

Considerations for Pavement Applications and Maintenance at Airports


Wednesday, February 28, 2018
2:00pm to 3:30pm ET

Purpose

Discuss research from the [Airport Cooperative Research Program](#) (ACRP)'s [Report 159](#): Pavement Maintenance Guidelines for General Aviation Airport Management and [Research Report 178](#): Guidance for Usage of Permeable Pavement at Airports.

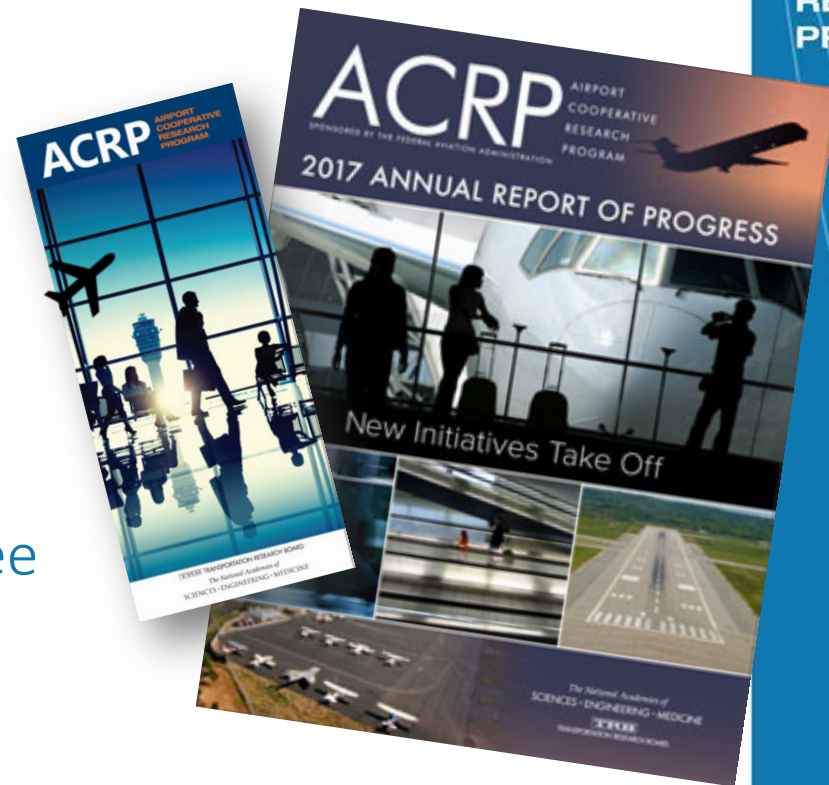
Learning Objectives

At the end of this webinar, you will be able to:

- Understand how to use the selection tool and its output, including the treatment assignment, cost estimator, and performance models
 - Identify sources of additional material and information
 - Discuss where and why permeable pavements were implemented at airports
 - Understand the considerations, current limitations, and hurdles for implementing permeable pavements
- 

ACRP is an Industry-Driven Program

- ✈ Managed by TRB and sponsored by the Federal Aviation Administration (FAA).
- ✈ Seeks out the latest issues facing the airport industry.
- ✈ Conducts research to find solutions.
- ✈ Publishes and disseminates research results through free publications and webinars.



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Opportunities to Get Involved!

- ✈️ ACRP's Champion program is designed to help early- to mid-career, young professionals grow and excel within the airport industry.
- ✈️ Airport industry executives sponsor promising young professionals within their organizations to become ACRP Champions.
- ✈️ Visit ACRP's website to learn more.



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Airport Roles in Reducing Transmission of Communicable Diseases

March 6–7, 2018 • Washington, D.C.

Featured speakers:

- CAPT Martin Cetron, MD – Director, CDC’s Division of Global Migration and Quarantine (DGMQ)
- Dr. Ansa Jordaan – Chief, Aviation Medicine Section, International Civil Aviation Organization
- Dr. Petra Illig – Aviation Medical Services, Alaska
- Dr. Kamran Khan – St. Michael’s Hospital, Toronto

Register for FREE:
bit.ly/ACRPMarchEvent

Moderated discussion by outbreak responders from Dallas-Fort Worth, New York City, Phoenix, and Portland.

Award-winning *Unseen Enemy* movie screening and interactive exercise included in registration.

A stylized white line-art illustration on a dark blue background. It depicts a city skyline with various buildings, wind turbines, and power lines. In the foreground, an airplane is shown in profile, flying over a runway with lights. Another airplane is visible in the sky above, with searchlights or spotlights illuminating it. The overall theme is aviation and urban infrastructure.

Challenges to Implementing Successful Land Use Strategies at Airports

April 10-11, 2018 | Washington, D.C.

FREE Registration: tinyurl.com/land-use-insight-event

Featuring interactive breakout sessions, networking opportunities, and keynote addresses. Speakers include:

- **Thella Bowens**, (retired) President/CEO, San Diego County Regional Airport Authority
- **Dr. Stephen Van Beek**, Director & Head of North American Aviation, Steer Davies Gleave
- **John Terrell**, Vice President Commercial Development, DFW International Airport

Economic and Social Sustainability at Airports

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INSIGHT EVENT

May 7 - 8, 2018 | Washington, D.C.

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With interactive breakouts, networking opportunities, and plenary presentations, this engaging and groundbreaking forum will help airports and their stakeholders frame, plan, communicate, implement, and report social and economic initiatives to fully realize triple bottom line sustainability benefits.

Featuring...

- Dr. Davina Durgana – *anti-human trafficking expert*
- Dr. Steve Nakana – *airport social equity expert*
- Ted Howard – *community wealth building expert*

FREE Registration: tinyurl.com/sustainability-insight-event

Upcoming ACRP Webinars

March 8

Assessing Community Annoyance with
Helicopter Noise

March 21

Interpreting the Results of Airport
Water Monitoring

April 5

Addressing Significant Weather Impacts
on Airports

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Additional ACRP Publications Available on this Topic

Report 39: Recommended Guidelines for the Collection and Use of Geospatially Referenced Data for Airfield Pavement Management

Synthesis 6: Impact of Airport Pavement Deicing Products on Aircraft and Airfield Infrastructure

Synthesis 11: Impact of Airport Rubber Removal Techniques on Runways

Synthesis 22: Common Airport Pavement Maintenance Practices

Visit: www.trb.org/ACRP

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Today's Speakers

Tom Freeman and Jeff Borowiec
Texas A&M Transportation Institute

Presenting

*Report 159: Pavement Maintenance Guidelines
for General Aviation Airport Management*

Jim Bruinsma
Applied Pavement Technology, Inc.

Presenting

*Report 178: Guidance for Usage of
Permeable Pavement at Airports*

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ACRP Report 159: Pavement Maintenance Guidelines for General Aviation Airport Management

**Thomas J. Freeman
Jeffrey Borowiec**



Thomas J. Freeman Principal Investigator

- Pavement Management Program Manager, Texas A&M Transportation Institute
- 30+ Years of Airport Pavement Inspection



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Jeffrey Borowiec

Research Scientist

- Research Scientist, Infrastructure Investment Analysis Program, Texas A&M Transportation Institute
- 23 Years Airport System Planning & Research Experience
- Chair, TRB Committee on Aviation System Planning



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ACRP Report 159

Oversight Panel

Joanna K. Ambroz, Port of Portland, Portland, OR (Chair)

Jo A. Lary, Pavement Consultants Inc., Seattle, WA

Thomas F. Mahoney, Massachusetts DOT, East Boston, MA

Joshua Mann, Kenton County Airport Board, Cincinnati/Northern
Kentucky International Airport

Angel E. Ramos, Lambert–St. Louis International Airport, St.
Louis, MO

Laith Tashman, Wellesley, MA

Gregory D. Cline, FAA Liaison

Stephen F. Maher, TRB Liaison

Marci A. Greenberger, Senior Program Officer

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ACRP Report 159: *Pavement Maintenance Guidelines for General Aviation Airport Management*

- Surveyed knowledgeable personnel
- Developed decision trees
- Presents airport distress mechanisms and preservation strategies
- Provides support documents and treatment justification
- Primarily for airports with little or no engineering staff
- Published May 2016

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For additional information:



ACRP Report 159

Pavement Maintenance Guidelines for General Aviation Airport Management

- Thomas J Freeman
 - T-Freeman@TAMU.EDU

<http://www.trb.org/Main/Blurbs/175058.aspx>

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Who did we talk to?

Table 11. Distribution of Responses.

