



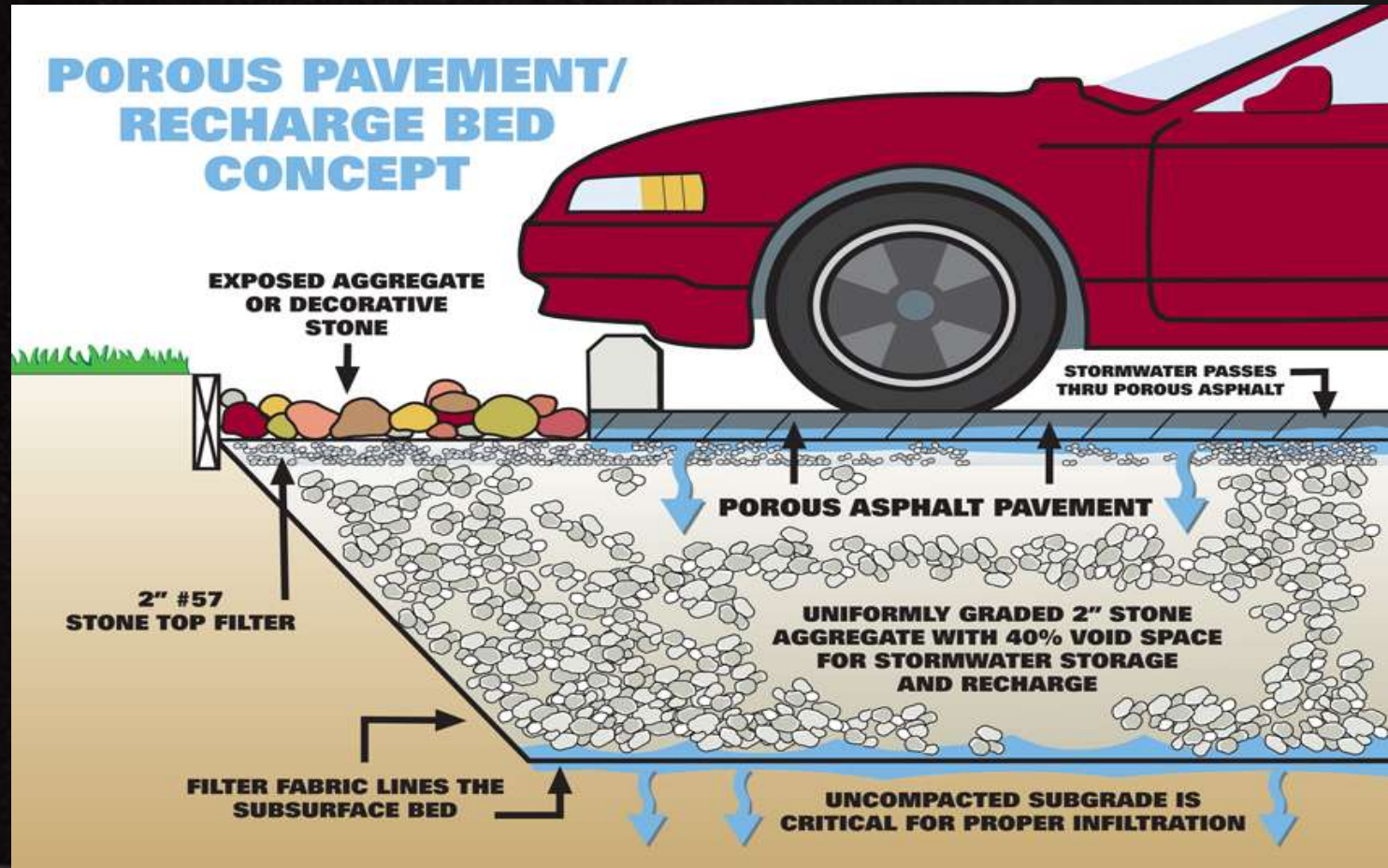
# Porous Asphalt Pavement Design, Construction and Maintenance

***Asphalt ... Defining Value !***  
**Safe, Smooth and Sustainable**

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# What are Porous Pavements?





# Porous Asphalt

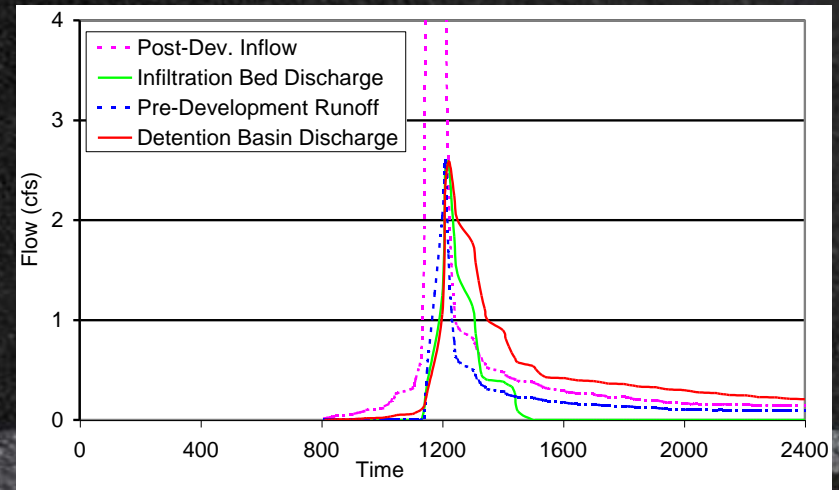


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# Why Porous Pavement?

- New stormwater regulations
  - Reduce total volume (not just peak flow)
  - Limiting impervious area
  - Improve runoff quality
  - Taxing runoff
- Sustainability
- Build lot flat,
- no puddles



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# Porous Asphalt Pavement Development

- Concepts developed by the Franklin Institute under US EPA grant – 1972
- Tested in pilot projects during 1970's
- Franklin Institute Press – Porous Pavement by Thelen and Howe - 1978
- Development of geotextiles in 1979
- Current design since 1980
- Cahill Associates (now CH2MHill) has built over 150 projects since 1980
- Outstanding engineering project - 2000

# Porous Asphalt Use – Light Duty Parking Facility



Asphalt.



# Porous Asphalt Use – Light Duty Parking Facility



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# Porous Asphalt Use – Light Duty Roadway



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# **POROUS PAVEMENT FOR STORMWATER CONTROL**

- Design
- Construction
- Maintenance



# POROUS PAVEMENT

Design, Construction, Maintenance

- **Components of a porous pavement system**
- Performance
- Design considerations
- Constructing a porous pavement system
- Ensuring long life through proper maintenance

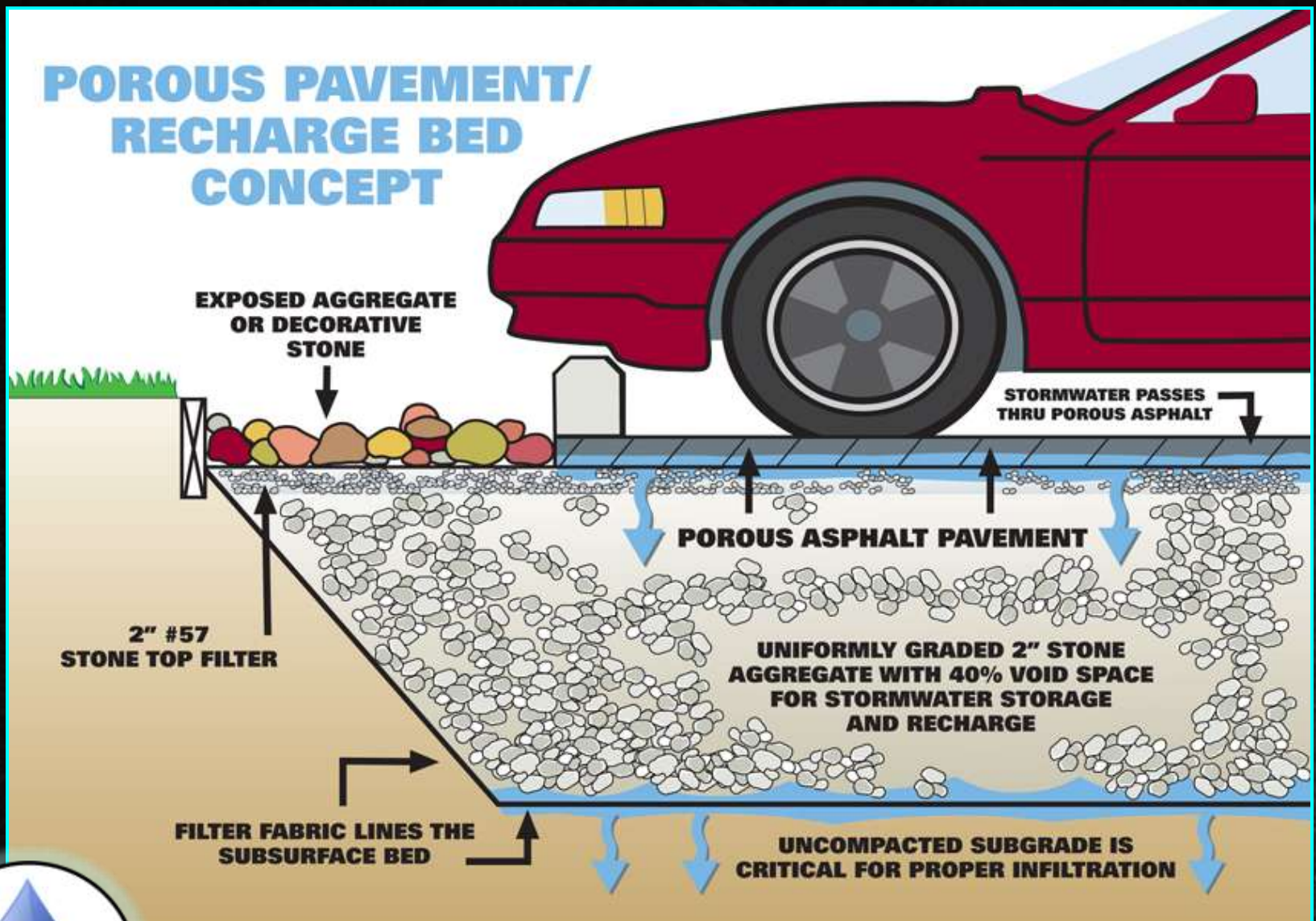


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# POROUS PAVEMENT/ RECHARGE BED CONCEPT



