Permeable Pavement

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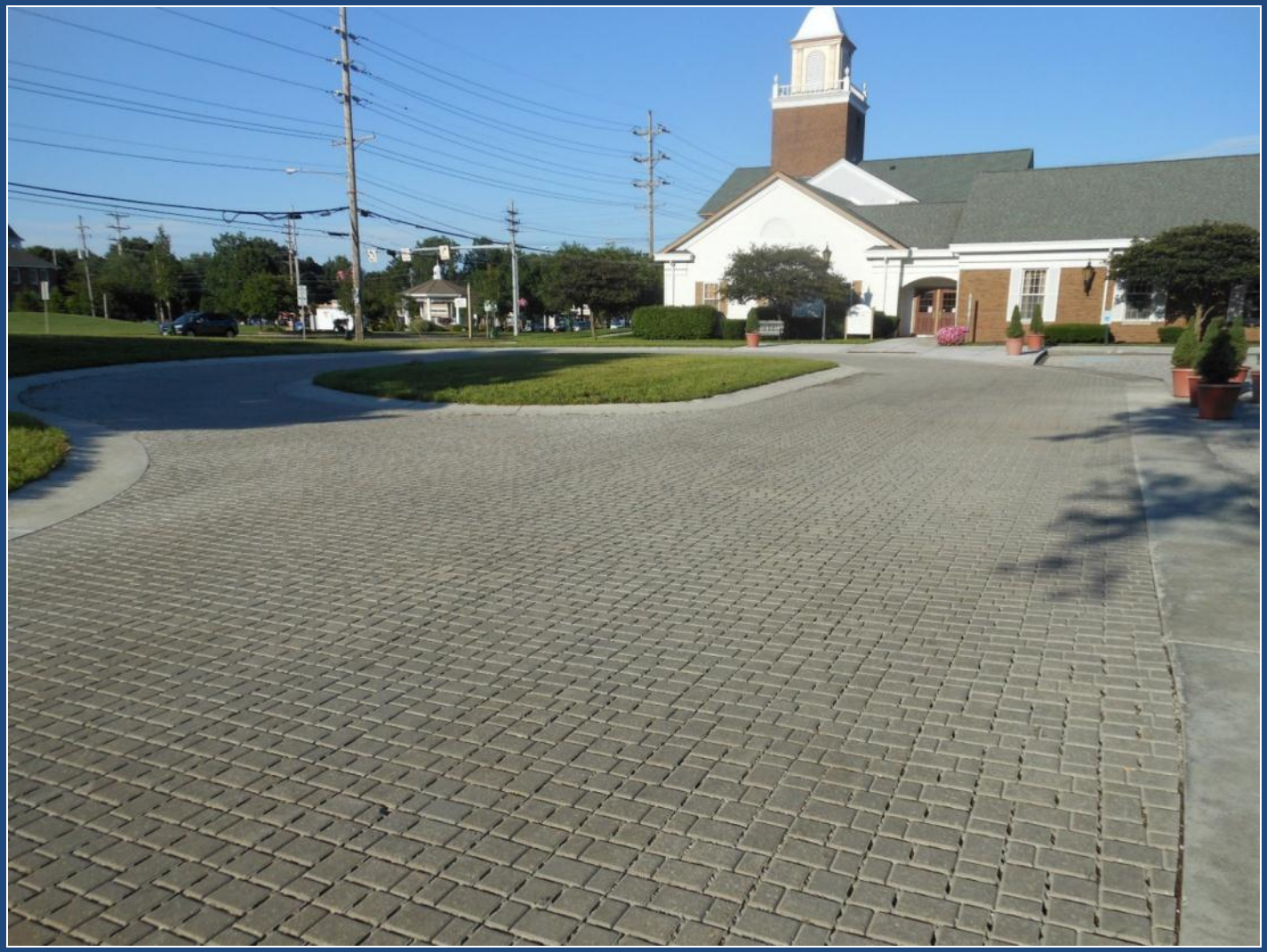
Stormwater Management Training for MS4 Municipal Employees

