

Application of Green Infrastructure BMPs To Reduce Non-Point Source Loading to Deal Lake, Sunset Lake and Wesley Lake Grant ID #WM18-016

Breakfast/Brunch Informational Meeting #1:
An overview of Watershed and Stormwater
Improvements Projects



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Overview

- The 319(h) grant
- The value of green infrastructure (GI) stormwater management
- GI's role in the improvement of the water quality of the lake and its tributaries
- Examples of the use of such measures (BMPs) as part of new and redevelopment projects, in general and for this grant
- Review their maintenance needs.

General Overview

Project Background, Scope



Overview

✓ 319 (h) program

- Clean Water Act Section 319(h) Non-point Source (NPS) and facilitated by NJDEP
- Support for water quality improvements in the watershed
- Builds on goals of previous WPPs and progress to achieving TMDL threshold

✓ DLC project:

- WQ Improvement
- Education and Outreach

Green Infrastructure and Water Quality Improvement

What is Green Infrastructure?

- Section 502 of the Clean Water Act defines green infrastructure as "...the range of measures that use plant or soil systems, permeable pavement or other permeable surfaces or substrates, stormwater harvest and reuse, or landscaping to store, infiltrate, or evapotranspire stormwater and reduce flows to sewer systems or to surface waters."
- Green infrastructure is a cost-effective, resilient approach to managing wet weather impacts that provides many community benefits. While single-purpose gray stormwater infrastructure—conventional piped drainage and water treatment systems—is designed to move urban stormwater away from the built environment, green infrastructure reduces and treats stormwater at its source while delivering environmental, social, and economic benefits.



Green Infrastructure

Gray Infrastructure - conventional piped drainage and water treatment systems

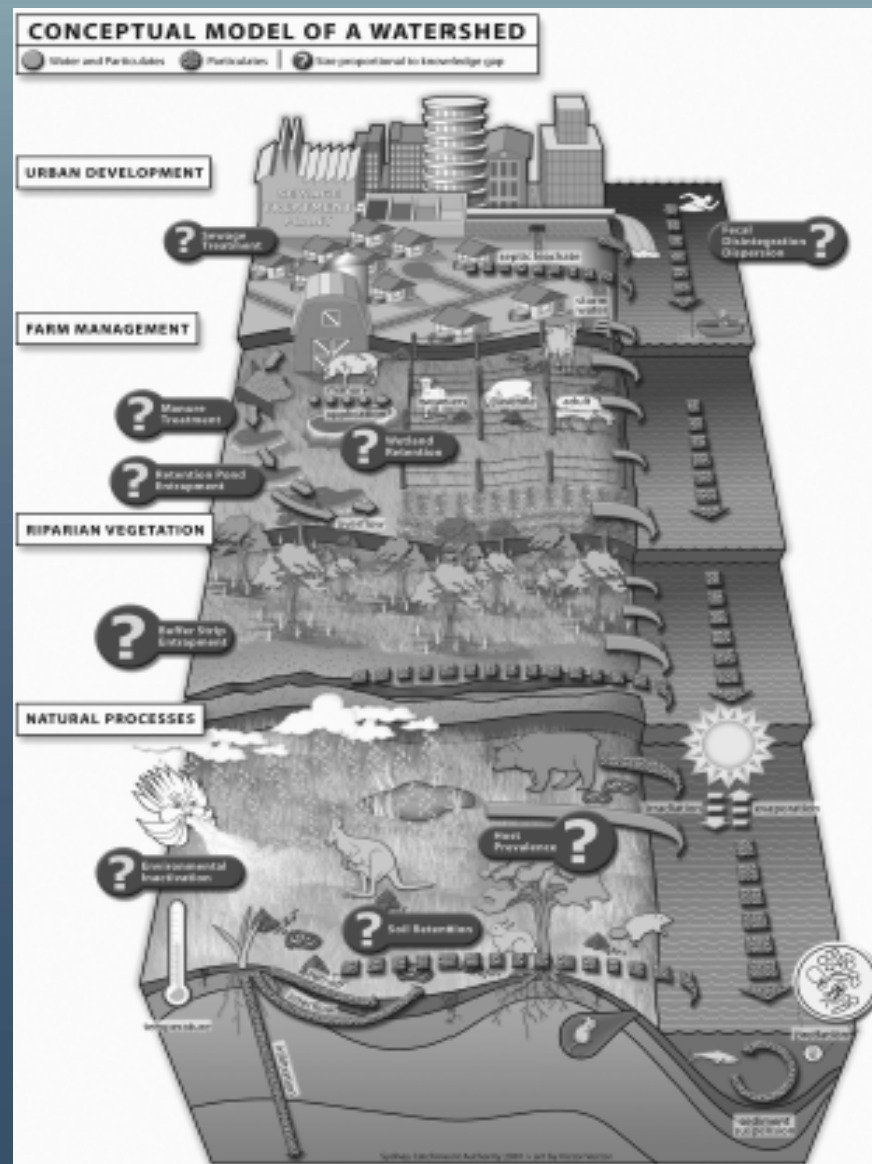
Green Infrastructure - nature-based, but often engineered solutions to stormwater management with multiple ecological benefits

Green Infrastructure

- ✓ Lower impact
- ✓ Better aesthetic
- ✓ Better performance than standard stormwater management techniques
- ✓ Less maintenance

Best Management Practices

Nutrient Transport in Watersheds





Structural vs. Non-Structural BMPs

✓ Structural

- Rain Gardens
- Infiltration Basins
- Stormwater Wetlands
- Detention/Retention Basins
- Manufactured Treatment Devices (MTDs)

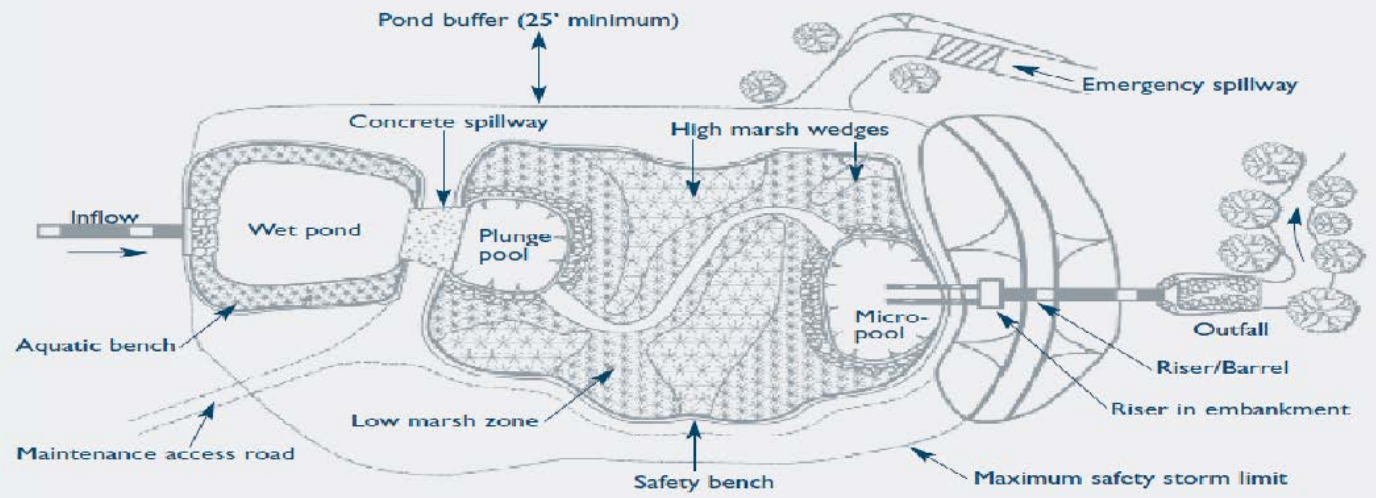
✓ Non-Structural

- Impervious Cover Limits
- Pet Waste Ordinances
- Street Sweeping
- Open Space Preservation
- Smart Development

