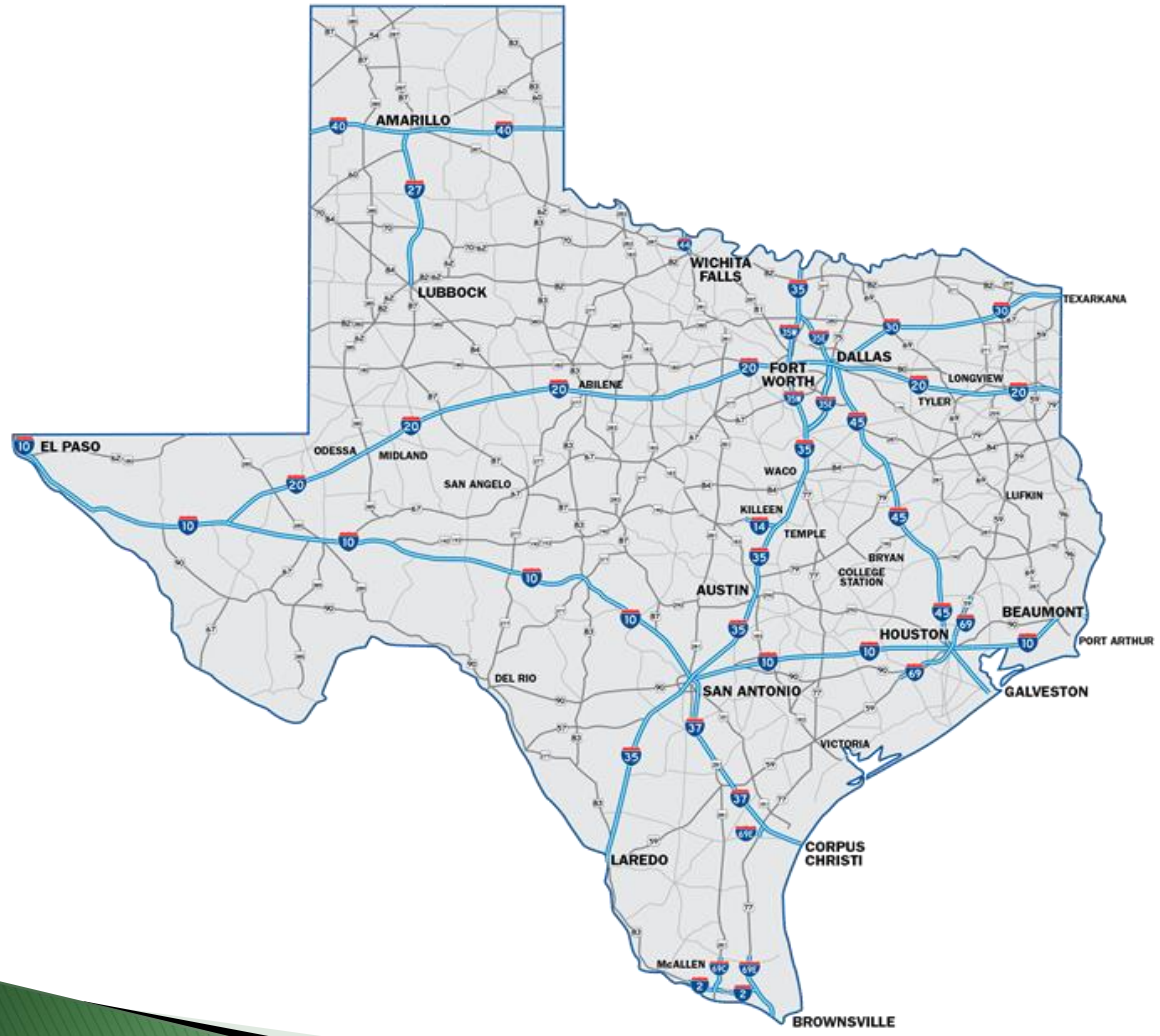
TxDOT 4-Year Pavement Management Plan and Pavement Preservation

Hui Wu, Ph.D., P.E.
Andre Smit, Ph.D., P.E.