<u>Responses</u>		<u>Representing Airports</u>	
State Aviation/Aeronautics	36	National Airport	11
National Airport	7	Regional Airport	26
Regional Airport	15	Local Airport	28
Local Airport	18	Basic Airport	24
Basic Airport	13	Total	89
Total	89		

By FAA Region

Alaskan	0
Western Pacific	9
Central	8
Eastern	8
Great Lakes	14
New England	12
NW Mountain	13
Southern	17
Southwest	8
Total	89

Straight to the Tool

<http://acrp-pavement-tool.tti.tamu.edu>

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Pavement Maintenance Guidelines for General Aviation Airport Management

ACRP Project No. 09-11

This tool will help you evaluate potential treatments for pavement distresses at your facility.
If you are not familiar with the names of pavement distresses, you may choose to start by [browsing the full list](#). Otherwise, or when you've completed reviewing the distress types:

[Get Started](#)

Sponsored by the Federal Aviation Administration
TRANSPORTATION RESEARCH BOARD OF THE NATIONAL ACADEMIES
WASHINGTON, D.C.
2016 www.TRB.org

Choose **Get Started** or **Your Facility** from the Navigation menu at top to begin.



Input Airport Parameters

Enter an optional, identifying word or phrase to designate the feature being evaluated.



ACRP 09-11 Home **Your Facility** Appendix Clear

Your Facility

Determining and Evaluating Your Options

If you are not familiar with the names of pavement distresses, you may choose to start by [browsing the full list](#).

Otherwise, please proceed below.

Feature Identifier (Optional)
For example, Runway, Taxiway, Apron

State (for climate determination)
-- Choose one --

FAA Airport Classification
-- Choose one --

Pavement Type (asphalt or concrete)
-- Choose one --

+ Add / Identify a Distress

Your Facility

Determining and Evaluating Your Options

If you are not familiar with the names of pavement distresses, you may choose to start by [browsing the full list](#).

Otherwise, please proceed below.

Enter your state.
This is a required
field.



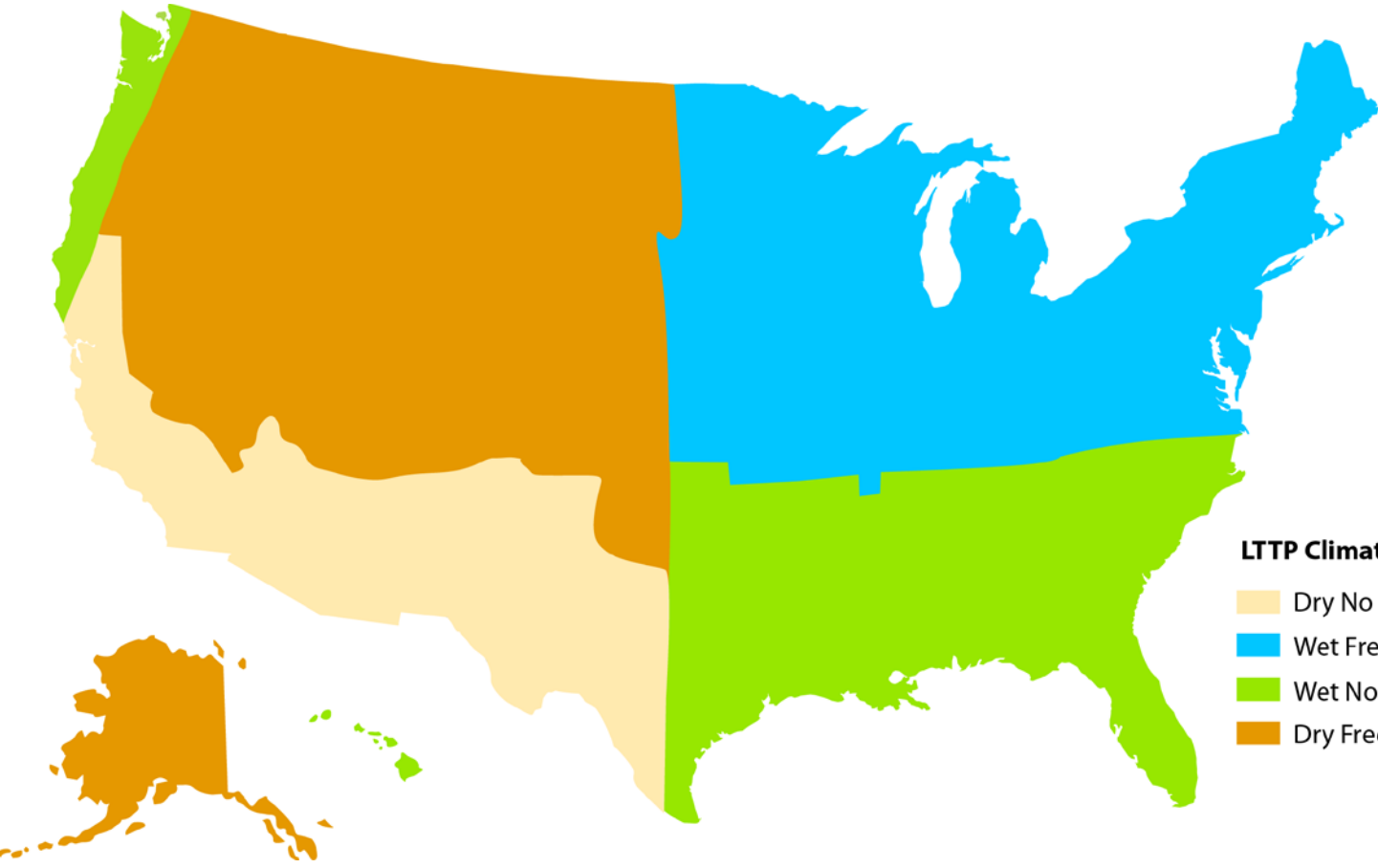
Feature Identifier (Optional)
For example, Runway, Taxiway, Apron

State (for climate determination)
-- Choose one -- ▾
FAA Airport Classification
-- Choose one -- ▾
Pavement Type (asphalt or concrete)
-- Choose one -- ▾

[+ Add / Identify a Distress](#)

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LTP Climate Zones

-  Dry No Freeze
-  Wet Freeze
-  Wet No Freeze
-  Dry Freeze



Your Facility

Determining and Evaluating Your Options

If you are not familiar with the names of pavement distresses, you may choose to start by [browsing the full list](#).

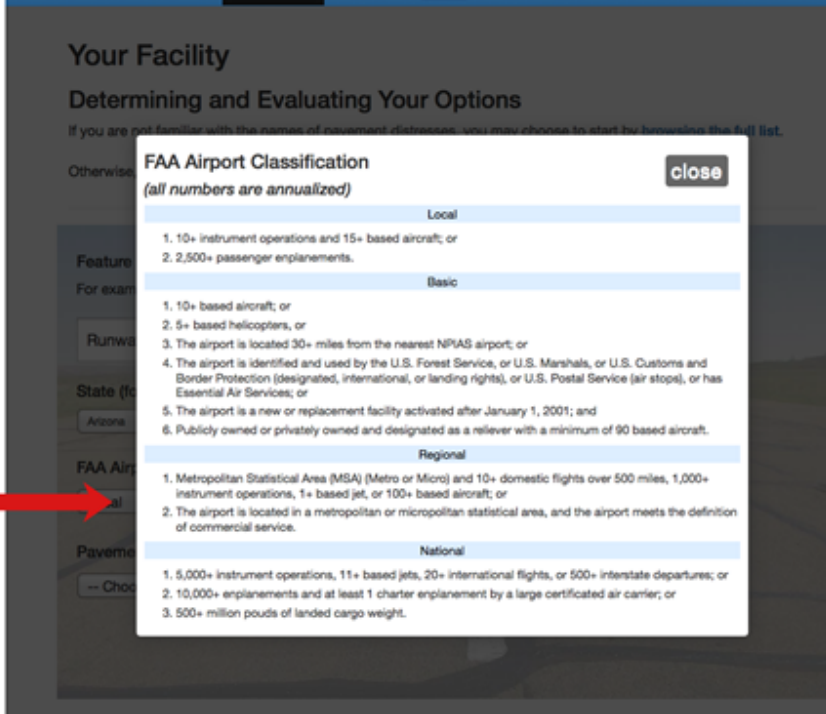
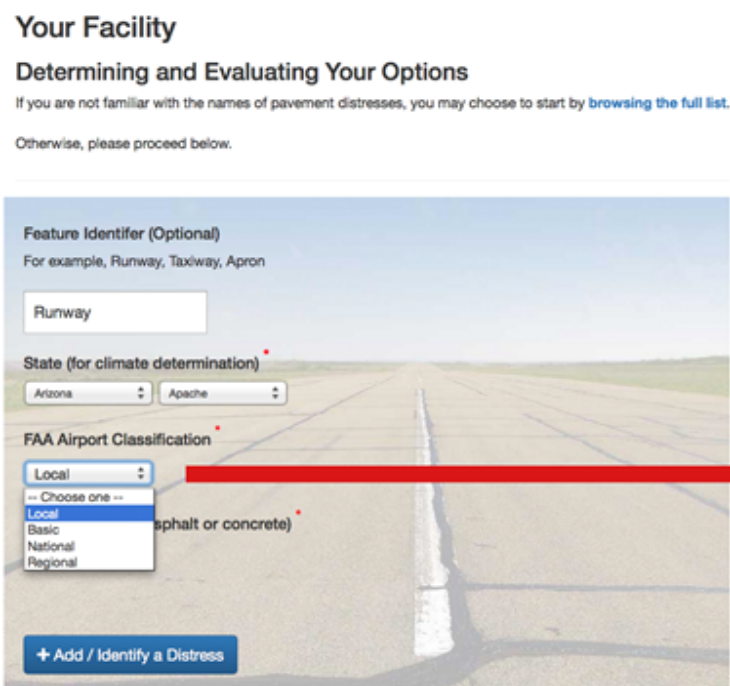
Otherwise, please proceed below.