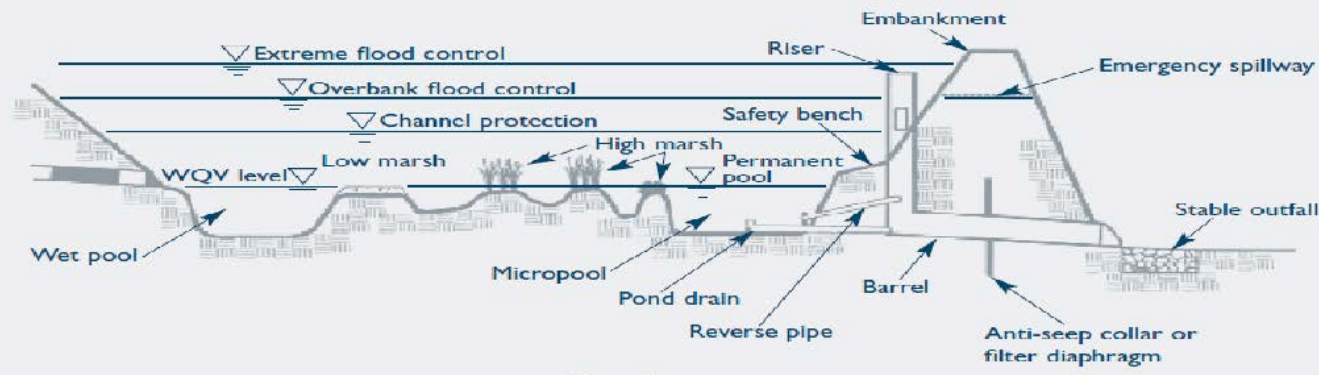
Stormwater Wetlands

- ✓ Promote slowing flow rates
- ✓ Utilize natural processes for nutrient sequestration and bacteria control
- ✓ Increase habitat and biodiversity





Plan View

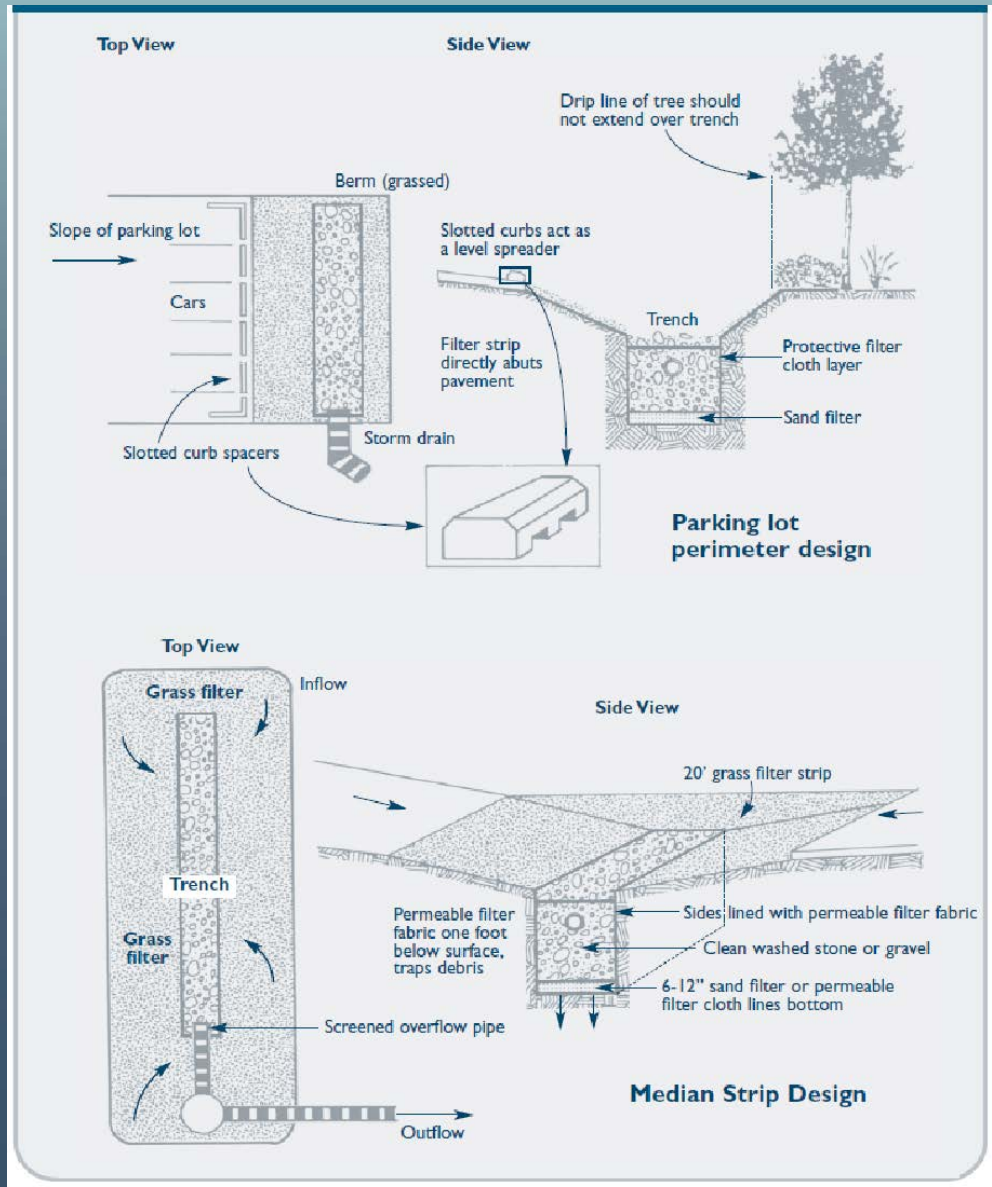


Section

Bio-Infiltration Practices

- ✓ Use soil and native vegetation to capture and treat runoff
- ✓ Select underlying soils for high infiltration rates
- ✓ “Rain Gardens”
- ✓ Can be used on large or small scales