- Training Session Agenda
  - Pre-Training Survey
  - Presentation & Site Visit
  - Post-Training Survey
- Today's Selected SCM: **Permeable Pavement**
  - Overview of SCMs
  - Design Basics for Permeable Pavement
  - Operation & Maintenance for Permeable Pavement

Stormwater Control Measure

Permeable Pavement



Permeable Pavement: Design Overview

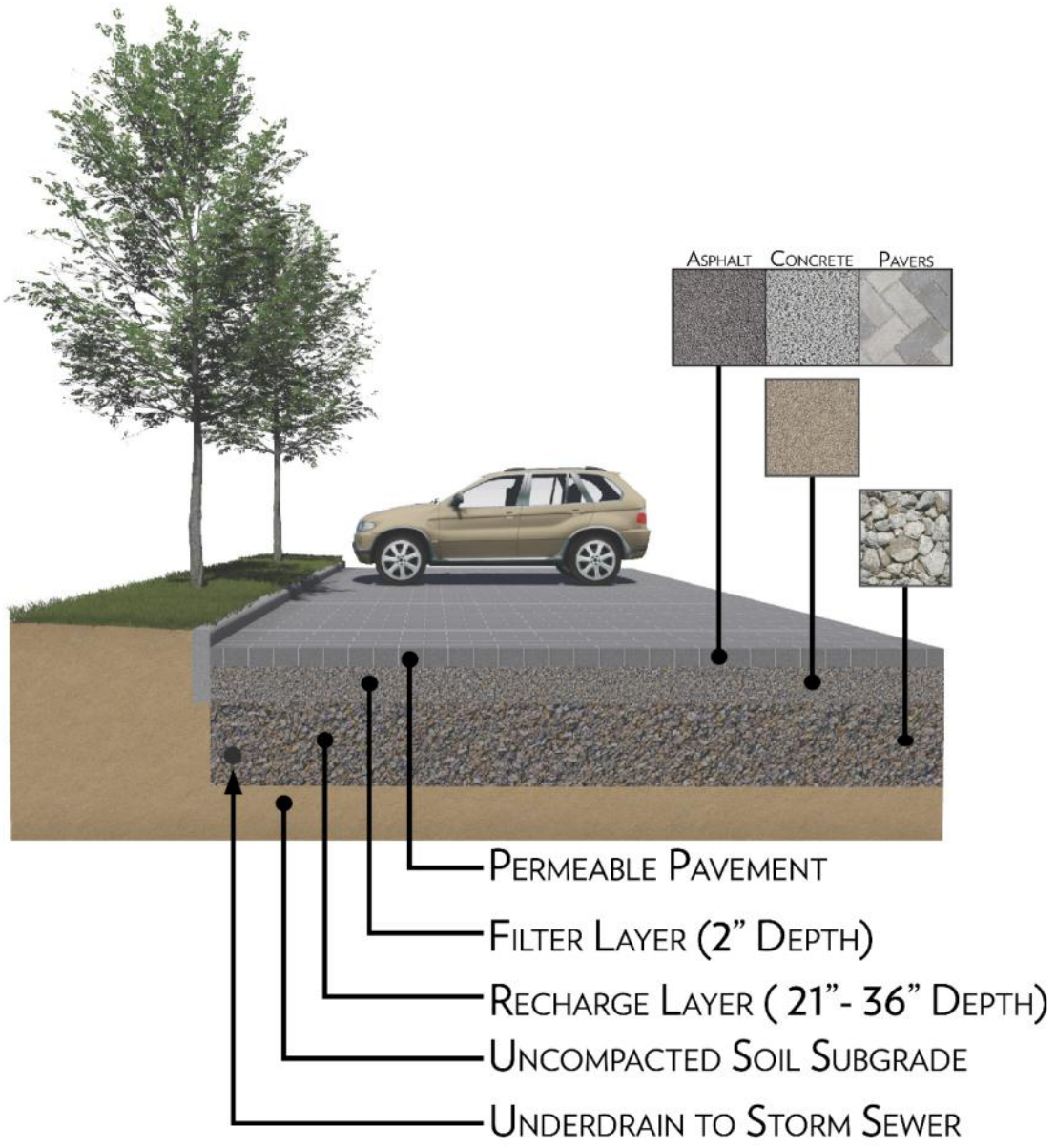


Figure courtesy of Chagrin River Watershed Partners, Inc. through a National Estuarine Research Reserve System Science Collaborative grant.

