MaineDOT Porous Pavement Projects

Maine Mall Road, Portland Maine 2009

International Marine Terminal, Portland Maine 2016

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Pavement Quality / Design MaineDOT

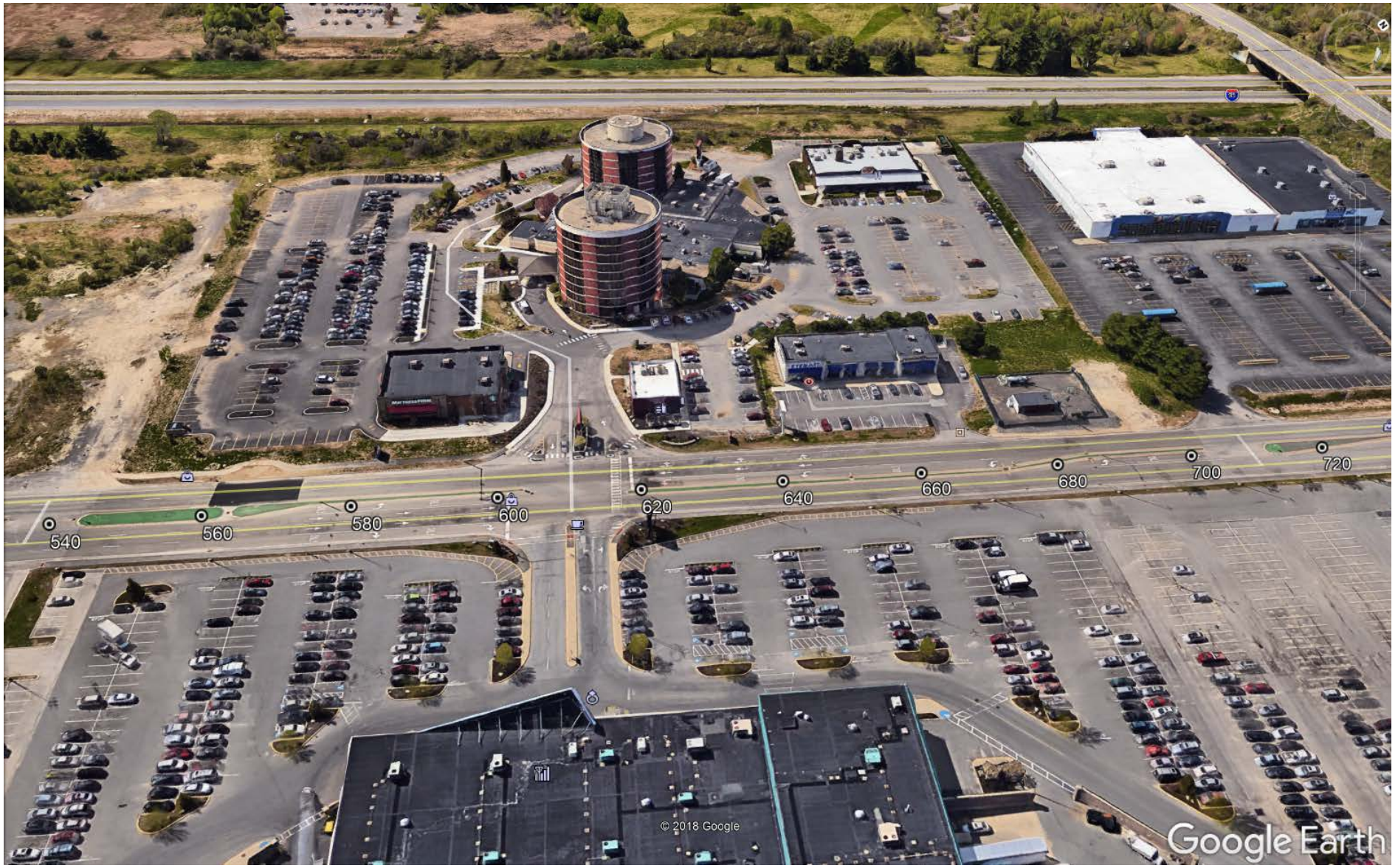
June 5th, 2019

Project Information

- Maine Mall Road in Portland, ME
  - Urban location
  - Mixed commuter and commercial traffic

2009 data

- Design AADT: 16,750 vehicles/day
- Design ESALs: 3,277,700 (20 years)
- Design Hourly Volume: 2412 vehicles
- Percent Heavy Trucks: 5%


540
560
580
600
620
640
660
680
700
720
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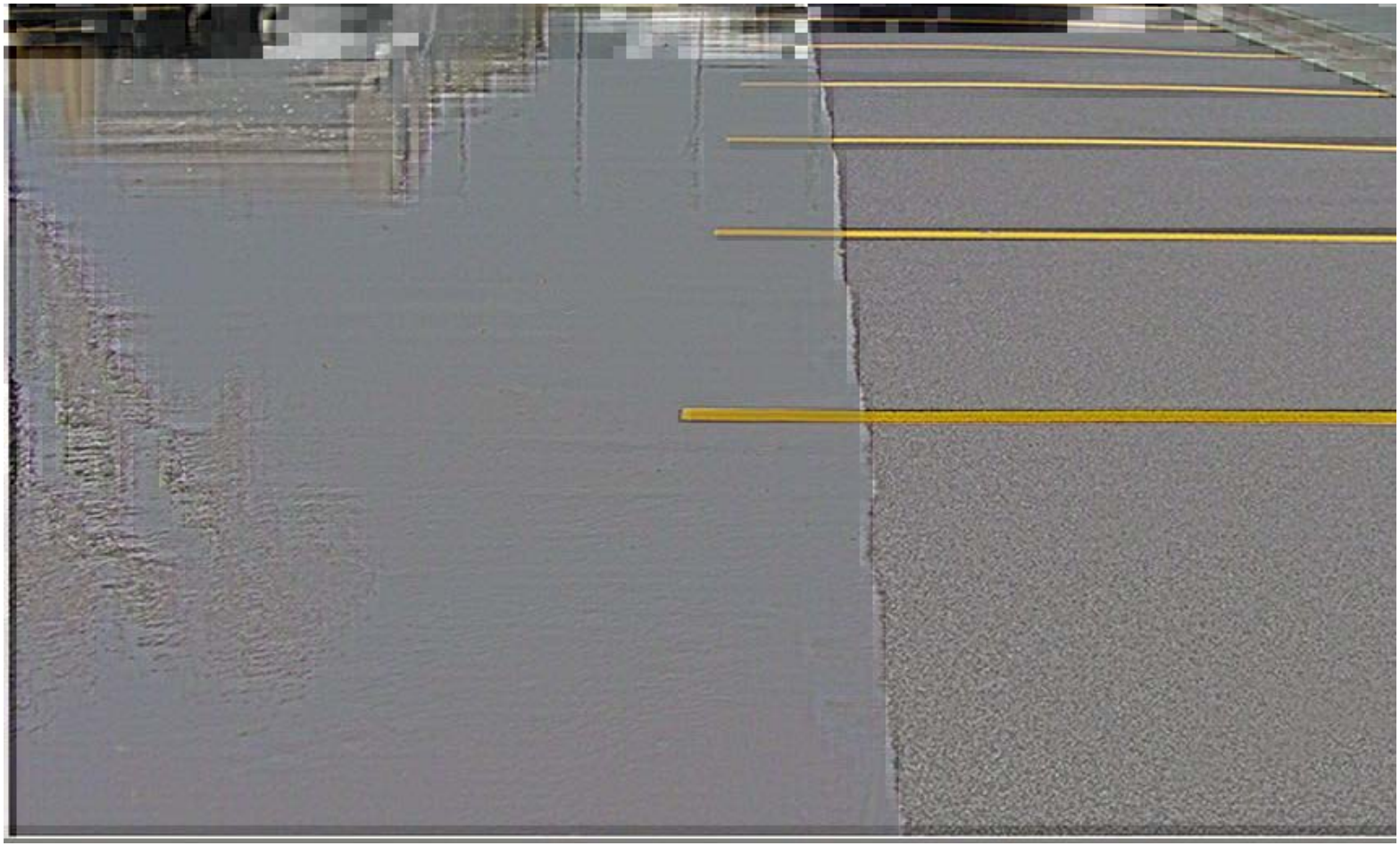
Google Earth