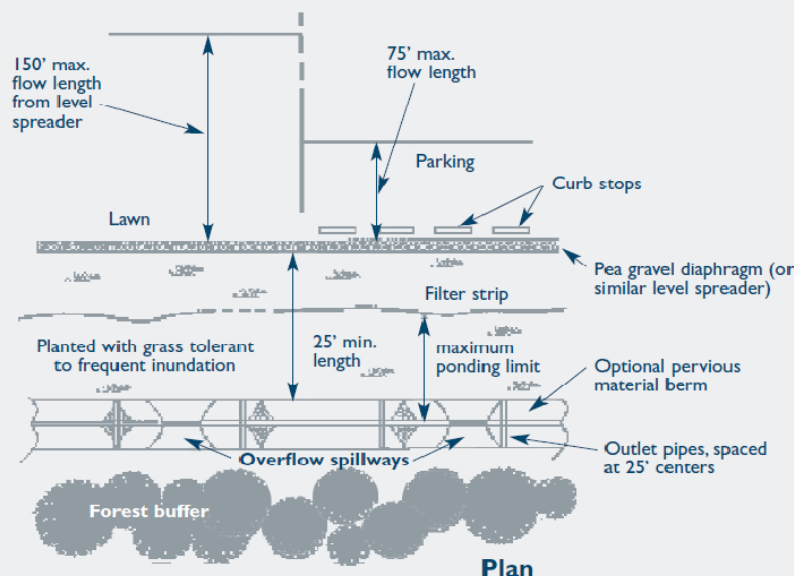




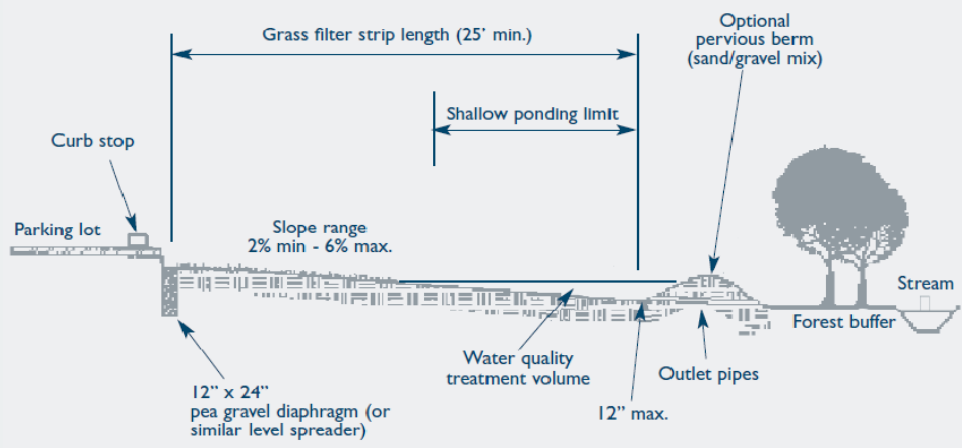
Vegetated Filter Strips

- ✓ Can be utilized to break up impervious areas or pre-treatment for larger BMP
- ✓ Slow water & settle solids





