipal Operations (MCM 6)
- Sharing Responsibility
- Reviewing and Updating SWMPs
- Monitoring
- Recordkeeping
- Reporting
SWMP Elements – MCMs

- MCM 1: Public Education & Outreach
- MCM 2: Public Involvement & Participation
- MCM 3: Illicit Discharge Detection & Elimination (IDD&E)
- MCM 4: Construction Site Runoff Control
- **MCM 5: Post-Construction SWM**
- MCM 6: Good Housekeeping
What do we think “counts” under the heading of PCSM and MCM 5?
REGULATORY LANGUAGE:

(5) Post-construction storm water management in new development and redevelopment.

(i) You must develop, implement, and enforce a program to address storm water runoff from new development and redevelopment projects that disturb greater than or equal to one acre, including projects less than one acre that are part of a larger common plan of development or sale, that discharge into your small MS4. Your program must ensure that controls are in place that would prevent or minimize water quality impacts.
REGULATORY LANGUAGE cont’d:

(ii) You must:

(A) Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs) appropriate for your community;

(B) Use an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under State, Tribal or local law; and

(C) Ensure adequate long-term operation and maintenance of BMPs.
REGULATORY LANGUAGE cont’d:

(iii) Guidance: If water quality impacts are considered from the beginning stages of a project, new development and potentially redevelopment provide more opportunities for water quality protection. EPA recommends that the BMPs chosen:

• be appropriate for the local community;
• minimize water quality impacts; and
• attempt to maintain pre-development runoff conditions.

In choosing appropriate BMPs, EPA encourages you to participate in locally-based watershed planning efforts which attempt to involve a diverse group of stakeholders including interested citizens.

When developing a program that is consistent with this measure's intent, EPA recommends that you:

• adopt a planning process that identifies the municipality's program goals (e.g., minimize water quality impacts resulting from post-construction runoff from new development and redevelopment),
• implementation strategies (e.g., adopt a combination of structural and/or non-structural BMPs),
• operation and maintenance policies and procedures, and
• enforcement procedures.
(iii) Guidance (cont’d)
In developing your program, you should consider assessing existing ordinances, policies, programs, and studies that address storm water runoff quality.

In addition to assessing these existing documents and programs, you should provide opportunities to the public to participate in the development of the program.

Non-structural BMPs are preventative actions that involve management and source controls such as:

• policies and ordinances that provide requirements and standards to
  • direct growth to identified areas,
  • protect sensitive areas such as wetlands and riparian areas,
  • maintain and/or increase open space (including a dedicated funding source for open space acquisition),
  • provide buffers along sensitive water bodies,
  • minimize impervious surfaces, and
  • minimize disturbance of soils and vegetation;
• policies or ordinances that encourage
  • infill development in higher density urban areas, and
  • areas with existing infrastructure;
• education programs for developers and the public about project designs that minimize water quality impacts; and
• measures such as minimization of percent impervious area after development and minimization of directly connected impervious areas.
(iii) Guidance (cont’d)
Structural BMPs include:
- storage practices such as wet ponds and extended-detention outlet structures;
- filtration practices such as grassed swales, sand filters and filter strips; and
- infiltration practices such as infiltration basins and infiltration trenches.

EPA recommends that you ensure the appropriate implementation of the structural BMPs by considering some or all of the following:
- pre-construction review of BMP designs;
- inspections during construction to verify BMPs are built as designed;
- post-construction inspection and maintenance of BMPs; and
- penalty provisions for the noncompliance with design, construction or operation and maintenance.

Storm water technologies are constantly being improved, and EPA recommends that your requirements be responsive to these changes, developments or improvements in control technologies.
So what does all the legal jargon mean?
Before diving into considerations associated with policies, procedures, etc. (e.g. inspections)...we will gain a better understanding of primary components of a PCSM program based on the regulations.
Post-Construction Stormwater Management

Permanent Facilities & BMPs
Remember this pic:
Develop and implement strategies which include a combination of structural and/or non-structural best management practices (BMPs) appropriate for your community.

**STRUCTURAL**

Structural BMPs (facilities) are the physical and tangible (permanent) stormwater controls addressing water quality and/or water quantity.

**vs.**

**NON-STRUCTURAL**

Non-structural BMPs are generally intangible products such as strategies, approaches, policies, etc. addressing water quality and/or water quantity.
STRUCTURAL BMPS: Think of structural BMPs just as it is described...the physical and actual facilities handling and managing water quality and/or water quantity.

NON-STRUCTURAL BMPS: Think of non-structural BMPS as the mechanisms, related activities, and strategies in place that allow appropriate structural BMPs to be implemented and operate efficiently.
Types of Structural BMPs:
• Detention Basin
• Infiltration Trench
• Floodplain Restoration
• Wet Pond
• Constructed Wetland
• Vegetated Swale
• Bioretention / Bioswale
• Hydrodynamic Structures
• WQ Inlet*

Types of Non-Structural BMPs:
• Developer/contractor education programs
• Education/guidance program for structural BMP owners
• Establish restrictions for Environmentally Sensitive Areas (ESAs)
• Require preventative maintenance
• Preserve existing soils and vegetation during construction

SIDEBAR:
- Generally refer to MCM 5 BMPs as “Treatment Control BMPs”
- Whereas, MCM 6 BMPs are “Source Control BMPs”
“Common” Structural BMPs (in PA)
Non-Structural BMPs
Water Quality Treatment Facilities
“King” of PCSM BMPs in Pennsylvania
Post-Construction Stormwater Management

O&M Requirements
Remember this pic:

4. Onsite stormwater management facilities shall be privately maintained by owner.
Ensure adequate long-term operation and maintenance of BMPs.