- Total watershed is 2200 acres; 640 acres (28 percent) is impervious
- All landowners with more than 1 acre of impervious surfaces - roofs, parking lots, roads - are regulated



What is Permeable/Porous Asphalt Pavement?

- Allows water to drain **through** the pavement structure into a stone bed and infiltrate into the soils below

Why?

Provide storm-water management systems that promote infiltration, improve water quality, and may eliminate need for detention basins or other drainage structures

Credit to: http://civilogistix.com/permeableporous-asphalt-pavement/

Pavement Section

OGFC

ATPB

Reservoir Stone

Filter Material

3”

6”

15”

6 – 12”

Sand Filter Layer

- Filters pollutants
- Help mitigate water temperature
- Includes 3 longitudinal runs of 6” perforated UD pipe, with laterals every 120’
- Filter material meets gradation for MaineDOT Type B underdrain sand

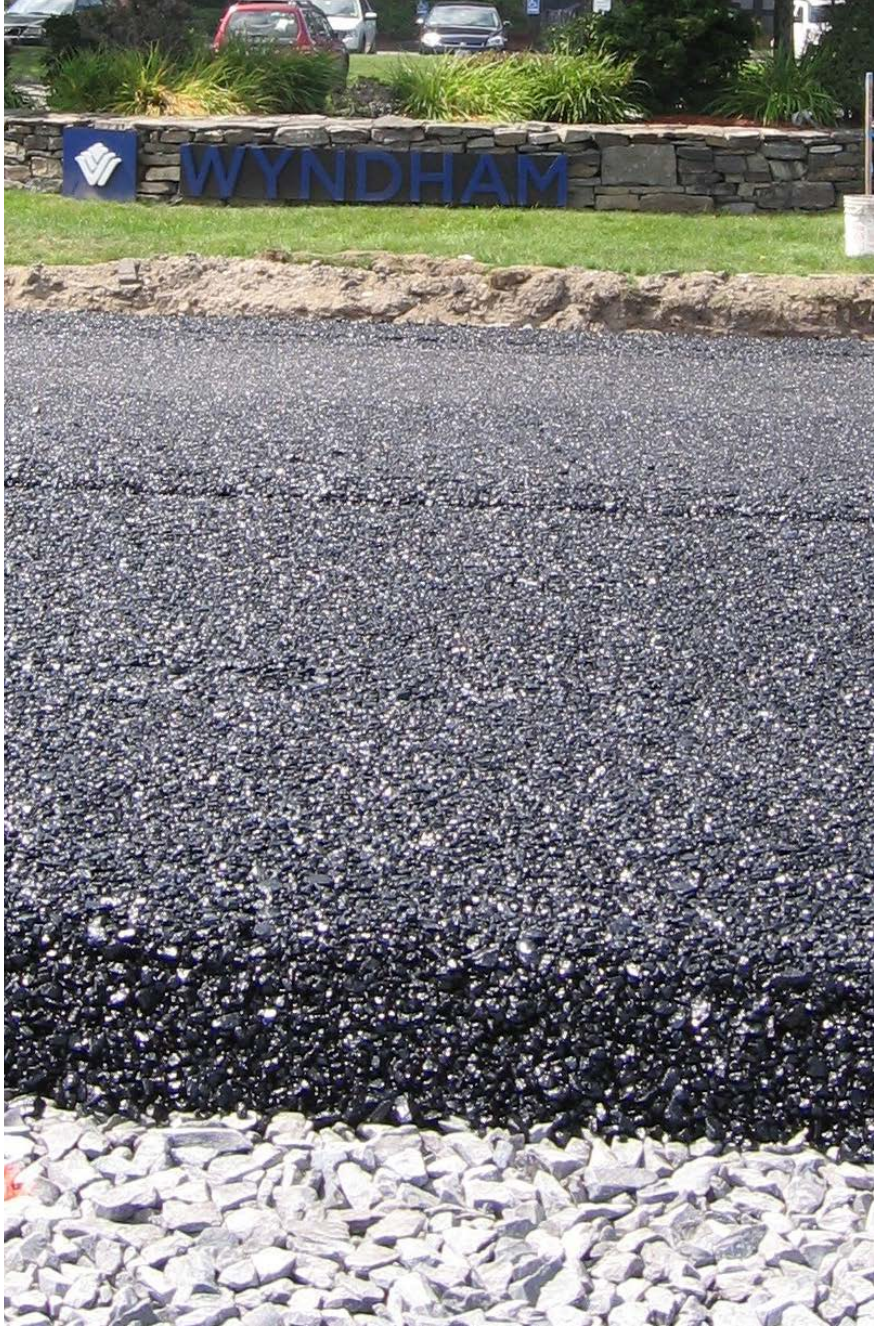
Reservoir Stone Layer

AGGREGATE REQUIREMENTS	
2-1/2”	100
2”	95 – 100
1”	0 - 30
¾”	0 – 5.0
L.A. Abrasion	25.0 max.