Permeable Pavement Design

Key Considerations:

- Hydrology
- Surrounding Area
- Surface Materials

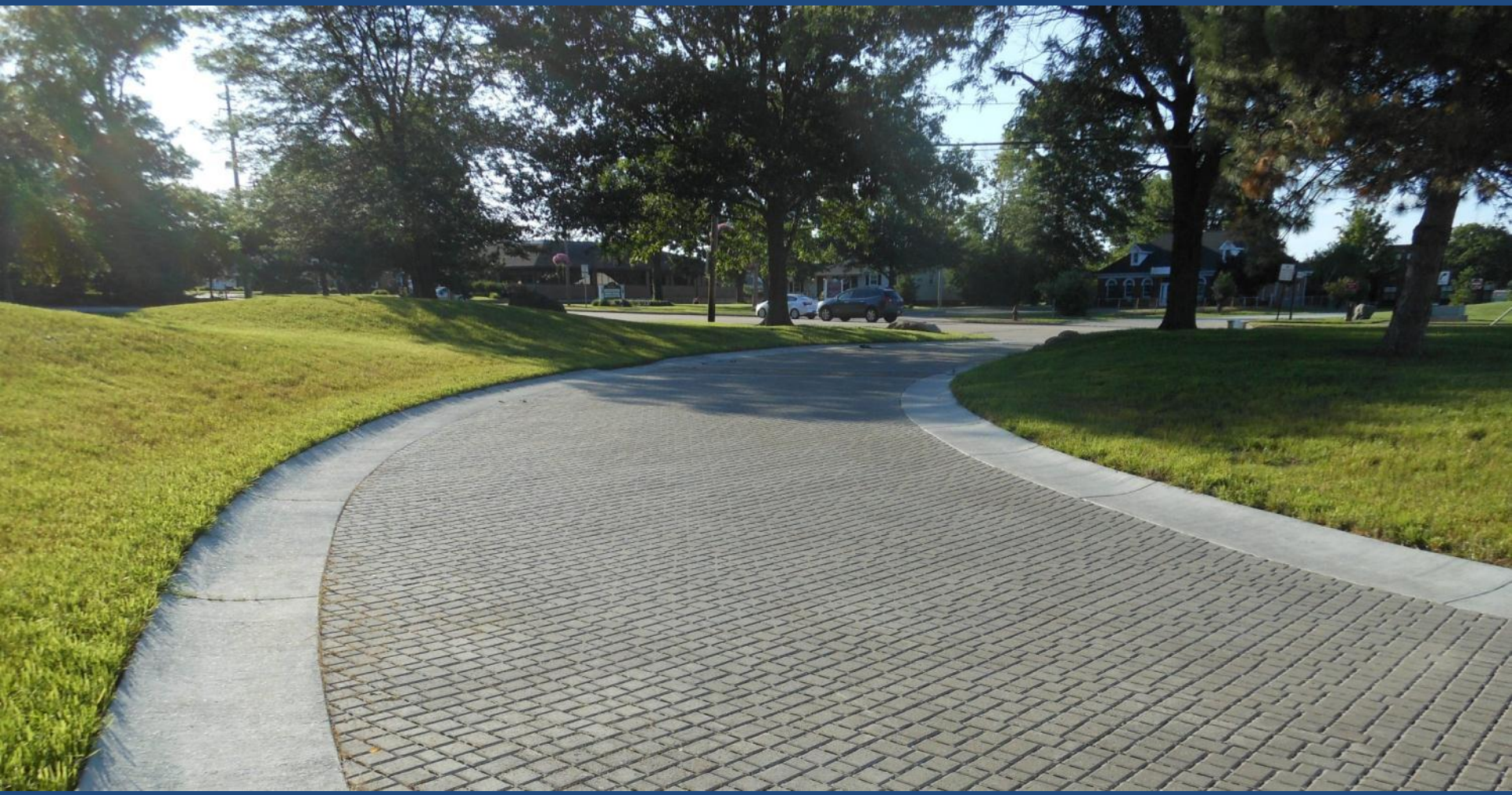
Hydrology: Without Run-On

Hydrology: With Run-On

Unstable Surrounding Area