Note that for some states, adding a county will be required to determine your facility's climate zone.

The screenshot shows a web form titled "Your Facility" with the following fields and options:

- Feature Identifier (Optional):** A text input field containing "Runway".
- State (for climate determination):** A dropdown menu with "Apache" selected. A red box highlights this dropdown, and a black arrow points from the text on the left to it.
- FAA Airport Classification:** A dropdown menu with "-- Choose one --" selected.
- Pavement Type (asphalt or concrete):** A dropdown menu with "-- Choose one --" selected.
- Buttons:** A blue button labeled "+ Add / Identify a Distress".

The dropdown menu for the State field is open, showing a list of counties: Apache, Cochise, Coconino, Gila, Graham, Greenlee, La Paz, Maricopa, Mohave, Navajo, Pima, Pinal, Santa Cruz, Yavapai, and Yuma. The "Apache" option is highlighted in blue.



Pick your facility's FAA Airport Classification.

Note that your entries up to this point will be retained on your computer or tablet for subsequent evaluations with the tool.

Note that the FAA Airport Classification input has supplemental details that will pop up to assist the user.

Your Facility

Determining and Evaluating Your Options

If you are not familiar with the names of pavement distresses, you may choose to start by [browsing the full list](#).

Otherwise, please proceed below.

Feature Identifier (Optional)

For example, Runway, Taxiway, Apron

State (for climate determination)

FAA Airport Classification

Pavement Type (asphalt or concrete)

+ Add / Identify a Distress

Pavement Type (asphalt or concrete)

-- Choose one --

Asphalt

Concrete

Choose the type of pavement used in the feature being evaluated.



Your Facility

Determining and Evaluating Your Options

If you are not familiar with the names of pavement distresses, you may choose to start by [browsing the full list](#).

Otherwise, please proceed below.

Feature Identifier (Optional)

For example, Runway, Taxiway, Apron

Runway

State (for climate determination)

Arizona Apache

FAA Airport Classification

Local

Pavement Type (asphalt or concrete)

Asphalt

DISTRESS #1

✕ remove

1 Identify a Distress

Cracking

Longitudinal

Transverse

Alligator

Block

Edge

Reflection

Surface Distress

Weathering

Raveling

Patching

Roughness

+ Add / Identify a Distress

Click **Add/Identify a Distress** to begin describing the distress(es) observed in the current feature. Observe that a list of distresses possible for the chosen pavement type will appear.



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The screenshot displays the FAA Airport Classification interface. At the top, there are dropdown menus for 'Local' and 'Asphalt' under the 'Pavement Type (asphalt or concrete)' section. Below this, a 'DISTRESS #1' section is visible. On the left, a list of distress types is shown under the heading '1 Identify a Distress'. The 'Block' option is highlighted with a blue bar and a small circle-i icon. A red arrow points from this icon to a larger information box that has appeared over the main content area. This box is titled 'Cracking » Block' and contains a detailed description of block cracking. Below the text, there are two small images showing examples of block cracking on a road surface. The information box also features a 'close' button in the top right corner.

1 Identify a Distress

- Cracking
 - Longitudinal
 - Transverse
 - Alligator
 - Block *i***
 - Edge
 - Reflection
- Surface Distress
 - Weathering
 - Raveling

2 Select an Amount & Severity

Cracking » Block close

Block cracks are interconnected cracks that divide the pavement into approximately rectangular pieces. The blocks may range in size from approximately 1 by 1 foot to 10 by 10 feet (0.3 by 0.3 meters to 3 by 3 meters). Block cracking is caused mainly by shrinkage of the asphalt concrete (AC) and daily temperature cycling (which results in daily stress/ strain cycling). It is not load associated. The occurrence of block cracking usually indicates that the asphalt has hardened significantly. Block cracking normally occurs over a large proportion of pavement area but sometimes will occur in non-traffic areas. This type of distress differs from alligator cracking in that alligator cracks form smaller, multisided pieces with sharp angles. Also, unlike block cracks, alligator cracks are caused by repeated traffic loadings and, therefore, are located only in traffic areas (i.e., wheel paths).

Block cracking - low severity

Hover your cursor over each distress and click the Circle-i icon to view an information box describing it.

Select an appropriate choice under **Select an Amount & Severity**.

When you choose a distress, a second group of choices will appear, as well as photos of the distress.

Click a photo for a larger view to help you determine which distress your features is experiencing.

Feature Identifier (Optional)
For example, Runway, Taxiway, Apron

Runway

State (for climate determination)
Arizona Apache

FAA Airport Classification
Local

Pavement Type (asphalt or concrete)
Asphalt

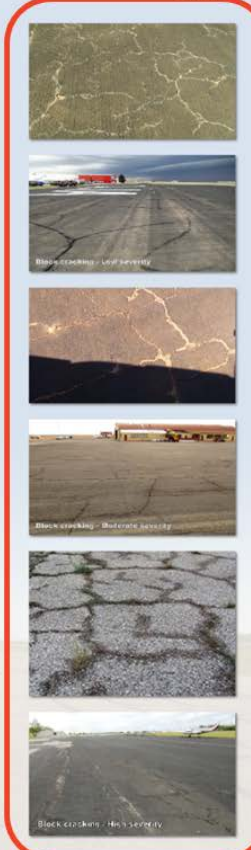
DISTRESS #1 remove

1 Identify a Distress

- Cracking
 - Longitudinal
 - Transverse
 - Alligator
 - Block**
 - Edge
 - Reflection
- Surface Distress
 - Weathering
 - Raveling
 - Patching
 - Roughness

2 Select an Amount & Severity

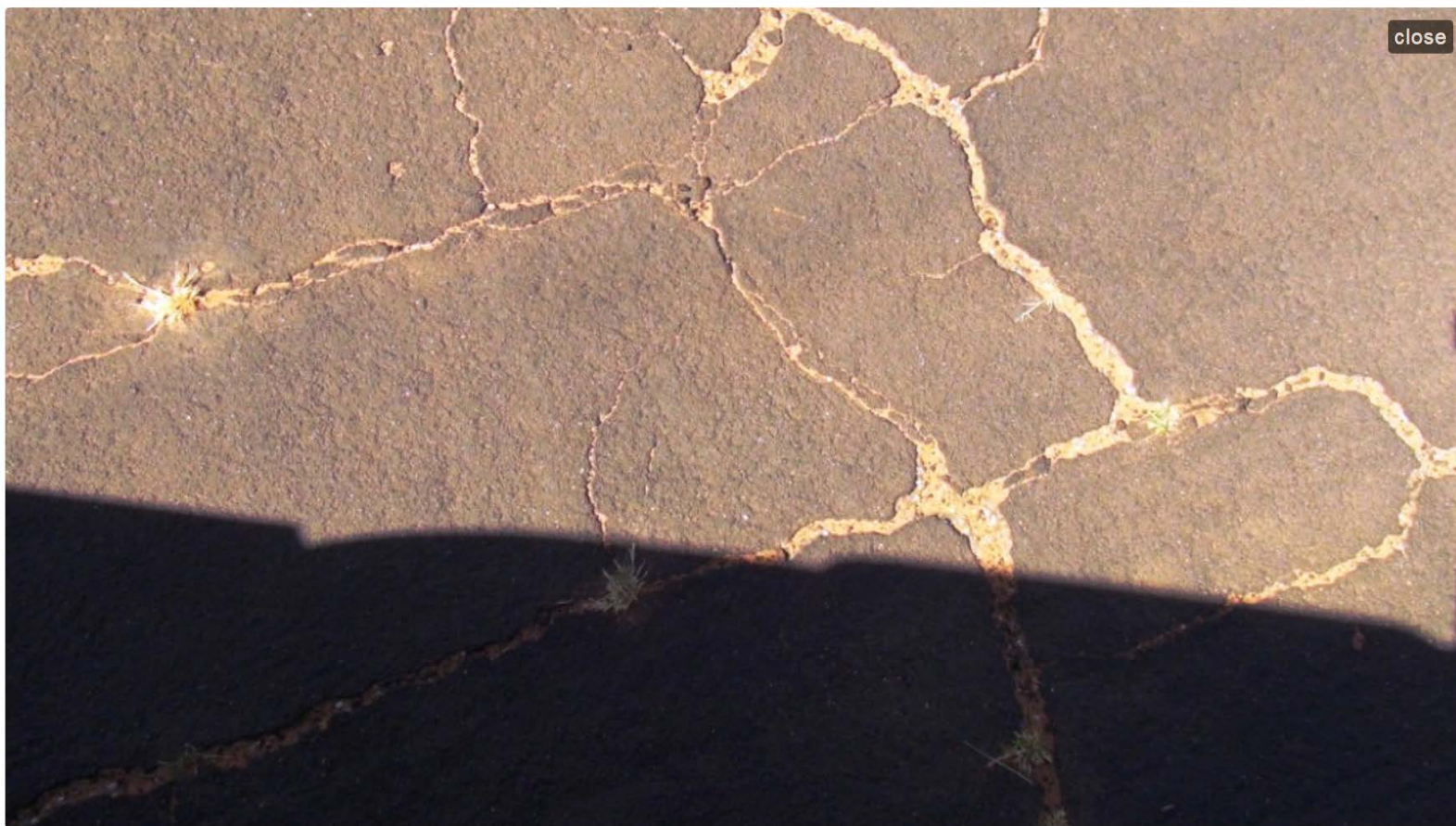
- Block cracking Low
- Block cracking Medium
- Block cracking High