Ingersoll Rand

Asphalt Treated Permeable Base

- Binder : PG 76–28 with SBS polymer
- Minimum 2% binder
- 95 percent coated particles (AASHTO T 195)
- 35 gyration design: looking for specimen that will be stable



Asphalt Treated Permeable Base

AGGREGATE QUALITIES	
Micro-Deval	18.0 maximum
% Fractured	85/80
Flat/Elongated	10

JOB MIX FORMULA		
SIEVE SIZE	TARGET	SPEC RANGE
37.5 mm	**100**	100
25 mm	**96**	95 – 100
19 mm	**90**	80 – 95
12.5 mm	**48**	35 – 70
4.75 mm	**6**	2 – 10
2.36 mm	**3**	0 – 5
0.075 mm	**1.3**	0 – 2.0
Binder content	**2.0**	2.0 minimum

ATPB Placement

- ATPB placed at 7.5” and compacted to 6” finished depth
- Placement/production temperatures: 290 – 340^{o}F
- Breakdown rolling temperature at approx. 200 – 210^{o}F
- Mixture needed to “stiffen” enough to support compaction equipment


BW 120 AD-3
64.6108

Open Graded Friction Course

- Binder : PG 76–28 with SBS polymer
  (now a 70E-28)
- Minimum 6.0% binder
- 20.0% Voids @ N_{des}
- 50 gyration design
- 0.3% Cellulose Fibers

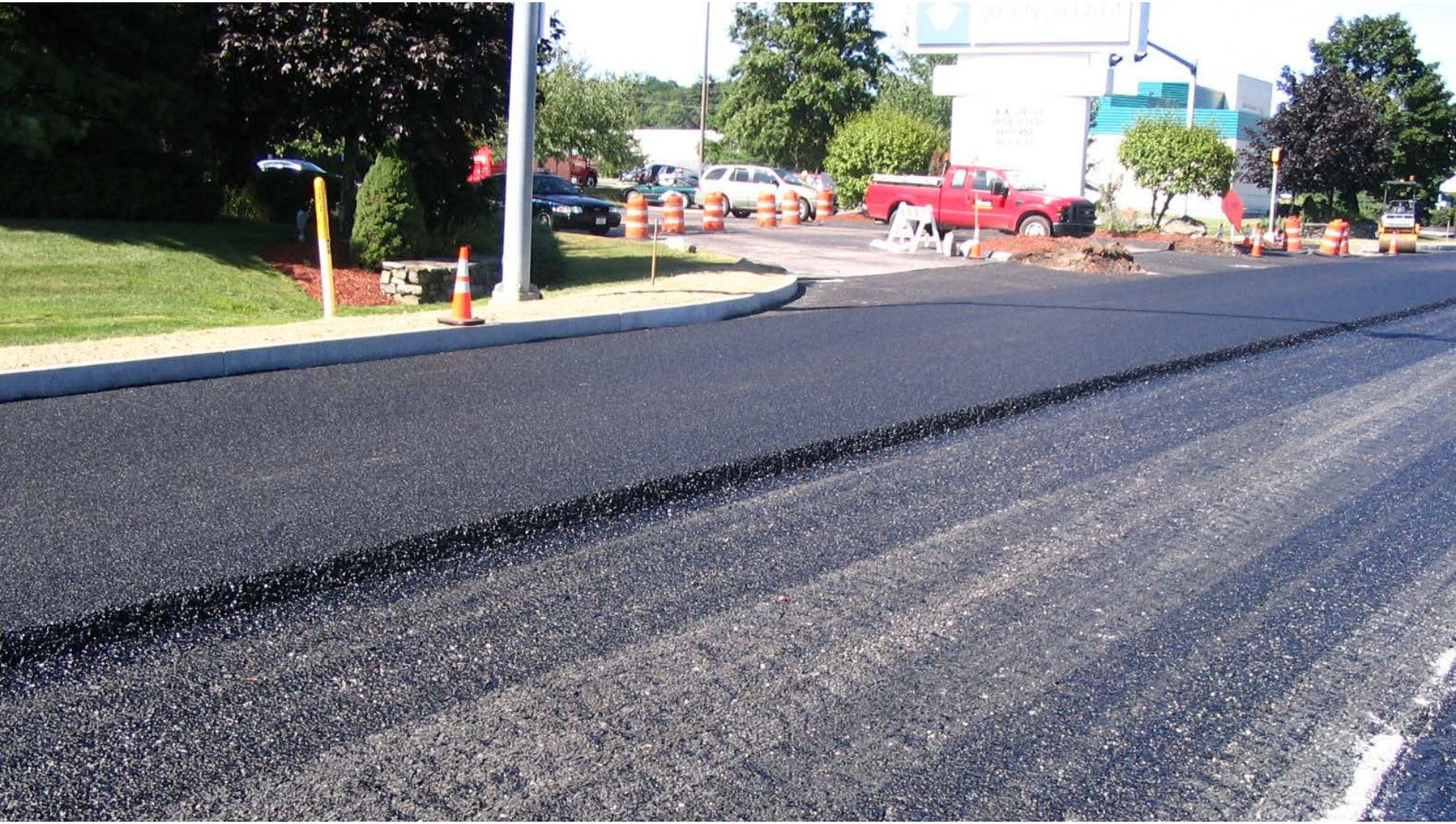
Open Graded Friction Course

AGGREGATE QUALITIES	
Micro-Deval	18.0 maximum
% Fractured	100/90
Flat/Elongated	5 max.
Sand Eq.	50
FAA	45

JOB MIX FORMULA		
SIEVE SIZE	TARGET	SPEC RANGE
19 mm	**100**	100
12.5 mm	**96**	85 - 100
9.5 mm	**65**	55 - 75
4.75 mm	**20**	10 - 25
2.36 mm	**8**	5 - 10
0.075 mm	**2.3**	2.0 – 4.0
Binder content	**6.0**	6.0% minimum

OGFC Placement

- Similar placement temperatures as ATPB
- 12 ton static roller was used as breakdown (approx. 180- 210 deg. F)
- 3-5 ton used as intermediate (approx 140 deg. F)
- 10 ton static finish roller, with 3-5 and 1 ton rollers to iron out any marks left behind



HOW DOES IT LOOK TODAY?