Unstable Surrounding Area

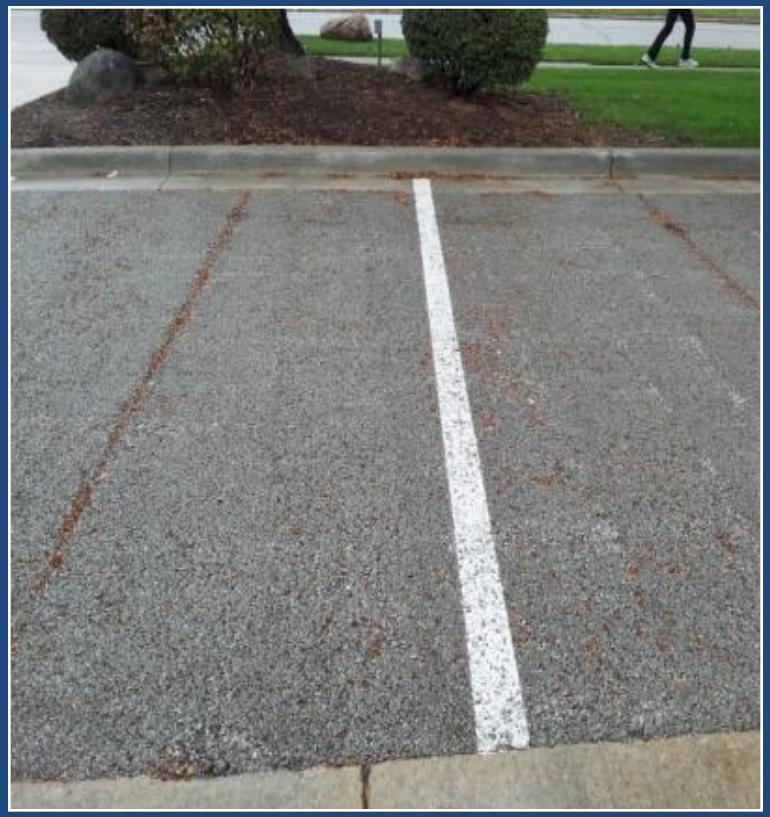
Stable Surrounding Area



Surface Types

Permeable Interlocking Concrete Pavement (PICP)

Porous Asphalt



Pervious Concrete

When is Maintenance Required?