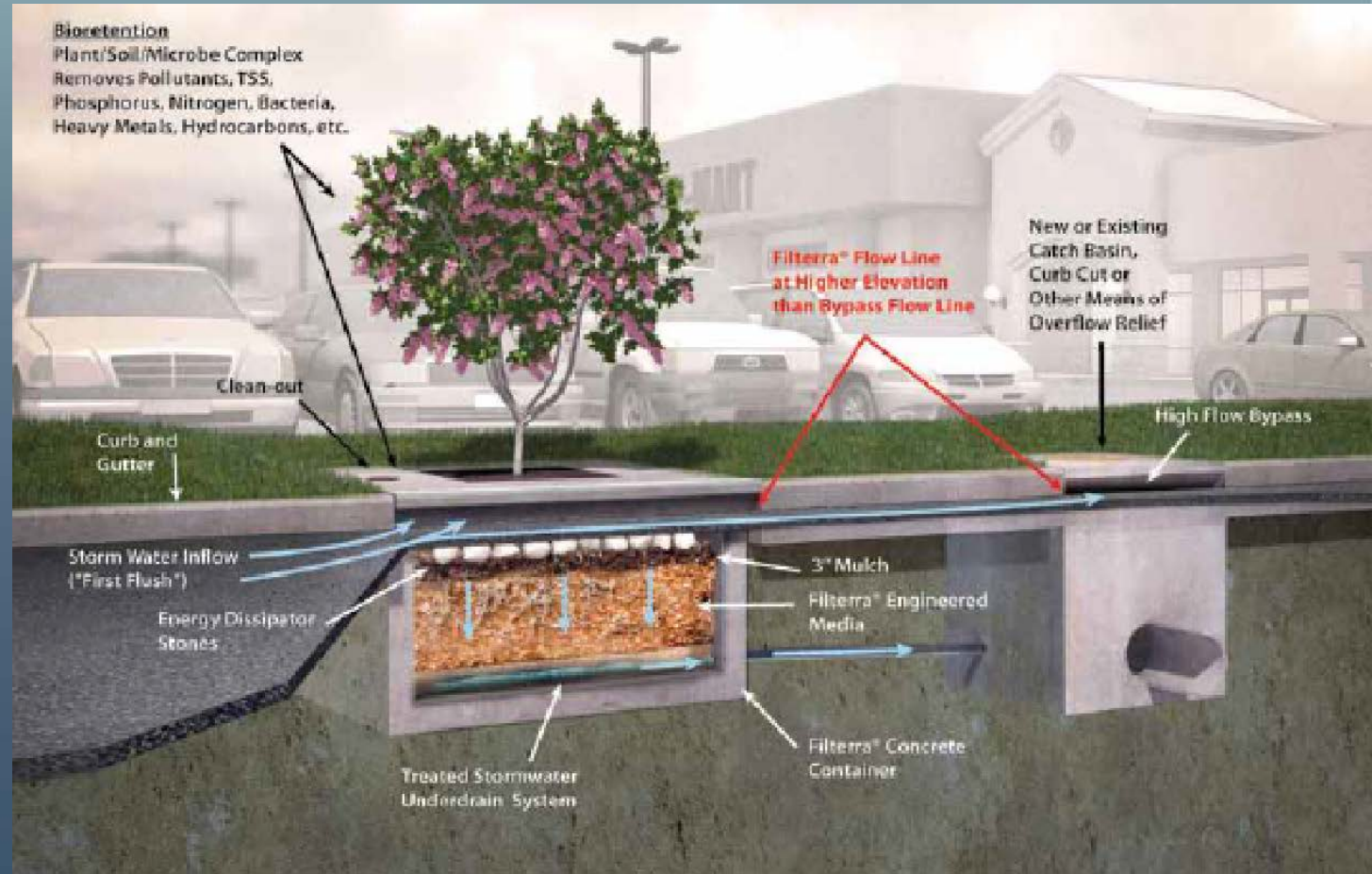
Plan

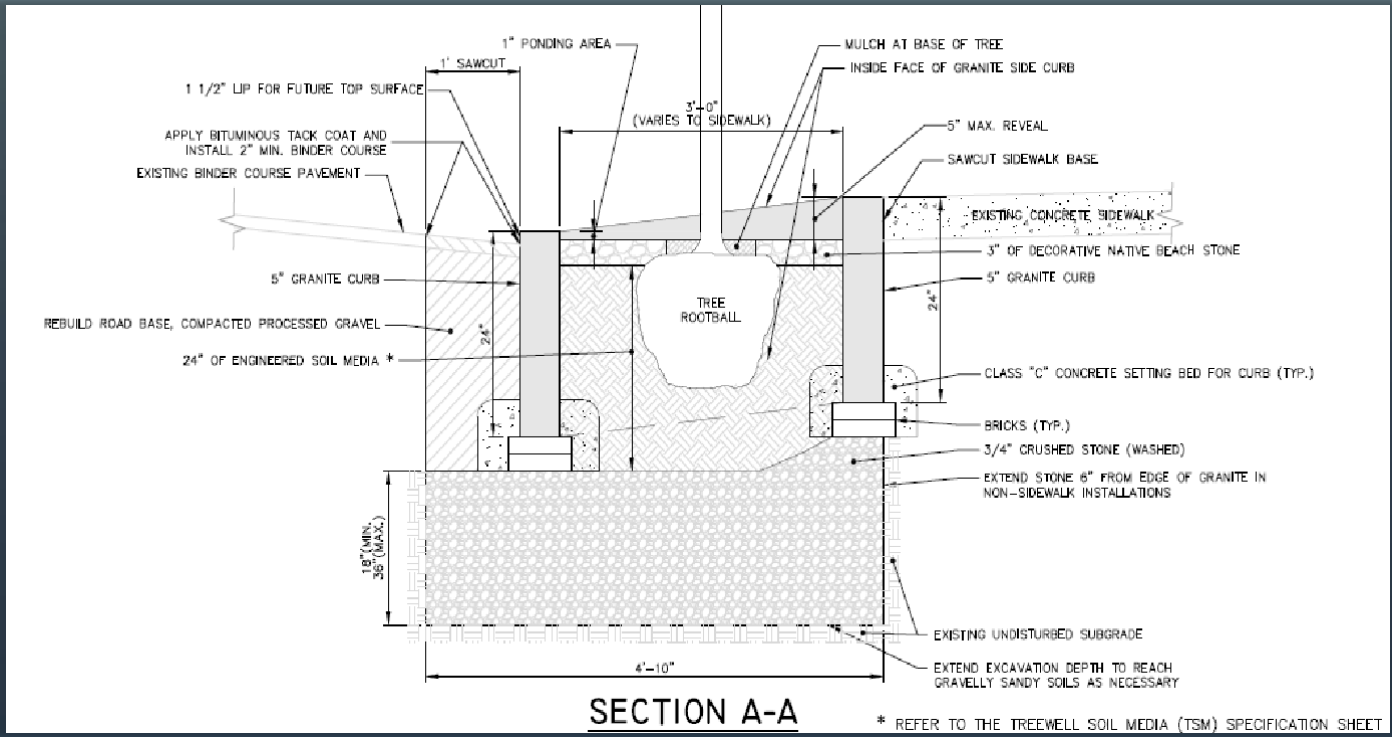


Profile

Tree Box Filter

- ✓ May be utilized in existing parking lots
- ✓ Plant / Soil / Microbe Complex removes pollutants and bacteria





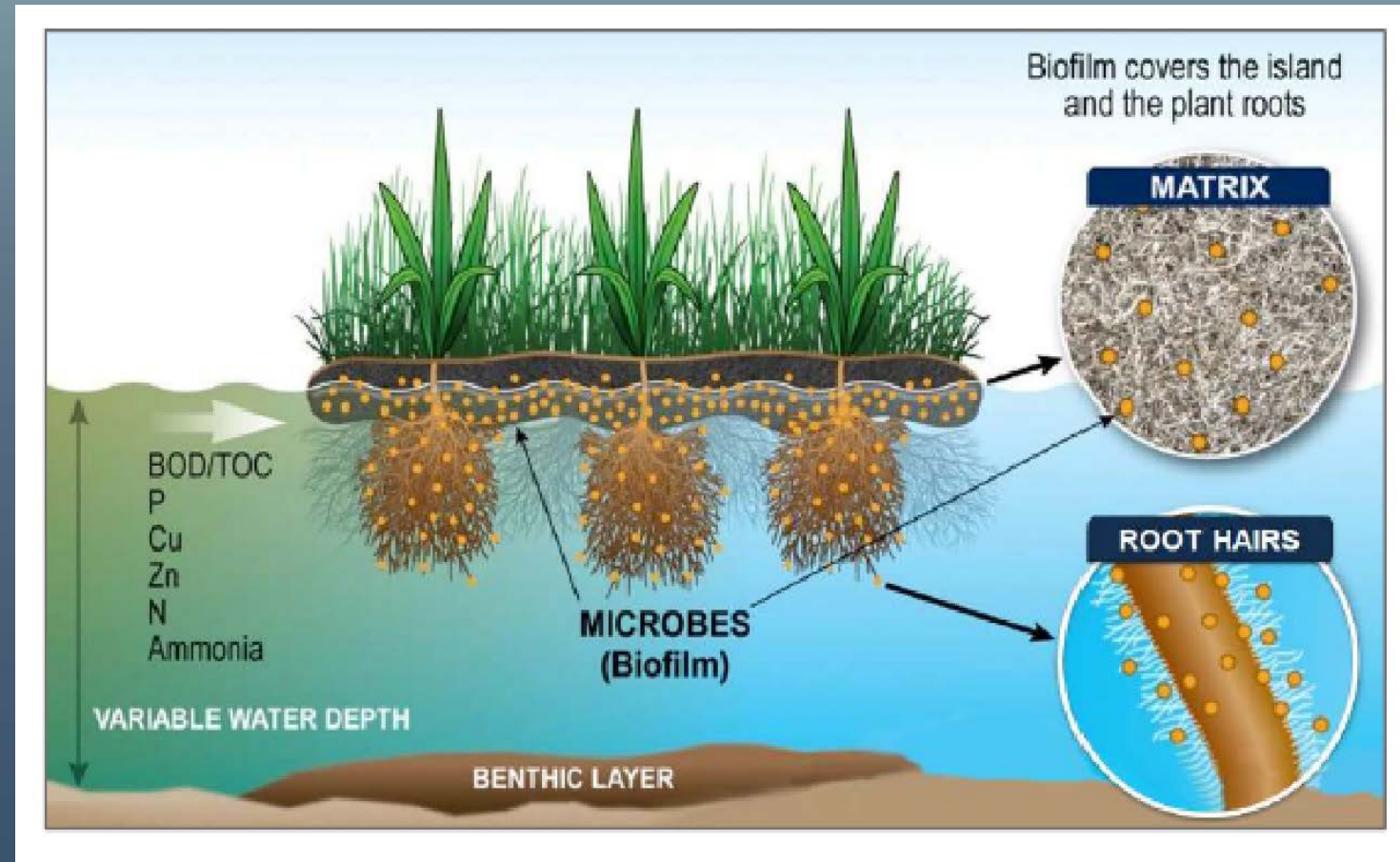
Catch Basin Inserts

- ✓ May be utilized in catch basins
- ✓ Select membrane filtration to remove 77% of fecal coliform and *E. coli*
- ✓ Monitor and replace as needed



Floating Wetland Islands (FWIs)

- ✓ Actual floating islands with living plant material
- ✓ Microbes colonize roots and float to remove nutrients from water column
- ✓ Depending on proximity to shore, may also act to stabilize banks/shoreline
- ✓ Relatively self-sustaining
- ✓ 10-15 yr effective life span



The Hideout, PA Lake Community in the Poconos



2010



2012



2014



Depth Reading

- Depth to Top of Sediment ≤ 4ft
- Depth to Top of Sediment > 4ft
- Proposed FWI Location

| ID | Depth to Top of Sediment (feet) | Depth to Bottom of Sediment (feet) | Sediment Thickness (feet) |
|----|---------------------------------|------------------------------------|---------------------------|
| 1 | 3.00 | 1.50 | 4.50 |
| 2 | 3.50 | 1.50 | 5.00 |
| 3 | 3.50 | 1.50 | 5.00 |
| 4 | 3.50 | 1.50 | 5.00 |
| 5 | 5.00 | 2.00 | 7.00 |
| 6 | 4.50 | 2.00 | 6.50 |
| 7 | 4.50 | 1.50 | 6.00 |
| 8 | 4.50 | 1.50 | 6.00 |
| 9 | 4.75 | 1.00 | 5.75 |
| 10 | 7.00 | 1.00 | 8.00 |
| 11 | 6.00 | 1.00 | 7.00 |
| 12 | 5.50 | 3.00 | 8.50 |
| 13 | 3.50 | 2.50 | 6.00 |
| 14 | 2.00 | 1.00 | 3.00 |
| 15 | 2.00 | 2.00 | 4.00 |
| 16 | 1.50 | 0.00 | 1.50 |
| 17 | 2.00 | 0.00 | 2.00 |
| 18 | 3.00 | 1.00 | 4.00 |
| 19 | 3.00 | 1.00 | 4.00 |
| 20 | 2.00 | 1.00 | 3.00 |

NOTES:
 1. Depth readings collected by Princeton Hydro on 07/25/2019.
 2. 2015 Orthoimagery obtained from N.J. Office of Information Technology (NJ OIT), Office of Geographic Information Systems (OGIS).



