

# Asphalt Pavement Resiliency

64<sup>th</sup> New Jersey Asphalt Pavement Association  
2021 Virtual Annual Conference



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- What is resilience?
- Why the interest in pavement resiliency?
- Case studies
- What advantages do asphalt pavements have?
- What's next?

# What is a resiliency (for pavements)?

- Resilient infrastructure (not just pavements)
- The need for resilient pavements is largely based on the desire to reduce the costs and disruption caused by extreme weather events and natural disasters
- “According to the GAO, federal appropriations for disaster relief between 2007 and 2013 increased 46 percent relative to the previous six years....total cost of weather disasters \$312 billion in 2017.”
- FHWA is encouraging state DOTs to adopt practices that would improve the resilience of roadways
  - FHWA guidance document coming out in spring/summer 2021

- Why the interest in resilience?
  - Resiliency is a concept that is a high priority for federal, state, local highway agencies
  - Future transportation appropriation legislation will include requirements for consideration of resiliency in decision making
  - Resilient pavements matter to our customers and other key stakeholder groups
  - Make sure public and designers understand the benefits of asphalt pavements compared to other pavement types

- September 10-11 in Dallas TX sponsored by National Asphalt Pavement Association (NAPA)
- Attendees were agency, industry and academia
- Moderated by Dr. Benjamin Bowers, Auburn University
  - Dr. Bowers authoring a report on this topic
- The goal of the workshop was to:
  - discuss and define resilience at it relates to asphalt pavements
  - Look at several case studies
  - Get feedback from the group

- FHWA Definition

“...the ability **anticipate**, **prepare for** and **adapt** to changing conditions and to **withstand**, **respond to** and **recover** rapidly from disruptions”

- AASHTO Definition

“...the ability to **prepare** and **plan for**, **absorb**, **recover from** or more successfully **adapt** to adverse events.”

Feedback from the group with respect to asphalt pavements

Prepare and Adapt	Withstand and Recover
Perpetual Pavement Design	Fast construction
Adaptable materials for climate extremes	Open to traffic almost immediately
Porous asphalt systems	Resilient designs used to protect critical corridors
Resilient adaptation can be built into long term maintenance schedules	Recyclable (e.g. crushing and reusing old, failed roadways)

- Three case studies will be presented:
  - Iowa flooding (emergency road repair after natural disaster)
  - Alaska earthquake (emergency road repair after natural disaster)
  - Delaware road inundation (evaluating roadways impacted by rising sea levels, decisions on repairs, abandonment, resilient design)
- What are lessons learned?



# **Iowa Flooding March and May 2019**

# Case Study #1 – Iowa Flooding

- Presented by Bill Rosener of the Asphalt Association of Iowa
- Severe flooding of Missouri River
  - First flood event in March 2019
  - A second flood event in May 2019
- Caused by rapid snowmelt and heavy rainfall
- Second 500-year flood in 10 years





# Aftermath of Iowa Flooding





# Response – Iowa Flooding

Status	Flood 1 (Dates)	Flood 2 (Dates)
Closed	3/14/2019	5/31/2019
Water Receded	3/27/2019 (debris cleared for testing)	6/10/2019
Contractor Mobilized	3/30/2019	6/10/2019
Open	4/2/2019	6/12/2019

- Accelerated contracting was critical to complete the job
- Contractor worked around the clock to complete large projects in two days
- Great example of using innovative contracting and asphalt pavement speed of construction

Credit: Bill Rosener, ACAI

- Iowa Flooding – March and May/June 2019
  - Strong relationship between Iowa DOT and asphalt paving contractors a key to success.

Iowa Engineer Dr. Scott Schram:

“You spend all those years building relationships with contractors, and when there is an emergency – they answer their phone when you need help. Even when you call them on a Friday afternoon. They bring their expertise to the problems.”