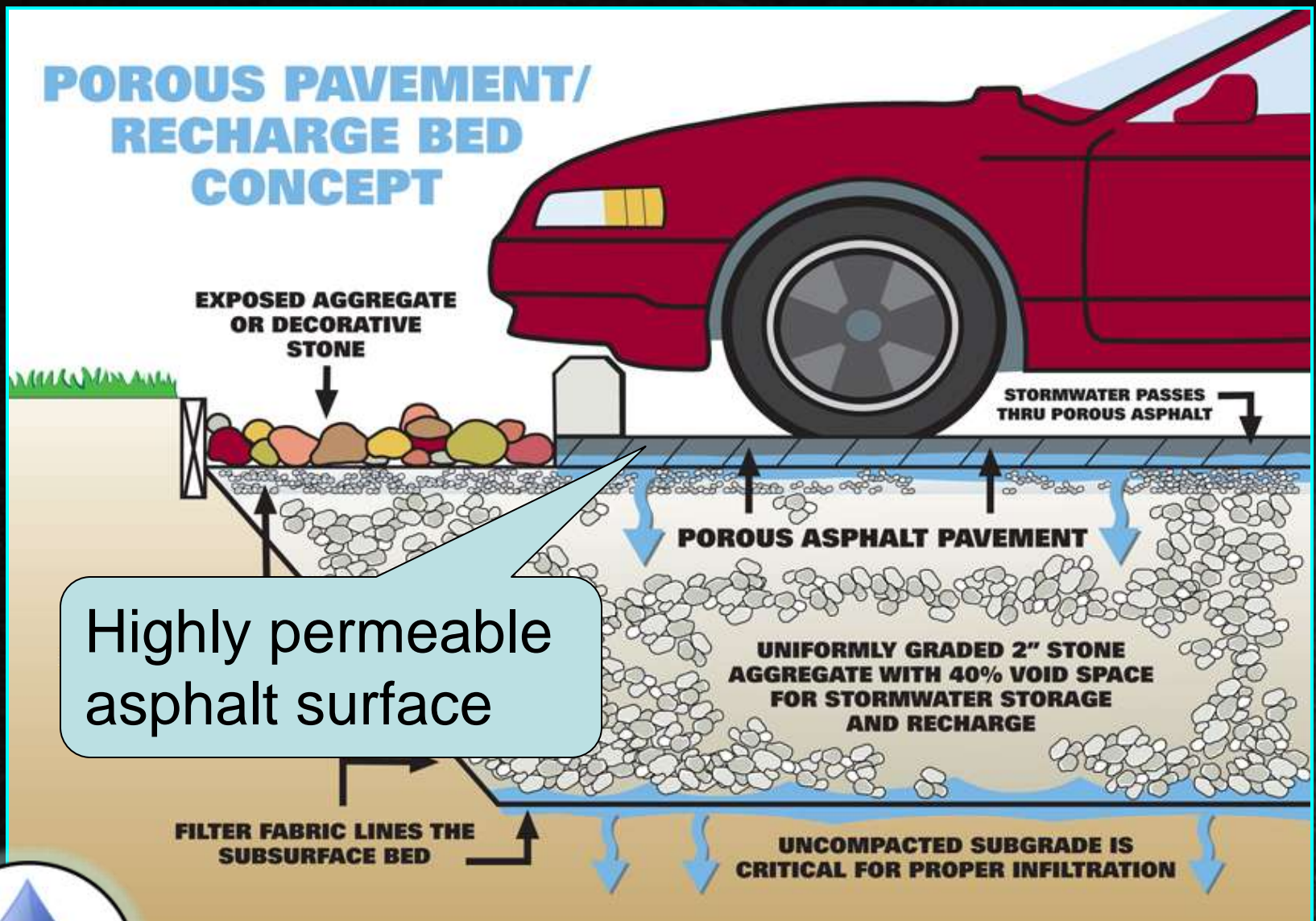
POROUS ASPHALT  
PAVEMENT

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# POROUS PAVEMENT/ RECHARGE BED CONCEPT



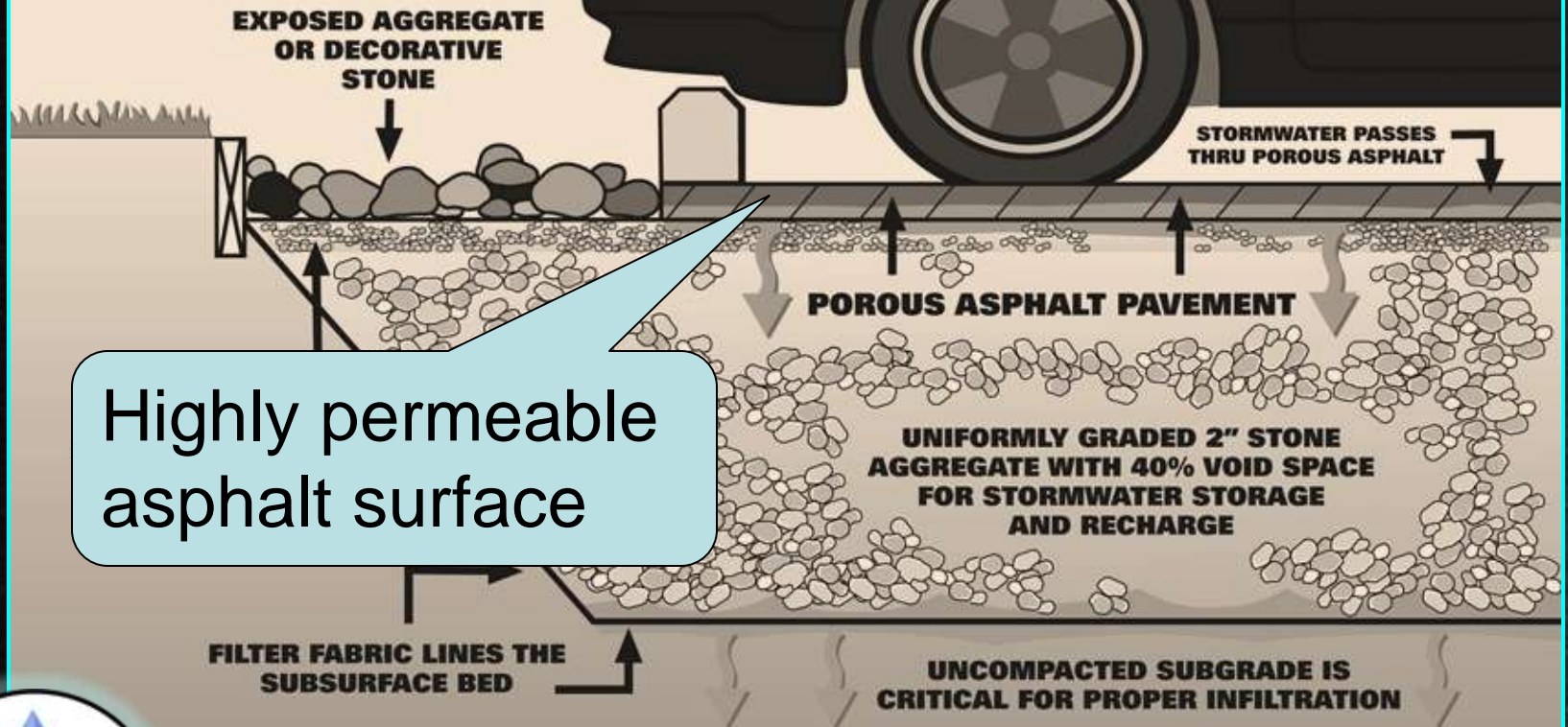
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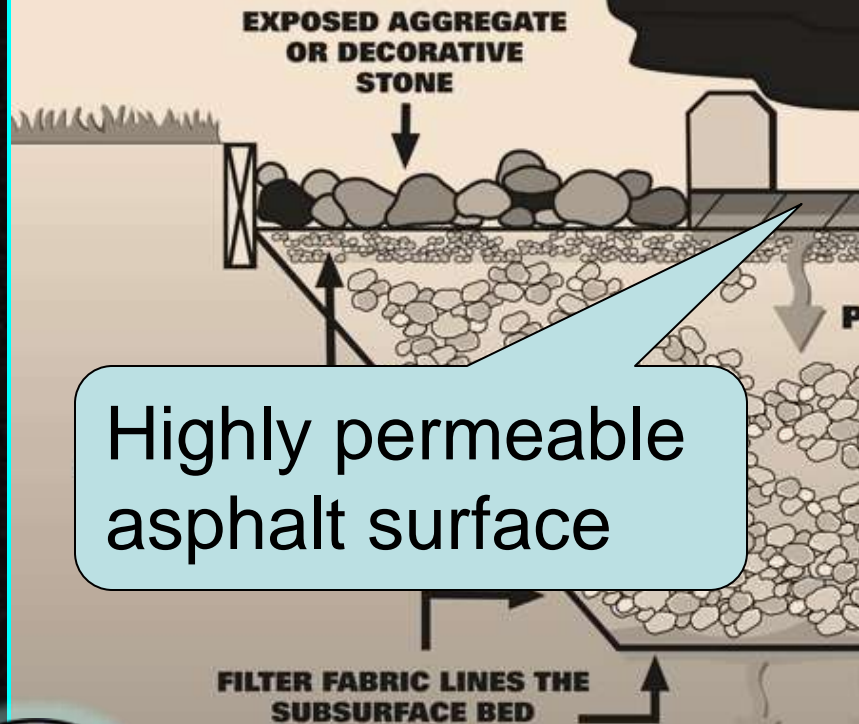
Highly permeable  
asphalt surface

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# POROUS PAVEMENT/ RECHARGE BED CONCEPT



Highly permeable  
asphalt surface

Air Voids: 17%

Permeability: 352 to 6000  
ft/day (soil: 6 in/hr)

AASHTO no. 8 size  
aggregate (1/2 inch max)

100% crushed stone for  
strength & stability

Polymer modified asphalt  
binder (6% min)

Layer thickness: 4 to 6  
inches

Modeled after ODOT SS803  
(open graded friction  
course)