SUNSET LAKE
DEPTH READING LOCATIONS
 SUN SET LAKE
 DEAL LAKE COMMISSION
 CITY OF ASBURY PARK
 MONMOUTH COUNTY, NEW JERSEY



Manufactured Treatment Devices (MTDs)

- ✓ ConTech Engineered Solutions
- ✓ Continuous Deflective Separation (CDS)
- ✓ Proposed CDS units have certified TSS removal of 50%



CDS® Stormwater Treatment

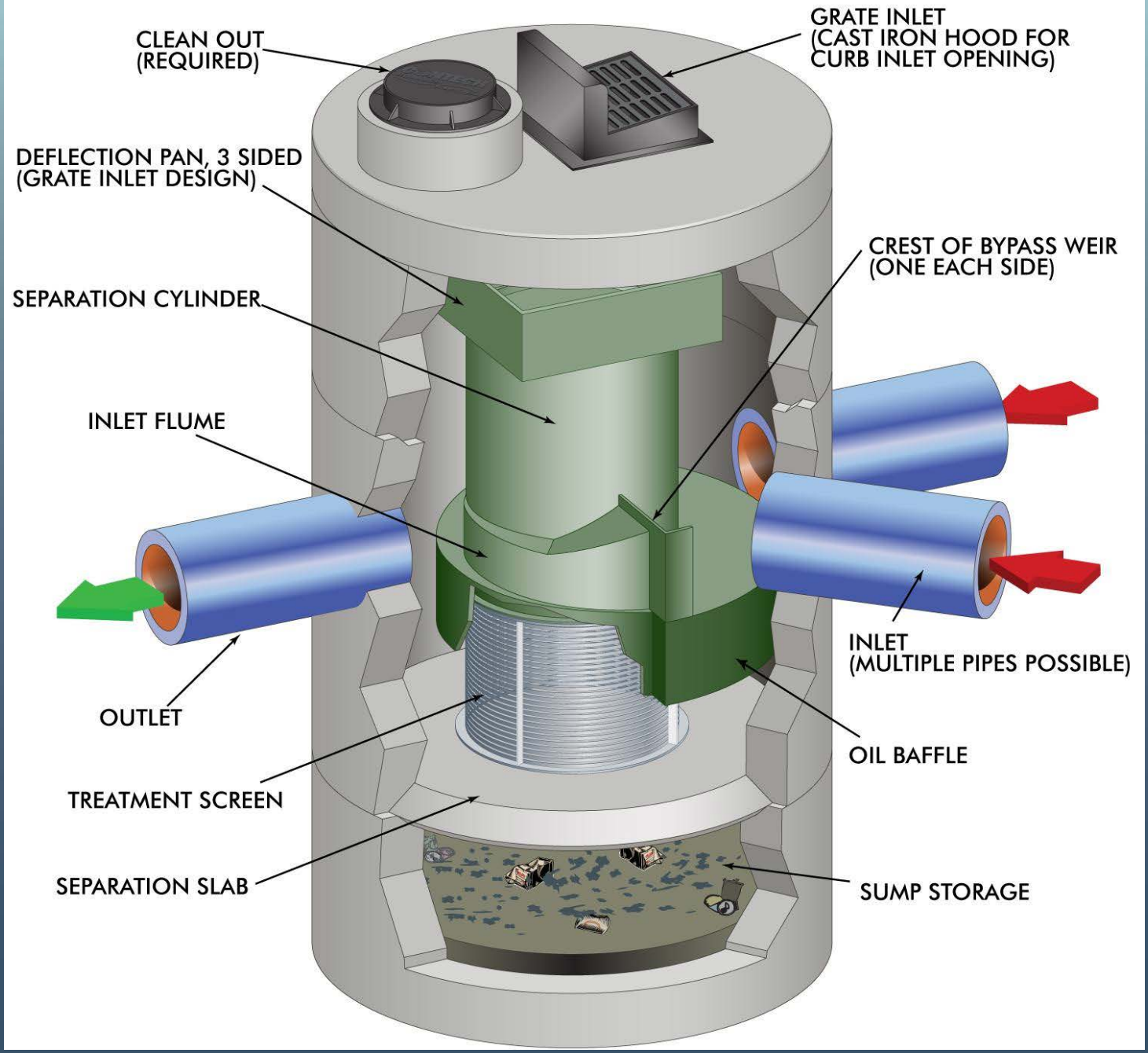
The CDS hydrodynamic separator uses swirl concentration and continuous deflective separation to screen, separate and trap trash, debris, sediment, and hydrocarbons from stormwater runoff. CDS *captures and retains 100% of floatables and neutrally buoyant debris 4.7 mm or larger, effectively removes sediment*, and incorporates a non-blocking screen.

Superior Stormwater Trash and Sediment Removal

CDS is used to meet trash Total Maximum Daily Load (TMDL) requirements, for stormwater quality control, inlet and outlet *pollution control*, and as pretreatment for filtration, detention/infiltration, bioretention, rainwater harvesting systems, and *Low Impact Development designs*.

Source: <https://www.conteches.com/stormwater-management/treatment/cds>





CDS Features and Benefits

| FEATURES | BENEFITS |
|---|--|
| 1. Captures and retains 100% of floatables and neutrally buoyant debris 4.7mm or larger | 1. Superior pollutant removal |
| 2. Self-cleaning screen | 2. Ease of maintenance |
| 3. Isolated storage sump eliminates scour potential | 3. Excellent pollutant retention |
| 4. Internal bypass | 4. Eliminates the need for additional structures |
| 5. Multiple pipe inlets and 90-180° angles | 5. Design flexibility |
| 6. Numerous regulatory approvals | 6. Proven performance |

Select CDS Certifications

- Washington Department of Ecology (GULD) - Pretreatment
- ***New Jersey Department of Environmental Protection (NJDEP)***
- Canadian Environmental Technology Verification (ETV)
- California Statewide Trash Amendments Full Capture System Certified

CDS Maintenance

- CDS provides unobstructed access to stored pollutants, making it easy to maintain.
- Maintaining a CDS is a simple process that can be easily accomplished using a vacuum truck, with no requirement to enter the unit.

Source: <https://www.conteches.com/stormwater-management/treatment/cds>



General Plan for BMPs in Deal, Sunset, and Wesley Lakes; Maintenance Needs

Proposed plan for BMPs

Proposed Locations of Deal Lake Improvements



FIGURE 2
DEAL LAKE

SPY 2017 SECTION 319(P) APPLICATION
DEAL LAKE, SUNSET LAKE, & LAKE WESLEY
MONMOUTH COUNTY, NEW JERSEY

PH PRINCETON HYDRO, LLC.
1108 OLD YORK ROAD
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RINGGEE, NJ 08551
*with offices in NJ, PA and CT

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Proposed Locations of Sunset Lake Improvements



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Proposed Locations of Wesley Lake Improvements

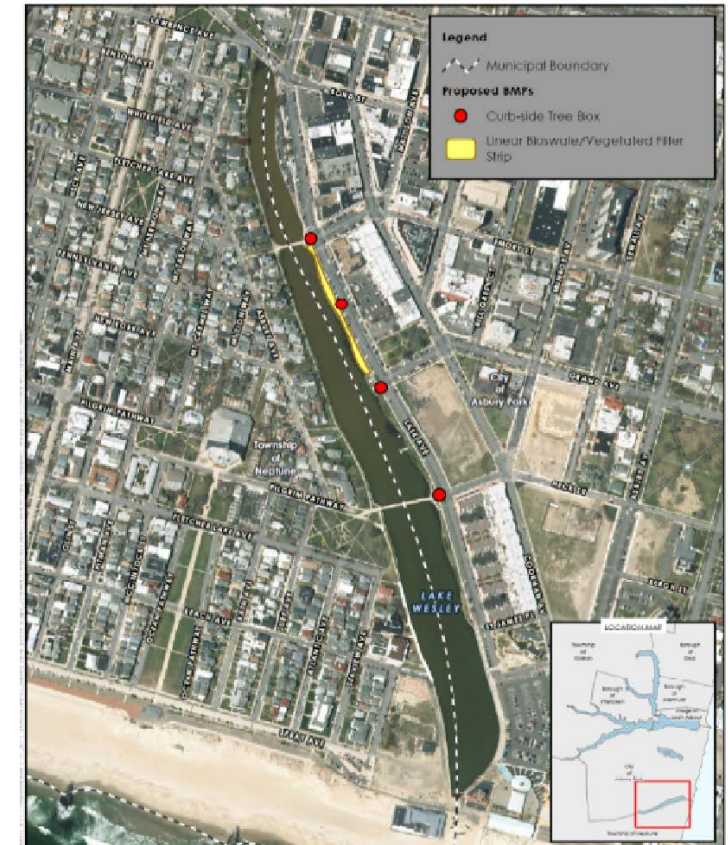


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Proposed plan for BMPs

Proposed Locations of Deal Lake Improvements



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Proposed Locations of Sunset Lake Improvements