Southbound Direction


THE MAINE MALL
EYEMART
DOUBLETREE


DOUBLE TREE
tru
Hilton
Bracker Barrel
LEFT LANE
MUST
TURN LEFT


CARMAX

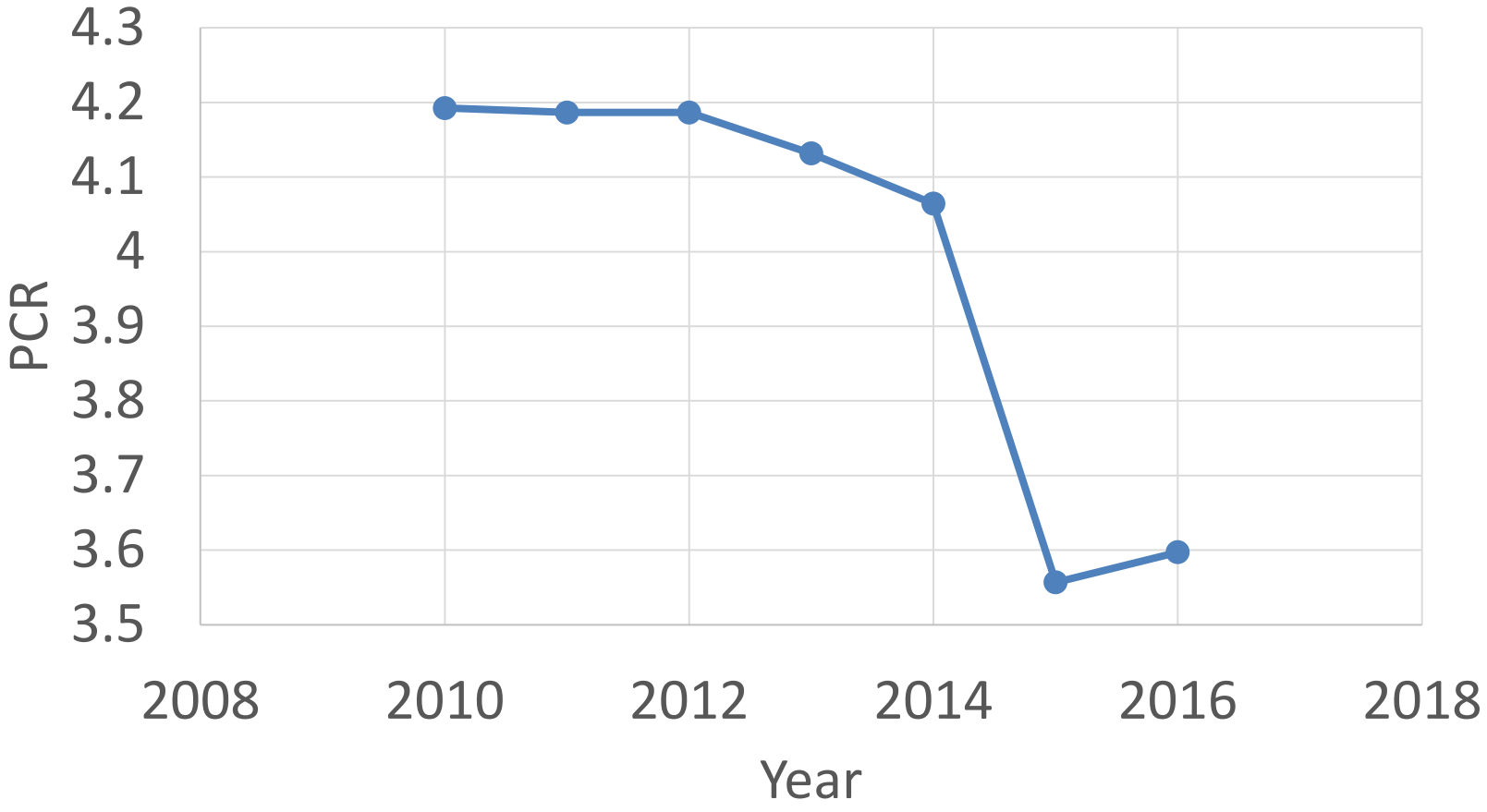
Northbound Direction


CHIPOTLE
MEXICAN GRILL
EYEMART
EYEMART
EYEMART
THE MAINE MALL

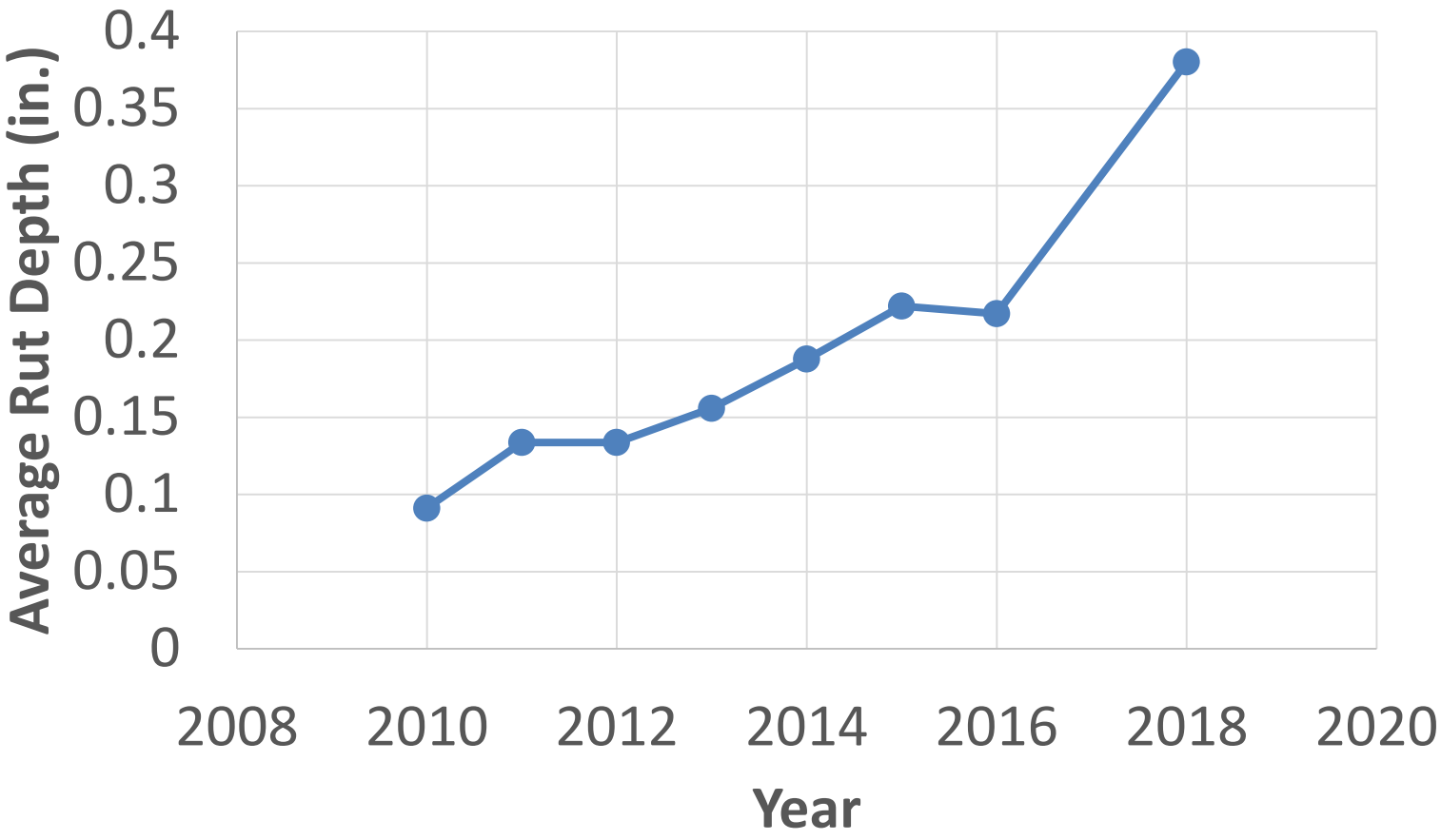

EYEMART
EYEMART
CHIPOTLE
MEXICAN GRILL

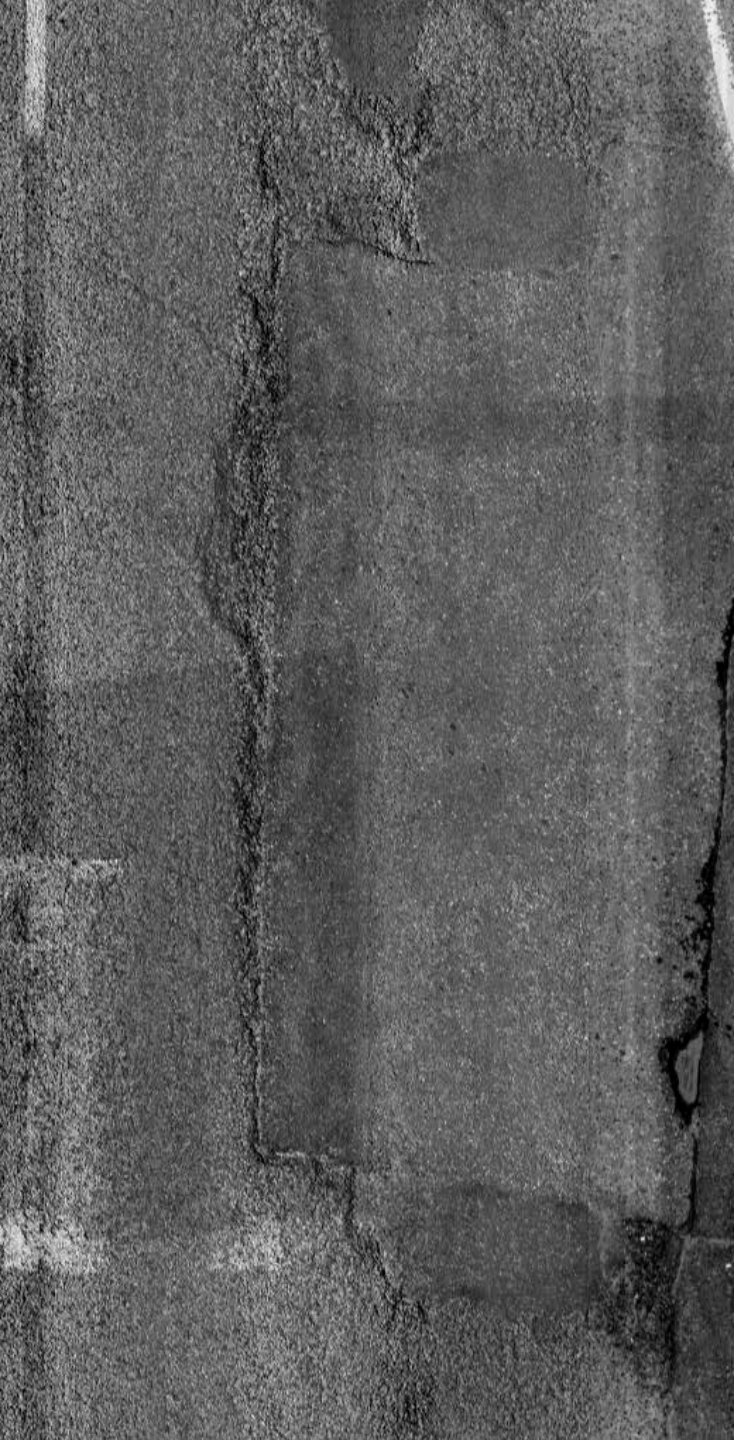

TOYS"R"US
LONGHORN

Pavement Condition Rating



Average Rutting





Observations

- Project holding up well after nine + years of service
- Localized raveling – primarily at construction joints
- Patching around the mall entrance – most likely due to tracking sand / salts onto porous section
- **MaineDOT very satisfied with the performance thus far**