+ Add / Identify a Distress

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1 Identify a Distress

Cracking

- Longitudinal
- Transverse
- Alligator
- Block
- Edge
- Reflection

Surface Distress

- Weathering
- Raveling
- Patching
- Roughness

+ Add / Identify a Distress

Initial Analysis

Block cracking Medium severity

Treatment	Cost Basis	Relative Benefit	Benefit/Cost
Recommended Asphalt Overlay/Mill+overlay	\$ 7.5 / sq yd	419	0.10
Acceptable Crack Seal/Fill	\$ 0.75 / linear ft.	68	0.07

Use the Ballpark Benefit/Cost Estimator for all treatments?

Final Analysis

For all treatments except seal and patching, it is recommended that a professional engineering firm with airport experience be engaged.

Block cracking Medium severity

Treatments		
Recommended	Asphalt Overlay/Mill+overlay	
Acceptable	Crack Seal/Fill	

[Print Report](#)

If the current feature is experiencing more than one distress, again click **Add/Identify a Distress** and follow the preceding steps to identify as many distresses as applicable.

1.1 Identify a Distress

Cracking

Longitudinal

Transverse

Alligator

Block

Edge

Reflection

Surface Distress

Weathering

Raveling

Patching

Roughness

1.2 Select an Amount & Severity

Few longitudinal cracks, Low

Few longitudinal cracks, Medium

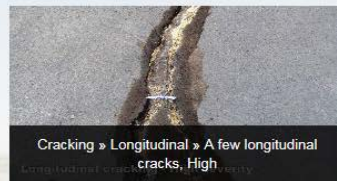
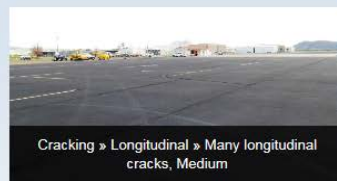
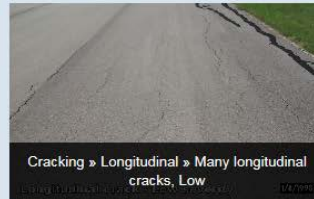
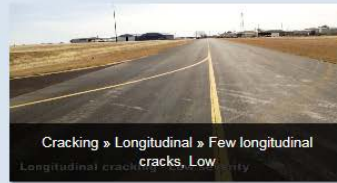
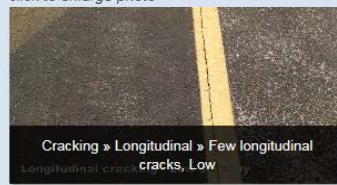
A few longitudinal cracks, High

Many longitudinal cracks, Low

Many longitudinal cracks, Medium

Many longitudinal cracks, High

[click to enlarge photo](#)



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When you do so, a summary table appears listing a recommended and acceptable treatment.

Initial Analysis
Block cracking Medium severity

	Treatment	Cost Basis	Relative Benefit Δ	Benefit/Cost Δ
Recommended	Asphalt Overlay/Mill+overlay	\$ 7.5 / sq yd	419	0.10
Acceptable	Crack Seal/fill	\$ 0.75 / linear ft	68	0.07

Use Ballpark Benefit/Cost Estimator for all treatments?

Final Analysis
For all treatments except sealing and patching, it is recommended that a professional engineering firm with airport experience be engaged.

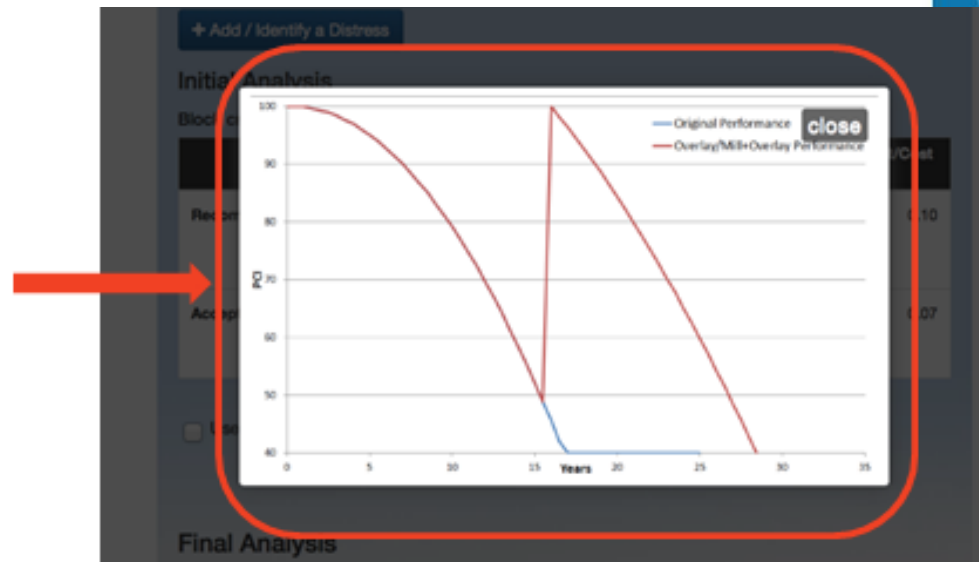
Block cracking Medium severity

Treatments	
Recommended	Asphalt Overlay/Mill+overlay
Acceptable	Crack Seal/fill

Print Report

In the treatment cells, click the graph icon to view a PCI curve, indicating the estimated increased performance that the treatment can do to extend the life of the pavement being evaluated.

If the current feature is experiencing just one distress, you can skip to the Ballpark Estimator.

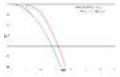
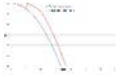


Initial Analysis

Block cracking Medium severity

	Treatment		Cost Basis	Relative Benefit ⓘ	Benefit/Cost ⓘ
Recommended	Asphalt Overlay/Mill+overlay 		\$ 7.5 / sq yd	419	0.10
Acceptable	Crack Seal/fill 		\$ 0.75 / linear ft	68	0.07

Starting to Weather (losing fines)

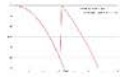

	Treatment		Cost Basis	Relative Benefit ⓘ	Benefit/Cost ⓘ
Recommended	Slurry/Micro 		\$ 2 / sq yd	146	0.13
Acceptable	Rejuvenator 		\$ 0.37 / sq yd	146	0.71

Use the Ballpark Benefit/Cost Estimator for all treatments?

Final Analysis

For all treatments except sealing and patching, it is recommended that a professional engineering firm with airport experience be engaged

Block cracking Medium severity

Treatments		
Recommended	Asphalt Overlay/Mill+overlay	
Acceptable	Crack Seal/fill	

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Initial Analysis

Block cracking Medium severity

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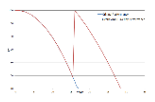
	Treatment		Cost Basis	Relative Benefit ⓘ	Benefit/Cost ⓘ
Recommended	Asphalt Overlay/Mill+overlay 		\$ <input type="text" value="7.5"/> / sq yd	419	0.10
Acceptable	Crack Seal/fill 		\$ <input type="text" value="0.75"/> / linear ft	68	0.07

Use the Ballpark Benefit/Cost Estimator for all treatments?



Initial Analysis

Block cracking Medium severity

	Treatment		Cost Basis	Relative Benefit ⓘ	Benefit/Cost ⓘ
Recommended	Asphalt Overlay/Mill+overlay 		\$ <input type="text" value="7.5"/> / sq yd	419	0.10
Acceptable	Crack Seal/fill 		\$ <input type="text" value="0.75"/> / linear ft	68	0.07

Use the Ballpark Benefit/Cost Estimator for all treatments?

Use the Ballpark Benefit/Cost Estimator for all treatments?