NATIONAL PAVEMENT PRESERVATION CONFERENCE
npc23
IMPACTS AND BENEFITS FROM PAVEMENT PRESERVATION
ncpp National Center for Pavement Preservation
MICHIGAN STATE UNIVERSITY
AASHTO TSP2 PAVEMENT PRESERVATION
ROCKY MOUNTAIN WEST PAVEMENT PRESERVATION PARTNERSHIP
SOUTHEAST PAVEMENT PRESERVATION PARTNERSHIP
MIDWESTERN PAVEMENT PRESERVATION PARTNERSHIP
NORTHEAST PAVEMENT PRESERVATION PARTNERSHIP

Texas Statistics



- Lane Miles : 201,928.3
- Districts: 25
- Counties: 254
- Population: 29.53 million (2021)

- Texas has the highest speed limit in the country. 85 mph on SH130
- Texas has 55,000 bridges that carry vehicular traffic.
- Texas is top of its game in providing important crash information
- Texas has over 5,000 species of wildflowers

TxDOT Pavement Management Plan

- 4-Year Pavement Management Plan Process

September to January: Nominating Projects
- September 1st is the start of a new four year PMP development process
- Issue a project call to Maintenance Supervisors and Area engineers to determine candidate projects
- Use PMS optimization tool to help nominate projects
- Final list of nominated projects in a "drive list" at end of January

February to March: Project Selection
- District staff drive each project to rank and determine exact needs
- Higher ranking projects undergo evaluation and design

April to May: Drafting District Plan
- District planning staff meet to review projects and develop the plan
- Initial district plan by May 30th

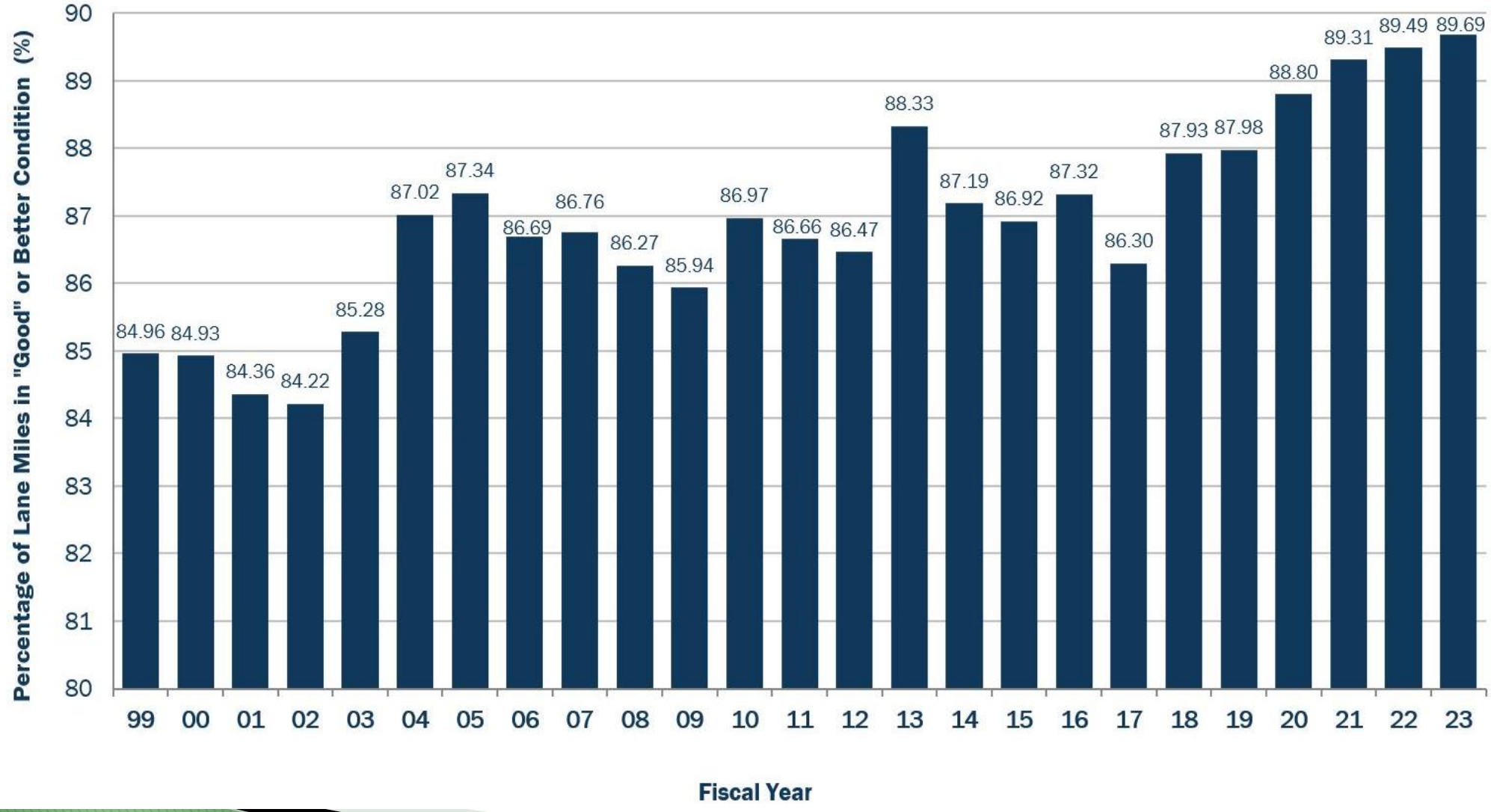
June: Finalizing District Plan
- Maintenance division review of plan
- Final plan by July 1