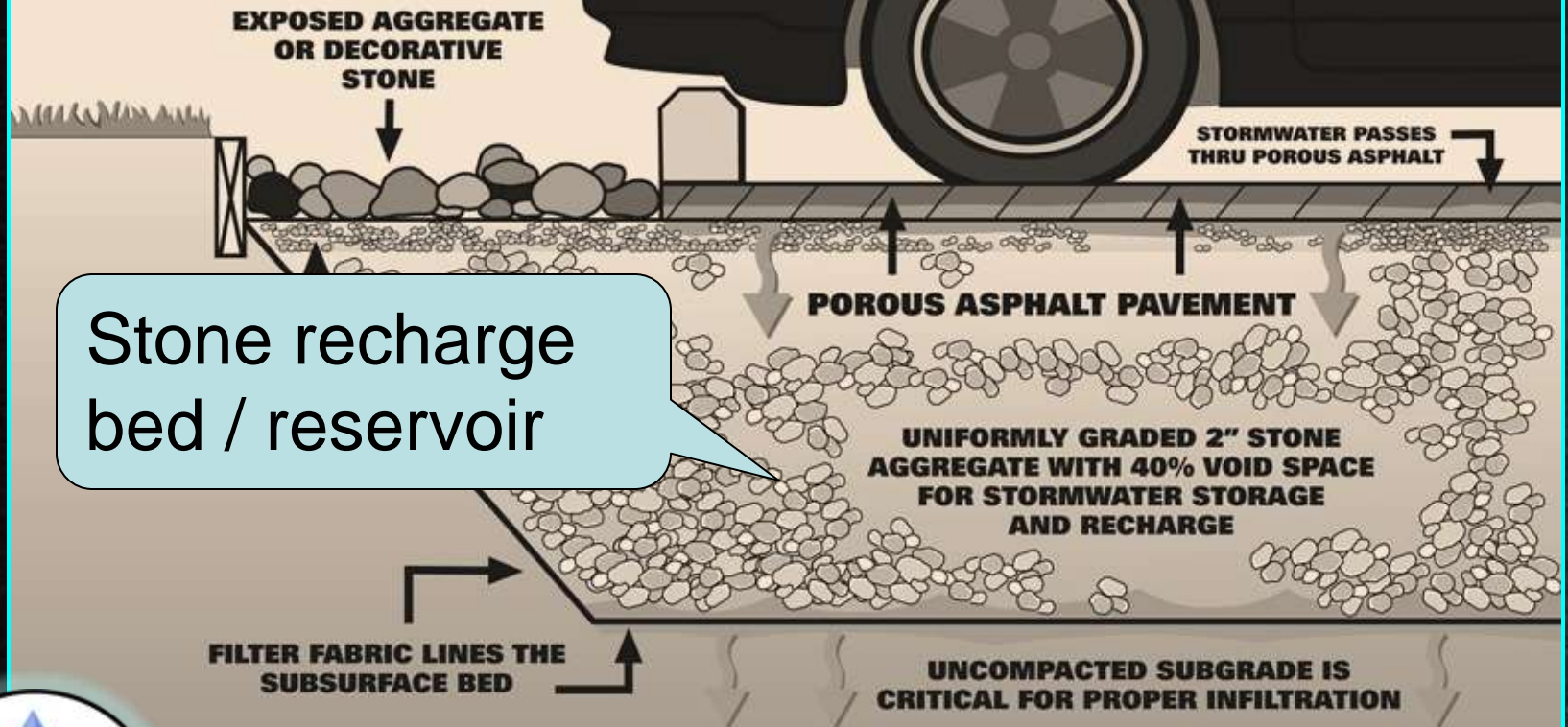
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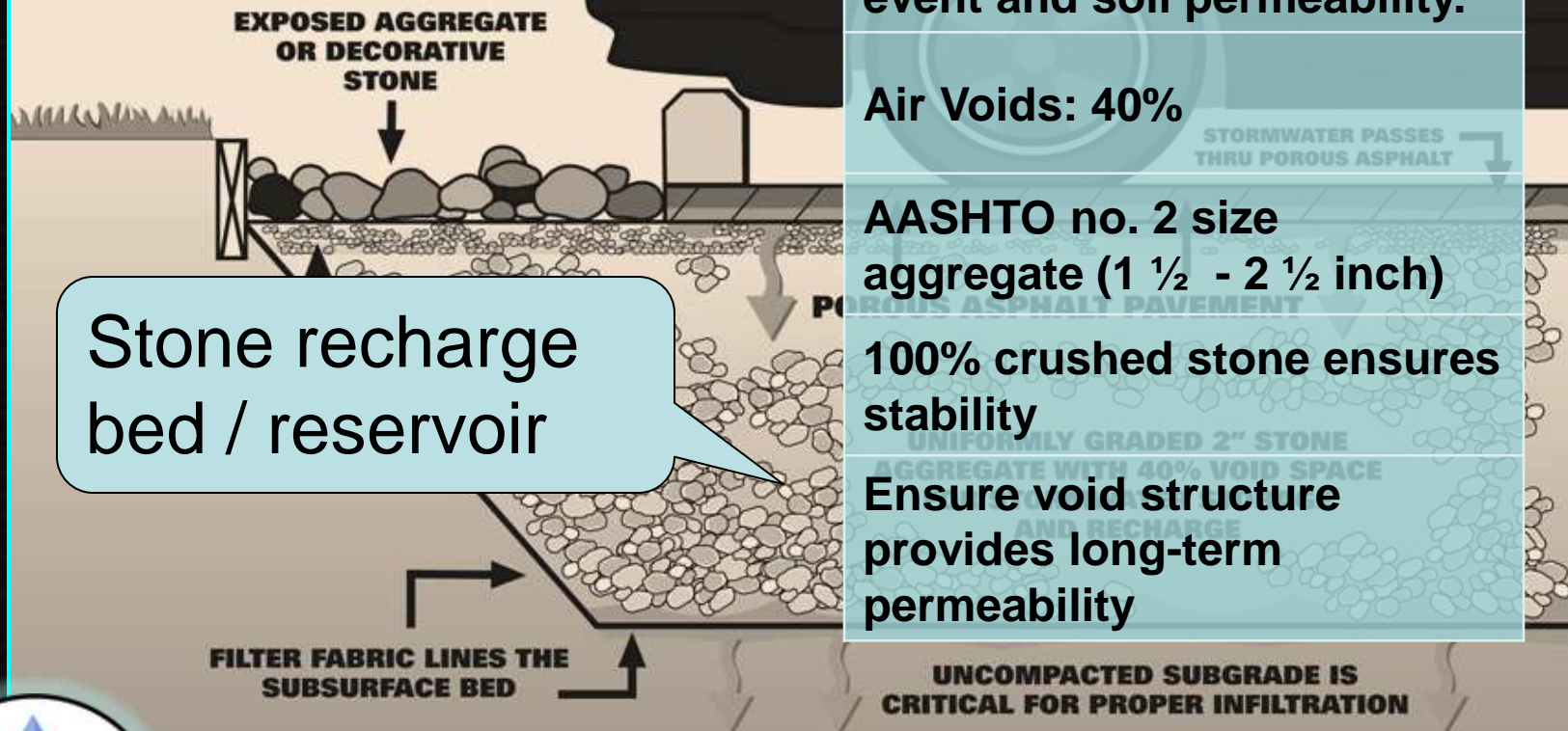
# POROUS PAVEMENT/ RECHARGE BED CONCEPT



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# POROUS PAVEMENT/ RECHARGE BED CONCEPT



**Purpose:** Stormwater storage and discharge

Depth/thickness of reservoir will depend on design storm event and soil permeability.

Air Voids: 40%

AASHTO no. 2 size aggregate (1 ½ - 2 ½ inch)

100% crushed stone ensures stability

Ensure void structure provides long-term permeability





<b>Aggregate Size</b>	<b>Voids (Average %)</b>
No, 2 Limestone	41
No. 4 Limestone	41
No. 57 Limestone	41
No. 8 Limestone	42
No. 7 Limestone	42
Limestone sand	36

Source: Ohio Aggregates and Industrial Minerals Association



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# Porous Asphalt Pavement

Surface Course (1" Thick)

Base Course (3" Thick)