Why?
There are generally two forms of substantial impacts of post-construction runoff.

The first is caused by an increase in the type and quantity of pollutants in stormwater runoff. As runoff flows over areas altered by development, it picks up harmful sediment and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus). These pollutants often become suspended in runoff and are carried to receiving waters, such as lakes, ponds, and streams. Once deposited, these pollutants can enter the food chain through small aquatic life, eventually entering the tissues of fish and humans.

The second kind of postconstruction runoff impact occurs by increasing the quantity of water delivered to the waterbody during storms. Increased impervious surfaces (e.g., parking lots, driveways, and rooftops) interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving water. The effects of this process include streambank scouring and downstream flooding, which often lead to a loss of aquatic life and damage to property.
DIRECT ANSWER(S)...

- Aesthetics
- Can become costly for repairs if you don’t stay ahead of monitoring a facility
- Unseen problems “brewing” (on-site and off-site)***
- Functionality in the grand “scheme of things”
So how do we define O&M requirements?
Not going to beat around the bush...

Need to translate what is provided and shown in a plan into an understandable O&M Plan for an owner/operator of a PCSM BMP/facility

...then implement processes that monitor the BMP/facility so it continues to operate as designed and intended to function.

**Detention Ponds (Including BMP Facilities)**

- Detention facilities are designed to hold and slowly release stormwater by use of a pond and specially designed control structure. Styles vary greatly from well-manicured to natural appearing. Generally, more natural-appearing vegetation is preferred for reduced maintenance and wildlife habitat. Some facilities are designed to appear as natural water bodies or are in park-like areas.
- Identify and report pollutant sources to the facility. Inspect the facility for oil and other pollutants and remove any pollutants greater in volume than a surface sheen.
- Trash is removed when it exceeds 1 cubic foot per 1000 square feet.
- Remove sediment when it accumulates to 10 percent designed pond depth.
- Disposal of waste from maintenance of drainage facilities shall be conducted in accordance with federal, state, and local regulations.
Furthermore, need to translate what to look for into a format “we” can understand as well to ensure long-term functionality and performance of a PCSM facility/BMP...
Post-Construction Stormwater Management

Ensuring long-term operations & maintenance
APPENDIX A

OPERATION AND MAINTENANCE (O&M) AGREEMENT

STORMWATER MANAGEMENT BEST MANAGEMENT PRACTICES (SWM BMPs)

THIS AGREEMENT, made and entered into this ______ day of ______________, 20____, by and between ____________________________, (hereinafter the "Landowner"), and __________________________________________, County, Pennsylvania, (hereinafter "Municipality");

WITNESSETH

WHEREAS, the Landowner is the owner of certain real property as recorded by deed in the land records of County, Pennsylvania, Deed Book at page , (hereinafter "Property").

WHEREAS, the Landowner is proceeding to build and develop the Property; and

WHEREAS, the SWM BMP Operation and Maintenance (O&M) Plan approved by the Municipality (hereinafter referred to as the "O&M Plan") for the property identified herein, which is attached hereto as Appendix A and made part hereof, as approved by the Municipality, provides for management of stormwater within the confines of the Property through the use of BMPs; and

WHEREAS, the Municipality, and the Landowner, his successors and assigns, agree that the health, safety, and welfare of the residents of the Municipality and the protection and maintenance of water quality require that on-site SWM BMPs be constructed and maintained on the Property; and

WHEREAS, the Municipality requires, through the implementation of the SWM Site Plan, that SWM BMPs as required by said SWM Site Plan and the Municipal Stormwater Management Ordinance be constructed and adequately operated and maintained by the
OVERVIEW OF BEST MANAGEMENT PRACTICE (BMP) FACILITY - MAINTENANCE & INSPECTION GUIDELINES

The operation and maintenance of the BMP facilities is very similar to traditional stormwater management facilities. Like traditional facilities, some turf grass shall be utilized on the terrestrial (upland) areas of the BMP facilities. The exception would be any specialized maintenance involved with the native herbaceous plant species established within the aquatic areas of BMP facilities. Because of the periodic inundation of stormwater and the attempt to use bioretention, it is critical that specialized plants be established to guarantee the facilities designed intention. The first two years of vegetative establishment in the basin bottom is the most important to the function of the BMP facilities. After this time, maintenance will be minimized to the regular weekly operation inspections and the occasional need to remove weeds and exotic plants.

After construction has ceased and the BMP is stabilized to its designed condition, careful monitoring during inspections shall verify if the filtration/infiltration basins are functioning properly. If infiltration of water is not taking place after a period of use, the sediment must be removed from the basin bottom, disposed of properly and the area needs to be immediately reestablished to its original specified design including the soil mix and plantings. The use of straw mulch or securing approved biodegradable erosion control matting as needed is recommended when new seeding is performed.
Weekly maintenance would include scheduled inspections and turf mowing as appropriate in and around the BMP facilities. Regular turf mowing to a height of not less than three (3) inches involves mainly the facility berms and side slopes and preventing the growth of weeds. After two years, regular turf mowing and operation inspections will govern most of the maintenance involved with the BMP's. Careful observation is necessary to ensure unwanted plants do not establish themselves and dominate the desired vegetative community, especially in the designated BMP planting areas. Most of the BMP areas that have been designed to be periodically inundated with water during storm events. These zones are especially important to the establishment and maintenance of the bio-retention plantings. These zones are not mowed regularly. However, they need to be mowed at least once annually in the early spring at a height less than three (3) inches. The control of weeds and exotic plants in these zones are of the utmost importance. The manual removal of invasive weeds and exotic vegetation most adequately achieve this task. This is especially critical in the first two years for plant establishment and will ensure the effectiveness of the facility and reduce maintenance costs in the long run. If manual removal is not practical, then "high mowing" is advisable. When weeds dominate the "zone" and become twelve to eighteen inches (12"-18") high, it is recommended that the "zones" be mowed down to six to eight inches (6"-8"). This will help warm up the soil and weaken the cool season weeds to deter excessive growth and will encourage the specified plants in the bio-retention area to become properly established. Chemical weed control is not recommended but may be used if federal, state and local regulations are met.