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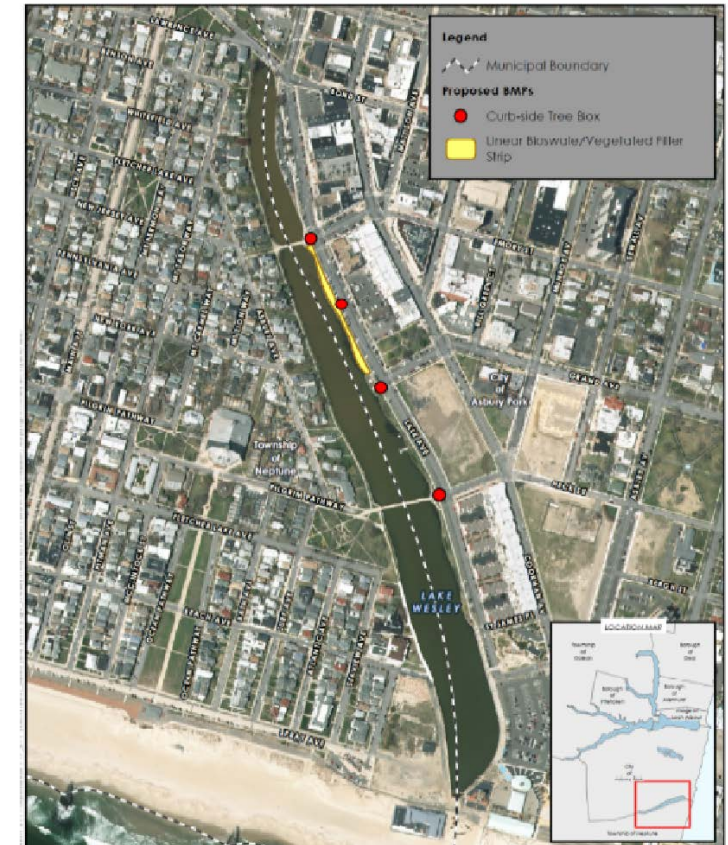


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Proposed Locations of Deal Lake Improvements



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Map Projection: NAD 1983 StatePlane New Jersey NAD 1983 Feet
Scale: 1" = 500'

Proposed Locations of Sunset Lake Improvements



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Proposed Locations of Wesley Lake Improvements

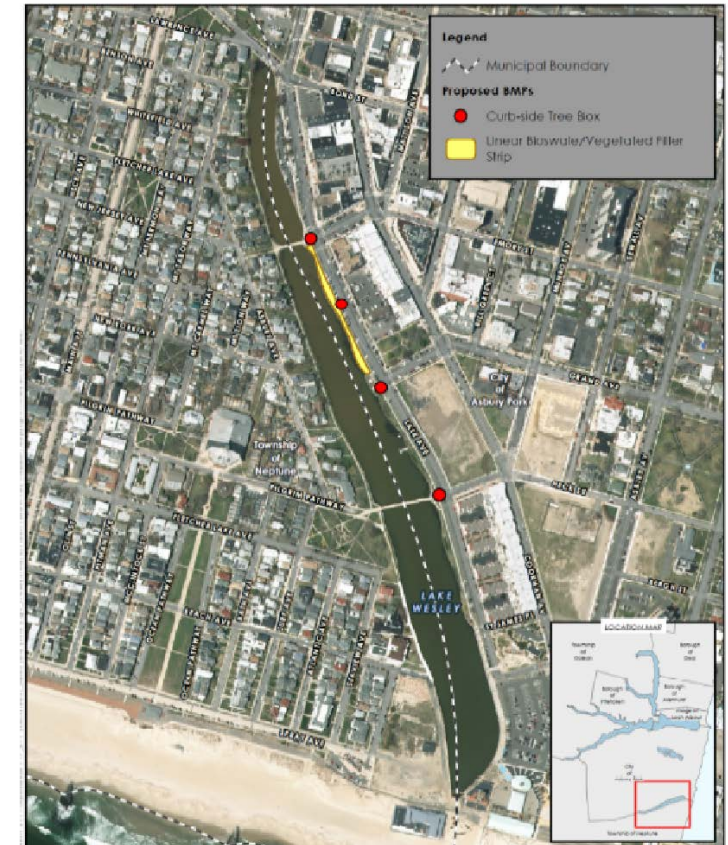


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Proposed plan for BMPs

Proposed Locations of Deal Lake Improvements



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Proposed Locations of Sunset Lake Improvements



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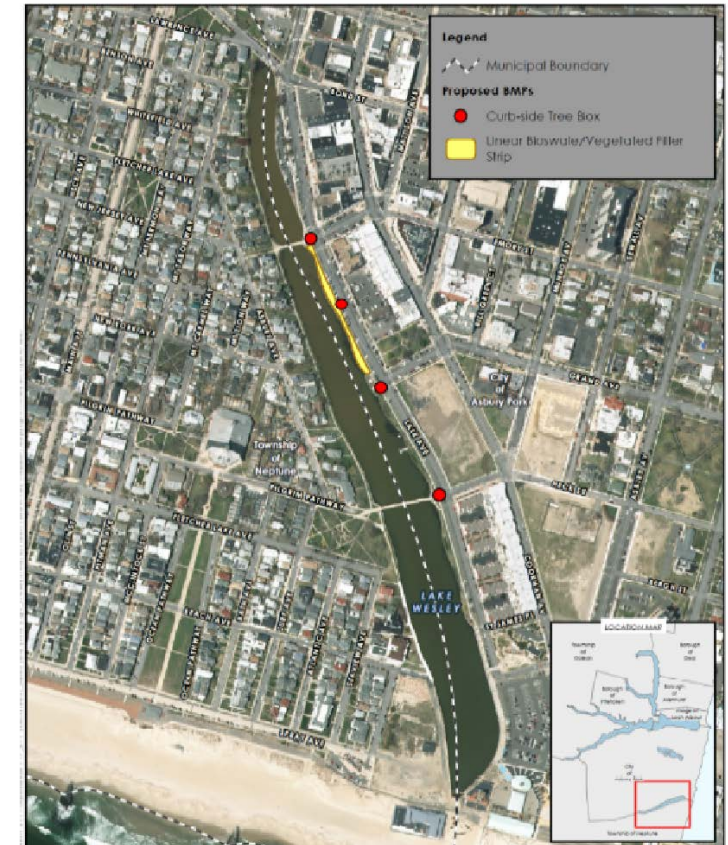


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Map Projection: NAD 83 StatePlane New Jersey NAD 83 FIPS 502 Feet