Stabilizing Layer

Stone Recharge Bed / Reservoir

Filter Fabric

Uncompacted Subgrade

INCREASING VOID  
DIMENSION

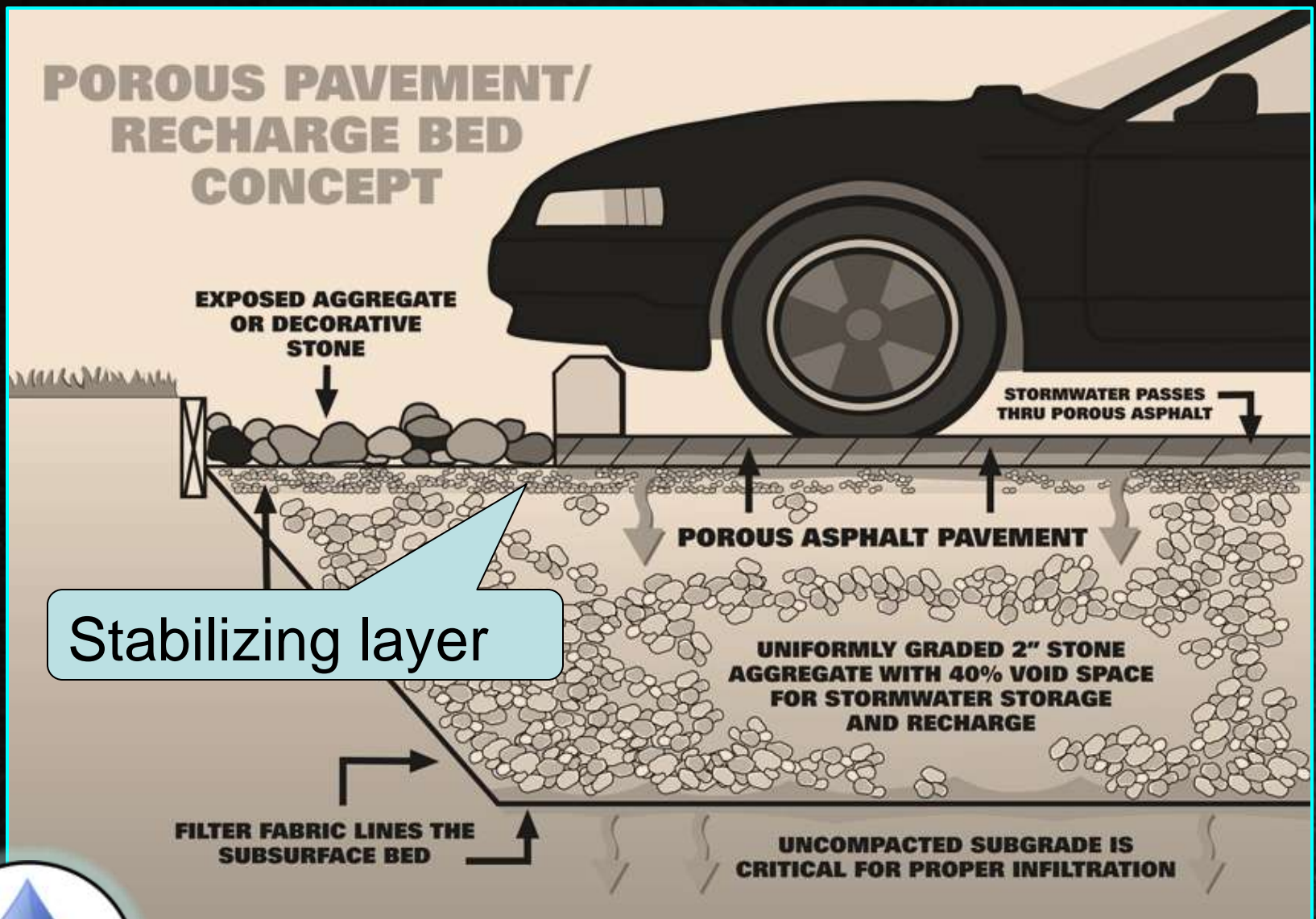


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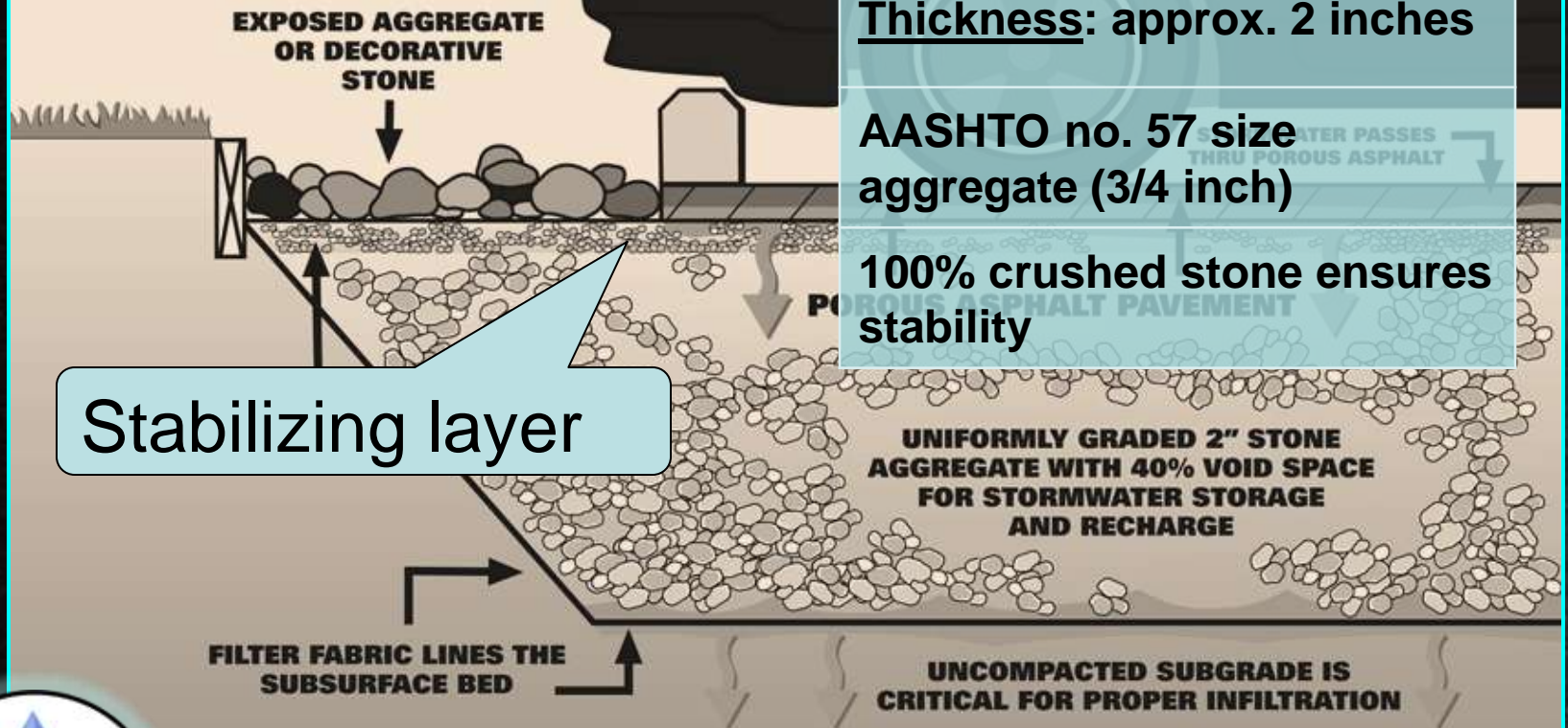
# POROUS PAVEMENT/ RECHARGE BED CONCEPT



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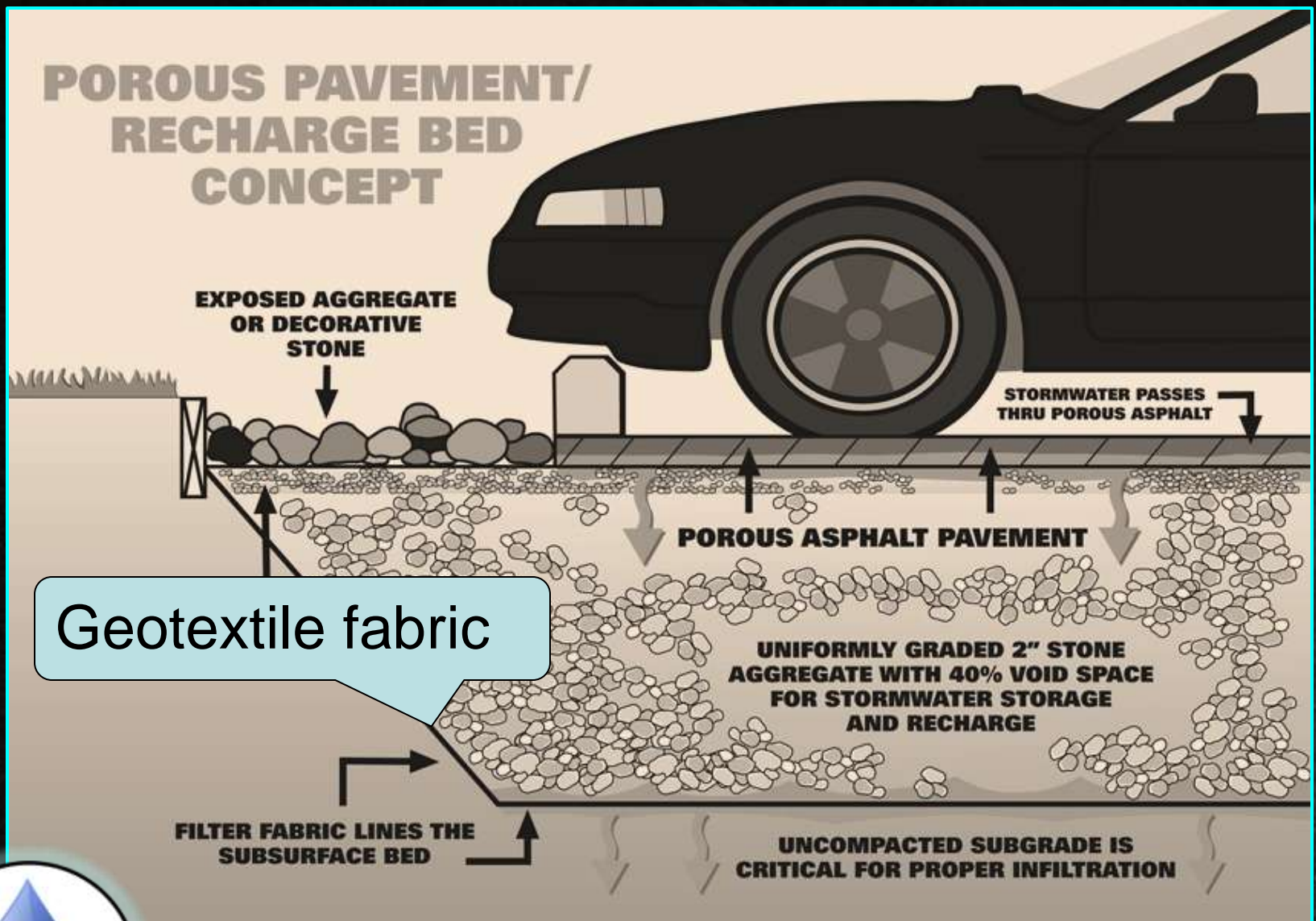
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# POROUS PAVEMENT/ RECHARGE BED CONCEPT