During and after construction all BMP facilities shall be monitored for establishment progress and verify their functionality on a daily basis. When vegetation has established itself, weekly inspections should be adequate. A regular program of inspecting the terrestrial (upper) and aquatic (lower) benches of the BMP facilities should be established. Additional inspections shall occur after any major storm event to ensure the integrity of the stormwater & BMP facilities. The purposes for the inspections are not only to ensure the facilities are functioning properly but more importantly that the facilities are operating safely.
TURF

Any turf that needs to be repaired or replaced beyond its normal maintenance care should be carefully investigated prior to over-seeding or applying fertilizers. Seeding specifications are available according to the approved erosion and sedimentation control plans. The use of low-growing, stoloniferous, turf type cool season grasses is recommended. Fertilization of the turf area should be in limited amounts and be applied only as necessary to avoid contributing to storm and ground water pollution.

SHRUBS, PERENNIALS & ORNAMENTAL GRASSES

In addition to the planting specifications provided in the approved plans, the following guidelines may also be utilized for the replacement of planting materials:

* All plant material shall be installed in conformance with and meet the specifications of "The American Nursery Association" guidelines.
* Rootstock of the plant material shall be kept moist during transportation from nursery to job site and until planting. If necessary, larger material such as trees may be "healed in" in a designated temporary holding area for no more than two (2) months.
* Walls of the planting hole shall be dug vertical.
* The diameter of the planting hole shall be six inches (6") larger on all sides than that of the plant's root ball.
* The root ball crown shall be planted flush if not slightly above adjacent grade.
* Backfill around root ball by hand with specified amended soil medium. Backfill in four inch (4") lifts and tamp by hand to ensure proper compaction.
* Never cover the top of the root ball with soil. Mound soil slightly around hole to create a watering bowl.
* Cover planting area with two to three inches (2"-3") of aged wood mulch as specified.
* Water thoroughly.
* Plants in general receive needed nutrients from good soil medium and do not require additional fertilization. If fertilizer is used, only a natural biodegradable fertilizer is recommended such as processed cow manure.
Soon time to “replace” turf
4. Onsite stormwater management facilities shall be privately maintained by owner.
Detention Basin
Detention Basin

Upon completion of final grading and topsoiling of entire site or portions thereof, permanent seeding mixture shall be applied and mulched immediately.

The permanent seed mixture shall be as follows:

<table>
<thead>
<tr>
<th>Proportion By Weight</th>
<th>Common Name</th>
<th>Min. % Germ.</th>
<th>Min. % Pure Sd.</th>
</tr>
</thead>
<tbody>
<tr>
<td>30%</td>
<td>Baron Kentucky Bluegrass</td>
<td>75%</td>
<td>95%</td>
</tr>
<tr>
<td>30%</td>
<td>Fylking Kentucky Bluegrass</td>
<td>75%</td>
<td>95%</td>
</tr>
<tr>
<td>40%</td>
<td>Manhattan II or Pennfine Perennial Ryegrass</td>
<td>40%</td>
<td>98%</td>
</tr>
</tbody>
</table>
# Detention Basin

## Plant List

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Qty.</th>
<th>Key</th>
<th>Botanical Name</th>
<th>Common Name</th>
<th>Spacing</th>
<th>Size</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acer rubrum</td>
<td>Red Maple</td>
<td>7' o.c.</td>
<td>4' C.D.</td>
<td>B&amp;B</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Cornus Florida</td>
<td>Flowering Dogwood</td>
<td>9' o.c.</td>
<td>4' C.D.</td>
<td>B&amp;B</td>
</tr>
</tbody>
</table>

### Deciduous Trees

|        |      |     | Lindera benzoin | Common Spicebush | 5' o.c. | 20'    | B&B      |

### Deciduous Shrub

|        |      |     | Juniperus conferta | Shrub Juniper | 5' o.c. | 15'    | B&B B&B  |
|        |      |     | Jasminum x polyanthum | Polyanthine | 5' o.c. | 15'    | B&B B&B  |

### Evergreen Shrub

|        |      |     | Pachyandra terminalis | Japanese Spurge | 8' o.c. |        | PLATS    |

### Groundcovers
## DETENTION BASIN

### INSPECTION AND MAINTENANCE CHECKLIST

<table>
<thead>
<tr>
<th>DEFECT</th>
<th>CONDITIONS WHEN MAINTENANCE IS NEEDED</th>
<th>SCORE</th>
<th>COMMENTS</th>
<th>RESULTS EXPECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trash &amp; Debris</td>
<td>Trash and debris accumulated in basin.</td>
<td>2</td>
<td>No evidence of dumping. Minor trash present.</td>
<td>Trash and debris cleared from site and disposed of properly.</td>
</tr>
<tr>
<td>Invasive/poisonous vegetation</td>
<td>Poisonous or nuisance vegetation</td>
<td>3</td>
<td>Definite invasive appears to be porcelain berry, etc.</td>
<td>Use integrated pest management techniques or similar to control weeds or invasive.</td>
</tr>
</tbody>
</table>

- **No deficiencies identified.**

**Monitor** – Although maintenance may not be required at this time, a potential problem exists that will most likely need to be addressed in the future. This can include items like minor erosion, concrete cracks/spalling, or minor sediment accumulation. This item should be revisited at the next inspection.