Mattress Firm
STARBUCKS COFFEE

International Marine Terminal

Chassis Yard Paving Project

MaineDOT

MAINE PORT AUTHORITY

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Objective of the expansion of the International Marine Terminal was to increase the use of rail to receive and send containers in and out of the port

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Existing Paved Container Storage Yard

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...and are unloaded with a MI-Jack Reach Stacker onto a chassis...

... then trucked to storage area by yard trucks

Typical chassis

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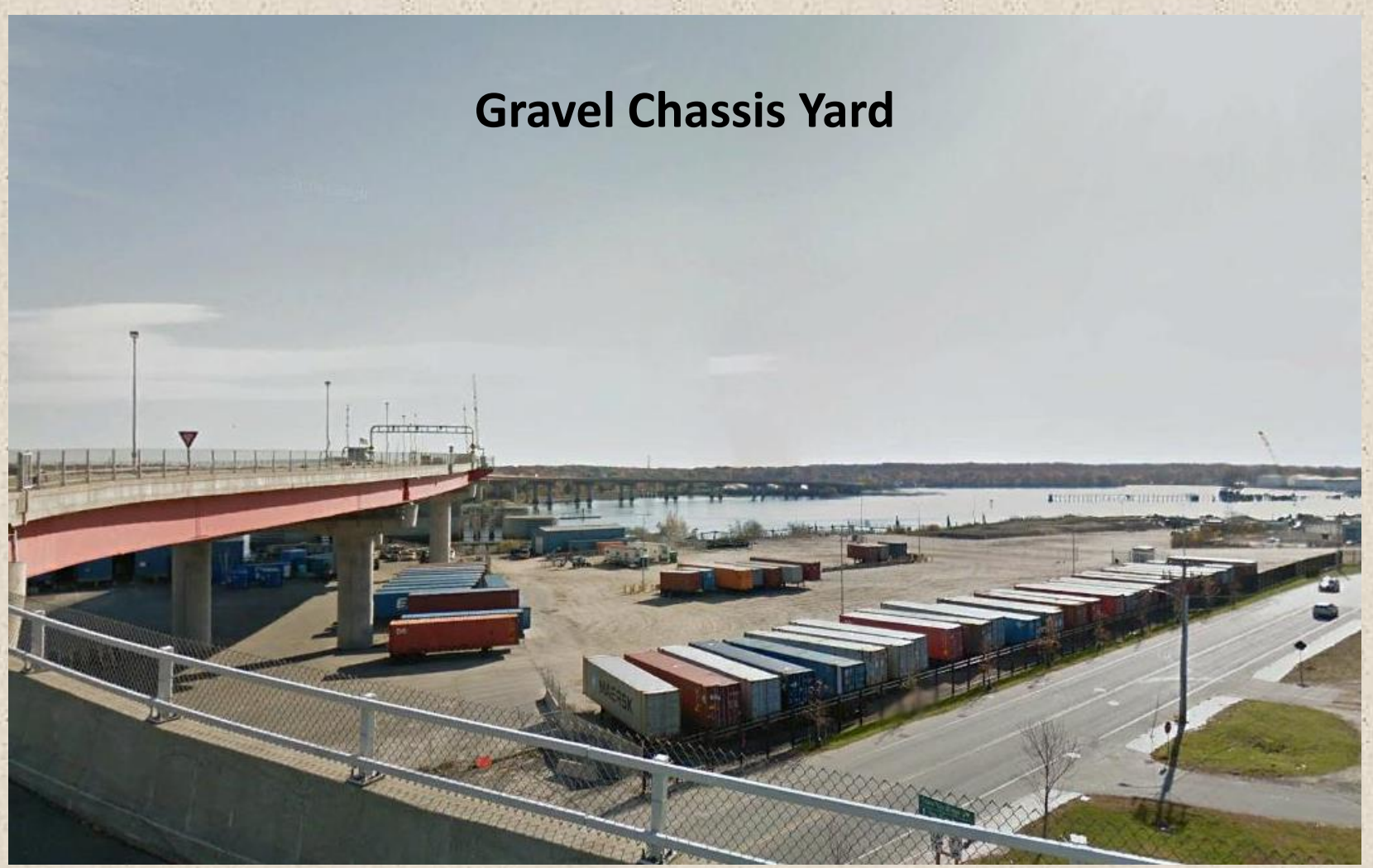
Chassis Yard Paving