July to August: Statewide PMP Report
- Draft PMP Statewide report by August 1
- Final PMP Statewide report by August 31

TxDOT Pavement Management Plan

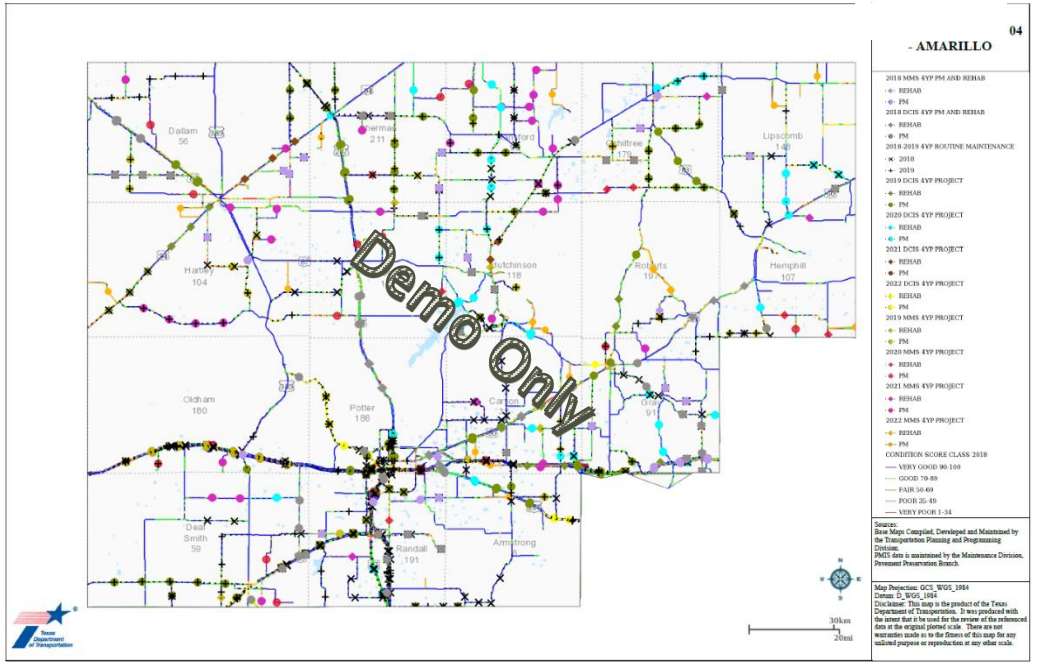
- Develop a comprehensive pavement management plan which is roadway specific to the greatest extent possible and is fiscally constrained.
- Districts take the lead and prepare 4-yr PMP plans
- 4-yr plan committee review meetings
- Annual report-- August31st
- MNT support – all year round. Provide tools, data, analysis and training to districts
  - Pavement Analyst®- official Pavement Management System at TxDOT
  - Prioritize needs, reduce costs, increase safety
  - Support engineering decision-making
  - Ensure limited resources are used wisely and that our infrastructure is maintained in good condition