# POROUS PAVEMENT/ RECHARGE BED CONCEPT



Geotextile fabric

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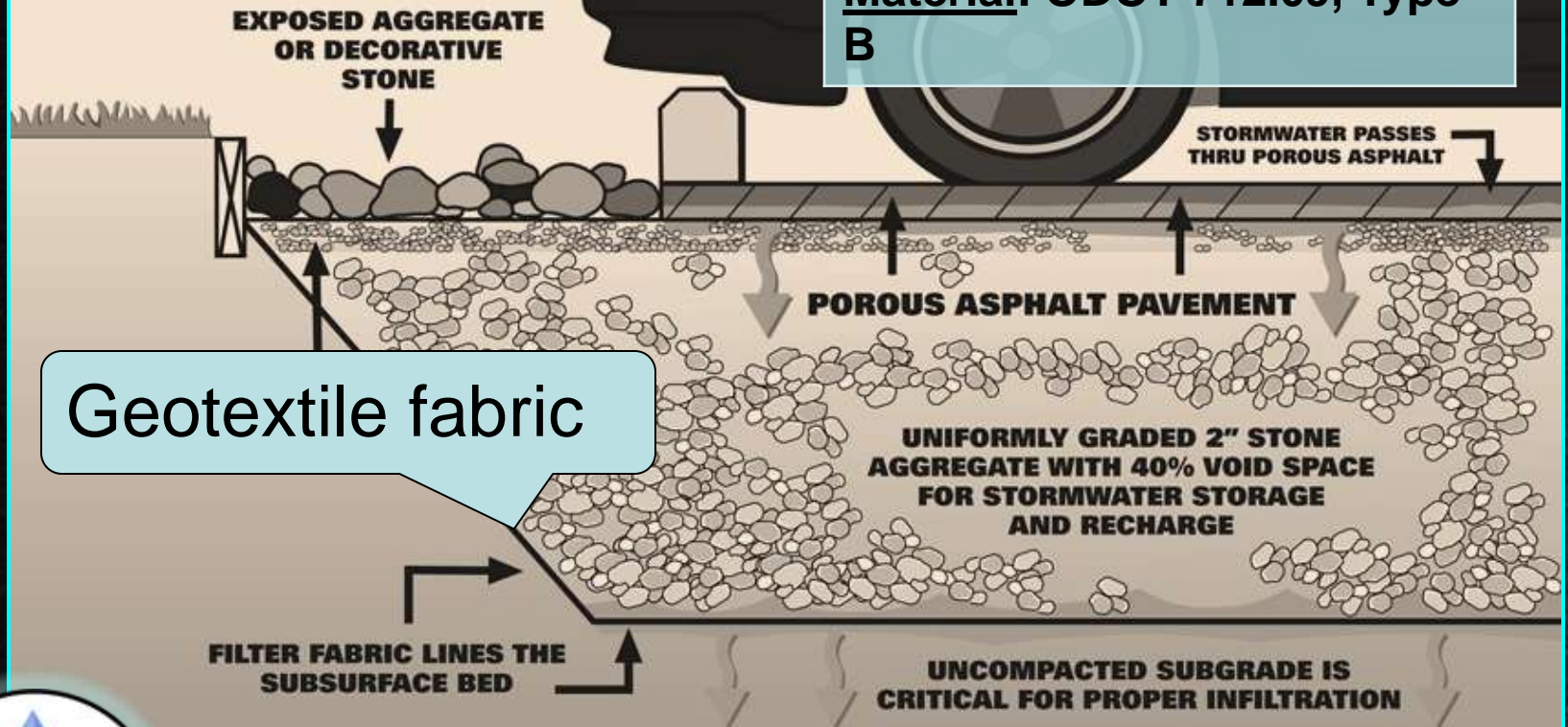
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# POROUS PAVEMENT/ RECHARGE BED CONCEPT

Purpose: Prevent migration of fines from subgrade or excavation into the pavement structure.

Material: ODOT 712.09, Type B



Geotextile fabric

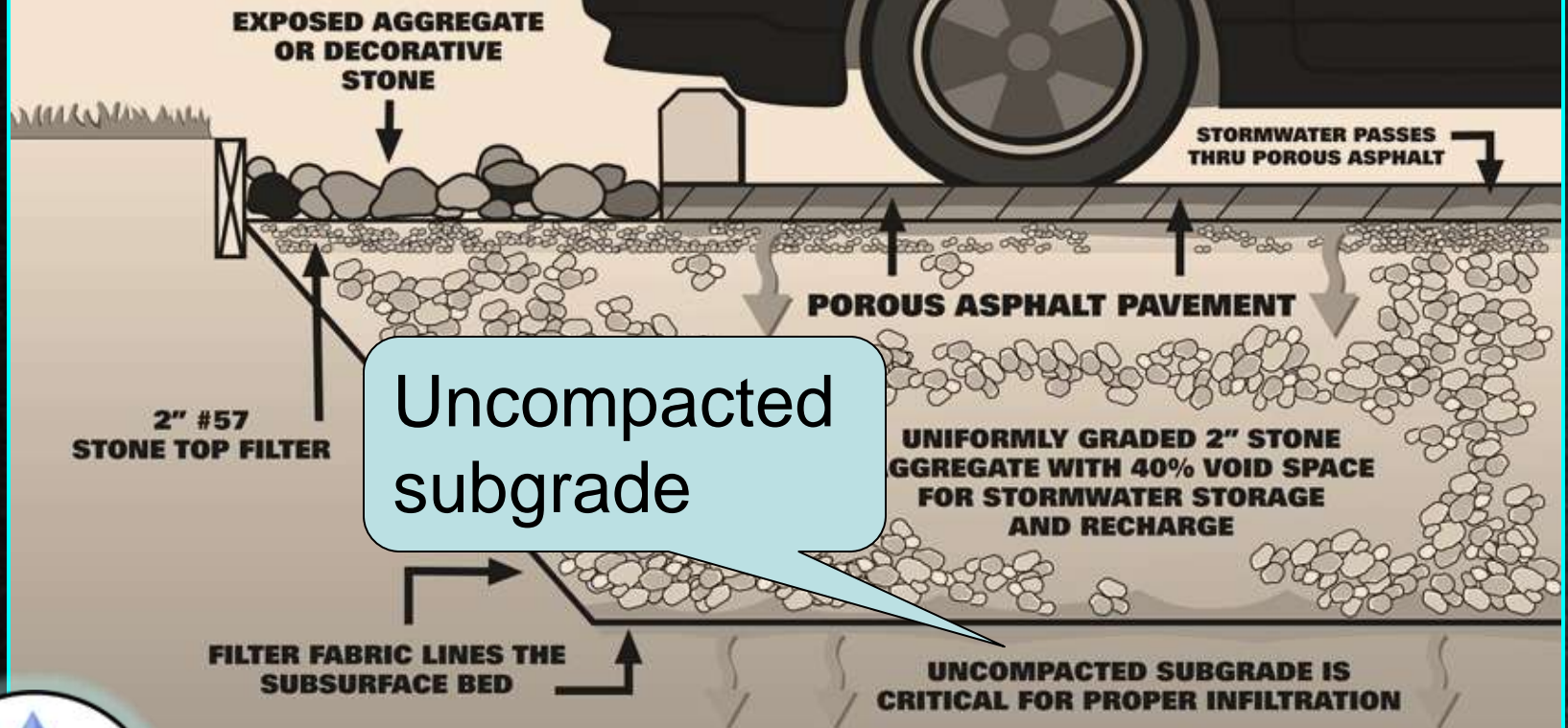
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# POROUS PAVEMENT/ RECHARGE BED CONCEPT



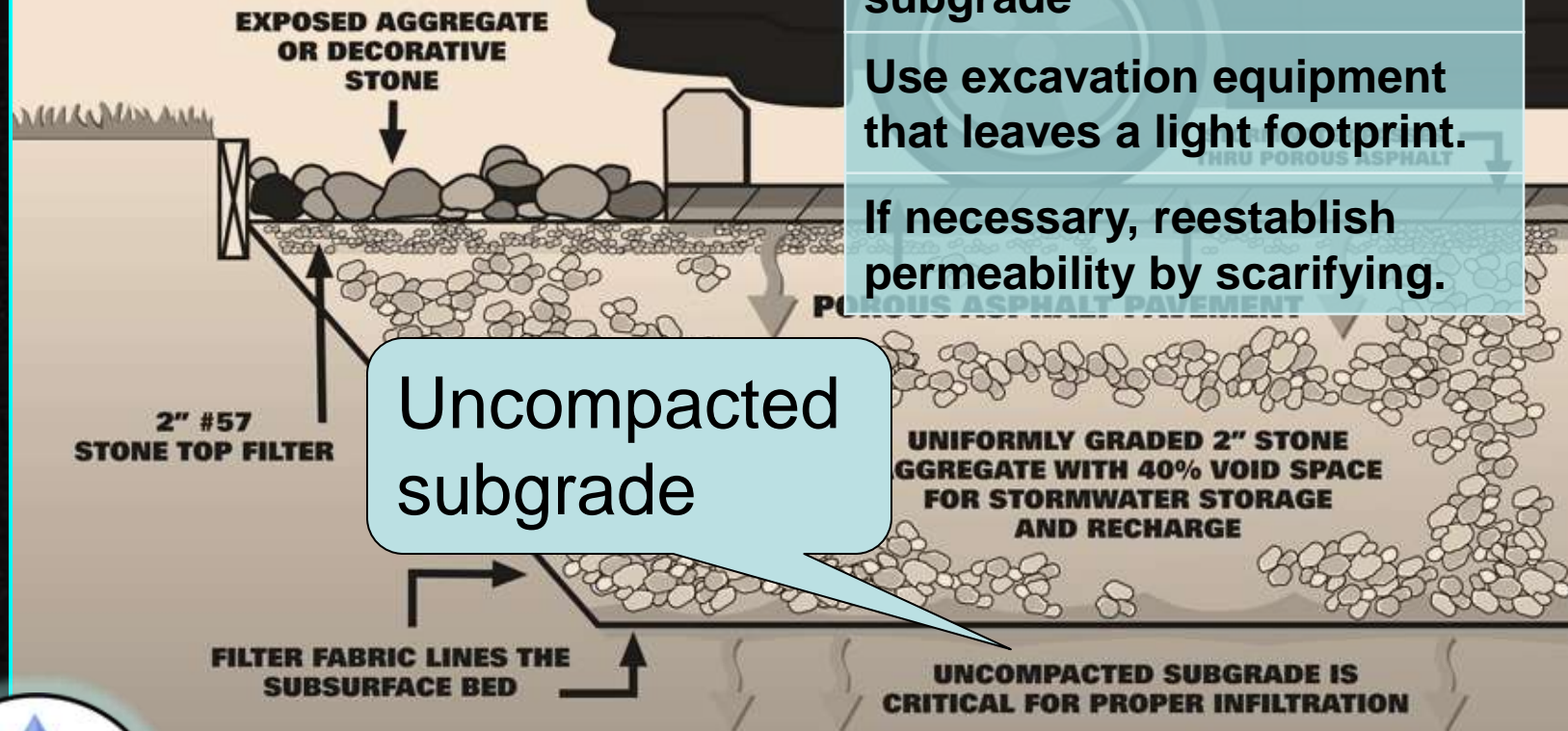
Uncompact  
subgrade

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PAVEMENT

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# POROUS PAVEMENT/ RECHARGE BED CONCEPT