Please enter the length and width, in feet, of feature

<input type="text" value="5000"/>	<input type="text" value="75"/>
-----------------------------------	---------------------------------

Ballpark Estimator for Block cracking Medium severity (375,000 sq ft)

	Recommended	Acceptable
Treatment	Asphalt Overlay/Mill+overlay	Crack Seal/fill
Cost Estimate	\$312,525	\$70,350

Final Analysis

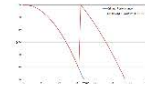
For all treatments except sealing and patching, it is recommended that a professional engineering firm with airport experience be engaged

Block cracking Medium severity

Treatments

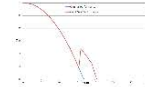
Recommended

Asphalt Overlay/Mill+overlay



Acceptable

Crack Seal/fill



[Print Report](#)



Summary

- Uses climate, surface type, and FAA designation along with distress type, severity, and extent to determine recommended acceptable treatment types
- Can add additional distress combinations
- Hierarchical tool decides which is most extensive Recommended and Acceptable treatments
- Can use “Ballpark Cost Estimator” to determine approximate treatment cost
 - User modifiable
- View results shows your entries and results
- Tons and tons of supporting documents in report

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Other Documentation

- **Final Report**
 - Detailed discussion of research that was done:
 - Questionnaire
 - Decision trees, etc
- **How To/Users Guide***
 - Step by step instructions
- **Field Guide***
 - Non-computer version of the tool
- **Guidebook***
 - Smaller version of Final Report

* - Under Appendix tab of the Tool

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Questions?

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ACRP Report 178: Guidance for Usage of Permeable Pavements at Airports

James E. Bruinsma, P.E.
Applied Pavement Technology, Inc.



James E. Bruinsma, P.E.

Principal Investigator

- Senior Engineer, Applied Pavement Technology, Inc.
 - Airfield pavement evaluation, design, management, and research
- Co-Authors:
 - Applied Pavement Technology – Kelly Smith, David Peshkin
 - VHB – Lauren Ballou, Bethany Eisenberg, Carol Lurie, Mark Costa, Cambria Ung
 - Washington State University – Somayeh Nassiri, Xianming Shi, Liv Haselbach (Lamar University)



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ACRP Report 178

Oversight Panel

Thomas F. Mahoney, Massachusetts Department of
Transportation, Aeronautics Division (Chair)

Alexander K. Bernier, Stantec

Kane Carpenter, Austin-Bergstrom International Airport

Mark Day, Blue Grass Airport

Meghan E. Kelly, Port Authority of New York and New Jersey

Xue Li, AECOM

Doug Johnson, FAA Liaison

Kent R. Hansen, Industry Liaison

Frederick Hejl, TRB Liaison

Theresia Schatz, ACRP Program Officer

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ACRP Report 178: *Guidance for Usage of Permeable Pavements at Airports*

- Identifies and documents use of permeable pavements at public-use airports
- Discusses potential installation locations for both airside and landside applications
- Identifies environmental, operational, and economic considerations
- Discusses design, materials, and construction considerations
- Identifies maintenance and operations considerations
- Published July 2017

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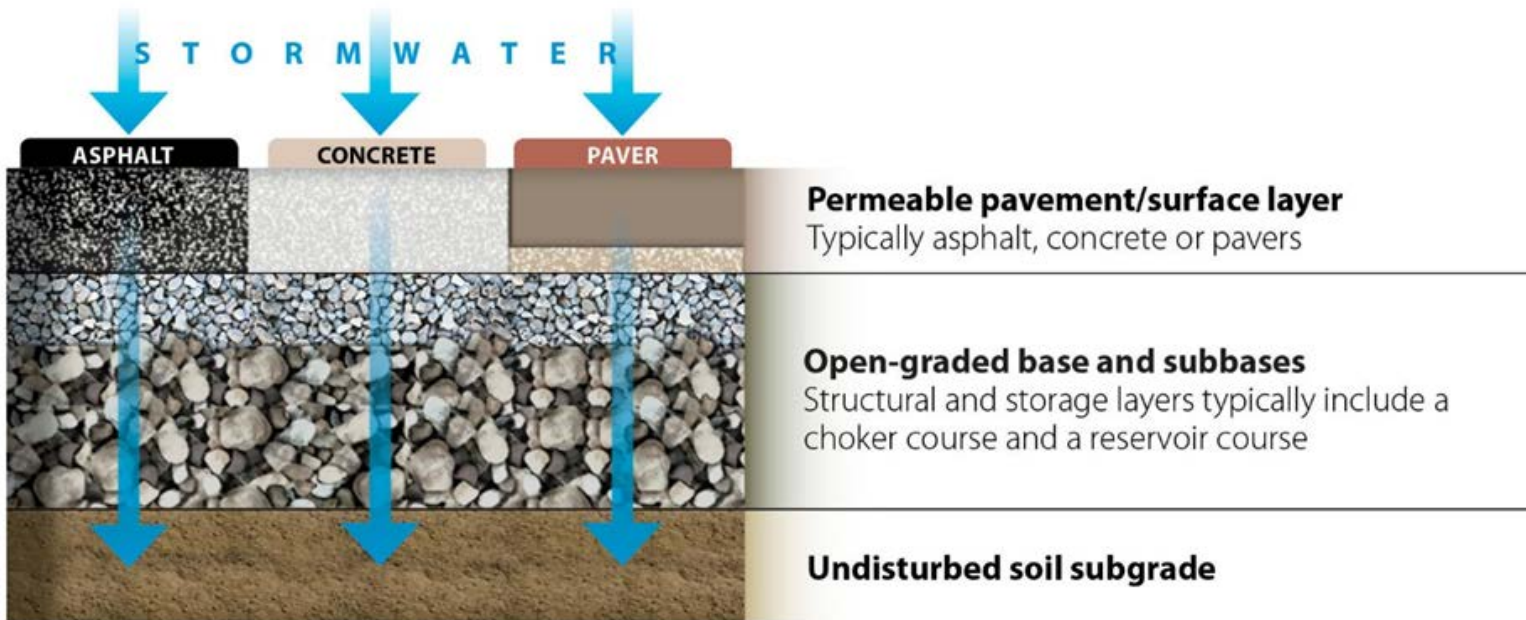
Project Background: The Challenge

- Millions of square yards of impervious pavement at airports
 - Pavements traditionally designed to keep moisture out of structure
 - Surface drainage/runoff
- Clean Water Act, NPDES, and changing stormwater management requirements at local levels coupled with limited property (and funding) availability
 - Looking for low-impact design alternatives

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Permeable Pavement



Source: © VHB

- Porous asphalt
- Pervious concrete
- Permeable interlocking concrete pavers
- Grids

FAA Perspective

- No currently accepted design procedure
- No currently approved materials specifications
- Therefore, no direct funding mechanism
- Intend to conduct testing at NAPTF before considering the use of permeable pavements under aircraft loadings