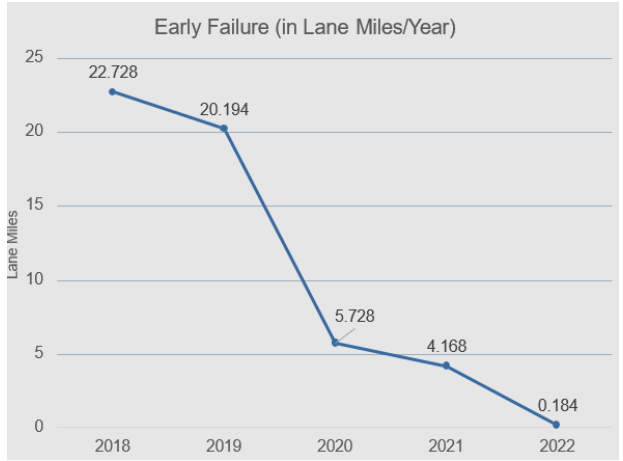
StatewidePavementCondition:FY1999-2023



Best Practices of 4-Year Plan

- RM & PM Considerations
- 4-year Plan and Pavement Score Map
- Surface Age Map
- Un-sealable Roads Map
- Interstate Overlay Program
- Prioritized Widening List
- Early Failure Report
- Wet Weather Crash Reduction Program





Statewide Statistics

- Statewide (as of 9/7/2023)

Fiscal Year	Seal Coat		HMA_PM		HMA_Rehab	
	LM	Cost**($)	LM	Cost**($)	LM	Cost**($)
2019	**15,084**	$ 243,853,433	**3,794**	$ 715,910,972	5,575	$ 1,487,049,911
2020	**13,318**	$ 243,524,519	**1,548**	$ 326,704,882	3,630	$ 890,867,647
2021	**14,096**	$ 279,857,945	**3,353**	$ 377,518,549	3,138	$ 844,138,618
2022	**11,868**	$ 239,275,128	**2,265**	$ 461,047,719	2,908	$ 1,140,710,712
2023	**13,228**	$ 333,113,918	**5,167**	$ 770,528,943	4,086	$ 2,034,336,736

*HMAincludesDG-HMA,PFC,SMA,Superpave,TBFC,andTOM(excl.HFST)