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Chassis Yard Paving Project

Original Graveled Surface Design

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Pavement Design

As per the Port Authority, the only heavy vehicles that would be using the chassis yard would be:

- Tractor trailers with loaded containers
- Unloaded container stackers (MI-Jack)

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Chassis Yard Paving Project

Design Vehicle #1

TRACTOR TRAILER

Design Methodology: Structural Number Method

- GVW (tractor and trailer) = 90,000 lbs
- Estimated 65 trucks/day (current)
- 2% truck growth per year for 20 years
- ESAL's provided by MaineDOT Traffic Section

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Chassis Yard Paving Project

Design Vehicle #2

MI-JACK 50 RS REACH STACKER

GVW (with container) = 256,000 lbs

Design Methodology: Asphalt Institute Single Wheel Load Method

- As per IMT = RS would only travel over pavement unloaded
  - GVW (unloaded) = 216,000 lbs
  - Single Wheel Load =59,520 lbs
- Structural Number calculated with this method
  - ESAL's then backcalculated from SN

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ESAL's calculated for both vehicle types were combined for final design

Unloaded MI-JACK ESAL's

TRACTOR TRAILER ESAL's

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Team tasked with developing a few options for a pavement with these requirements:

- Meets the stormwater / infiltration requirements
- Supports Port Authority yard vehicles
- Durable
- Constructible
- Cost effective
- Flexible in vehicle and storage use

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#1 Requirement

To provide a pavement structure that would allow stormwater to infiltrate and filter roadway pollutants before entering into the Casco Bay

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Several options were looked at for this project:

- **All Porous Asphalt Pavement**
- **Porous Asphalt with Roller Compacted Concrete Chassis pads**
- **Interlocking Concrete Pavers**

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Porous Asphalt Pavement

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Porous Asphalt with Concrete Chassis Pads

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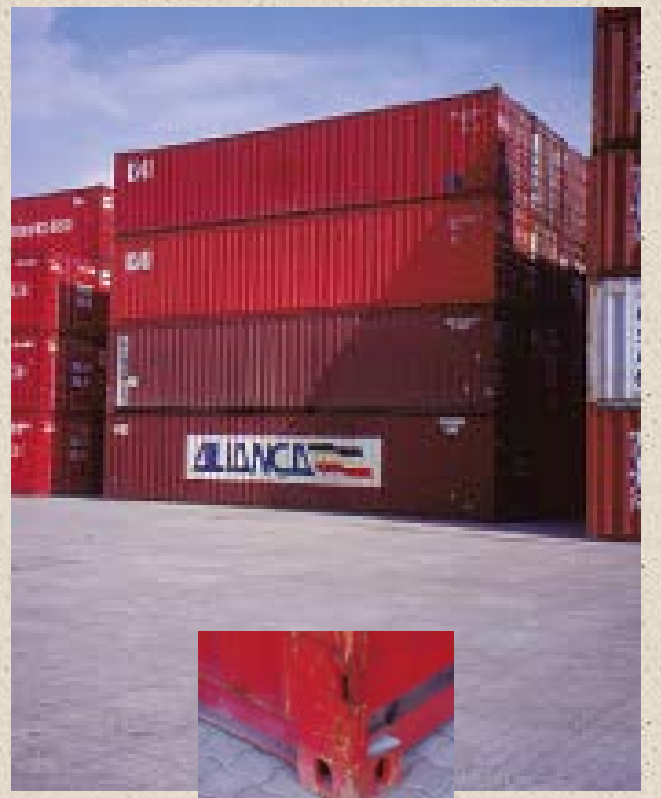
Interlocking Concrete Pavers



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Porous Asphalt Pavement was determined to be the best, most flexible solution for the chassis yard

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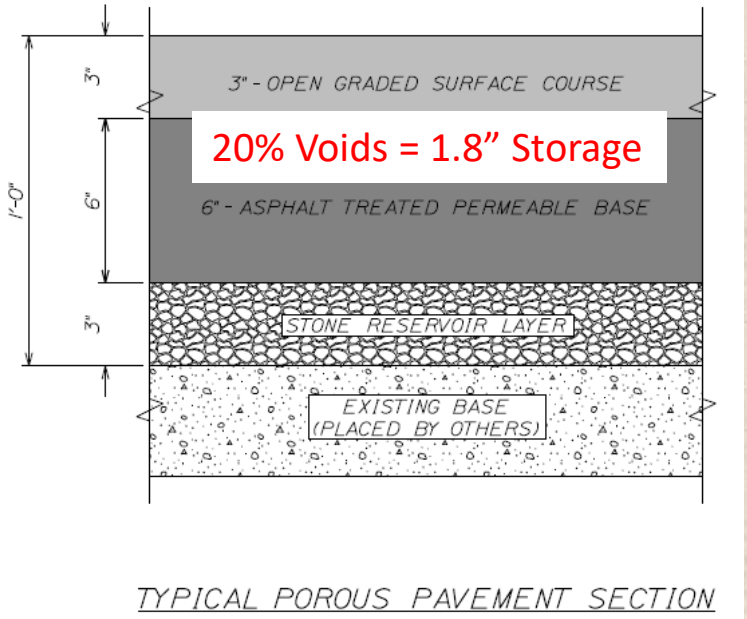
Chassis Yard Paving Project
Final Pavement Design

