Roadway Stormwater Quality

Pollutants, BMPs and Management

Presented by:

Richard W. Canavan, Ph.D., Tighe & Bond

Keeping It Clean

G Rated Practices for Managing Storm Water Discharged in Lakes

Presented by:

Chuck Eaton, PE, LEED-AP, CME Associates, Inc.

Rick Canavan, Ph.D., Tighe & Bond
Rick Canavan, PhD
Senior Environmental Scientist, Tighe & Bond

- Professional Wetlands Scientist
- Registered Professional Soil Scientist
- Started career with research on CT lake water quality in 1990s
- Additional research on lake sediment in the Netherlands
- Works on wetlands and stormwater environmental permitting
- Lake water quality monitoring and Watershed Planning

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Speakers

Charles Eaton, PE, LEED-AP
Director of Municipal Services, CME Associates, Inc.

- Professional Engineer licensed in CT, MA, NH, NY and RI
- 20+ years of experience in civil engineering and construction administration
- Bachelor’s Degree in civil and environmental engineering
- Specializes in Stormwater Management
- Committee Member for 2013 Rhode Island Soil Erosion and Sediment Control Handbook update
- USDA/NRCS Technical Service Provider in CT, MA, and RI
- Extensive experience with design and improvement of Stormwater drainage and treatment
- Served as the Consulting Engineer and Town Engineer for municipalities throughout Southern New England

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What do you **measure** in stormwater?

What does that **mean** for lake water quality?

How can you **improve** stormwater quality *from roads*?
## Water Quality Parameters – MS4

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Water Quality Parameters

Industrial SW includes:

- Total Copper
- Total Zinc
- Total Lead
- Aquatic Toxicity
There are many parameters and they do provide important information. We will focus on three parameters as examples of how:

 › They relate to lake water quality, and
 › How they can (and can not) be managed in stormwater
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Conductivity is a fast and easy way to measure the total salts in sample

- Typical temperature corrected (25 °C) and reported as Specific Conductance
- TDS – Total Dissolved Solids is another measure which is usually related
- Highly correlated with road salt use
Salt in lake water

- Ecological impacts at lower levels
- Fisheries
- Aquatic habitat
- Water supply

1% or more impervious surface at lake shore leads to increasing conductivity
Solids in water trapped by a filter; sources include:

- Soil erosion
- Debris on roadways (brake dust, tire wear)
- Decaying leaves and other organic matter
TSS can impact Water Quality by:

- Reducing clarity
- Impacting fish gills, filter feeding organisms
- Burying benthic organisms
- TSS can transport nutrients, metals and bacteria
Bacteria can be a public health risk; however, E. coli also exists in the natural environment.

Sources:
- Agriculture
- Wildlife
- Pets
- On-site wastewater

Stormwater flows usually increase bacteria counts.
Salt does not break down (like some Oil & Grease components)
Salt does not bind to anything else (like Phosphorus or metals)
Salt does not get trapped in a sand filter (like bacteria)
BMPs or *Best Management Practices* are... activities, design features and physical structures incorporated into stormwater management to improve water quality.

Different BMPs are effective for treating different pollutants.
Possible BMPs

Basin – Swale – Rain Garden

- Typically Treats 1” of Rainfall from Impervious Areas
- Water Quality Volume
Possible BMPs

Hydrodynamic Separator

• Typically Treats 1” of Rainfall from Impervious Areas
• Water Quality Flow
• Avoid Mixing of Additional Stormwater
Typical Lake Communities

- Steep Slopes & Roads
- Gravel Roads
- Limited Road Shoulder
- Narrow Rights of Way
- Limited Drainage Easements

- NO ROOM FOR BMPs
- DIFFICULT TO SAFELY CONVEY STORMWATER TO LAKE
BMP Siting Difficulty

Typical Challenges:

- Steep
- Limited Area
- Higher Than Average Impervious Area
Lake BMPs – Practical

• Maintain Sheet Flow
• Collect Drainage
• Create Stable Channels
• Obtain Area for BMPs
• Maintain Roadways
• Reduce Deicing

CONTROL DRAINAGE
Positives

- Infiltration
- Association Ordinances
- Tighter Regulations
- Willing Land Owners

Tax District Documents | Driveway Ordinance

Section 1. Definitions:

Applicant: The term “Applicant” refers to the person proposing a driveway apron.

Board: The Board of Directors of the Witcher Woods Tax District.

Driveway Apron: An access onto or an access from a District Road.

New Driveway Apron: An access onto or an access from a road that was not in existence on or before the adoption date of this ordinance, or an existing access or an existing access from a road where the use of that driveway apron has changed.

