Impervious Cover Assessment and Reduction Action Plan for Pilesgrove, New Jersey

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Rutgers Cooperative Extension

Rutgers Cooperative Extension (RCE) helps the diverse population of New Jersey adapt to a rapidly changing society and improves their lives through an educational process that uses science-based knowledge.
The Water Resources Program is one of many specialty programs under Rutgers Cooperative Extension.

Our Mission is to identify and address community water resources issues using sustainable and practical science-based solutions.

The Water Resources Program serves all of New Jersey, working closely with the County Extension Offices.
The Impact of Development on Stormwater Runoff

More development → More impervious surfaces → More stormwater runoff
The **Urban** Hydrologic Cycle

- Condensation
- Evaporation
- Much less infiltration
- Low groundwater flow
- Roofs, roads & paths stop infiltration
- More runoff
- Soil
- Bedrock
- No rain: streams dry up
  - Rain: streams flood
Original ICM developed based on 200+ reports and papers

Impervious Cover Model

Watershed Impervious Cover

Green Infrastructure

…an approach to stormwater management that is cost-effective, sustainable, and environmentally friendly

Green Infrastructure projects:

- capture
- filter
- absorb
- reuse

stormwater to maintain or mimic natural systems and treat runoff as a resource
Green Infrastructure includes:

- green roofs
- rainwater harvesting
- tree filter/planter boxes
- rain gardens/bioretenion systems
- permeable pavements
- vegetated swales or bioswales
- natural retention basins
- trees & urban forestry
- green streets
We must deal with impacts from impervious cover.

Are there impervious surfaces that you can eliminate?

If we can't eliminate it, can we reduce it?

If we can't eliminate or reduce it, can we disconnect it?

Are there impervious surfaces that you can harvest rainwater for reuse?

Are there conveyance systems that can be converted to bioswales?
Eliminate it!  “Depaving”
Reduce It!
Permeable Pavements

- Underlying stone reservoir
- Porous asphalt and pervious concrete are manufactured without "fine" materials to allow infiltration
- Grass pavers are concrete interlocking blocks with open areas to allow grass to grow
- Ideal application for porous pavement is to treat a low traffic or overflow parking area
- Terminology: porous asphalt, pervious concrete, permeable pavers
Permeable Pavements

**FUNCTIONS**

- Manage stormwater runoff
- Minimize site disturbance
- Promote groundwater recharge
- Low life cycle costs, alternative to costly traditional stormwater management methods
- Mitigation of urban heat island effect
- Contaminant removal as water moves through layers of system

**COMPONENTS**
Disconnect It!
For 1.25 inch storm, 3,811 cubic feet of runoff = **28,500 gallons**

1 acre directly connected impervious cover

2 acres pervious cover

Total drainage area = 3 acres

Runoff direction

Stormwater inlet
For 1.25 inch storm, 581 cubic feet of runoff = 4,360 gallons

1 acre directly connected impervious cover

2 acres pervious cover

Total drainage area = 3 acres

Runoff direction

Stormwater inlet
<table>
<thead>
<tr>
<th>Design Storm</th>
<th>Connected (gallons)</th>
<th>Disconnected (gallons)</th>
<th>Percent Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.25 inches (water quality storm)</td>
<td>28,500</td>
<td>4,360</td>
<td>85%</td>
</tr>
</tbody>
</table>
Disconnected with Rain Water Harvesting

Disconnect your downspout by installing a rain barrel

Impervious area is now “disconnected” from flowing directly into the storm sewer system
So Many Barrels to Choose From…
Or Larger Rainwater Harvesting Systems...
Rooftop runoff is now “disconnected” from flowing directly into the storm sewer system.
Lots of Rain Gardens
Impervious Cover Assessment
Impervious Cover Assessment