**Routine Maintenance Required** – Some inspection items can be addressed through the routine maintenance program. This can include items like vegetation management or debris/trash removal.

**Immediate Repair Necessary** – This item needs immediate attention because failure is imminent or has already occurred, or facility is not functioning as designed. This could include items such as structural failure of a feature (outlet, weir, manhole, etc.), significant erosion, or significant sediment accumulation. This score should be given to an item that can significantly affect the function of the facility.
Detention Basin-Example 2

General
- Trash & debris
- Invasives
- Contaminants
- Rodent Holes
- Tree/Brush growth
- General vegetation
- Outfall structure
- Drainage time

Side Slopes
- Erosion

Storage Area
- Sediment
- Liner

Emergency Overflow
- Settlement
- Tree/Brush growth
- Spillway

Inlet/Outlet Pipes/Openings
- Trash & debris
- Debris barrier
- Flow control devices
- Fences & gates
- Miscellaneous
Vegetated Swale

**General**
- Sediment accumulation
- Standing water
- Flow spreader
- Baseflow
- Poor vegetation coverage
- General vegetation
- Excessive shading
- Inlet/outlet
- Trash & debris
- Erosion/scouring
- Miscellaneous
Post-Construction Stormwater Management

PCSM Plan Implementation
<table>
<thead>
<tr>
<th>Locality</th>
<th>Locality Code</th>
<th>Address</th>
<th>Suburb</th>
<th>Postcode</th>
<th>Description</th>
<th>Responsible Agency</th>
<th>Date</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yamba</td>
<td>YMB</td>
<td>123 Main St, Yamba</td>
<td>Yamba</td>
<td>2469</td>
<td>BMP Inventory</td>
<td>Yamba Shire Council</td>
<td>2023-01-01</td>
<td></td>
</tr>
</tbody>
</table>
# BMP Inventory

<table>
<thead>
<tr>
<th>BMP #</th>
<th>Plan Name</th>
<th>BMP Type</th>
<th>Owner</th>
<th>Owner Phone</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMP00001</td>
<td>5100 Main Street Lots 1 &amp; 2</td>
<td>Rain Garden/Bioretention</td>
<td>5100 Main Realty, LP</td>
<td>717-569-4519</td>
</tr>
<tr>
<td>BMP00002</td>
<td>5100 Main Street Lots 1 &amp; 2</td>
<td>Vegetated Swale</td>
<td>5100 Main Realty, LP</td>
<td>717-569-4519</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Owner Address</th>
<th>Date Inspected</th>
<th>Maintenance Required</th>
<th>Insp Letter Sent</th>
<th>Maintenance complete</th>
</tr>
</thead>
<tbody>
<tr>
<td>5260 Main Street PO box 404 East Petersburg PA 17520</td>
<td>3/18/2015</td>
<td>No</td>
<td>2/16/2015</td>
<td></td>
</tr>
<tr>
<td>5260 Main Street PO box 404 East Petersburg PA 17520</td>
<td>3/18/2015</td>
<td>No</td>
<td>2/16/2015</td>
<td></td>
</tr>
</tbody>
</table>

### DEP BMP

<table>
<thead>
<tr>
<th>DEP BMP #2</th>
<th>Form</th>
<th>NPDES #</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.4.5</td>
<td>Form E</td>
<td>PAG02003611094 (1)</td>
<td></td>
</tr>
<tr>
<td>6.4.8</td>
<td>Form G</td>
<td>PAG02003611094 (1)</td>
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### BMP ID2

<table>
<thead>
<tr>
<th>BMP ID2</th>
<th>RAV Plan #</th>
<th>Township Plan #</th>
<th>LID</th>
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<tbody>
<tr>
<td>EH-218-FP-2011</td>
<td>11-24-FP</td>
<td></td>
<td></td>
</tr>
<tr>
<td>EH-218-FP-2011</td>
<td>11-24-FP</td>
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</tr>
</tbody>
</table>
# VEGETATED SWALE

## INSPECTION AND MAINTENANCE CHECKLIST

<table>
<thead>
<tr>
<th>DEFECT</th>
<th>CONDITIONS WHEN MAINTENANCE IS NEEDED</th>
<th>SCORE</th>
<th>COMMENTS</th>
<th>RESULTS EXPECTED</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment Accumulation</td>
<td>Sediment accumulating near culverts and/or in channels builds up to &gt; 3 inches at any spot, or it covers vegetation.</td>
<td></td>
<td>When finished, swale should be level from side to side and drain freely toward outlet. There should be no areas of standing water once inflow has ceased and sediment is disposed of properly.</td>
<td></td>
</tr>
<tr>
<td>Standing Water</td>
<td>When water stands in the swale between storms and does not drain within 5 days</td>
<td></td>
<td>There should be no areas of standing water once inflow has ceased. Any of the following may apply: sediment or trash blockages removed, improved grade from</td>
<td></td>
</tr>
</tbody>
</table>
# SWM/PCSMB Facility-BMP O&M - Field Inspection Checklist

