Pervious Pavement as Public Infrastructure

2013 International Low Impact Development Symposium

St. Paul, MN

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Shoreview

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Presentation Outline

- Development of Pervious Concrete in Minnesota
- Details of Shoreview Projects
- Highlight Successful Implementations
- Share Observations

Pervious Concrete History

- 1990's
  - Noise/Road Spray Research (FHWA, MnDOT)
  - High Speed, High Volume Applications
- 2000's
  - Green Road Initiatives
  - Low Volume Streets, Parking Lots

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Minnesota Based Research

- Local Road Research Board
  - Inv. 879, Pervious Concrete (current)
  - Storm Water BMP Guide (2009)
  - Street Sweeping Best Practices (2008)
  - MnRoad Facility Testing (2005)
- Transportation Engineering & Road Research Alliance (TERRA)
  - Pervious Concrete Fact Sheet (2008)
- RMC Foundation
  - Performance Evaluation of Pervious Concrete Pavements in Cold Weather (2010)

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Minnesota Examples

- At Least 50 Locations (public/private)
- Public Infrastructure
  - Minneapolis, Duluth, St. Cloud, Detroit Lakes, Richfield, Shoreview
- Options for environmental permitting
- Maintenance is a Mixed Bag

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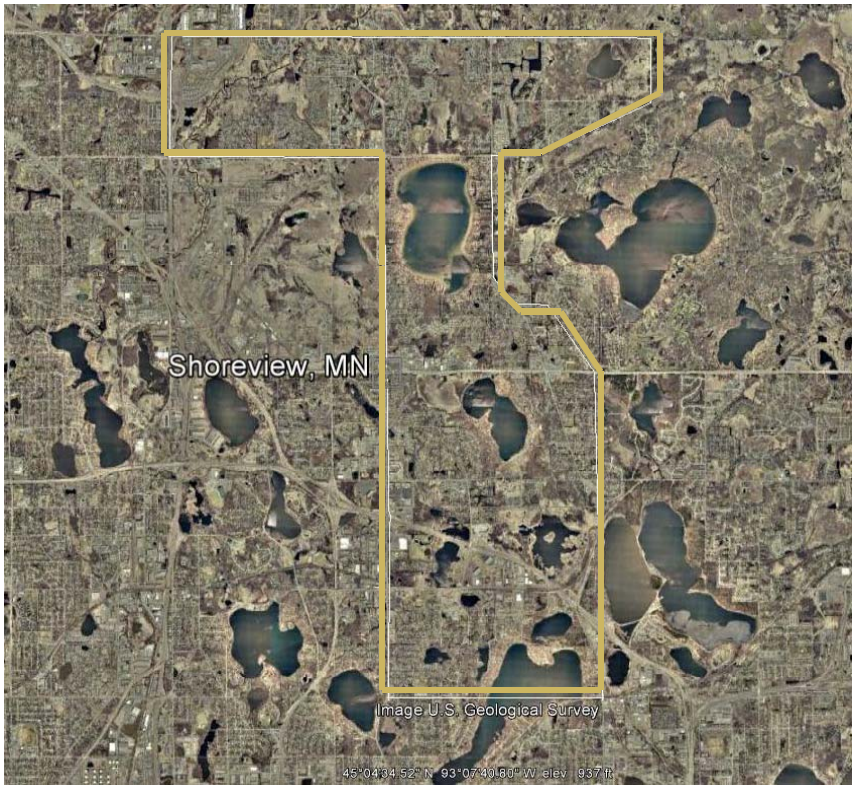
Shoreview, Minnesota

- 27,000 Pop.
- 12 Square Miles
- 33% Parks, Open Space & Water Bodies
- 100 miles of Streets
- Rapid Growth 1970/80's



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Dale Street Alley (2007)

900’ long, 12’ wide (1,200 SY)

8” Pervious Concrete, 6” CA Filter, 12” Select Granular Subgrade Drainage (low infiltration soils)