• Analysis completed by watershed and by municipality
• Use 2007 Land Use data to determine impervious cover
• Calculate runoff volumes for water quality, 2, 10 and 100 year design storm and annual rainfall
• Contain three concept designs
Recreational Land, 13.8%
Commercial, 3.1%
Industrial, 0.5%
Mixed Urban, 3.7%
Transportation/Infrastructure, 3.2%
Low Density Residential, 8.1%
Medium Density Residential, 1.6%
High Density Residential, 0.5%
Rural Residential, 65.5%
<table>
<thead>
<tr>
<th>Watershed</th>
<th>Total Area (ac)</th>
<th>Impervious Cover (ac)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alloway Creek</td>
<td>1,177</td>
<td>13.3</td>
<td>1.1%</td>
</tr>
<tr>
<td>Game Creek</td>
<td>1,193</td>
<td>16.9</td>
<td>1.4%</td>
</tr>
<tr>
<td>Mannington Creek</td>
<td>38.8</td>
<td>0.5</td>
<td>1.3%</td>
</tr>
<tr>
<td>Nichomus Run</td>
<td>2,930</td>
<td>49.6</td>
<td>1.7%</td>
</tr>
<tr>
<td>Oldmans Creek</td>
<td>5,265</td>
<td>147.8</td>
<td>2.8%</td>
</tr>
<tr>
<td>Salem River</td>
<td>11,885</td>
<td>258.7</td>
<td>2.2%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>22,489</strong></td>
<td><strong>486.8</strong></td>
<td><strong>2.2%</strong></td>
</tr>
<tr>
<td>Subwatershed</td>
<td>NJ Water Quality Storm (MGal)</td>
<td>Annual Rainfall of 44” (MGal)</td>
<td>2-Year Design Storm (3.3”) (MGal)</td>
</tr>
<tr>
<td>-------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------------</td>
</tr>
<tr>
<td>Alloway Creek</td>
<td>0.45</td>
<td>15.89</td>
<td>1.19</td>
</tr>
<tr>
<td>Game Creek</td>
<td>0.57</td>
<td>20.19</td>
<td>1.51</td>
</tr>
<tr>
<td>Mannington Creek</td>
<td>0.02</td>
<td>0.60</td>
<td>0.04</td>
</tr>
<tr>
<td>Nichomus Run</td>
<td>1.68</td>
<td>59.26</td>
<td>4.44</td>
</tr>
<tr>
<td>Oldmans Creek</td>
<td>5.02</td>
<td>176.58</td>
<td>13.24</td>
</tr>
<tr>
<td>Salem River</td>
<td>8.78</td>
<td>309.07</td>
<td>23.18</td>
</tr>
<tr>
<td>TOTAL</td>
<td>16.52</td>
<td>581.58</td>
<td>43.62</td>
</tr>
</tbody>
</table>
WE LOOK HERE FIRST:

- Schools
- Churches
- Libraries
- Municipal Building
- Public Works
- Firehouses
- Post Offices
- Elks or Moose Lodge
- Parks/ Recreational Fields

- 20 to 40 sites are entered into a PowerPoint
- Site visits are conducted
Pilesgrove Township
Impervious Cover Assessment
Pilesgrove Municipal Building, 1180 US 40

PROJECT LOCATION:

SITE PLAN:

1. BIOSWALE: An existing swale could be modified into a bioswale to remove the runoff from the parking lot. A bioswale is a vegetated system that will convey stormwater runoff while removing sediment and pollutants.

2. BIORETENTION SYSTEMS: Crushed rock will be used to filter stormwater runoff from the parking area to enter into the bioswale system. The retention system will reduce sediment and nutrient loading to the local waterway.

3. RAINWATER HARVESTING SYSTEM: A rainwater harvesting system could be installed to capture stormwater runoff from one of the rooftops to wash vehicles, fill street sweepers, etc.
Pilesgrove Township
Impervious Cover Assessment
Woodstown Preschool Academy, 343 Lincoln Road

PROJECT LOCATION:

SITE PLAN:

1. BIOSWALE: A bioswale could be installed to treat runoff from the parking lot. A bioswale is a vegetated system that will convey stormwater while removing sediment and nutrients.

2. BIORETENTION SYSTEM: The bioretention system will reduce sediment and nutrient loading to the local community. Culverts will be used to allow stormwater runoff from the parking area to enter into the bioretention system.