Maintenance Indicator 1: Standing Water

Maintenance Indicator 2: Sediment or Debris on Surface and in Joints

Pervious Concrete and Porous Asphalt Sediment and Debris

Maintenance Indicator 3: Vegetation Growing Between Joints

Maintenance Indicator 4: Inadequate Gravel Between Pavers

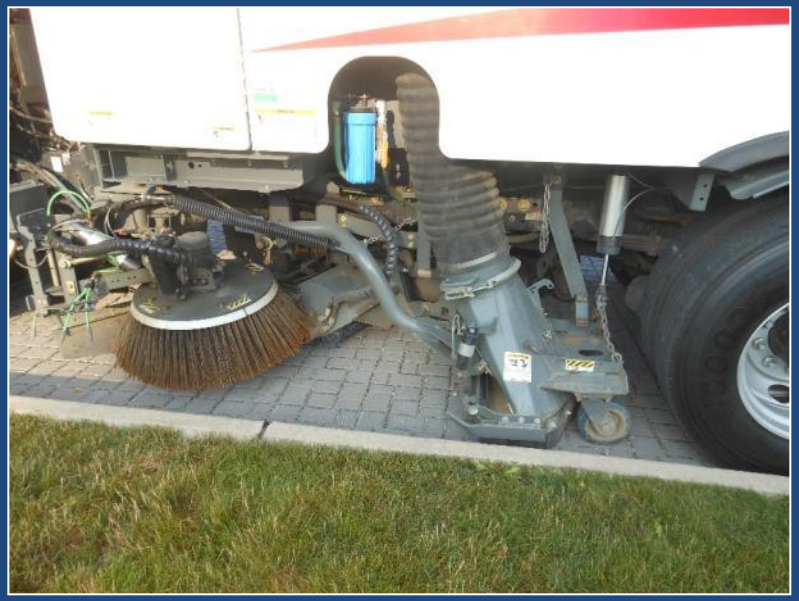
Maintenance Indicator 5: Deterioration of Surface Materials

Maintenance Overview – Routine

- Inspect during and after rain events.
- Remove sediment and debris from surface.
- Remove weeds or vegetation.

Maintenance Overview – Non-Routine

- Sweep entire surface or known clogged areas using a vacuum truck.
- Replace gravel within joints of PICP, especially after vacuum sweeping.