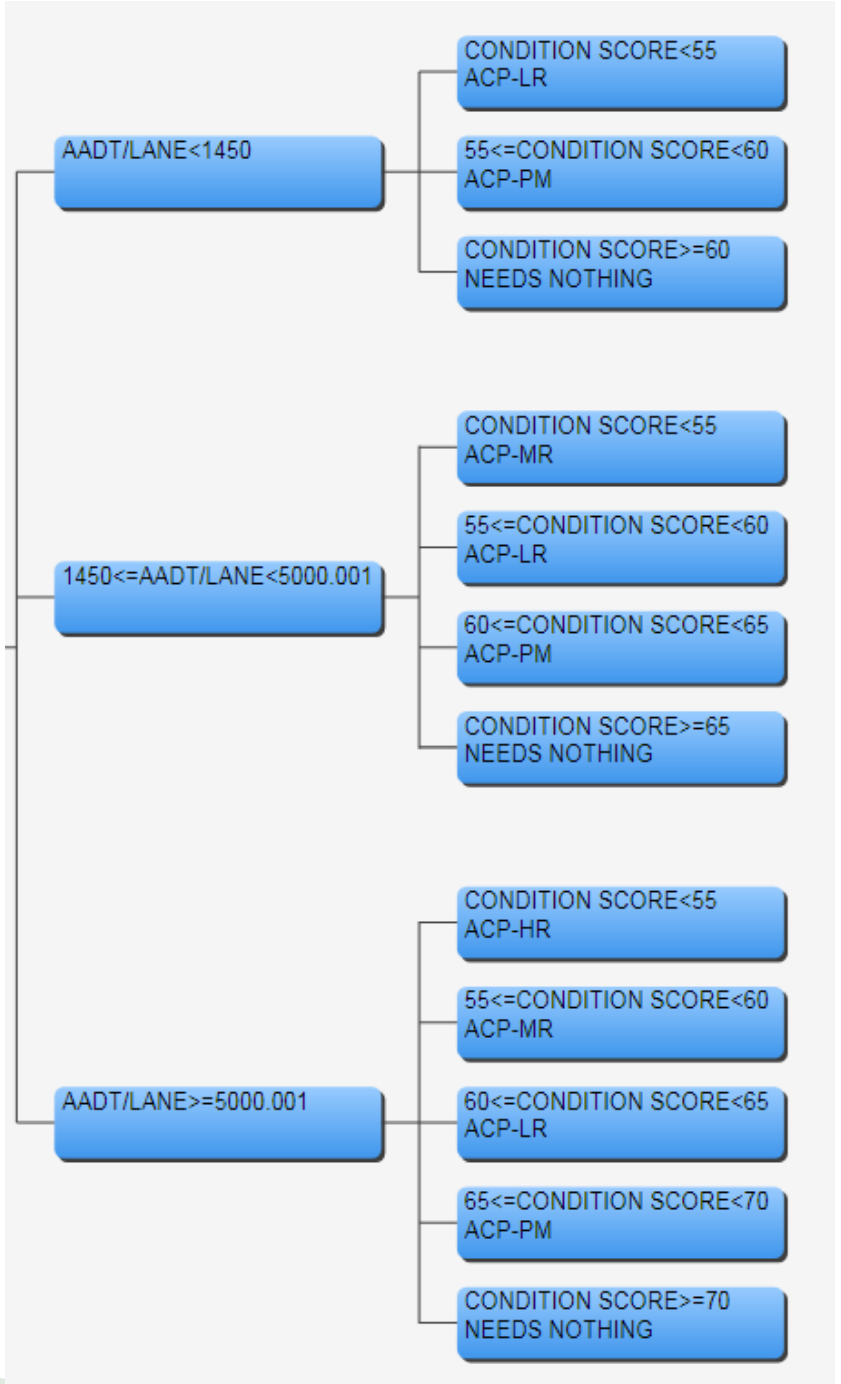
**CAT1 & CAT 11 Only

Rehabilitation: Preventative Maintenance Options

- Seal coat
- Thin Overlay 2" Thick or Less
- Mill and Inlay 2" or less
- Hot In-Place Recycling
- Microsurfacing/Slurry Seal
- Scrub Seal

Rehabilitation decisions

- Type: Heavy, Medium, Light, PM
- District preference
- Traffic
- Condition: Structural/Functional
- Age
- Budget



Thin overlays (Items 347/8)