3. POROUS ASPHALT: Porous asphalt promotes groundwater recharge and reduces stormwater.

1. BIOSWALE
2. BIORETENTION SYSTEM
3. POROUS ASPHALT
Pilcsgrove Township
Impervious Cover Assessment
Woodstown NJ State Police Station, 769 US 40
PROJECT LOCATION:

SITE PLAN:

1. BIORETENTION SYSTEM: The bioretention system will remove sediment and nutrient loading to the local waterway. Curb cuts will be used to allow stormwater runoff from the driveway to enter into the bioretention system.

2. POROUS ASPHALT: Porous asphalt promotes groundwater recharge and filters stormwater.

BIORETENTION SYSTEM
CURB CUTS
POROUS ASPHALT
Impervious Cover Reduction Action Plan
Salem River Watershed (West)

1. Woodstown NJ State Police Station
2. Sunoco Gas Station
3. Fulton Bank of New Jersey
4. Richmans Ice Cream
5. The Church of Jesus Christ of Latter-day Saints
6. Sharptown United Methodist Church
7. Dollar General
8. The Corner
9. Salem County Public Works
Salem River Watershed (East)

10. Now & Then Consignment and Antiques Mall
11. William Roper Early Childhood Learning Center
12. Pilesgrove Municipal Building
13. Woodstown Mini Storage
14. Wood Lanes
15. Franklin Bank
16. Lighthouse Christian Center
17. Woodstown Veterinary Hospital
18. Camp Crockett County Park
Nichomus Run Watershed

1. Acme
2. Rite Aid
3. Wendy’s
4. Joe’s Pizza / Donna’s Hallmark Shop
5. Tri-County Veterinary Hospital
Oldmans Creek Watershed

1. Woodstown Preschool Academy

2. R E Pierson Construction Co. Inc.
Wood Lanes
1173 US 40 Pilesgrove, NJ 08098
Block 40, Lot 12.05
118,567 sq. ft.

Grass pavers could be installed along the western edge of the building to treat its runoff. The parking lot could be retrofitted with bioretention islands and porous pavement. A preliminary soil assessment for this site suggested that the site's existing soils have suitable drainage characteristics for green infrastructure.

<table>
<thead>
<tr>
<th>Impervious Cover</th>
<th>Existing Loads (lbs/year)</th>
<th>Runoff Volume (Mgal)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>For the 1.25” Water Quality Storm</td>
</tr>
<tr>
<td>%</td>
<td>Square Feet</td>
<td>TP</td>
</tr>
<tr>
<td>69%</td>
<td>82,292</td>
<td>3.97</td>
</tr>
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<tr>
<th></th>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioretention systems</td>
<td>0.113</td>
<td>19</td>
<td>8,310</td>
<td>0.28</td>
</tr>
<tr>
<td>Grass pavers</td>
<td>0.412</td>
<td>69</td>
<td>30,227</td>
<td>1.01</td>
</tr>
<tr>
<td>Porous pavement</td>
<td>0.352</td>
<td>59</td>
<td>25,776</td>
<td>0.86</td>
</tr>
</tbody>
</table>

Estimated cost is $5,438 for 1,088 sq. ft. of bioretention systems. Estimate cost is $114,570 for 4,583 sq. ft. of grass pavers and porous pavement with a two-foot stone reservoir under the pavement.
Wood Lanes
1173 US 40 Pilesgrove, NJ 08098
Block 40, Lot 12.05
118,567 sq. ft.
For this site, we recommend bioretention systems, grass pavers, and porous pavement. Click on the link below to view or download the Reduction Action Plan.
Final Thoughts

- Plans promote action
- Plans are a conduit for funding
- Impervious cover reduction action plan provide sites for developers to offset impacts
- Wide range in cost of projects (Eagle Scout projects to economic stimulus money projects)
- Foundation for stormwater utilities, watershed restoration plans, stormwater mitigation plan, and/or integrated water quality plans
Next Steps

• Funding is available to implement some of the concept plans or other projects identified in the action plan

• Decide who will take ownership of the assessment and action plan
  – Township Committee
  – Township Engineer and Business Administrator
  – Environmental Commission
  – Sustainable Jersey Green Team
  – Local Watershed Association

• Form a Municipal Action Team
Questions?

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