Proposed Locations of Sunset Lake Improvements



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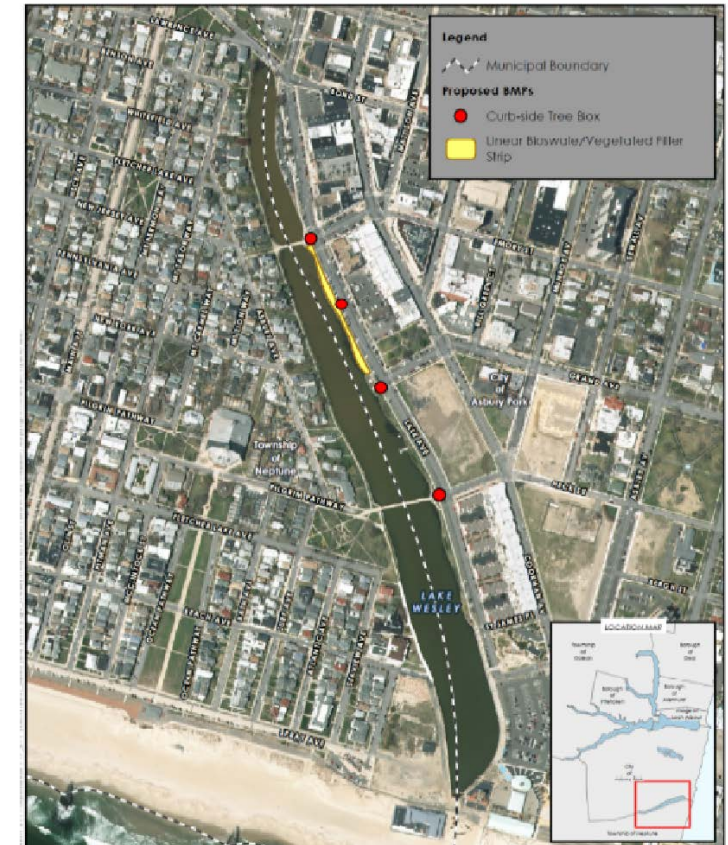


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Proposed plan for BMPs

Proposed Locations of Deal Lake Improvements



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Proposed Locations of Sunset Lake Improvements



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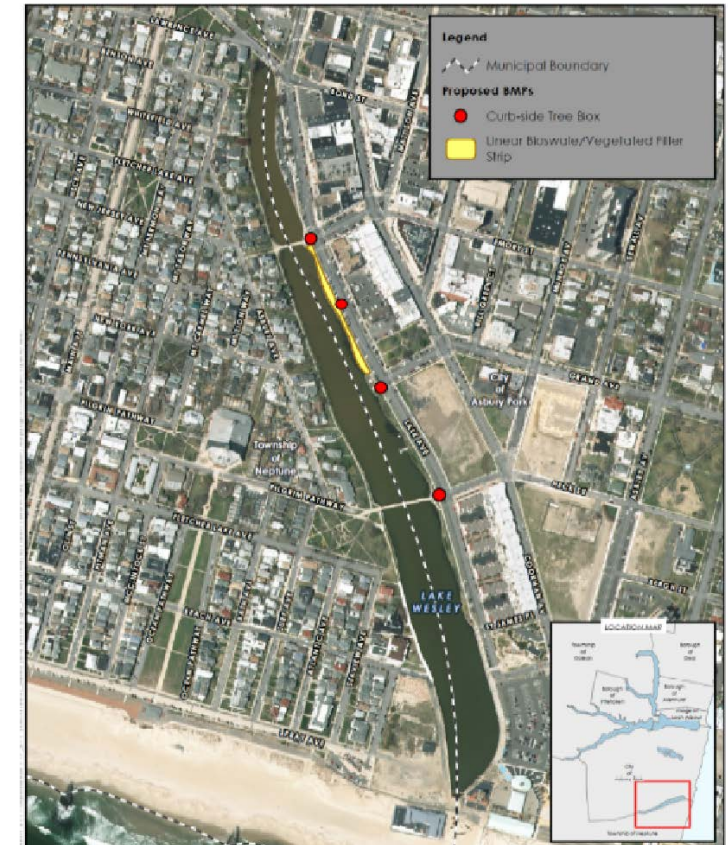


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Map Projection: NAD 83 StatePlane New Jersey NAD 83 FIPS 502 Feet

Proposed plan for BMPs

Proposed Locations of Deal Lake Improvements



FIGURE 2
DEAL LAKE

SPY 2017 SECTION 319(b) APPLICATION
DEAL LAKE, SUNSET LAKE, & LAKE WESLEY
MONMOUTH COUNTY, NEW JERSEY

PH PRINCETON HYDRO, LLC.
1108 OLD YORK ROAD
P.O. BOX 720
RINGGEE, NJ 08551
*with offices in NJ, PA and CT

NOTES:
1. Proposed BMP locations are approximate.
2. Surrounding geographic information from New Jersey Geographic Information System (NJGIS).
3. All coordinates are based on NAD 83 datum.
4. All coordinates are based on the U.S. National Geodetic Survey (NAD 83) datum.
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Proposed Locations of Sunset Lake Improvements



FIGURE 3
SUNSET LAKE

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Proposed Locations of Wesley Lake Improvements

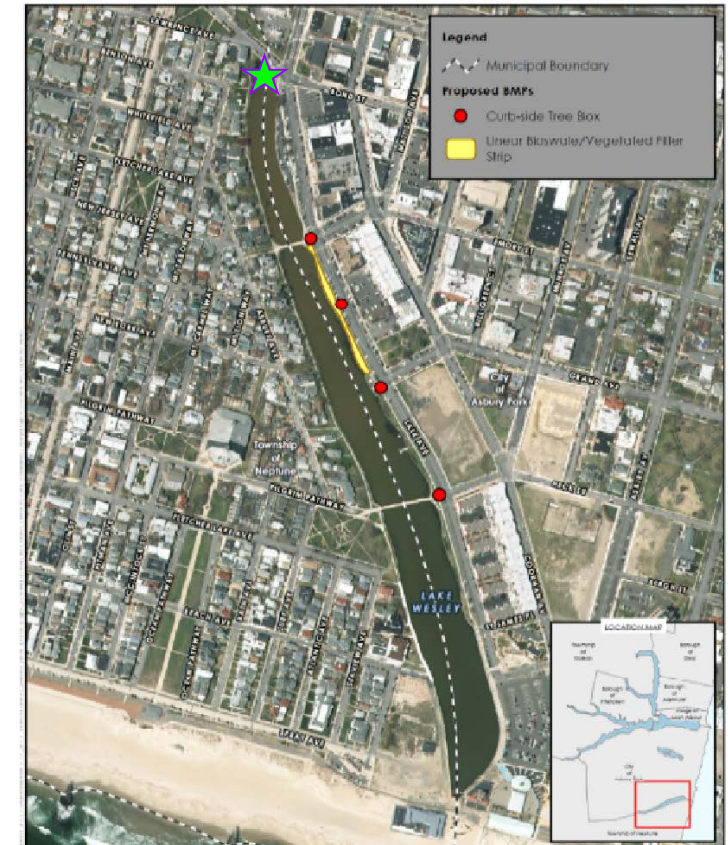


FIGURE 4
LAKE WESLEY

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Proposed plan for BMPs

Proposed Locations of Deal Lake Improvements



FIGURE 2
DEAL LAKE

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DEAL LAKE, SUNSET LAKE, & LAKE WESLEY
MONMOUTH COUNTY, NEW JERSEY

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5. All information is for informational purposes only.
6. All information is for informational purposes only.
Map Projection: NAD 83 StatePlane New Jersey NAD 83 Feet
Scale: 1" = 200'

Proposed Locations of Sunset Lake Improvements



FIGURE 3
SUNSET LAKE

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DEAL LAKE, SUNSET LAKE, & LAKE WESLEY
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Map Projection: NAD 83 StatePlane New Jersey NAD 83 Feet
Scale: 1" = 250'