Thin bonded friction course

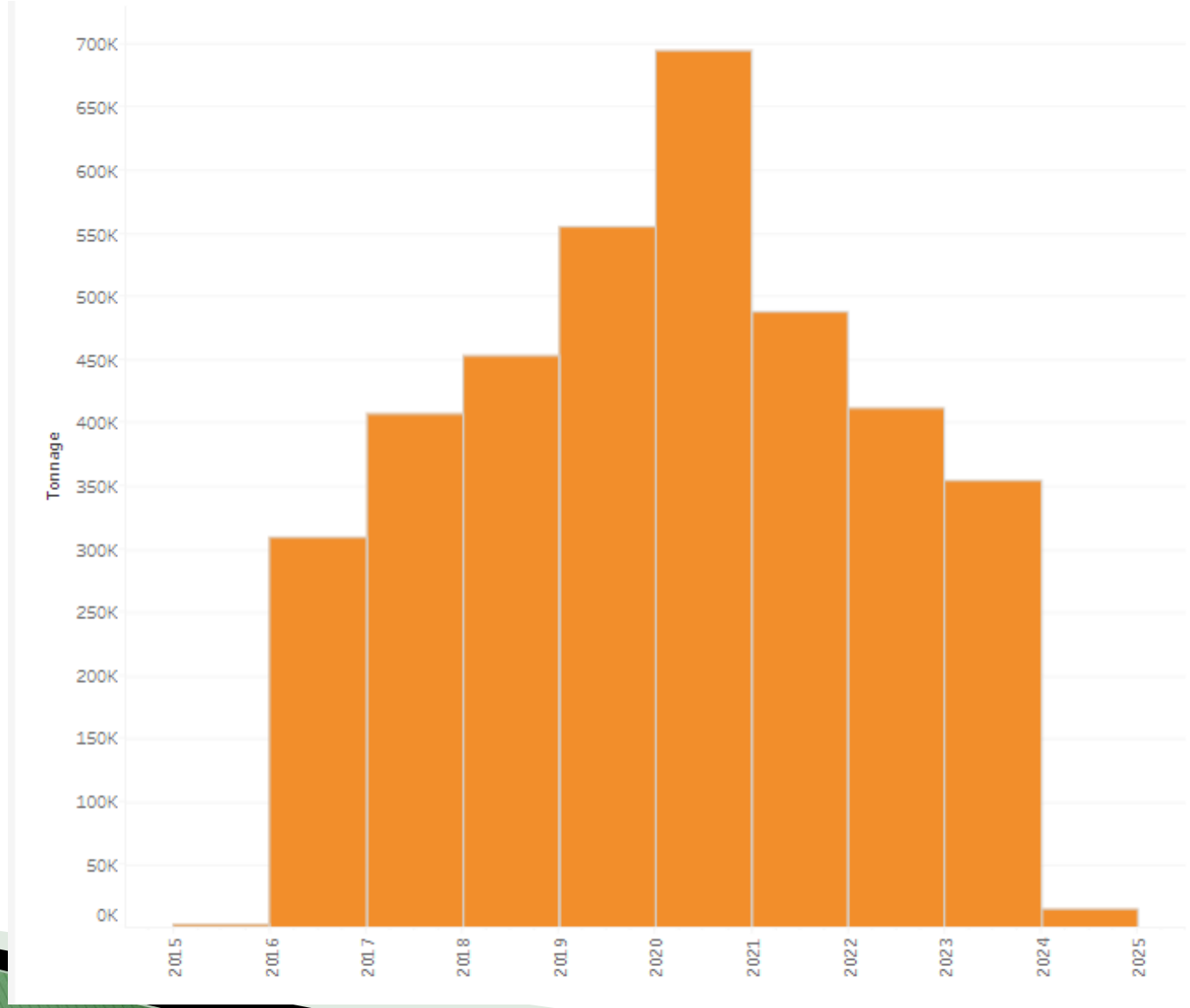
Thin overlay mix

Surface texture of TOMs

TOM-C

TOM-F

Thin overlays quantities



Seal Coats

Recent/Ongoing Research Studies

0-6989, Update Seal Coat Rate Field Adjustments

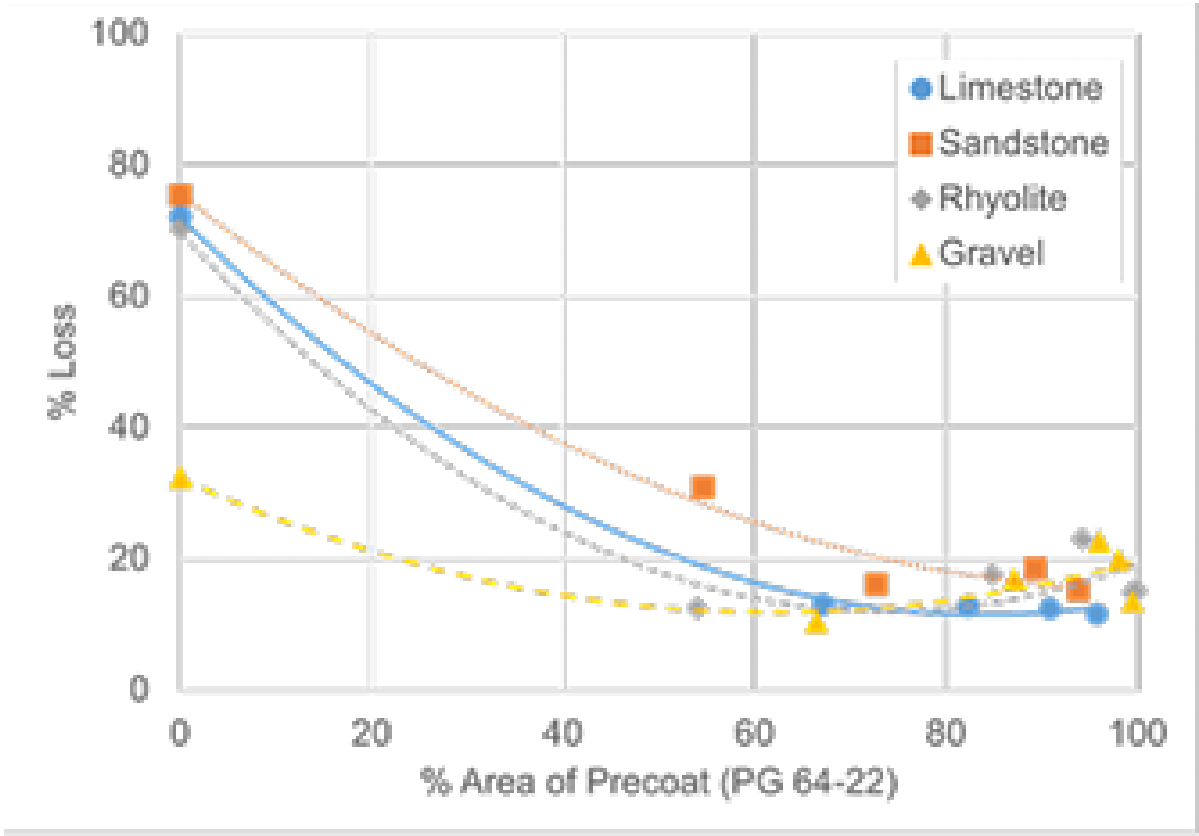
- The objective in designing the rates is that the resulting seal will:
  - not have too much binder so that it flushes or bleeds in the summer; however
  - there is enough binder to prevent rock loss over the winter.