Rolled-in Joints, Poly Sheeting

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Woodbridge Neighborhood (2009)

25’ Wide Residential Streets (8,600 SY)

7” Pervious Concrete, 18”-30” CA Filter

No Storm Sewer or Sub drains (high infiltration soils)

Saw Joints, Curing Fabric

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Woodbridge Neighborhood Project

Residential Area 38 acres

- Fully Developed
- Adjacent to Impacted Water Body (Lake Owasso)

9,000 Sq. Yds. Of Existing Asphalt Roadway

Storm Drainage

- One (1) storm inlet for Neighborhood
- Direct Discharge to the Lake

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Project Objectives

Remove and Replace Roadway

Upgrade Municipal Utilities Where Needed

Improve Storm Water Management

- Traditional Design vs. Creative Approaches (Infiltration)
- Leverage Recent Cold-Weather Research Initiatives
- Cost-effective, Life Cycle Approach
- Pervious Concrete Selected by City Council

Total Project Cost $1.5M

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Selection of Pervious Concrete

- Elimination of discharge pipe to lake
- Underground pipes not required
  - Reduce impact on neighborhood character
- Past City experience
  - 2007 installed 900 x 12 foot alley
- Soil type perfect for infiltration
- Advancements in mix designs and placement techniques
- **Could control maintenance schedule**

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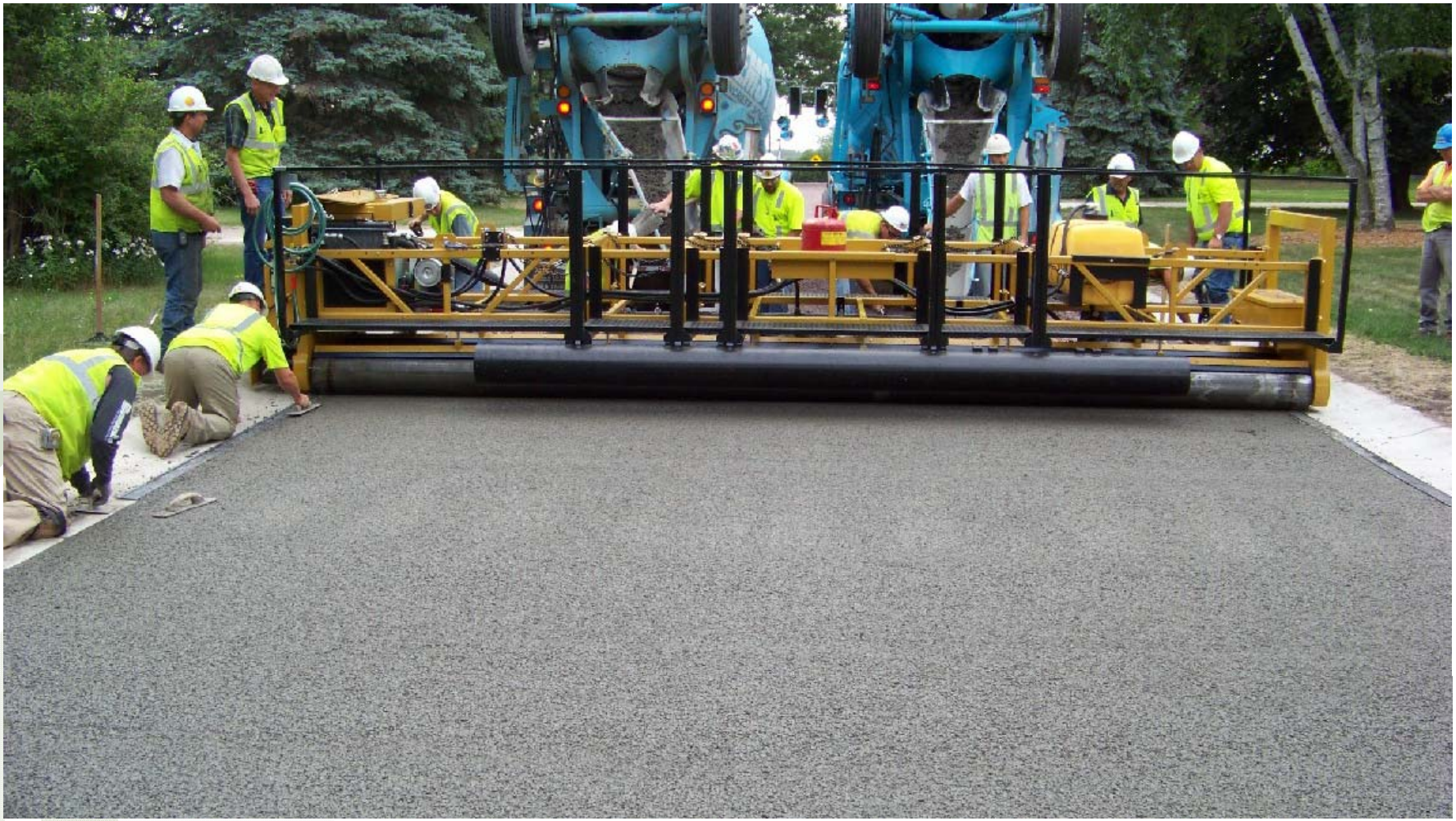