## General Information

<table>
<thead>
<tr>
<th>Facility/BMP Name</th>
<th>ID#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>MS3 ID</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Facility/BMP Owner/Operator</th>
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</tr>
</thead>
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<table>
<thead>
<tr>
<th>Inspector’s Name</th>
<th></th>
</tr>
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</table>

<table>
<thead>
<tr>
<th>Inspector’s Title</th>
<th></th>
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<table>
<thead>
<tr>
<th>Signature</th>
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<table>
<thead>
<tr>
<th>Date of Inspection</th>
<th></th>
</tr>
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</table>

- Inspection Type (check all applicable)
  - Regular Schedule Inspection
  - Follow-up Inspection
  - Complaint-Driven
  - Other: ____________

<table>
<thead>
<tr>
<th>Weather</th>
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## Facility/BMP Information

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<thead>
<tr>
<th>Facility/BMP Type(s)</th>
<th></th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Other Notes</th>
<th></th>
</tr>
</thead>
</table>

## Maintenance Score Reference

N/A - indication a component may not exist in a facility/BMP.

0 - No deficiencies identified.

Monitor – Although maintenance may not be required at this time, a potential problem exists that will most likely need to be addressed in the future. This can include items like minor erosion, concrete cracks/spalling, or minor sediment accumulation. This item should be revisited at the next inspection.

1 - Routine Maintenance Required – Some inspection items can be addressed through the routine maintenance program. This can include items like vegetation management or debris/trash removal.

2 - Immediate Repair Necessary – This item needs immediate attention because failure is imminent or has already occurred, or facility is not functioning as designed. This could include items such as structural failure of a feature (outlet, weir, manhole, etc.), significant erosion, or significant sediment accumulation. This score should be given to an item that can significantly affect the function of the facility.
MAINTENANCE SCORE REFERENCE

N/A - indication a component may not exist in a facility/BMP.

0  No deficiencies identified.

Monitor – Although maintenance may not be required at this time, a potential problem exists that will most likely need to be addressed in the future. This can include items like minor erosion, concrete cracks/spalling, or minor sediment accumulation. This item should be revisited at the next inspection.

1  Routine Maintenance Required – Some inspection items can be addressed through the routine maintenance program. This can include items like vegetation management or debris/trash removal.

2  Immediate Repair Necessary – This item needs immediate attention because failure is imminent or has already occurred, or facility is not functioning as designed. This could include items such as structural failure of a feature (outlet, weir, manhole, etc.), significant erosion, or significant sediment accumulation. This score should be given to an item that can significantly affect the function of the facility.
Detention Basin

The following components included conditions that require **immediate repairs** and/or attention to restore accessibility and functionality associated with the detention basin:

- Removal of the excessive overgrown invasive/nuisance vegetation (weeds) and trees/brush inhibiting (see Pictures 1 and 2):
  - The ability to perform proper maintenance activities across the entire facility,
  - The ability for the designed groundcover to establish and eliminate erosion potential,
  - Emergency Overflow/Spillway functionality, and
  - The functionality of the facility in general and overall.

- Reestablish non-existent groundcover to reduce erosion and performance (see Picture 3).
- Remove the excessive and accumulated sediment, silt, debris, etc. within the storage area and side slopes of the facility, and return elevations to designed basin depth and shape.
- Emergency Overflow/Spillway (see Picture 3)
  - An emergency overflow/spillway could not be visually confirmed based on the design layout, profile, and details of the component. In turn, it is reasonable to

**Immediate Repair Necessary** – This item needs immediate attention because failure is imminent or has already occurred, or facility is not functioning as designed. This could include items such as structural failure of a feature (outlet, weir, manhole, etc.), significant erosion, or significant sediment accumulation. This score should be given to an item that can significantly affect the function of the facility.

| General Vegetation | Overgrown or lack of appropriate vegetation is observed. | 3 | No designed ground cover present. Overgrown. |
Process for PCSM facility/BMP selection

- Selection of PCSM facilities for inspection
  - Follows the PCSM Plan update with the date(s) selected denoted in the SWMP schedule.
    - The date may be selected during the PCSM Plan update process. However, the SWMP defaults to a later selection date to allow any set-up activities that may be required prior to date selection (e.g. PCSM Plan review required updates to the inventory prior to selection of facilities and BMPs for inspection).
  - The outline generated for the PCSM Plan update during the Annual SWMP Review and Assessment will include notes regarding carrying over or establishing new activities for PCSM inspections or focus areas and will include considerations associated with:
    - Changes to a priority area classification for an MS3
    - PCSM facilities and BMPs in newly listed High Priority and Problem Area classified areas are listed for inspection.
- Facilities and BMPs installed three years or less are selected for inspection.
- Facilities and BMPs “flagged” for deficient maintenance are inspected for two years following remediation and/or corrective actions.
- Facilities and BMPs where the O&M Verification Form was not returned are selected for inspection.
- Remaining facilities and BMPs are distributed between five (5) groups. The groups are rotated during each permit year for inspection to allow all PCSM facilities and BMPs inspections to occur in a permit cycle.
  - The SWMP schedule is updated to reflect timeframe of PCSM facility and BMP inspections.
  - The SWMP schedule is updated to reflect distribution of the O&M Requirements Notice (and applicable O&M Verification Forms). The schedule includes a denotation of the last day for receipt of verification forms.
    - Notice is provided to owners/operators of PCSM facilities and BMPs of scheduled inspections.
Process for PCSM facility/BMP inspections