Person: Includes Corporations, Partnerships, Firms, Associations and/or any other entity.

Street/Road: Any District maintained way constructed for and dedicated to movement of vehicles and pedestrians. The word shall not include private driveways and rights-of-way (R.O.W.).

District: The Witcher Woods Tax District

Section 2. Purpose:

It is the declared purpose of this ordinance to regulate driveways for the purpose of providing safe and structurally adequate access on roads.

Section 3. Procedure:

1. No person shall construct a new driveway, new driveway apron or modify an existing driveway leading into a District Road without first obtaining a written permit from the Board, or its agent.

2. No Building Permit(s) will be issued until the applicant has applied for and received a Driveway Apron Construction Permit.

3. A plot plan shall be submitted on behalf of the property owner showing the proposed layout.

4. Construction of the driveway apron must begin only after issuance of the Driveway Apron Construction Permit. Road area must be kept clean of mud, dirt, stone, etc. by installing a grading pad, to reduce the amount of onsite soils to be tracked on to the adjacent road.

5. Final approval of the driveway apron will be issued by the Board or its designee when all work is completed in accordance with the standards as verified by a post construction inspection. The Town of Woodstock Building Official will be notified when this approval is given.

6. All driveway aprons must and will abut existing surface of the District Road. No overlayment will be allowed onto the District Road surface.
What Can Residents Do?

- Monitor
- Clean and Clear
- Maintain
- Update Ordinances
- Grant Property and Easements
Roadway Drainage

- Crown
- Gutter
- Shoulder
- Ditch

**Typical Crowned Gravel Roadway Cross Section**

**Surface Gravel**

<table>
<thead>
<tr>
<th>Sieve</th>
<th>SPASSING</th>
</tr>
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<tbody>
<tr>
<td>3/4&quot;</td>
<td>100</td>
</tr>
<tr>
<td>No.4</td>
<td>50-78</td>
</tr>
<tr>
<td>No.8</td>
<td>37-67</td>
</tr>
<tr>
<td>No.40</td>
<td>13-35</td>
</tr>
<tr>
<td>No.200</td>
<td>4-10</td>
</tr>
<tr>
<td>Plasticity Index</td>
<td>4-12</td>
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**Base Gravel**

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<tr>
<td>3 1/2&quot;</td>
<td>100</td>
</tr>
<tr>
<td>1 1/2&quot;</td>
<td>52-100</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>25-60</td>
</tr>
<tr>
<td>No.10</td>
<td>15-45</td>
</tr>
<tr>
<td>No.40</td>
<td>5-25</td>
</tr>
<tr>
<td>No.100</td>
<td>0-10</td>
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<tr>
<td>No.200</td>
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Roadway Drainage

- Crown
- Gutter
- Shoulder
- Ditch
Roadway drainage is part of reducing deicing
Understanding Gravel Roads

- Use Good Material (Well Draining with Sealed Surface)
- Reduce Dust (Loss of Fines Removes Sealed Surface)
- Grade Often to Maintain Drainage
- Maintain Ditches
- Do Not Allow Driveways to Interrupt Ditch
- Remove Secondary Ditches

Guidelines for Grading

- Grade roads in the spring as soon as the frost leaves the ground, or as soon as possible after a rain while the surface materials are still moist but not wet.
- Limit the amount of road surface disturbed to that which can be stabilized by the end of the workday.
- Grade when gravel is moist after or during a light rain (do not grade if heavy rain is in the forecast.)
- Crown roads 1/2 to 3/4 inch for each foot of road width, measured from the center of the roadway to the outside edge, to ensure good drainage.
- Cutslope roads with over-the-bank drainage problems entirely toward the ditched side of the road.
- When possible, compact the entire width of the newly graded roadway with a steel wheel roller by end of day.
- Scarify the existing surface to blend the soils and improve compaction.
- Add approximately 2 to 3 inches of new material to correct any faults.
- Add new material by running a truck down the center of the roadway and dumping; then blend the old material with the new using a grader, followed by compaction using a steel wheel roller.
- Regravel road surface every 4 to 5 years with 2-3 inches of new gravel; this should be built into the regular operations budget rather than a capital expenditure.
- A recommended aggregate mix would be uniformly graded from coarse to fine; approximate sizes for surface composition are: soil (<0.074 mm), sand (0.074-2.0 mm) and aggregate (>2.0 mm).
- Be sure not to leave a gravel or sod berm between the road and the ditch slope.
Understanding Gravel Roads

- Secondary Ditches

*Proper shoulder maintenance will prevent false ditches*
Questions

Pollutants, BMPs and Management

Thanks for Attending