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WATER

Pervious Concrete Cost Comparison (Woodbridge Neighborhood 2009)

- Common Excavation – 11,000CY($6.00/CY) = $ 66,000*
- Fabric – 11,000SY($1.00/SY) = $ 11,000
- 1-1/2” Crushed Rock – 5000CY($52.00/CY) = $260,000*
- 7” Pervious Concrete – 8470SY($46.50/SY) = $394,000
- **Total Cost for Pervious Concrete System = $731,000**
- **Per SY Cost for Pervious Concrete System = $ 86.30****

**Average depth beneath concrete = 1.75-feet*

- Estimated Bituminous Road Cost = $257,000
- Estimated Underground Infiltration Cost = $417,500
- **Total Est Cost – Bit Road & Infiltration = $674,000**
- **Per SY Est Cost – Bit Road & Infiltration = $ 79.60****

***8.5% Increased Cost for Pervious Concrete*

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Shoreview Maintenance Building (2011)

20 Vehicle Parking Lot (800 SY)
6” Pervious Concrete, 30” CA Filter Aggregate
Subgrade Drainage (low infiltration soils)
Saw Joints, Curing Fabric

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Pervious Concrete Success Stories

- Leverage High Infiltration Soils
  - Cost-effective without drainage systems
- Creative Approach Preserves Character
  - Developed areas without room for ponds
- Maintenance Requirements Understood
  - Owner with training and equipment

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Pervious Concrete Observations

- Mix Design
  - 125 pcf, 21% air voids +/- 3% (Avg)
- Joints
  - Saw cut joints 24-48 hrs after pour
  - Saw cut appears more durable than rolled-in
- Coarse Filter Aggregate
  - Angular vs. Rounded
  - 1-1/2” Railroad Ballast
  - Need 40% Void Space

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Pervious Concrete Observations

- Concrete Curing
  - Fabric in lieu of poly sheeting
  - Very vulnerable to drying out (spalling)
- Placement
  - Roller tube paver provided tighter surface cores show top 2 inches more consolidated
- Restoration behind curb

Keeping the Pavement Clean

Infiltration rates of 300–500in/hr – can live with some clogging

Clogging occurs in top ¼ inch

Need Vacuum/Regenerative air sweeper

- Best surface cleaning based on in-field tests
- Some areas require deeper cleaning
- Schedule of cleaning is a work in progress