**Purpose: retain soil permeability**

**Avoid any activities that would result in compacted subgrade**

**Use excavation equipment that leaves a light footprint.**

**If necessary, reestablish permeability by scarifying.**





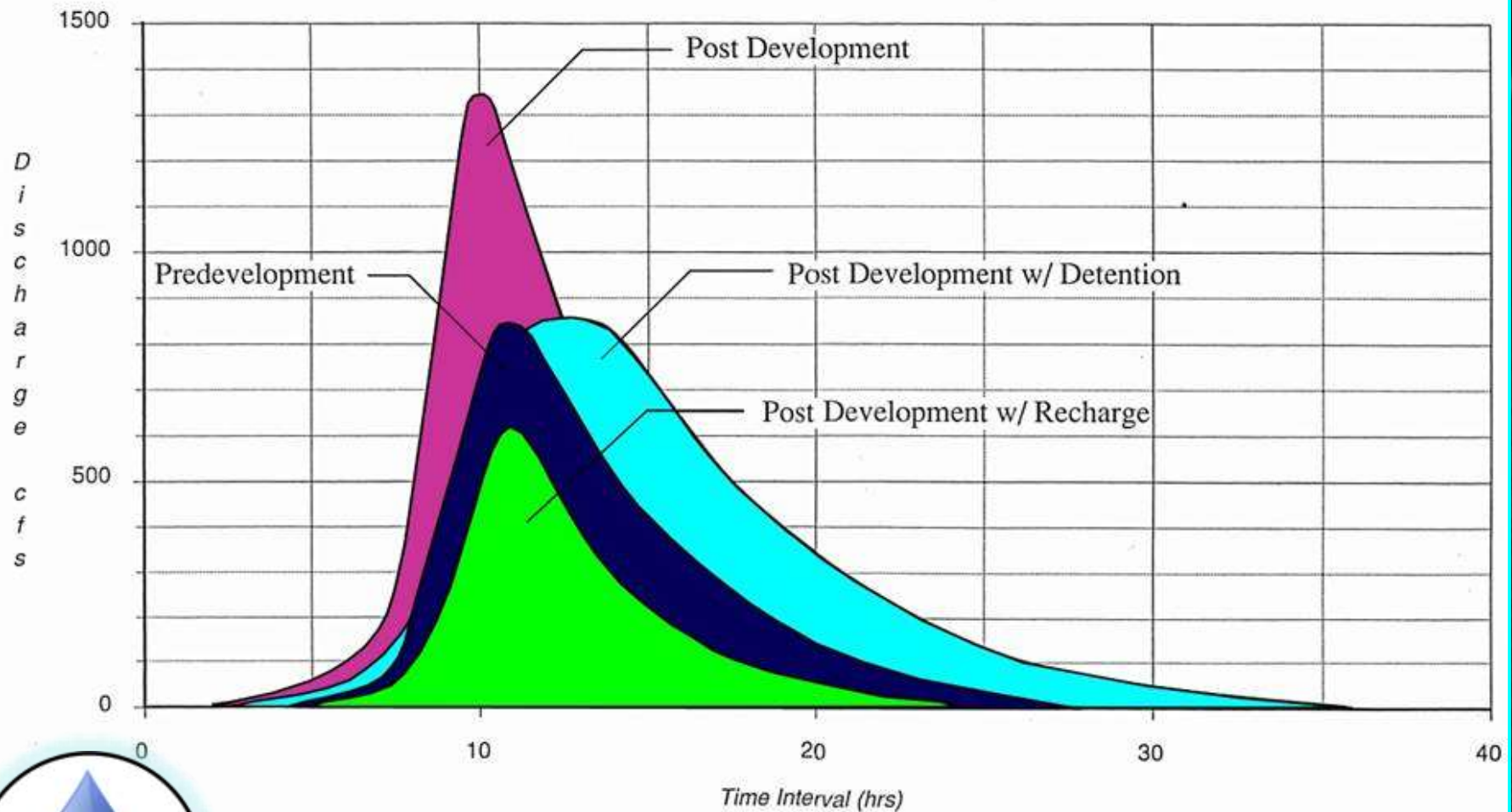
# POROUS PAVEMENT

## Design, Construction, Maintenance

- Components of a porous pavement system
- **Performance**
- Design considerations
- Constructing a porous pavement system
- Ensuring long life through proper maintenance