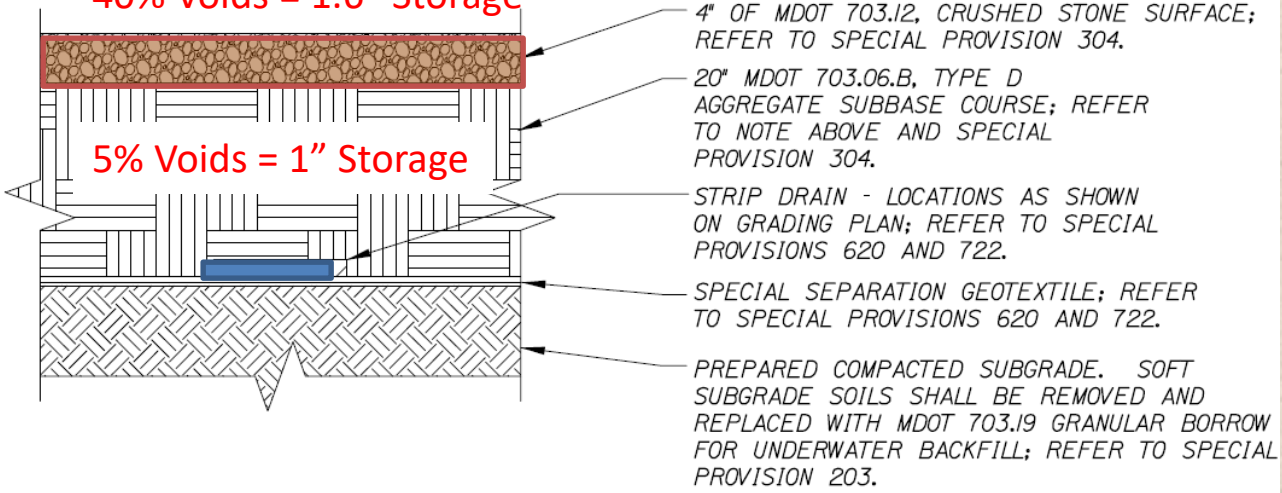
(DARWin 3.1 Software used to calculate final Porous Pavement design)



TYPICAL POROUS PAVEMENT SECTION

Total Storage = 4.4"

NOTE:
TYPE D AGGREGRATE SUBBASE SHALL HAVE BETWEEN 4% AND 7% FINES (PERCENT PASSING #200 SIEVE) TO ACT AS A FILTER LAYER.



CHASSIS STORAGE YARD POROUS SURFACE DETAIL
NOT TO SCALE

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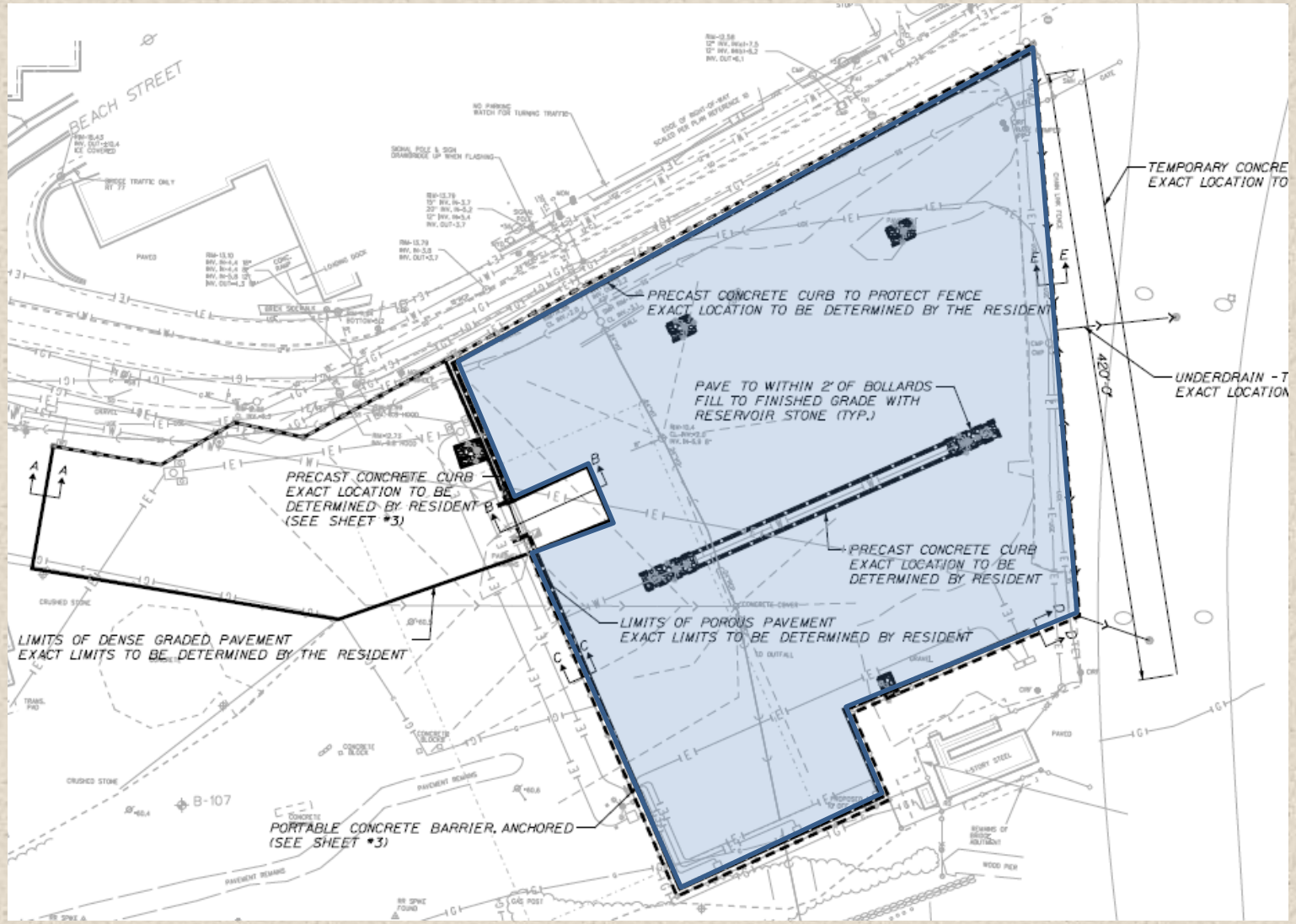
Chassis Yard Paving Project

Phase 2 – 2016 Pavement Construction
Construct Porous Pavement Structure - 3.4 Acre



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6” – Asphalt Treated Permeable Base

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Work Continued Night and Day as Temperatures Allowed.

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Chassis Yard Paving Project
3” – Open Graded Friction Course “OGFC”

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Chassis Yard Paving Project
Open Graded Friction Course “OGFC”