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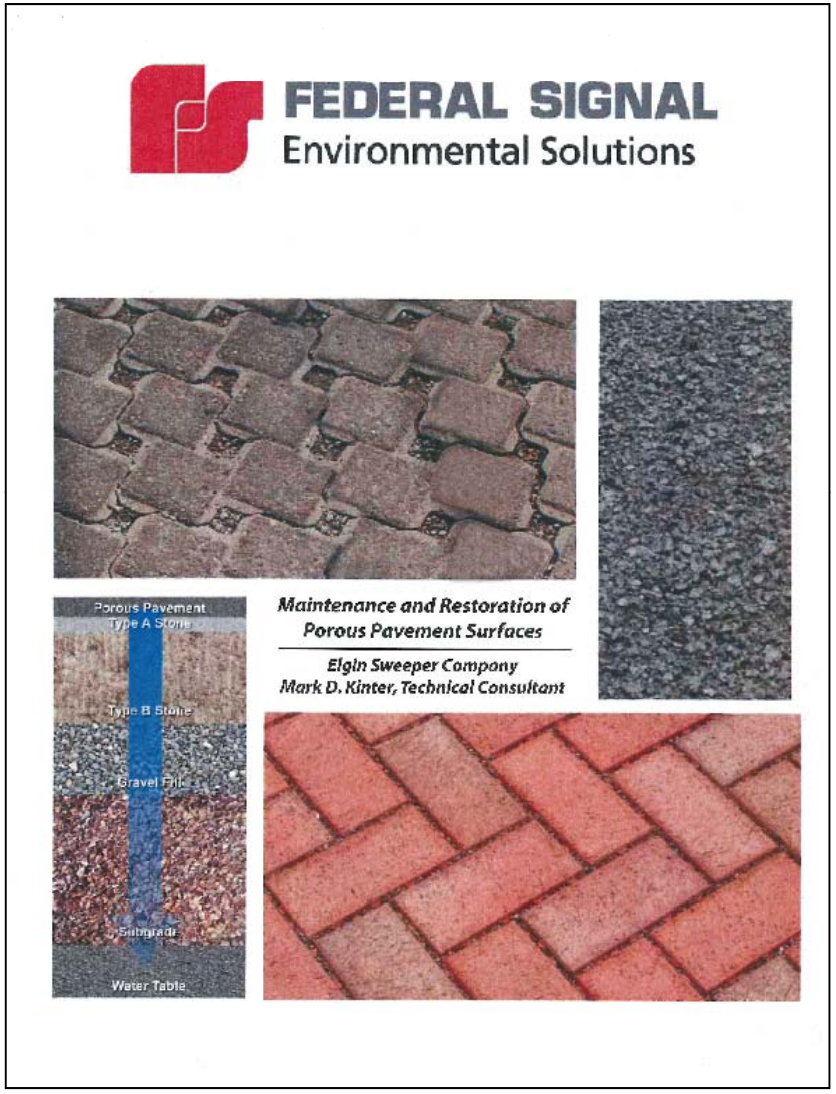
RESEARCH
2008 RIC06
Resource for Implementing a
Street Sweeping Best Practice
LRRB
Take the steps... Research...Knowledge...Innovative Solutions!
Transportation Research


FEDERAL SIGNAL
Environmental Solutions
Porous Pavement
Type A Stone
Type B Stone
Gravel Fill
Subgrade
Water Table
Maintenance and Restoration of
Porous Pavement Surfaces
Elgin Sweeper Company
Mark D. Kinter, Technical Consultant