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Project Approach

Data collection

- Literature review
- Industry survey

Prepare case studies

- Document collection
- Telephone interviews
- Site visit

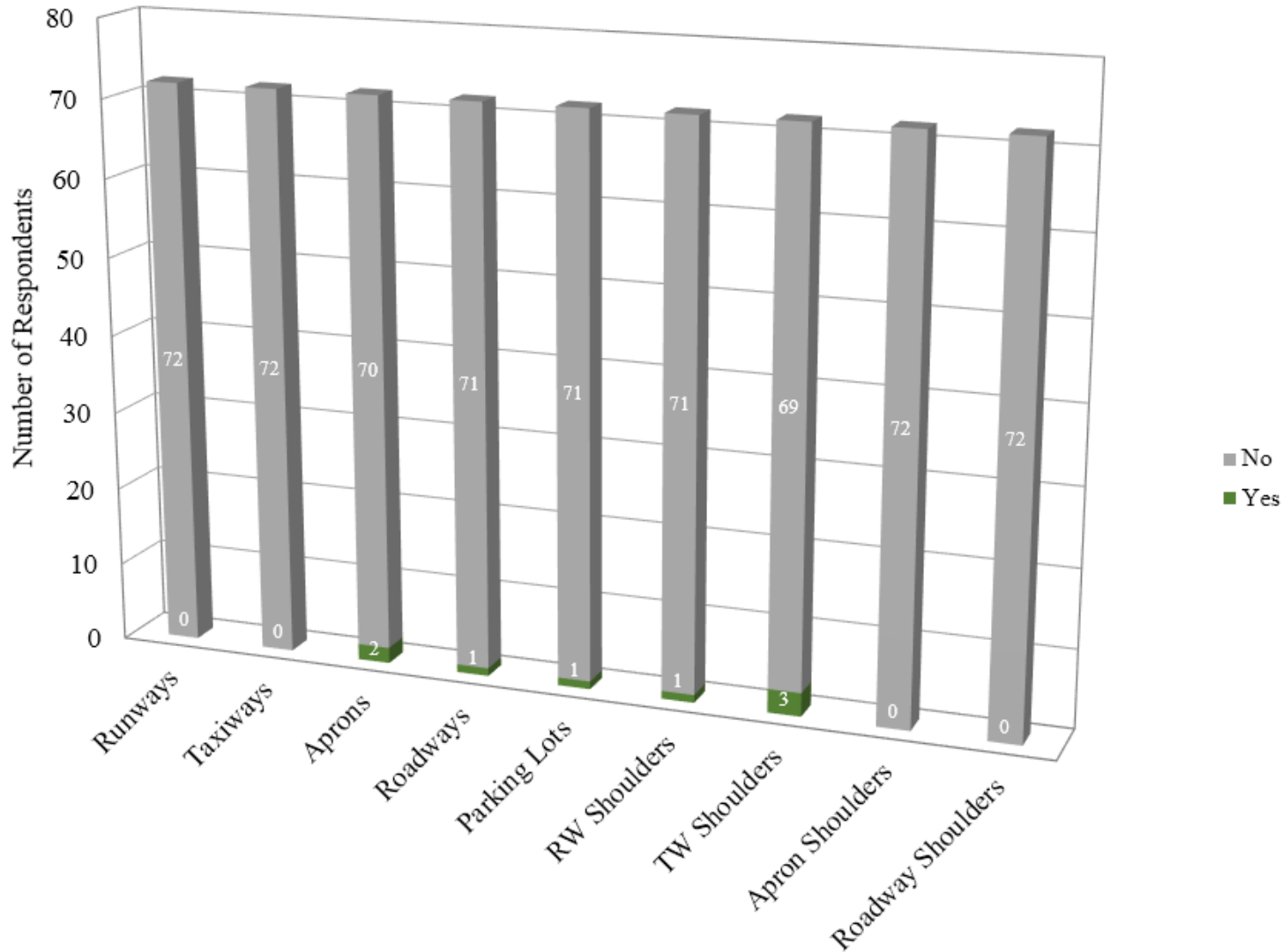
Develop *Guidance* document

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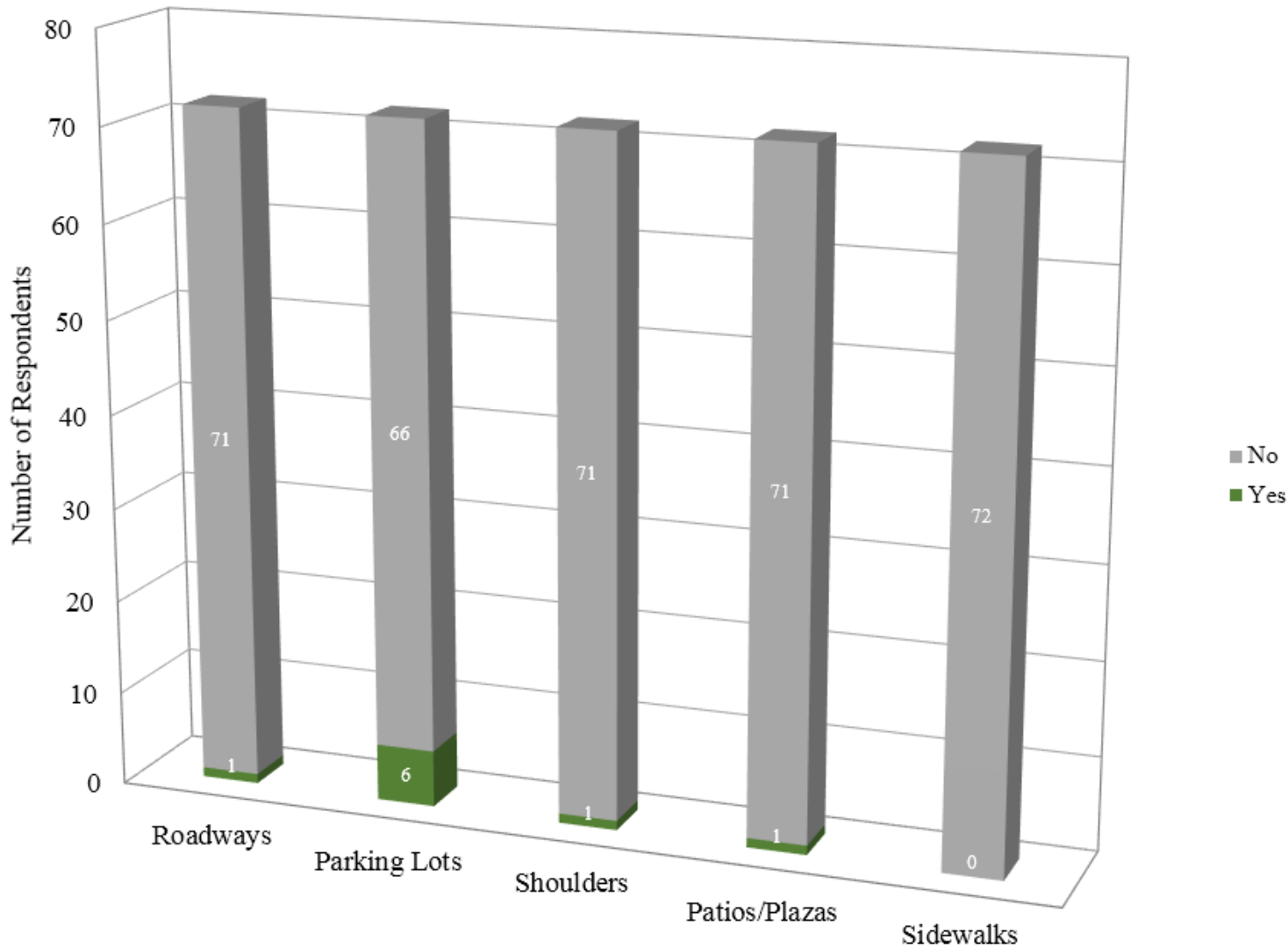
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Implementation – Airside



Implementation – Landside



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ACRP Case Study Projects

Culpeper Regional Airport

- Executive/T-hangar Apron

Paine Field

- Future of Flight Aviation Center (FFAC) Apron

Richmond International Airport

- Taxiway Shoulders

Paine Field

- 30th West Avenue

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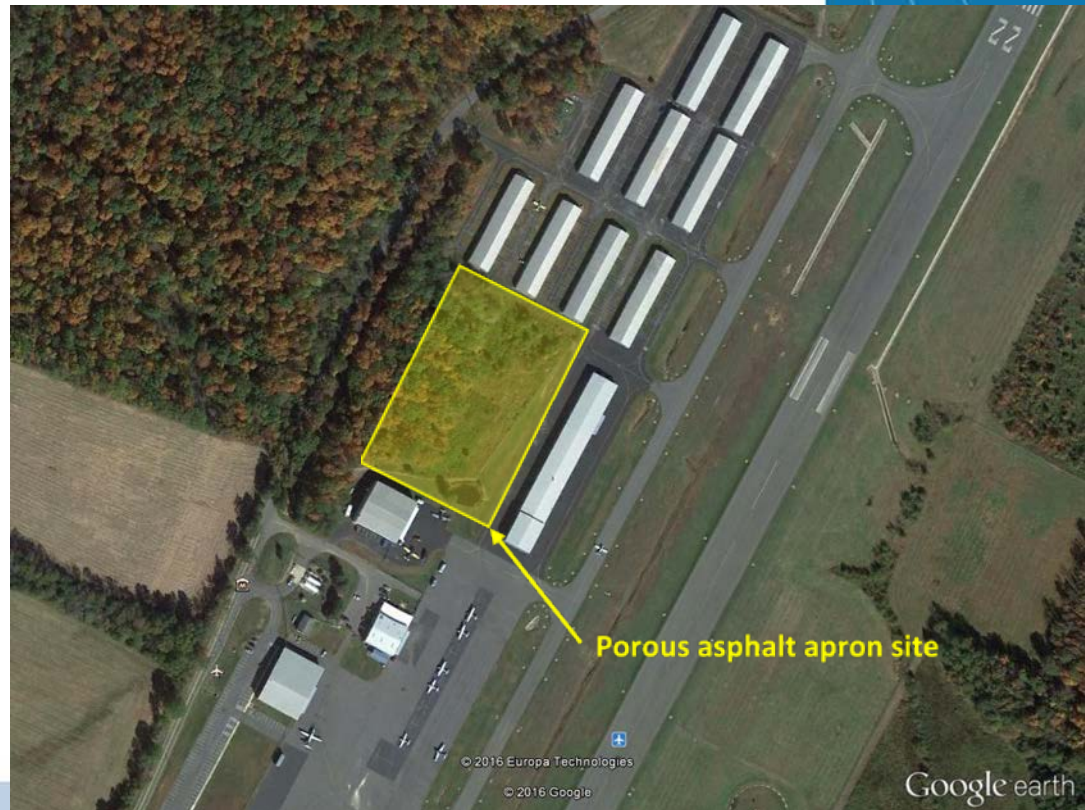
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Culpeper Regional Airport