- Iowa Flooding – Emergency Road Repair
- Lesson Learned: Have a plan in place for rapid response to repair damaged infrastructure
  - Communicate with industry before the unexpected happens
  - Anticipate problem areas and have a plan in place
  - Accelerated contracting system
  - Select asphalt pavements for rapid emergency road repair

# **Anchorage Alaska Earthquake November 2018**



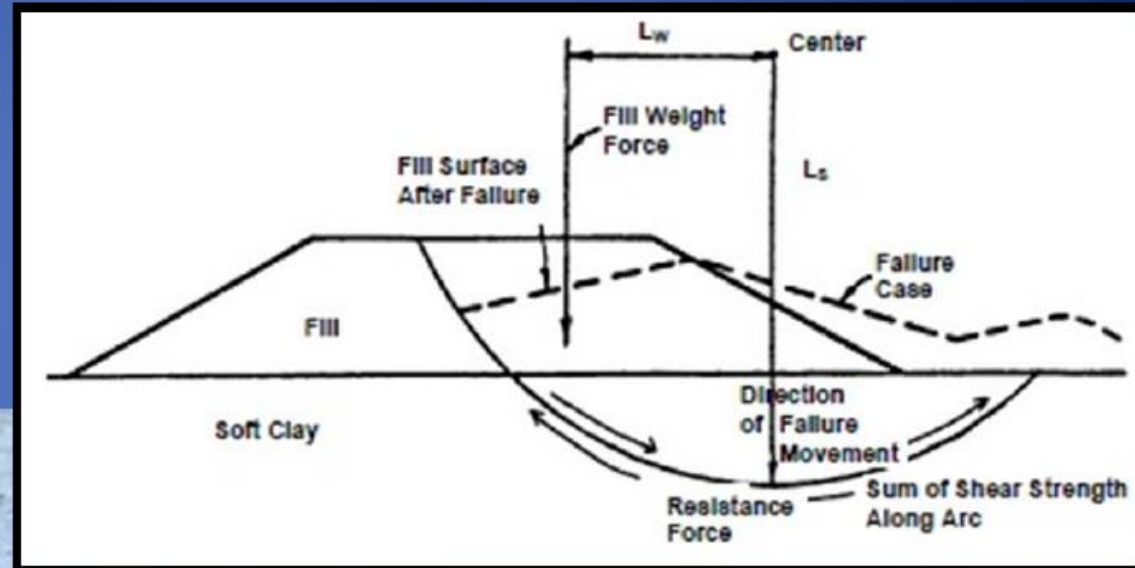
# Anchorage Alaska – November 30 2018



7.0 Earthquake – 8:29 am

# Damage Assessment

- 200' Long x 35' Wide x 12' Deep
- Rotational Slope Failure









01:03:37 PM, 2018-12-01





# Slope Stabilization

05:07:52 PM, 2018-12-02



08:17:54 PM, 2018-12-03





# Final Compaction

09:16:34 PM, 2018-12-03



**7.0 EARTHQUAKE IN ALASKA. WE WILL  
REBUILD!!**



**72 HOURS LATER...AAAAND  
DONE**

DOWNLOAD MEME GENERATOR FROM [HTTP://MEMECRUNCH.COM](http://MEMECRUNCH.COM)



- Alaska Earthquake – Emergency Road Repair
- Lesson Learned: Have a plan in place for rapid response to repair damaged infrastructure
  - Accelerated contracting system
  - Select asphalt pavements for rapid emergency road repair
  - Although not ideal, emergency repair with temporary asphalt pavements possible in sub-freezing temperature
  - Emergency repair might need later permanent repair
  - Correct design flaw – ensure drainage system does not allow for standing water at the toe of the embankment