- PCSM facility and BMP inspections
  - Checklist(s) used corresponding to facility and BMP type (e.g. separate checklists used for detention basins, rain gardens, etc.), and based on the intended design and function of the facility and/or BMP.
  - Inspections are conducted during dry-weather.
  - Results of inspections are summarized and forwarded to the owner/operator of the facility and/or BMP.
  - The SWMP schedule is updated with follow-up actions that are required and a result of an inspection.
Process for PCSM facility/BMP inspection notifications

- O&M requirements notice to owners/operators of PCSM facilities and BMPs.
  - Notice regarding expected and required maintenance of PCSM facilities and/or BMPs (including water quality treatment facilities and/or BMPs) are provided annually to all owners/operators.
    - Notices will provide a denotation if the specific facility and/or BMP will be inspected by the borough during the permit year.
  - For PCSM facilities and/or BMPs not scheduled for inspection during the permit year, an O&M Verification Form will be provided with the notice.
    - The owner/operator is required to return the form verifying the PCSM facility and/or BMP is operating as intended and maintenance is being performed.
  - Owners/operators of new PCSM facilities and/BMPs are provided a more detailed summary of the PCSM Plan and corresponding obligations and requirements of the new owner/operator to maintain the facility and/or BMP.
Inspection Checklists

- Inlet Structures/Catch Basins*
- Bioretention Areas
- Vegetated Buffer Strip
- Constructed Wetlands (Basin)
- Detention Basin
- “Flow-through” Planter
- Hydrodynamic Separators/Structures
- Infiltration Trench
- Infiltration Basin
- Media Filter (WQ treatment facility)
- Pervious Pavement
- Tree Well
- Vegetated Swale
- Wet Pond (Basin)
- Wetland
- Riparian Buffer
- Stream Restoration/Stabilization
- Floodplain Restoration
- *Plus more
PCSM Plan is set...time to implement

- Have your inventory “complete” (and back-up)
- Checklists are set and ready to go
- O&M Verification Forms
- Facilities/BMPs selected
- Notifications distributed and inspections scheduled

Time to head out into the field
Head out to inspect a detention basin...
Discharge Point (outfall-type structure)

| Outfall Structure | Debris, silt, or sediment build-up obstructs the outfall structure. |

Remove debris, silt, and/or sediment build-up and dispose of properly.
Head out to inspect another detention basin...
## Initiate IDD&E processes

<table>
<thead>
<tr>
<th>Enforcement Level</th>
<th>Details</th>
<th>Responsibility</th>
</tr>
</thead>
</table>
| **Level I – Education** | • Provide educational outreach materials (general IDD&E outreach material(s), discharge specific information (e.g. BMP Fact Sheet))  
 • Encourage voluntary compliance  
 • Provide summary letter setting expected compliance date  
 • Additional staff support or technical assistance  
 • Request evidence of corrected problem (if applicable)  
 • Site visit to verify compliance | Public Works Superintendent;  
Environmental Resource Manager |
| **Level II – Written Warning** | • Send “Notice of Violation” letter to property owner regarding unresolved issue(s) or repeat violation  
 • Set second compliance date (determined on individual incident basis)  
 • Provide additional voluntary compliance encouragement (assistance may be offered based on the nature of the issue)  
 • Site visit to verify compliance | Public Works Superintendent;  
Planning & Engineering Manager (Code Enforcement Officer) |
| **Level III – Ordinance Provisions** | • Send second “Notice of Violation” letter indicating that unresolved issues will be referred to the Solicitor  
 • The borough may correct problems and re-capture costs from the property owner  
 • Issue monetary penalties based on the SWMO provisions  
 • Outline additional future considerations and timelines associated with continued non-compliance (determined on individual incident basis) | Planning & Engineering Manager (Code Enforcement Officer) |
Basic items to look for (almost every PSCM BMP)...

- Dumping
- Overgrown or lack of vegetation
- Erosion (e.g. gullies forming?)
- Blockage of inlet/outlet structures AND openings
- “Emergency” components present
- Stains and discoloration (including dying vegetation)
- Structural integrity of applicable components
- Trash & debris
- Sediment accumulation
- Settlement/Subsidence
- **Stable system***
Bump-out (flow-through planter)

- Vegetation
- “Debris” build-up
- Erosion
- Structural integrity (if applicable)
- “Downstream” observations
Detention Basin

- Vegetation
- Sediment deposition
- Rodent Holes, settlement
- Gully erosion
- Structural integrity
Rain Garden

- Vegetation
- Sediment deposition
- Erosion
- “Discolored” components
- Forebay
Post-Construction Stormwater Management

PCSM Plan Support Processes
O&M Verification Process

- O&M requirements notice to owners/operators of PCSM facilities and BMPs.
  - Notice regarding expected and required maintenance of PCSM facilities and/or BMPs (including water quality treatment facilities and/or BMPs) are provided annually to all owners/operators.
    - Notices will provide a denotation if the specific facility and/or BMP will be inspected by the borough during the permit year.
  - For PCSM facilities and/or BMPs not scheduled for inspection during the permit year, an O&M Verification Form will be provided with the notice.
    - The owner/operator is required to return the form verifying the PCSM facility and/or BMP is operating as intended and maintenance is being performed.
  - Owners/operators of new PCSM facilities and BMPs are provided a more detailed summary of the PCSM Plan and corresponding obligations and requirements of the new owner/operator to maintain the facility and/or BMP.
PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM

BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS

1. Transcribe the following information from your notification letter and make corrections as necessary:

   Permit No.: ________________________________________________

   BMP Location: ______________________________________________

   Responsible Party: ____________________________________________

   Phone Number: ( )  Email: ____________________________

   Responsible Party Address: ____________________________________

   Number  Street Name & Suffix  City/Zip

   □ Check here for Address or phone number change

2. Using the Table below, please describe the inspections and maintenance activities that have been conducted during the fiscal year (July 1 – June 30), and date(s) maintenance was performed. Under “Results of Inspection,” indicate whether maintenance was required based on each inspection, and if so, what type of maintenance. If maintenance was required, provide the date maintenance was conducted and a description of the maintenance. REFER TO THE BACK OF THIS SHEET FOR MORE INFORMATION DESCRIBING TYPICAL MAINTENANCE INDICATORS AND MAINTENANCE ACTIVITIES. If no maintenance was required based on the inspection results, state “no maintenance required.”
## O&M Verification Form (cont’d)

<table>
<thead>
<tr>
<th>What To Look For</th>
<th>Date Inspected</th>
<th>Results of Inspection: Work needed? (Yes/No)</th>
<th>Date Maintenance Completed and Description of Maintenance Conducted</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulation of Sediment, Litter, Grease</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standing Water</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erosion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overgrown Vegetation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poor Vegetation Establishment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Damage</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
PRIVATE TREATMENT CONTROL BMP
OPERATION AND MAINTENANCE VERIFICATION FORM

BIORETENTION FACILITIES, VEGETATED SWALES & HIGHER RATE BIOFILTERS-SIDE 2

This guide sheet provides general indicators for maintenance only and for a wide array of treatment control BMPs. Your developer prepared maintenance plans specifically for your treatment control BMP as an appendix to the Stormwater Management Plan. Also, if you have a manufactured structure, please refer to the manufacturer’s maintenance instructions.

Biofilters include the following:

☐ Vegetated Filter Strip/Swale  ☐ Bioswale  ☐ Bioretention Facility  ☐ Planter Boxes
☐ Manufactured Higher-Flow-Rate Biofilters, such as Tree-Pit-Style Units.

Routine maintenance is needed to ensure that flow is unobstructed, that erosion is prevented, and that soils are held together by plant roots and are biologically active. Typical maintenance consists of the following:
## Bioretention BMPs Inspection and Maintenance Checklist

<table>
<thead>
<tr>
<th>Typical Maintenance Indicators</th>
<th>Typical Maintenance Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accumulation of sediment (over 2 inches deep or covers vegetation), litter, or debris</td>
<td>Remove and properly dispose of accumulated materials, without damage to the vegetation. Confirm that soil is not clogging and that the area drains after a storm event. Till or replace soil as necessary.</td>
</tr>
<tr>
<td>Poor vegetation establishment</td>
<td>Ensure vegetation is healthy and dense enough to provide filtering and to protect soils from erosion. Replenish mulch as necessary (if less than 3 inches deep), remove fallen leaves and debris, prune large shrubs or trees, and mow turf areas.</td>
</tr>
<tr>
<td>Overgrown vegetation—woody vegetation not part of design is present and grass excessively tall (greater than 10 inches)</td>
<td>Mow or trim as appropriate, but not less than the design height of the vegetation (typically 4-6 inches for grass). Confirm that irrigation is adequate and not excessive and that sprays do not directly enter overflow grates. Replace dead plants and remove noxious and invasive weeds.</td>
</tr>
<tr>
<td>Erosion due to concentrated irrigation flow</td>
<td>Repair/re-seed eroded areas and adjust the irrigation.</td>
</tr>
<tr>
<td>Erosion due to concentrated stormwater runoff flow</td>
<td>Repair/re-seed eroded areas and make appropriate corrective measures such as adding erosion control blankets, adding stone at flow entry points, or re-grading where necessary. Remove obstructions and sediment accumulations so water disperses.</td>
</tr>
<tr>
<td>Standing water (BMP not draining) If mosquito larvae are present and persistent, contact the San Diego County Vector Control Program at (858) 694-2888. Mosquito larvicides should be applied only when absolutely necessary and then only by a licensed individual or contractor.</td>
<td>Where there is an underdrain, such as in planter boxes and manufactured biofilters, check the underdrain piping to make sure it is intact and unobstructed. Abate any potential vectors by filling holes in the ground in and around the biofilter facility and by insuring that there are no areas where water stands longer than 96 hours following a storm.</td>
</tr>
<tr>
<td>Obstructed inlet or outlet structure</td>
<td>Clear obstructions.</td>
</tr>
<tr>
<td>Damage to structural components such as weirs</td>
<td>Repair or replace as applicable.</td>
</tr>
</tbody>
</table>
For Homeowners Associations and Property Owners

Types of BMPs • Signs of a Degraded BMP • Who Should Carry Out Maintenance
Signs of a Degraded BMP

- Algae blooms
- Poorly designed dry detention facility
- No pollutant filtering capabilities
- Broken outfall pipe
- Eroding bank and Canada geese
- Bank failure
Appropriate to partner up to create a guide to help with costs, unify the message, etc.
Post-Construction Stormwater Management

PCSM within the SWMP
Maximum Extent Practicable (MEP)

It is recognized that "pollutant reductions that represent MEP may be different for each small MS4, given the unique local hydrologic and geologic concerns that may exist and the differing possible pollutant control strategies. Therefore, each permittee will determine appropriate BMPs to satisfy each of the six minimum control measures through an evaluative process" (Federal Register, Volume 64, No. 235, page 68754, December 8, 1999.).