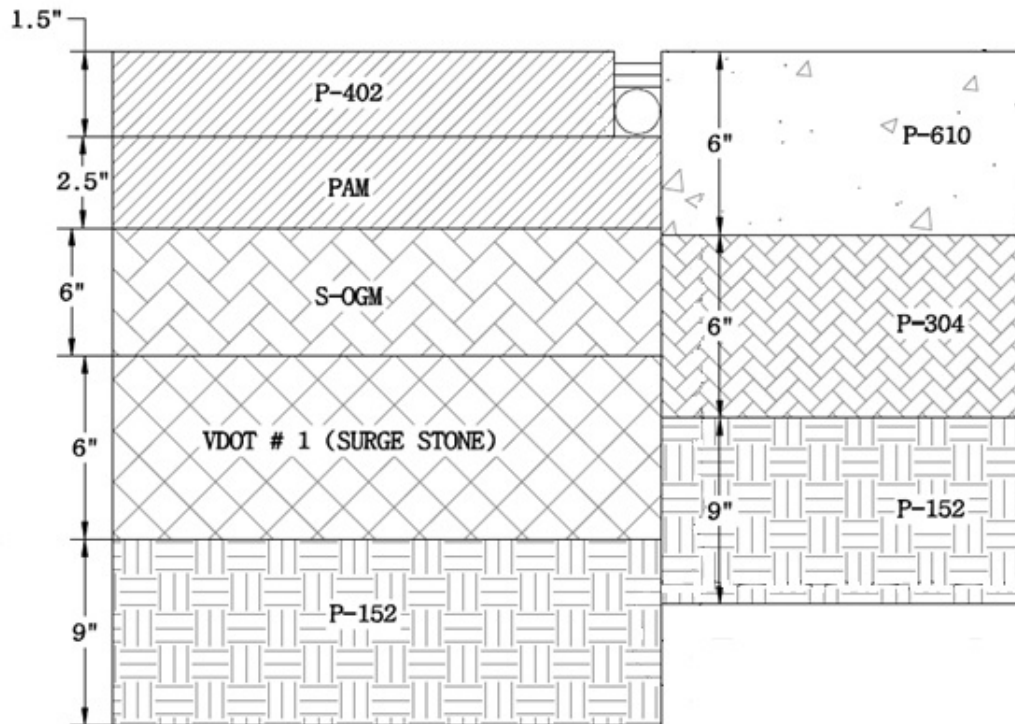
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- Apron/hangar expansion project
- Porous asphalt surface
- General aviation traffic
- 2016 construction



Culpeper – Pavement Section



Courtesy Campbell & Paris

Culpeper – Construction

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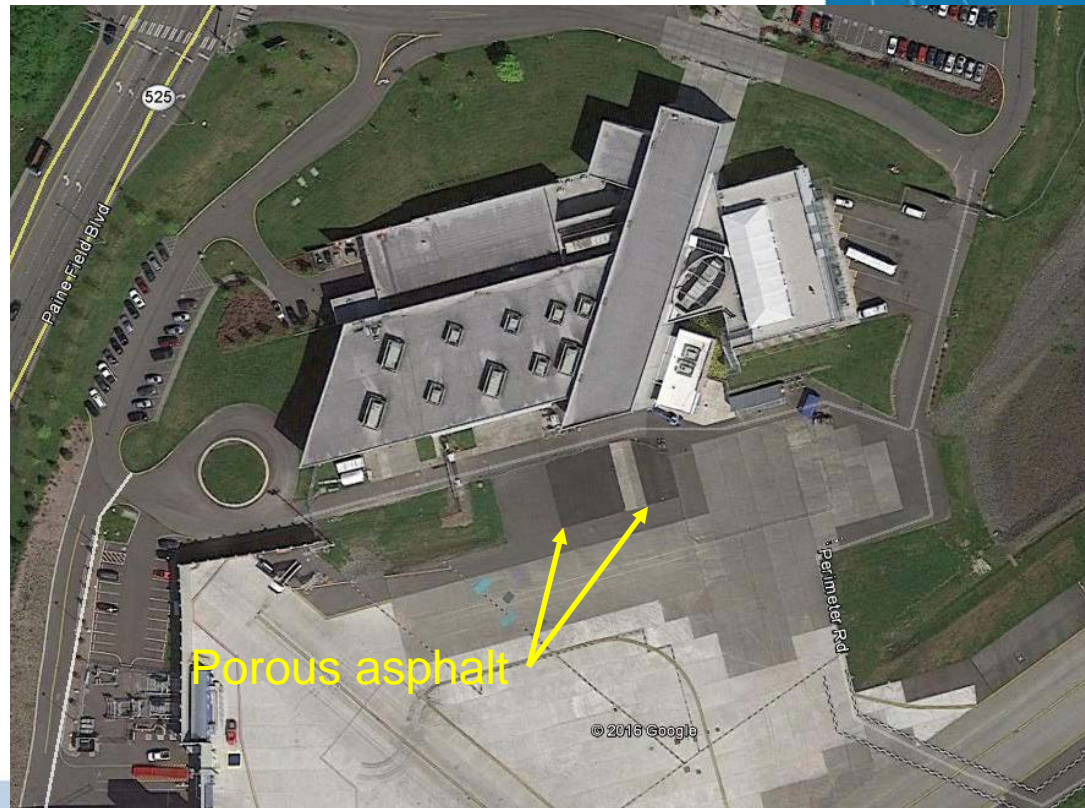


Paine Field – FFAC Apron

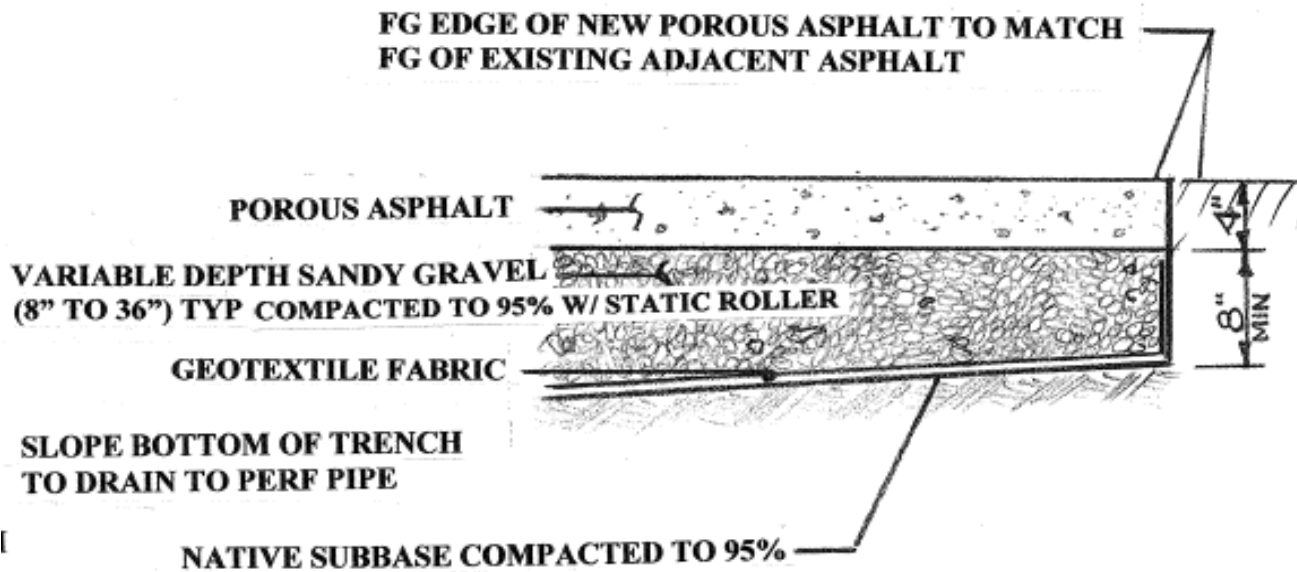
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- Apron in-fill
- Porous asphalt
- Industrial airport – commercial traffic*
- 2011 construction



Paine Field – Pavement Section



Courtesy Paine Field

Paine Field – Performance

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Courtesy Greg Duncan



Richmond International Airport – Taxiway Shoulders

- Constructed in 1995-1996
- Porous asphalt surface
 - ¾ to 1 inch P-402
 - 9 inches cement-treated open-graded material
 - 7 inches open-graded aggregate
- No maintenance (20 years) and still drains