- Replace deteriorated surface materials.



Surface Debris Blowing

Mechanical Sweepers

- Use for routine and preventative maintenance.
- Can break up surface clogging layer.
- Only good for minor surface clogging (upper 0.25-0.5”).

www.bae.ncsu.edu/stormwater
Courtesy of Elgin Street Sweepers

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Regenerative Air Street Sweeper

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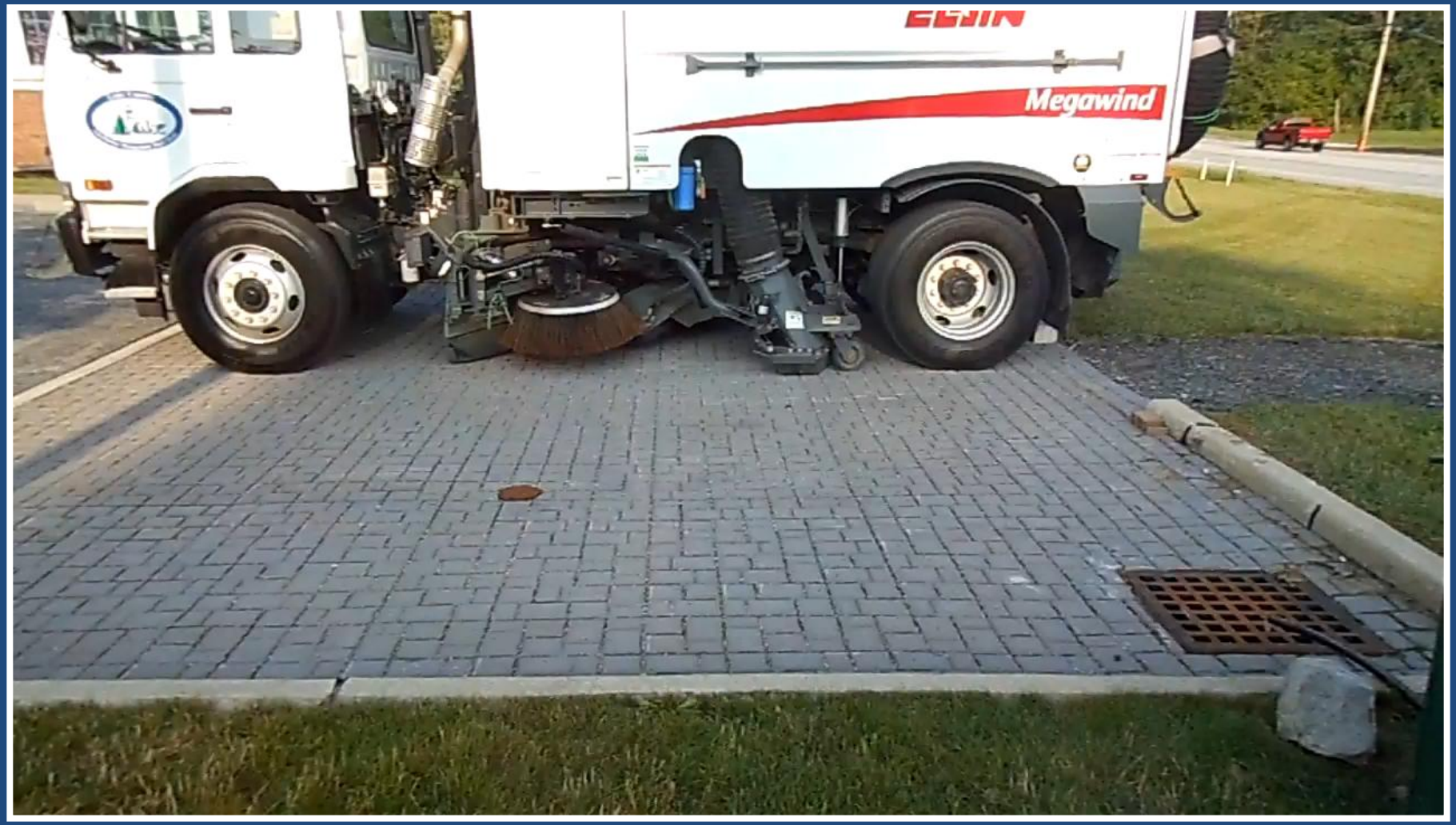
- Use for routine and preventative maintenance.
- Also good for areas that do not clog heavily.
- Okay for surface-deposited sediment.
- Cannot restore function if severe clogging has occurred.