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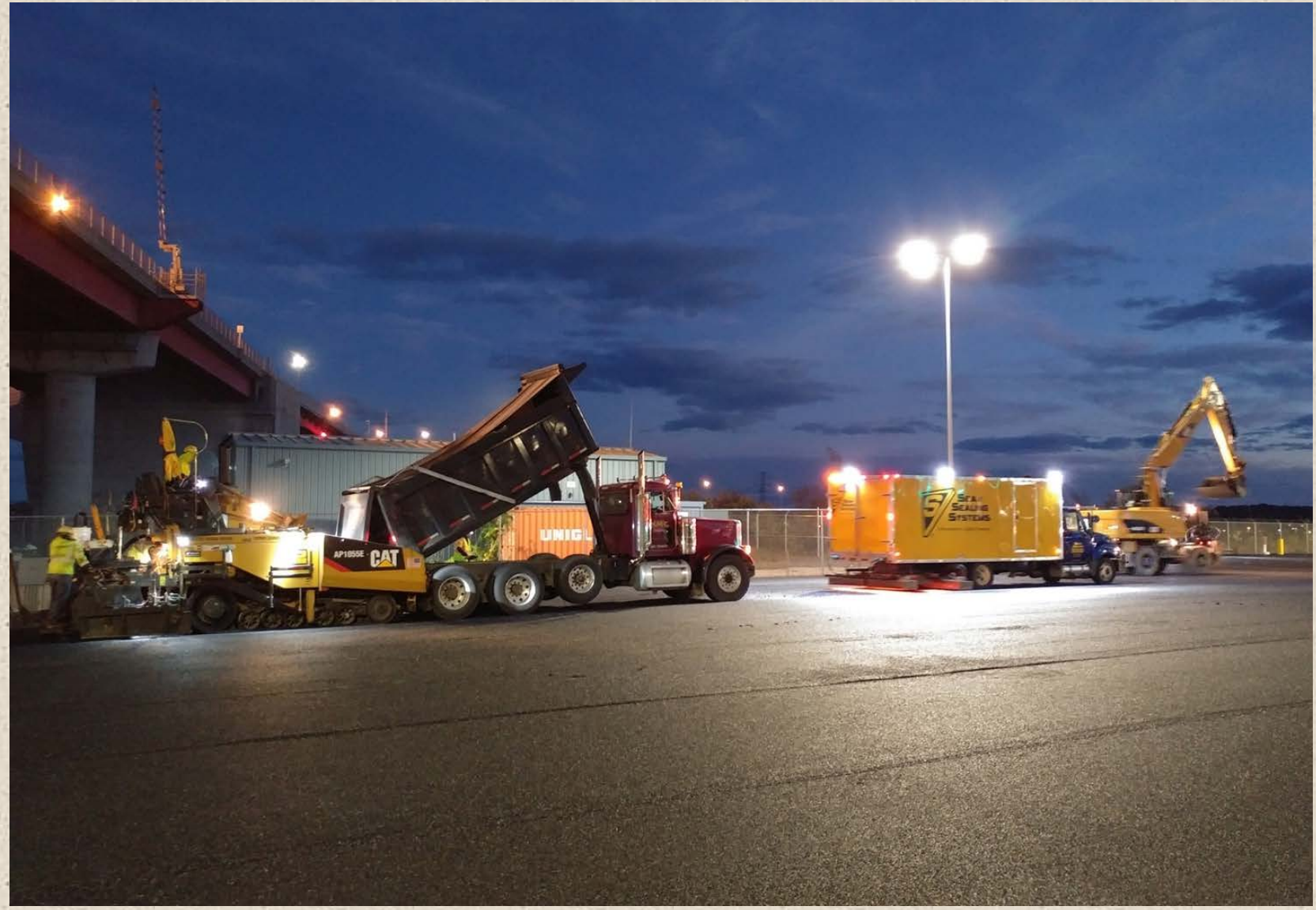
Chassis Yard Paving Project
6” – Asphalt Treated Permeable Base



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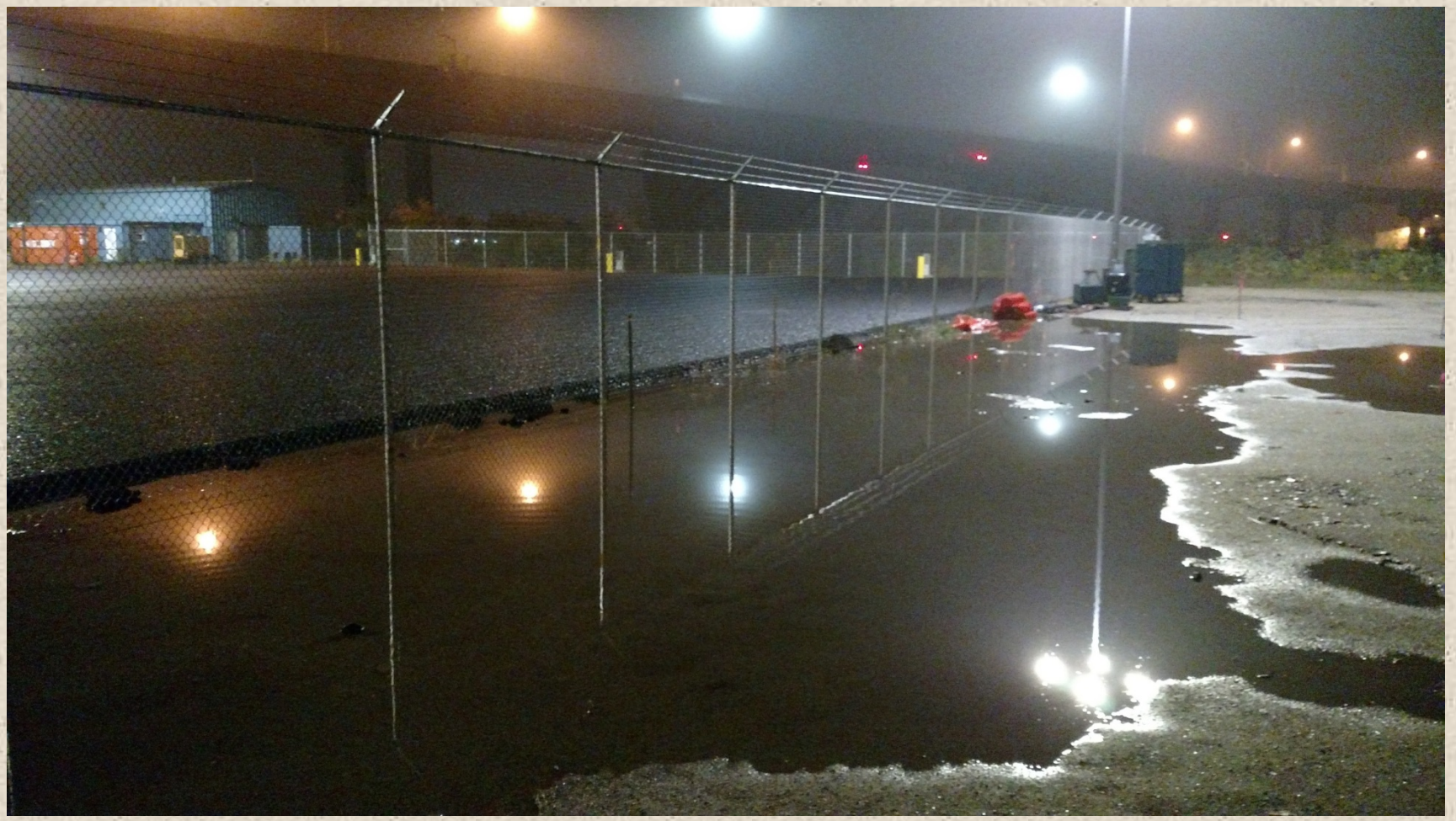
10-Year Storm Event - October 22, 2016



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6 Month Check-In

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Pavement Grinding Areas Flagged for Repair

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Vacuum Truck used within the milled sections

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Paving Repair Sections with OGFC

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SS-1 Emulsion Applied to Joints

Runway Loading

Careful trip planning should always include determining the weight bearing strength of airport pavements.

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Maine Mall Road, Portland Maine

International Marine Terminal, Portland Maine

Questions ?