Courtesy Campbell & Paris

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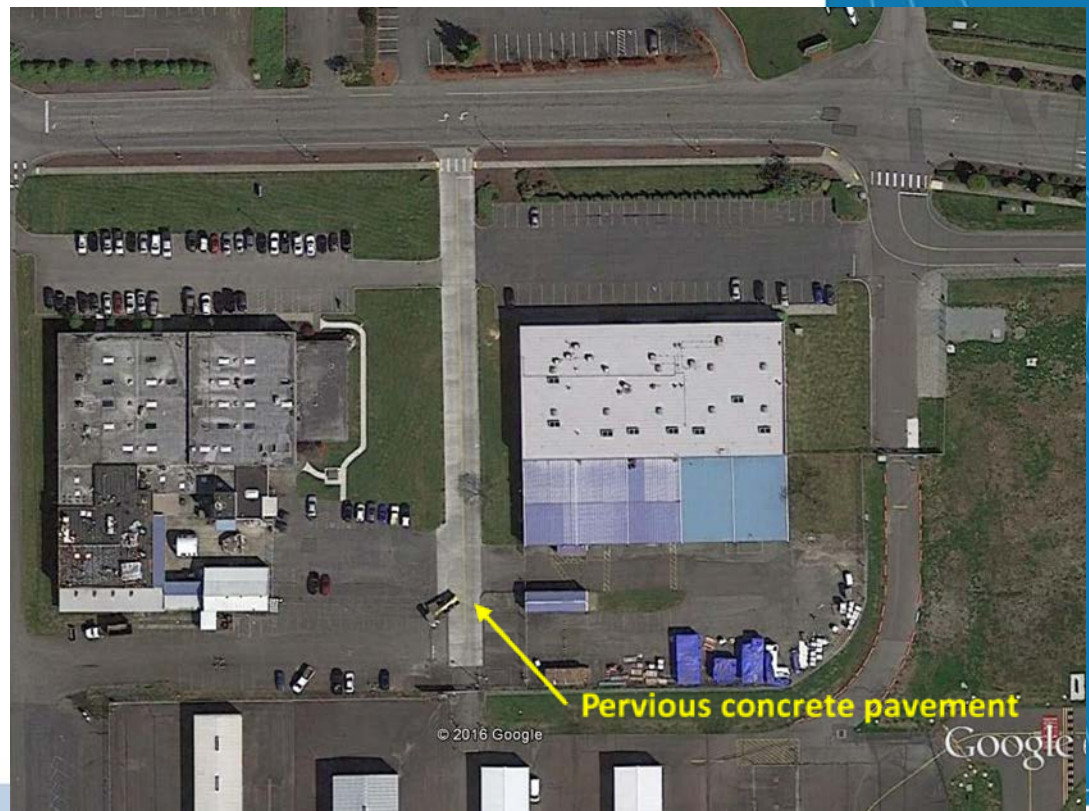
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Paine Field - Roadway

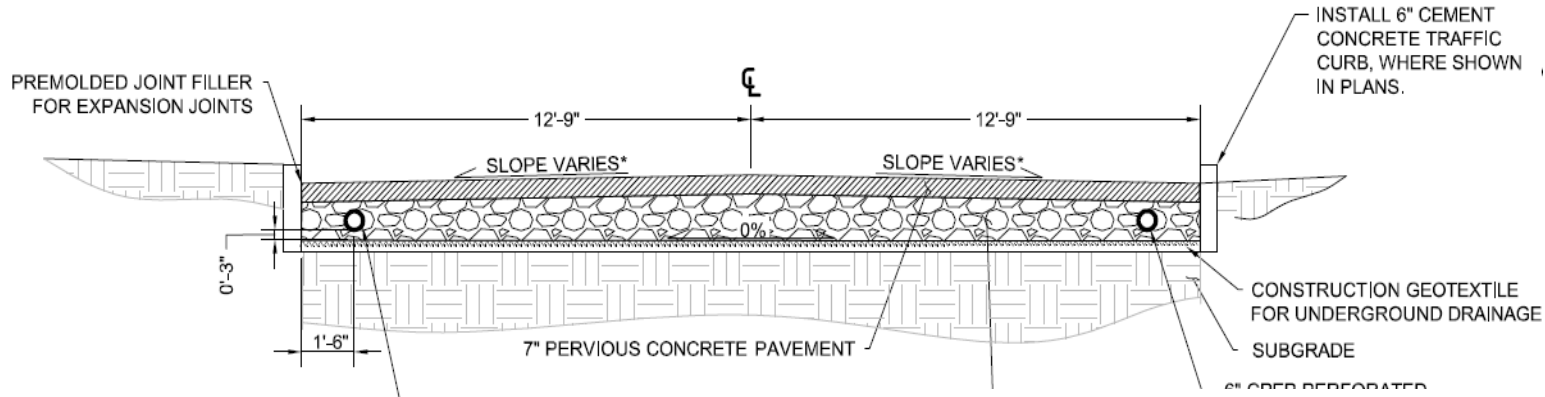
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- Entrance road to Central Ramp and adjacent buildings
- Pervious concrete
- Medium truck traffic
- 2013 construction

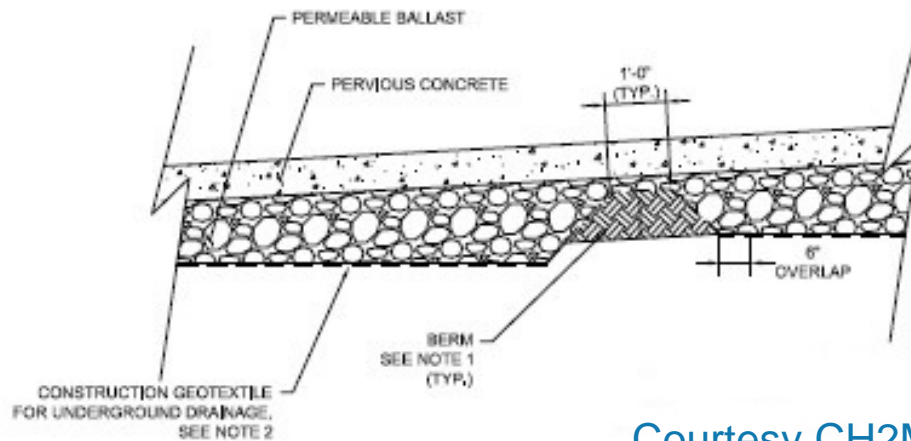


Paine Field – Pavement Section



* SLOPE VARIES, THE FOLLOWING ARE GUIDELINES; COORDINATE FOR EXACT SLOPES AND STATIONS:

- STA 10+23± - 11+30± - MATCH EXISTING AT EDGE OF P.
- STA 11+30± - 11+80± - SLOPE = 1%
- STA 11+80± - 13+05± - SLOPE = 2%
- STA 13+05 TO 14+15±5P - MATCH EXISTING AT EDGE (



Courtesy CH2M

Paine Field – Performance



Courtesy CH2M

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Summary of Use at Airports

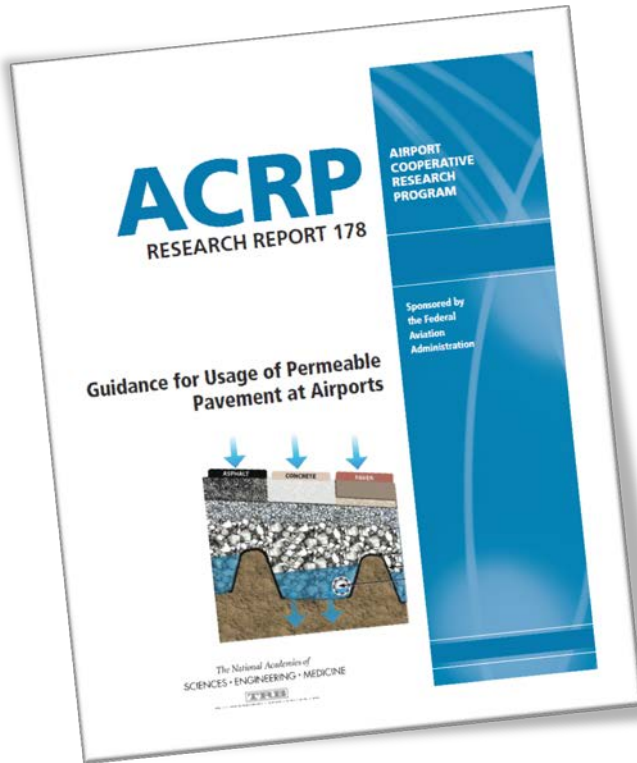
- Permeable pavements have been used for airside applications (although few) as well as landside
- Current airside projects have been funded using alternative funding sources (non-FAA funds)
- Designed using FAARFIELD (and previously LEDFAA) and AASHTO 1993, but inputs suitable for aircraft loadings need to be validated as well as the performance models
- Materials specification/selection is critical to performance, as it is for conventional pavements
- Maintenance (vacuum sweeping) appears to maintain long-term permeability
- Use of tenant agreement clauses to minimize risk of spills

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For additional information:



ACRP Report 178

Guidance for the Usage of Permeable Pavement at Airports

- Jim Bruinsma
 - jbruinsma@appliedpavement.com

<http://www.trb.org/ACRP/Blurbs/176396.aspx>

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Today's Participants

- Thomas Mahoney, *Massachusetts Department of Transportation*, thomas.mahoney@state.ma.us
- Jeff Borowiec, *Texas A&M Transportation Institute*, J-Borowiec@TAMU.EDU
- Tom Freeman, *Texas A&M Transportation Institute*, T-Freeman@TAMU.EDU
- James Bruinsma, *Applied Pavement Technology, Inc.*, jbruinsma@appliedpavement.com



Panelists Presentations

<http://onlinepubs.trb.org/onlinepubs/webinars/180228.pdf>

After the webinar, you will receive a follow-up email containing a link to the recording

Get Involved in ACRP

- Submit a research idea to ACRP.
- Volunteer to participate on a project panel.
- Prepare a proposal to conduct research.
- Get involved in TRB's Aviation Group of committees.
- Take part in the Champion or Ambassador Programs.

For more information:

<http://www.trb.org/acrp/acrp.aspx>