Vacuum Sweeper

- Use for non-routine maintenance.
- Also for areas prone to heavy clogging.
- Very powerful suction.
- Remove sediment from at and below surface.
- Can restore infiltration to neglected permeable pavement systems.

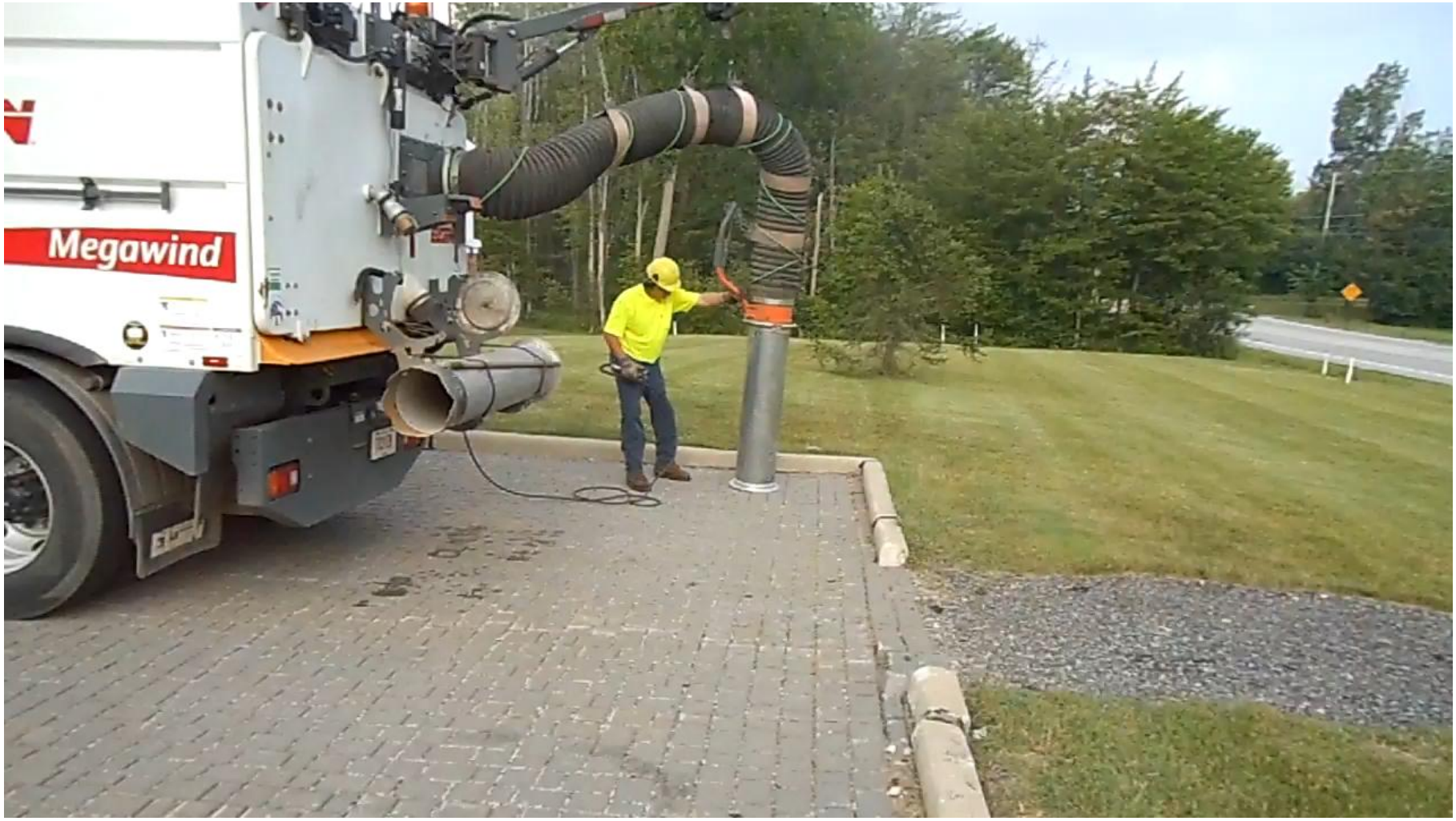
Vacuum Sweeping

Sweeping Truck Limitations



Curbing Limitations

Curbing Maintenance Option



Fill Joints with Gravel

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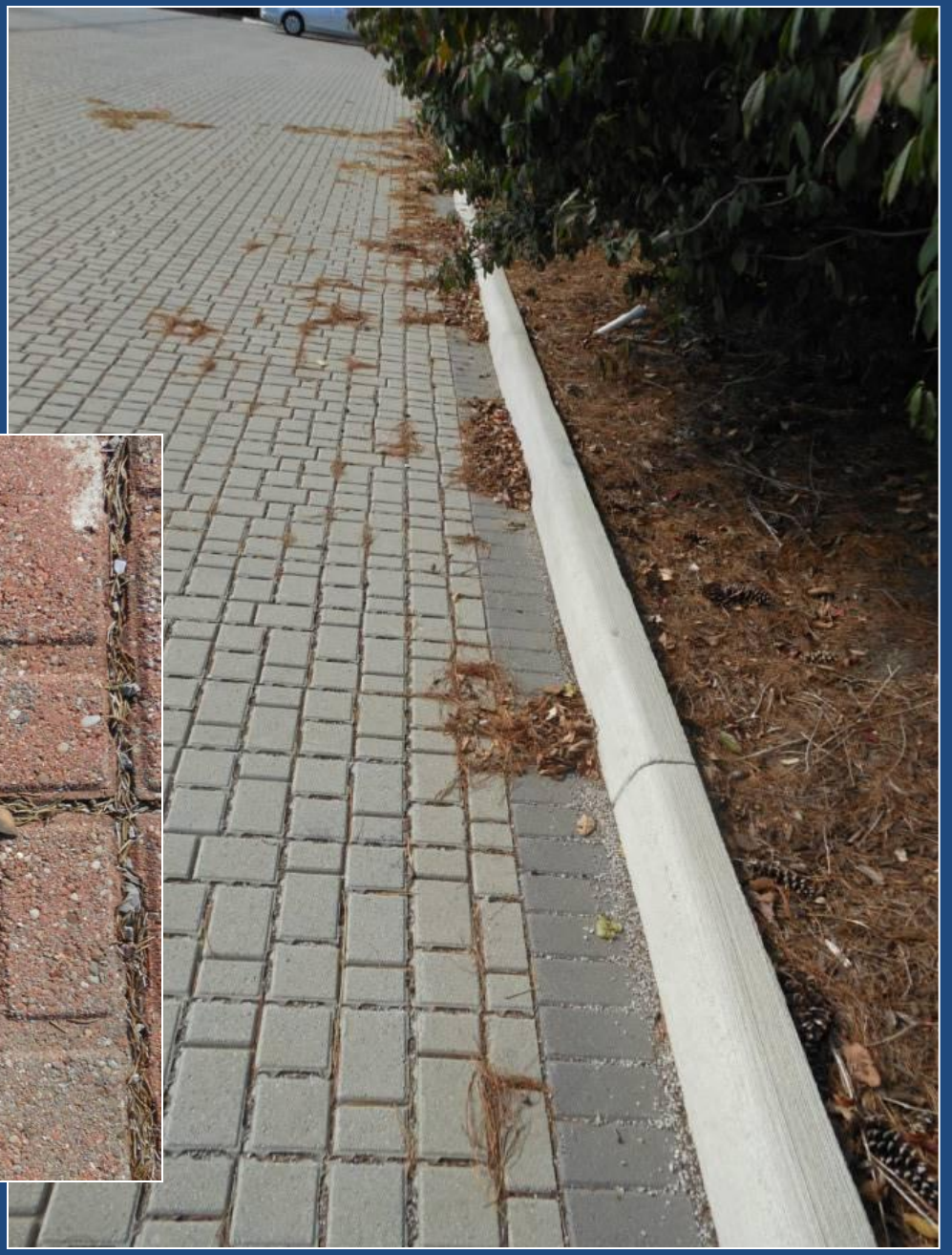
Common Problem Spot 1: Permeable-Impermeable Interface:

Common Problem Spot 2: Under Trees



Common Problem Spot 3: Concentrated Flow Areas

How do I know when maintenance is needed?

Consider Performing the "Simple Infiltration Test"

- Performed in under 5 minutes by an individual.
- Easily-furnished and cheap materials.
- Better predict actual infiltration during rainfall.

Step 1: Construct the Device

- Materials:
  - One 8-foot piece of unwarped 2”x4” lumber.
  - Screws and drill.
  - 80 oz. plumber’s putty.
  - 5 gallon bucket of water.
  - Stopwatch or timepiece.
- Cut 2x4 into four sections and screw together into rectangular frame.

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Step 2: Apply Plumber's Putty and Place

- Apply 1" bead of putty to the frame (or inside)
- Place frame in area to be tested and apply gentle pressure to seal

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Step 3: Rapidly Add 5 Gal. Water & Time

- Apply weight to frame to maintain seal.
- Quickly pour contents of one 5-gal bucket and begin timing.
- Record time for all standing water to infiltrate joints/voids.

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Step 4: Assess Performance & Prescribe Maintenance

Drawdown Time	Condition
< 30 seconds	Newly Installed / Recently Maintained
30-60 seconds	Acceptable – Routine / Preventative Maintenance – Regenerative Air
60-90 seconds	Partially Clogged – Schedule Non-Routine / Restorative Maintenance – Vacuum Sweeper
> 90 seconds	Clogged – Restorative Maintenance Needed Immediately – Vacuum Sweeper

Winter Considerations

- Lift plow blade 0.5” above surface and/or use blade with rubber edge.
- Do not pile and store snow on permeable pavement.
- Do not apply sand and cinders.
- May need less salt application.

Questions?