The preamble to the Federal Register states: "EPA has intentionally not provided a precise definition of MEP to allow maximum flexibility in MS4 permitting. MS4s need the flexibility to optimize reductions in storm water pollutants on a location-by-location basis..."
Targeting Areas based on real data

LOADING LEVELS

Model 1

Model 2

Real Data

Target Areas

Outfalls

(Tied to MS3, Drainage Areas)

Threshold (e.g. TMDL, WQ criteria)

MS4 Modeling Software Predictions

Target Areas
Quantifying to locate where to “right-size” BMPs

LOADING LEVELS

Threshold (e.g. TMDL, WQ criteria)

Real Data

Outlet (or similar) for area with “issue”

Outfall (last discharge point)

Outlets/”Observation Points”
Locations and Strategies

When pursuing “right-sizing” exercises, solutions and strategies do not need to be limited to the MS4 permittee.

- Stream & discharge issues
- Discharge issues
- Stream issues

Rock Lititz location
Basic example relationships with other MCMs

• MCM 1 (public education)
  • PCSM facility owners/operators are an identified Target Audience Group, and passive outreach materials are tailored towards the group.
  • Part of developer educational outreach includes a component regarding training new PCSM facility owners/operators in proper O&M.

• MCM 2 (public involvement)
  • Regional group or local business sponsors and conducts workshop targeting proper PCSM facility/BMP maintenance practices.

• MCM 3 (IDD&E)
  • Evidence of dumping and/or illicit discharges is a component of PCSM facility inspections.

• MCM 4 (construction)
  • Requires its’ own workshop

• MCM 6 (good housekeeping)
  • Municipality observes O&M requirements and processes with its own PCSM facilities, and “advertises” it.
Post-Construction Stormwater Management

Tailoring a Program
Tailoring a PCSM program essentially sends you down a pathway to identify, develop, and implement non-structural BMPs.
For Homeowners Associations and Property Owners

Types of BMPs • Signs of a Degraded BMP • Who Should Carry Out Maintenance
Non-Structural BMPs

• Comprehensive Plan(s) support
  • A reference to watershed and/or local issues (based on information generated out of the SWMP/MS4 program) should be a “layer” of consideration for establishing goals and strategies.

• Zoning Ordinance(s) support
  • Overlay districts with a water quality component/consideration based on information generated out of the SWMP/MS4 program (based on MS3s)

• Building permit requirement(s)
  • A condition for issuing a ‘Certificate of Occupancy’ includes delivery of an O&M manual for each PCSM facility/BMP for use by the owner/operator.
Other Non-Structural BMPs

- Riparian Buffer Zones (requirements via ordinance)
- Incorporate Low Impact Development (LID) approaches via Open Space Requirements
- The “Homeowner’s Guide” idea presented previously (as part of an overall support process for ensuring long-term O&M of PCSM facilities/BMPs

The processes and procedures themselves, that define your PCSM Plan are non-structural BMPs as well (O&M verification process, inspection processes, checklists, etc.)
Post-Construction Stormwater Management

Additional Thoughts
**Worksheet 13 - Pollutant Reduction Through BMP Applications***

*Fill this worksheet out for each BMP type with different pollutant removal efficiencies. Sum pollutant reduction achieved for all BMP types on final sheet.

**BMP Type:** Floodplain Restoration

**Disturbed Area Controlled by this BMPs (AC):** 97.73

### Disturbed Area Controlled by this BMPs:

<table>
<thead>
<tr>
<th>Land Cover Classification</th>
<th>TSS EMC (mg/l)</th>
<th>TP EMC (mg/l)</th>
<th>Nitrate- Nitrite EMC (mg/l as N)</th>
<th>Cover (Acres)</th>
<th>Runoff Volume (AF)</th>
<th>TSS** (LBS)</th>
<th>TP** (LBS)</th>
<th>NO3 (LBS)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permeable Surfaces</td>
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<td></td>
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<td></td>
<td></td>
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<tr>
<td>Forest</td>
<td>39</td>
<td>0.15</td>
<td>0.17</td>
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<td>Meadow</td>
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<td>Fertilized Planting Area</td>
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<td>Native Planting Area</td>
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<td>Golf Course Fairway/Green</td>
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<td>Grassed Athletic Field</td>
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<td>Impervious Surfaces</td>
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<td>Low Traffic/Residential Street</td>
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<tr>
<td>Res. Driveway, Play Courts, etc.</td>
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<td>0.47</td>
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<td>Low Traffic Parking Lot</td>
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<td>0.15</td>
<td>0.39</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**TOTAL LOAD TO THIS BMP TYPE:** 2,949.31 8.89 15.24

**POLLUTANT REMOVAL EFFICIENCIES FROM APPENDIX A. STORMWATER MANUAL (%):** N/A N/A N/A

**POLLUTANT REDUCTION ACHIEVED BY THIS BMP TYPE (LBS):** 169,779.00 88.80 5,077.00

**POLLUTANT REDUCTION ACHIEVED BY ALL BMP TYPES (LBS):**

<table>
<thead>
<tr>
<th>REQUIRED REDUCTION from WS12 (LBS)</th>
<th>2,506.91</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.55</td>
<td>7.62</td>
</tr>
</tbody>
</table>

---

*Pollutant Load = [EMC, mg/l] X [Volume, AF] X [2.7, Unit Conversion]

**TSS and TP calculations only required for projects not meeting CG1/CG2 or not controlling less than 90% of the disturbed area.
Lime Spring Farm Development
Rock Lititz & Landis Homes
The MS4 Permit is an Authorization to Discharge (ATD) based on the requirements of the CWA (uses, WQ criteria, anti-degradation policy). Develop the SWMP framework before addressing MCMs…identify what the system is discharging. The elements of the SWMP (including MCMs) are based on the SWMP framework and pollutants of concern.


Final Thoughts and Questions?

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717-627-4440