Proposed Locations of Wesley Lake Improvements

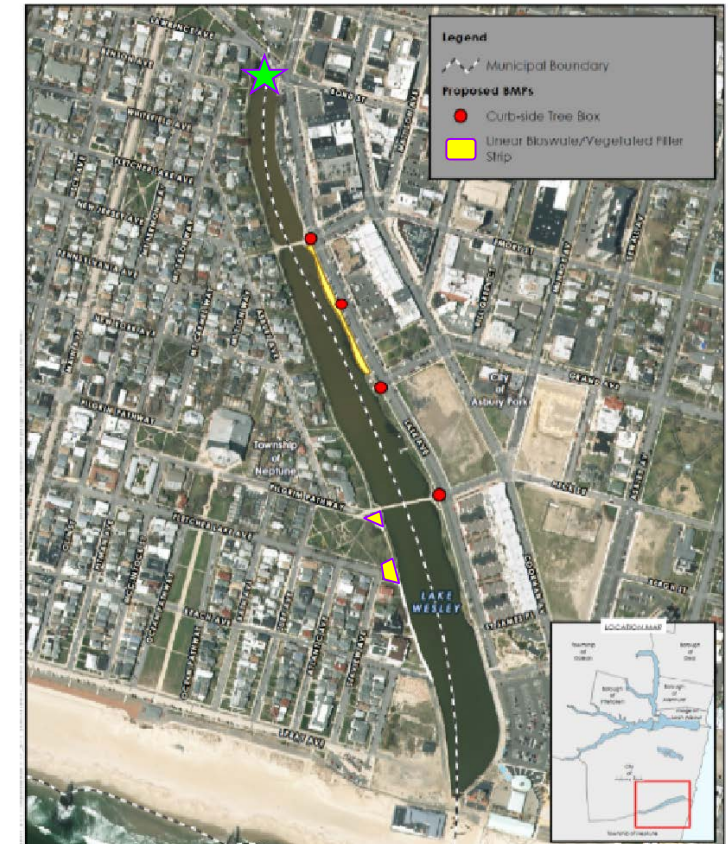


FIGURE 4
LAKE WESLEY

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DEAL LAKE, SUNSET LAKE, & LAKE WESLEY
MONMOUTH COUNTY, NEW JERSEY

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Map Projection: NAD 83 StatePlane New Jersey NAD 83 Feet
Scale: 1" = 400'

Proposed plan for BMPs

Proposed Locations of Deal Lake Improvements



FIGURE 2
DEAL LAKE

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3. All coordinates are in NAD 83 UTM Zone 18Q. All distances are in feet.
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Map Projection: NAD 83 UTM Zone 18Q
Scale: 1" = 200 feet

Proposed Locations of Sunset Lake Improvements



FIGURE 3
SUNSET LAKE

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6. All information is for informational purposes only.
Map Projection: NAD 83 UTM Zone 18Q
Scale: 1" = 125 feet

Proposed Locations of Wesley Lake Improvements

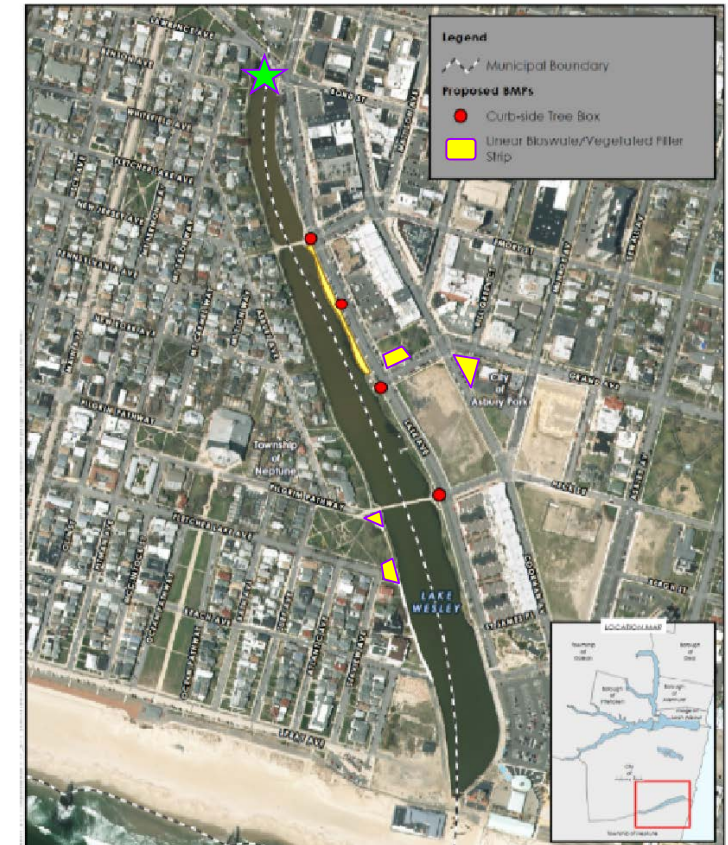


FIGURE 4
LAKE WESLEY

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Map Projection: NAD 83 UTM Zone 18Q
Scale: 1" = 200 feet

WQ Benefits

- ✓ TSS Removal
- ✓ TP Removal
- ✓ Projected nutrient load decrease - will be calculated after final BMP/MTD decisions have been made

Maintenance Needs

- ✓ Minimal, sometimes less than existing features
- ✓ Depends on BMP type
 - Green Infrastructure:
 - FWI
 - ✓ occasional monitoring for location and/or vandalism
 - ✓ otherwise no intensive long term work
 - Bioswale and Bioinfiltration
 - ✓ no-mow buffer, keep clippings away from water
 - ✓ mow 1-2x annually, 6-8" mow height (higher than most other grass areas, much less frequently)
 - ✓ clearing any trash wracks of debris
 - Treeboxes - manufacturer recommended clean outs (annually, semi-annually)
 - Manufactured Treatment Device:
 - ConTech MTD - O&M Manual, recommended pump outs (often annually)

General Maintenance for Cleaner Water

- ✓ Keeping storm drains clear
- ✓ Regular street sweeping
- ✓ Remove fallen leaves and lawn clippings from lawns
- ✓ Limit use of fertilizers on lawns
- ✓ Properly dispose of pet waste
- ✓ Limits to impervious cover
- ✓ Smart development and Low-Impact Design (LID)
- ✓ Regular septic pump outs (where applicable)
- ✓ Commitment by Twp to add new BMPs into routine

Future Meetings

Next Meetings

- Spring 2020 - prior to installation to garner support and volunteers for the planting of FWIs in Sunset Lake
- Late summer/fall of 2020 - once plants have been established on the FWIs, maintenance practices should be reviewed, and plans for additional BMPs throughout the watershed will be more concrete

QUESTIONS?



Jack Szczepanski, Ph.D.

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jszczepanski@princetonhydro.com

Turner Shell

Leon S. Avakian, Inc.
tshell@leonsavakian.com

THANK
YOU!

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QUESTIONS?



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THANK
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QUESTIONS?



| MTD Cost Estimate | | | | |
|---|---------------|------------|----------|------------------|
| Location | Drainage Area | CDS Unit # | Cost | 2x Install |
| Memorial Dr. between Sunset Ave. and 5th Ave. | 80 acres | 5678 | \$61,728 | \$123,456 |
| Sunset Lake - 5th Avenue and Grand Avenue | 44 acres | 5653 | \$51,440 | \$102,880 |
| Sunset Lake - Sunset Avenue and Grand Avenue | 22 acres | 4045 | \$30,250 | \$60,500 |
| | | | TOTAL: | \$286,836 |

THANK
YOU!

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