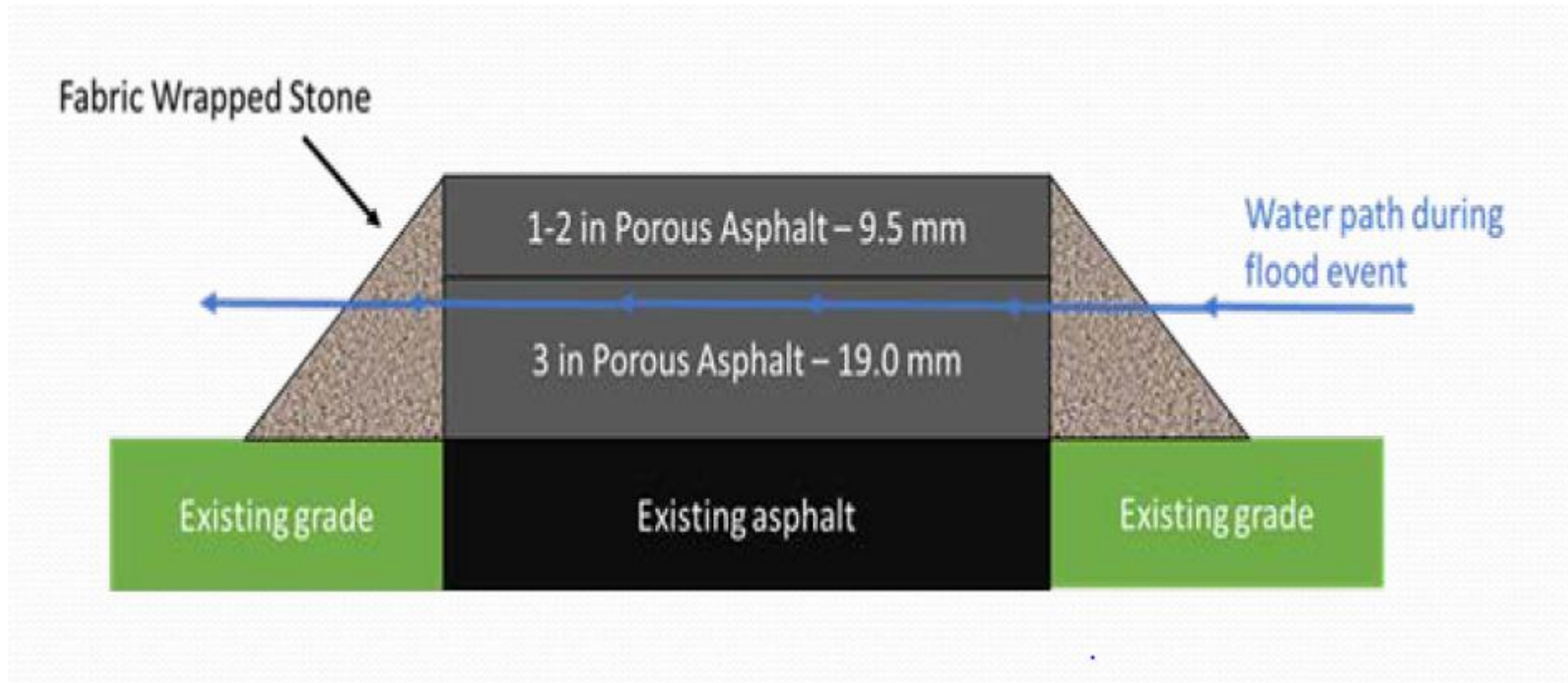
# **Delaware Pavement Inundation 2021**

# Pavement Inundation - Delaware

- In coastal areas, DelDOT dealing with daily inundation of pavements due to sea level rise (and sinking roads)



## South Bowers Road – Possible Pavement Section





# Erosion after weather event - Delaware

- DelDOT decided to “harden” the roadway
  - Re-build protective dunes and stabilize the underlying subgrade





# “Hardened” Roadway – Finished Product



- Delaware inundated roadways – Anticipate, prepare for and adapt
- Lesson Learned: How to respond to inundated roadways
  - Recognize the problem
  - Assess options – do nothing, elevate, harden, abandon
  - Build resilient asphalt pavement by using porous asphalt pavement technology

Post in Q & A:  
Any case studies of resiliency  
in New Jersey?



- What advantages does asphalt pavement have?
  - Speed of Construction
    - Many examples of rapid recovery from damaged pavements
  - Easily increase structural capacity
    - Increased thickness needed when subgrade inundated
    - Increased thickness needed with increased loading during disaster
    - Maintenance overlay
  - Porous asphalt pavements
    - Both surface and subgrade permeable layers are proven to quickly drain water
  - **Asphalt pavement is the sustainable and most resilient pavement type**

- What's Next?
  - Publication of NAPA report on resiliency
  - Publication of FHWA Pavement Resiliency Guide
    - “FHWA Pavement Resiliency Guidebook”
  - Expect to hear more about this topic in the future
    - High priority with FHWA and legislators
    - Therefore, will be high priority for state DOTs

# 2021 Asphalt Institute Members





# Thank you!