# Stormwater Quantity Control

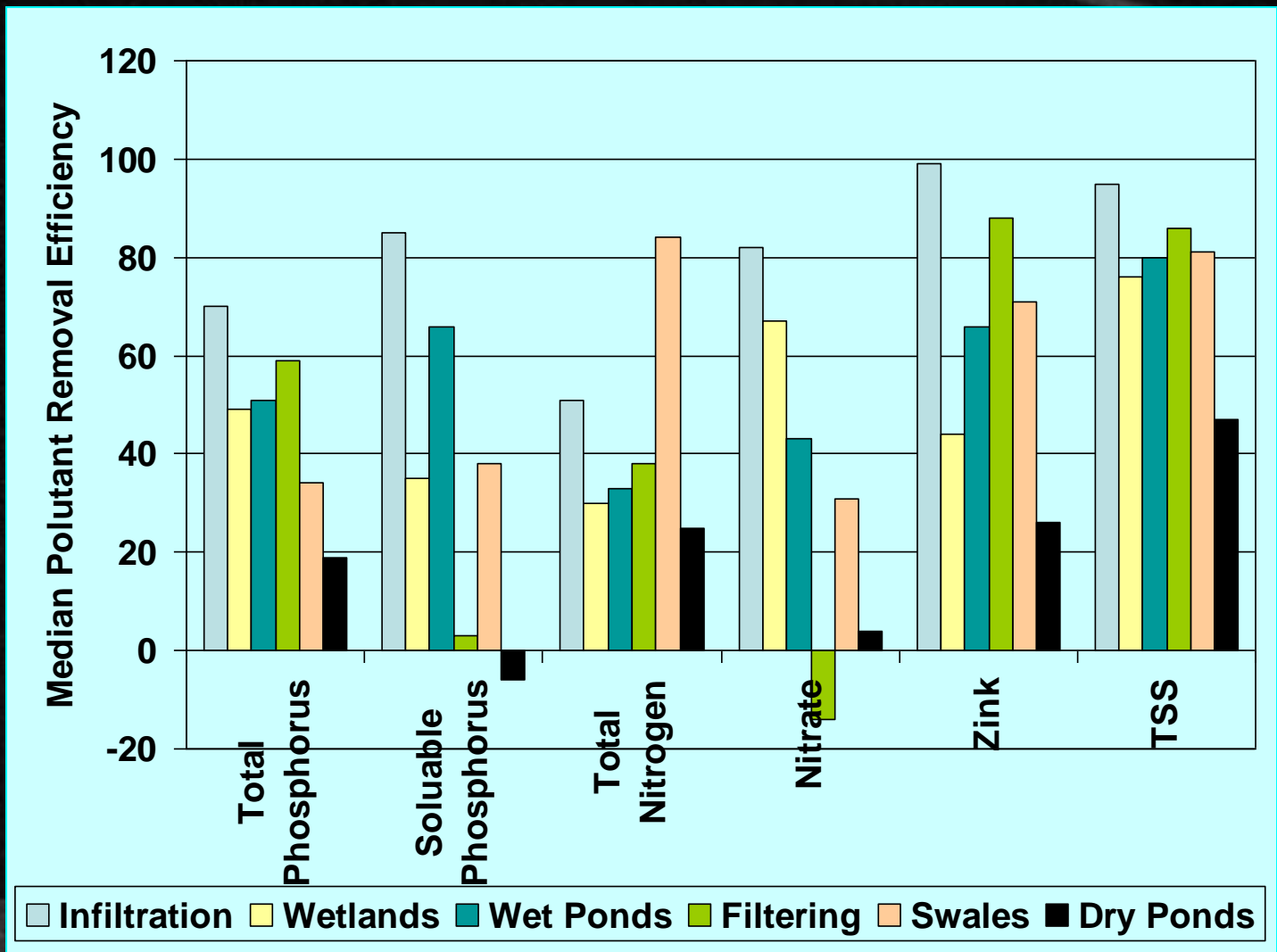


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# Pollutant Removal

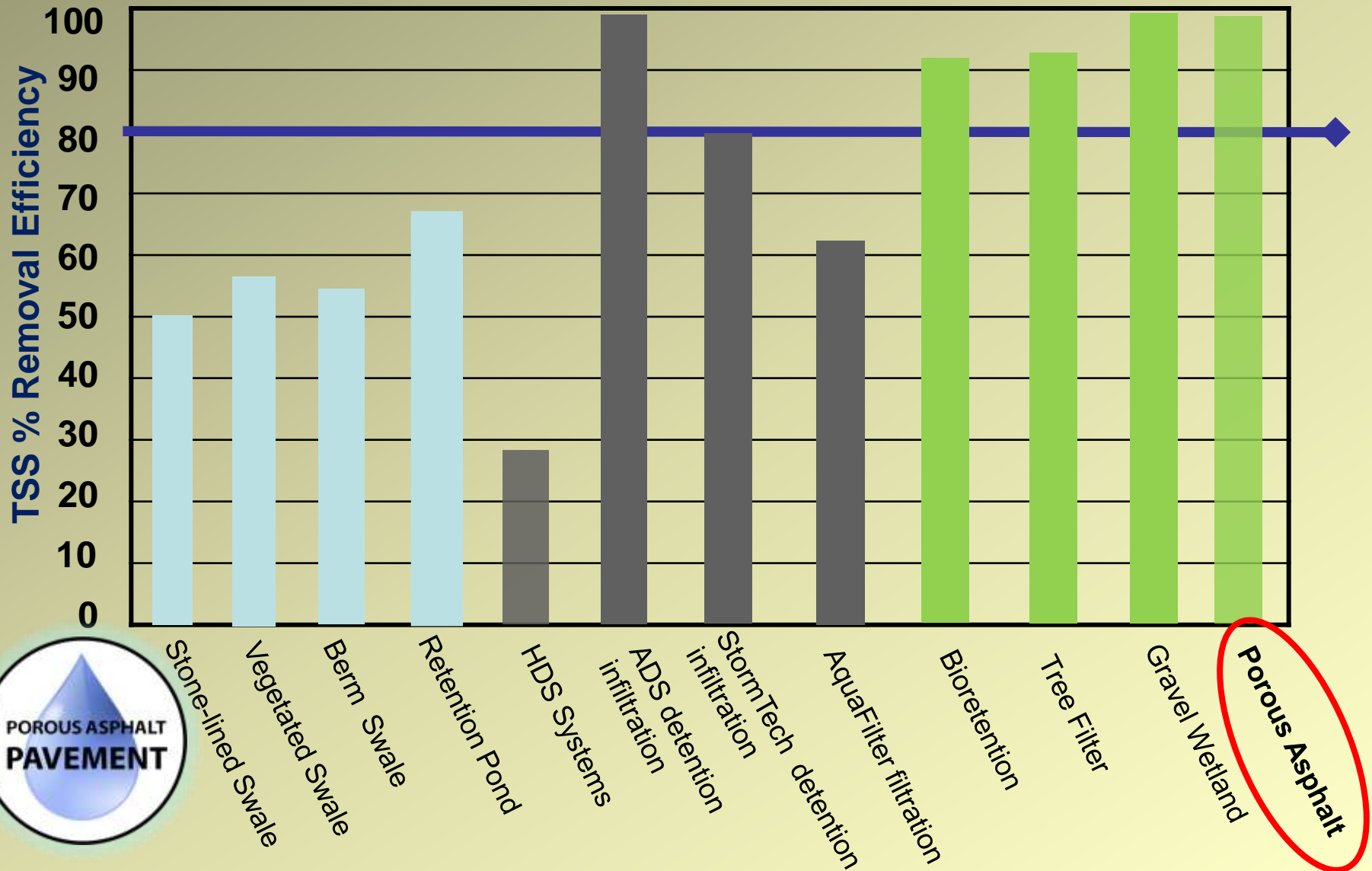


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# TSS Removal Efficiencies

Source: University of New Hampshire Storm Water Center





# Pavement Longevity



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**Dense-graded Pavement –  
Two maintenance treatments**

**Porous Pavement –  
No maintenance treatments**





# POROUS PAVEMENT

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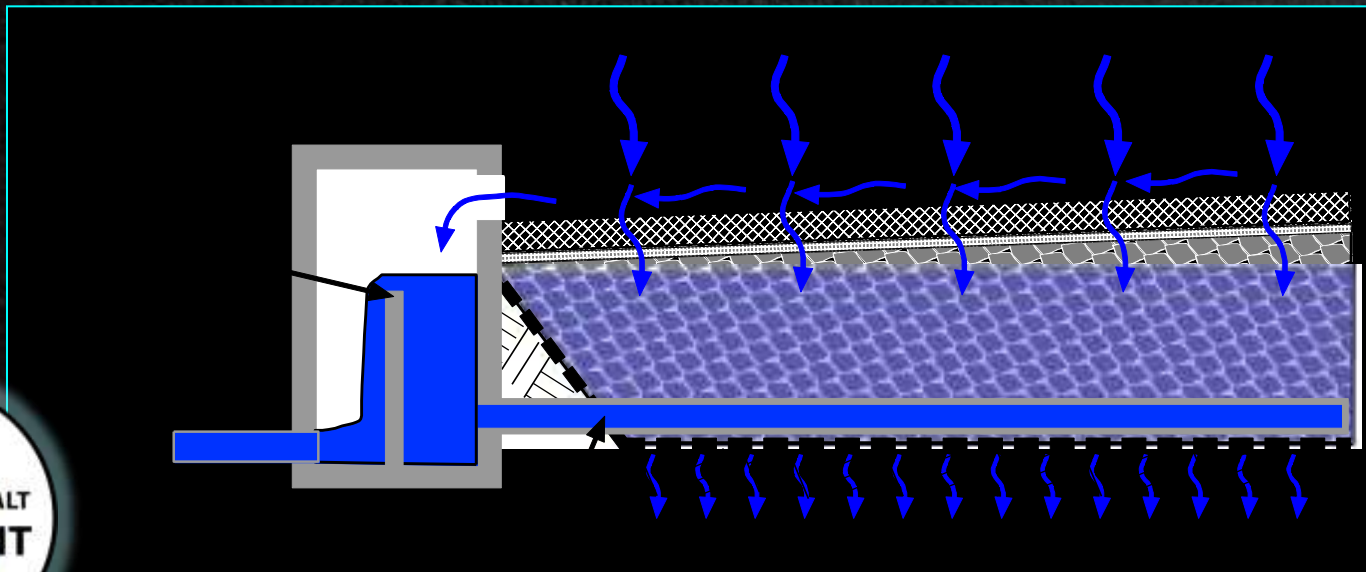
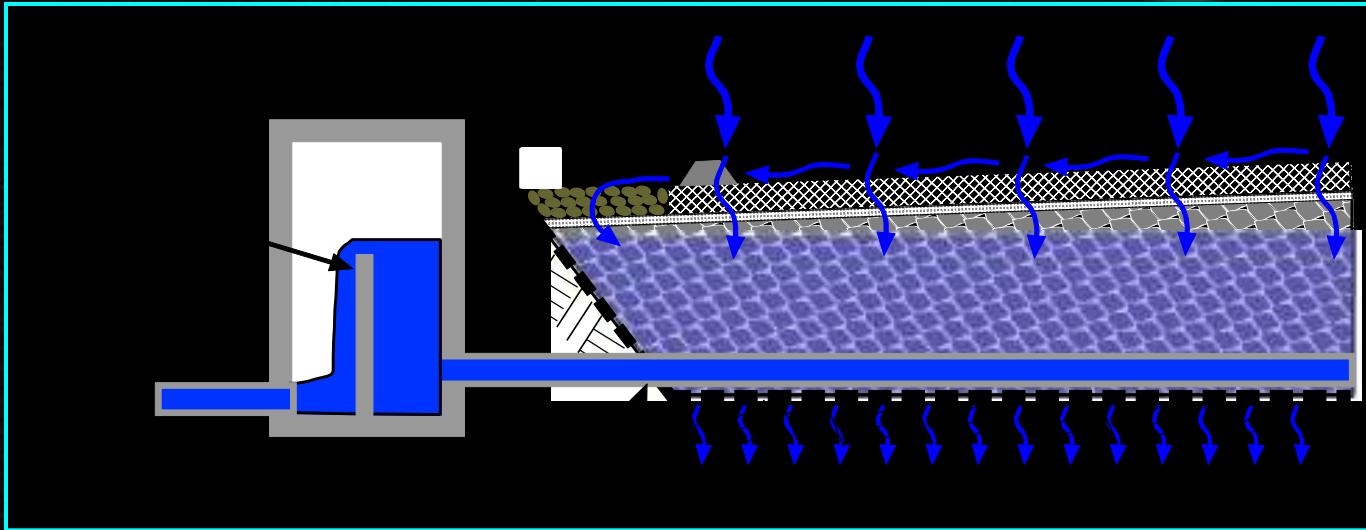
# Design Considerations

- Porous pavements can be designed as infiltration OR detention systems
- UNHSC research indicates some infiltration will occur even in low-permeability, clay-like soils.
  - TANK project confirms infiltration occurs in poor draining soil
  - Build in failsafe (e.g. underdrains, catchbasins, etc)





# Failsafe



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# Failsafe



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# Design Considerations

- Soil bed must be designed to be flat to maximize infiltration area. Step pavement to assure flat surface.



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# Design Considerations

- Provide a pavement structure that will carry paving equipment without distorting.
  - Avoid thick courses ( $> 3$  inches) of single size aggregate such as no. 57





# POROUS PAVEMENT

## Design, Construction, Maintenance

- Components of a porous pavement system
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# Constructing a Porous Pavement System

- Build porous pavement last
  - Protect from construction debris
  - Protect from debris laden runoff
- Protect site from heavy equipment
  - Avoid compaction of subgrade by construction equipment
- Excavate to subgrade using soft footprint





# Constructing a Porous Pavement System

- Place filter fabric, ensuring fabric extends above excavation to protect pavement until vegetation is established



# Constructing a Porous Pavement System

- Compaction of asphalt mixes is crucial to performance
- Asphalt binder content is 6.0 min.

Source:  
University of  
New  
Hampshire  
Storm Water  
Center



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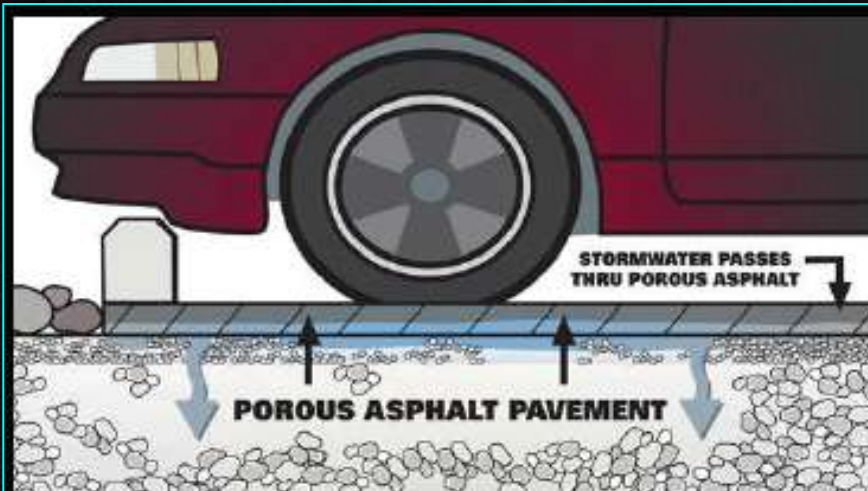


# POROUS PAVEMENT

## Design, Construction, Maintenance

- Components of a porous pavement system
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## LET IT FLOW !