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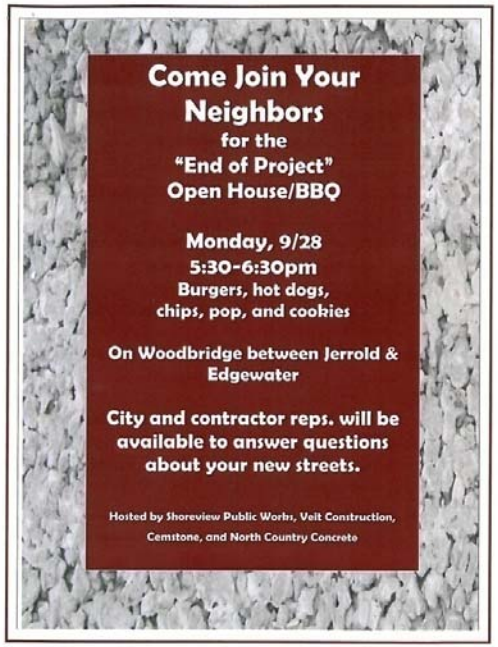
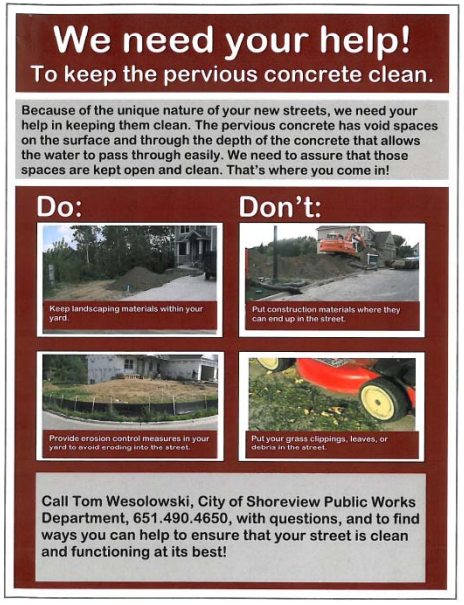
Staying Green……

- Winter Maintenance Philosophy (Shoreview)
  - Use zero salt
  - 1 ton PU for plowing
- Educating Residents
  - Need continued outreach effort
  - Focused Erosion Control/Grading Inspections
- Monitoring Wells/Rain Gauge


Come Join Your Neighbors
for the
"End of Project"
Open House/BBQ
Monday, 9/28
5:30-6:30pm
Burgers, hot dogs,
chips, pop, and cookies
On Woodbridge between Jerrold & Edgewater
City and contractor reps. will be available to answer questions about your new streets.
Hosted by Shoreview Public Works, Veit Construction, Cemstone, and North Country Concrete


We need your help!
To keep the pervious concrete clean.
Because of the unique nature of your new streets, we need your help in keeping them clean. The pervious concrete has void spaces on the surface and through the depth of the concrete that allows the water to pass through easily. We need to assure that those spaces are kept open and clean. That's where you come in!
Do:
Don't:
Keep landscaping materials within your yard.
Put construction materials where they can end up in the street.
Provide erosion control measures in your yard to avoid eroding into the street.
Put your grass clippings, leaves, or debris in the street.
Call Tom Wesolowski, City of Shoreview Public Works Department, 651.490.4650, with questions, and to find ways you can help to ensure that your street is clean and functioning at its best!

PERVIOUS
PAVEMENT
THE FOLLOWING ARE
NOT ALLOWED ON THE
ROADWAY:
• NO LANDSCAPING
MATERIALS
• NO DISCHARGED
GRASS CLIPPINGS
• NO DUMPSTERS
• NO BUILDING
MATERIALS
PLEASE HELP KEEP YOUR ROAD CLEAN

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Minnesota's Experience…..

Soil Types Can Be A Significant Factor

Significant Resources Available

Can Be Built and Maintained Correctly

Pervious Pavements Do Work As Public Infrastructure

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Contacts

Local Government- City of Shoreview, Minnesota

- Woodbridge Project (www.shoreviewmn.gov)

Research Resources

- TERRA (terraroadalliance.org)
- Mn LRRB (lrrb.org)
- RMC Foundation (rmc-foundation.org)

Industry Certifications

- Nat'l Ready Mix Concrete Assn. (nrmca.org)
- Minnesota Aggregate Ready Mix Assn (armofmn.com)

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