DO NOT USE SAND OR OTHER  
ABRASIVES FOR SNOW AND ICE  
CONTROL

DO NOT PLACE SOIL, MULCH OR  
OTHER MATERIAL THAT CAN CLOG



REGULARLY SWEEP, VACUUM OR  
BLOW PAVEMENT TO REMOVE  
LEAVES, NEEDLES OR OTHER  
DEBRIS THAT CAN CLOG

POROUS ASPHALT  
PAVEMENT

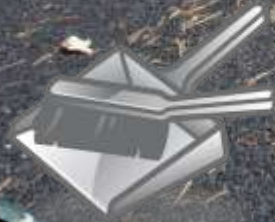
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**Regularly sweep, vacuum or blow pavement to remove leaves, needles or other debris that can clog.**



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**Regularly sweep, vacuum or blow pavement to remove leaves, needles or other debris that can clog.**



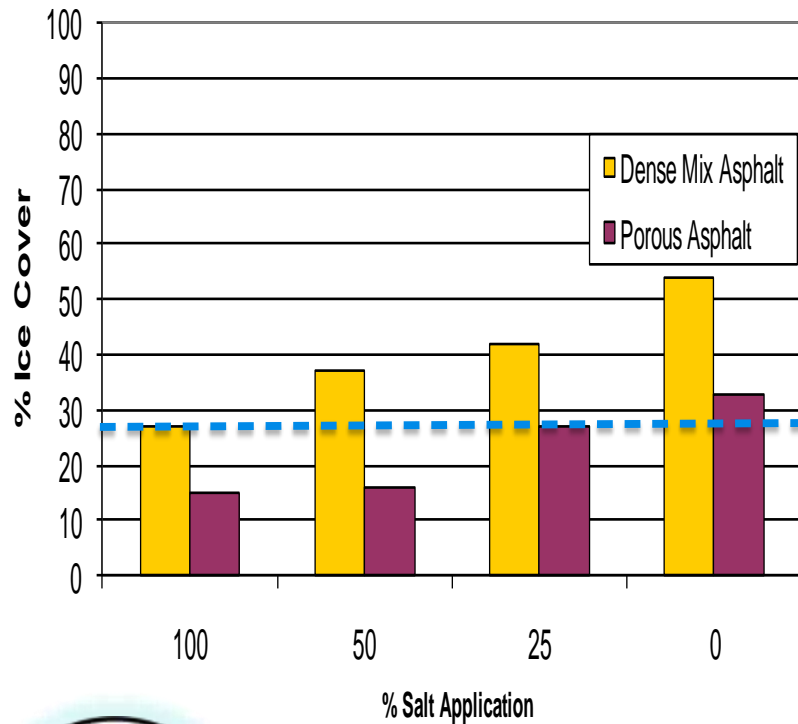
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# Snow & Ice

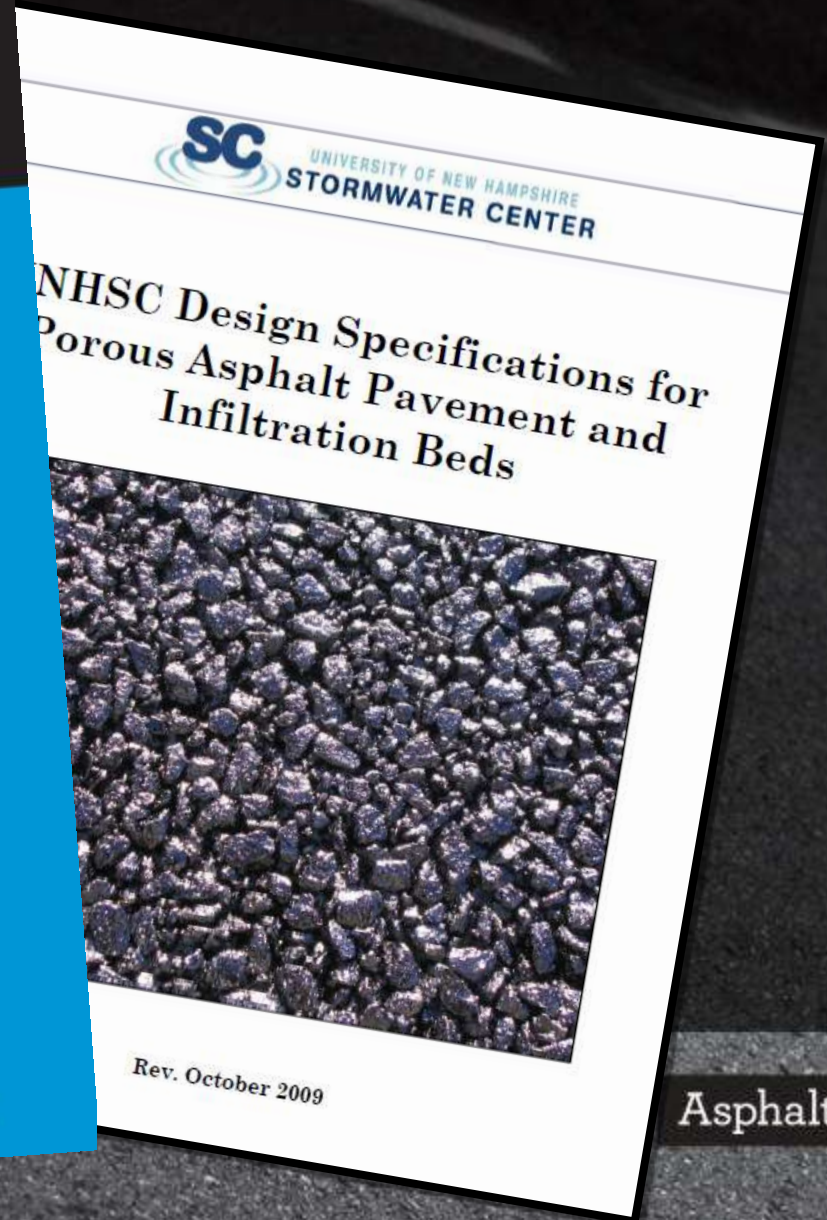
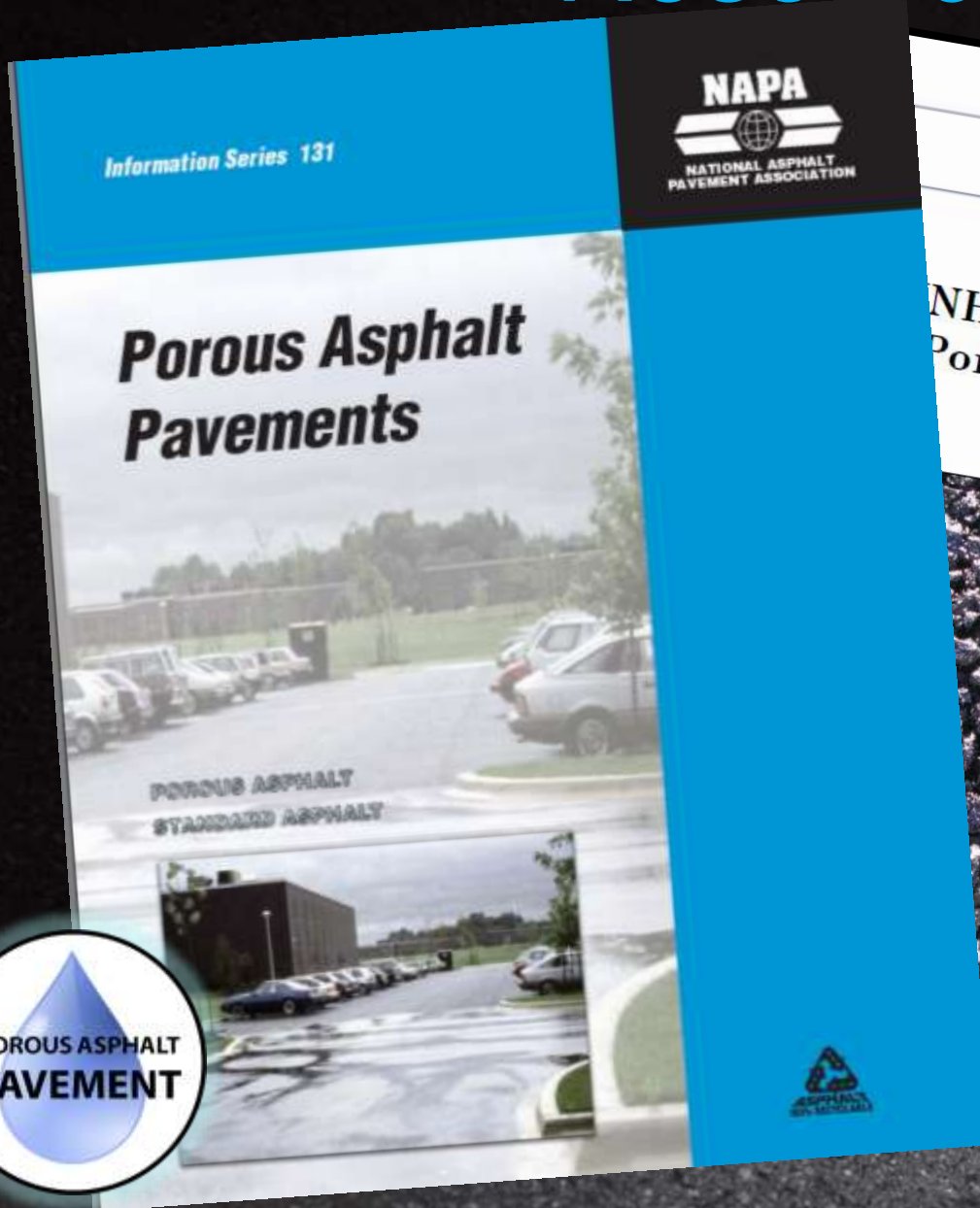
% Ice Cover



Source: University of New Hampshire Storm Water Center

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# Resources





# Resources

<http://www.flexiblepavements.org>



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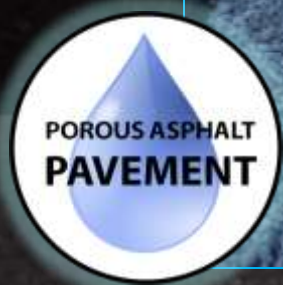
# Porous Asphalt Use – Light Duty Parking Facility



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# Porous Asphalt Use – Light Duty Parking Facility



**Anna Dean Medical Complex –  
VASCO Asphalt Co.**

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# Quality Award for Asphalt Paving

Porous Asphalt Parking Facility at  
Munroe Falls Metro Park 10/14/2010 11:14  
Contractor: Perrin Asphalt





# Porous Asphalt Use – Light Duty Parking Facility



**Munroe Falls Metro Park  
– Perrin Asphalt**

10/20/2010 10:37

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# Questions ?

***Asphalt ... Defining Value !***  
**Safe, Smooth and Sustainable**

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