0-7029, Evaluation of the Performance of Rumble Strips on Pavements where Seal Coats Have Been Applied

- How effective are rumble srips after sealing?
- Design tool developed that accounts for:
  - Rumble strip depth
  - Speed limit
  - Seal coat type

0-7057, Developing guidelines for Precoating of aggregates in Seal Coats

- Precoating of aggregate increases aggregate adhesion
- Image analysis can be used to determine the precoat area
- Aggregate precoat area below 50% has little effect on aggregate retention, but precoat area above 85% tends to produce clumping. Thus, the optimum precoat area is between approximately 50% and 85%.



0-7058, Development of a Performance Related Test for Designing Seal Coats

- The Sweep test best evaluates the binder-aggregate adhesion.
- Vialit tests more indicative of binder fracture than adhesion.
- The Sweep test seems more indicative of early age aggregate loss
- Field evaluations indicate that aggregate “punch-in” to the pavement is more of a problem than aggregate loss.

0-7070, Develop Guidelines and Best Practices for Bonding Hot-Mix Asphalt Portland Cement Concrete Pavement

- Simple pull-off strength test developed
- Tack coat type is significant
- Application rate not significant
- Sandblasting and hydro-demolition are the best-performing surface textures
- PCC surface cleanliness and PCC surface moisture on PCC-HMA bond is not significant
- Pull-off strength higher than 25 psi, which can be used as a frame of reference for acceptable performance

0-7077, "Synthesis: Evaluation of Selection Criteria for TXDOT Form 2088, Surface Aggregate Selection Form"

Demand for Friction	Low (1)	Moderate (2)	High (3)
Rain Fall (inches/year)	≤20	>20 ≤40	>40
Traffic (ADT)	≤5000	>5000 ≤15,000	>15,000
Speed (mph)	≤35	>35 ≤60	>60
Trucks (%)	≤8	>8 ≤15	>15
Vertical Grade (%)	≤2	>2 ≤5	>5
Horizontal Curve (°)	≤3	>3 ≤7	>7
Driveways (per mile)	≤5	>5 ≤10	>10
Intersecting Roadways (ADT)	≤500	>500 ≤750	>750
Wet Surface Crashes (%)	≤5	>5 <15	≥15
Summary of Total Frictional Demand			
***Available Friction**	**Low (2)**	**Moderate (5)**	**High (8)**
Cross Slope (%)	<2	2 - 3	3 - 4
Surface Design Life (years)	>10	>5 ≤10	≤5
Macro Texture of proposed surface	Fine (Such as: HMAC Type 'D' and 'F')	Medium (Such as: HMAC Type 'C', CMHB, SuperPave, Microsurface)	Coarse (Such as: PFC, SMA, Seal Coat, NovaChip)
Aggregate MicroTexture	SAC C	SAC B	SAC A

0-7084, Develop Improved Methods for Eliminating Striping on Roadway Surfaces

- The flailing method was found to be effective for removing thick markings (over 100 mil), was cheaper, and required low level equipment and expertise compared to the water blasting method
- Water blasting method was found to be more effective in removing stripes (on Portland cement concrete), exhibited lower scarring and ghosting, and perceived as environmental & health friendly when compared to the flailing method
- The 200W average power laser was not sufficient to produce high removal rates

0-7103, Investigating Prime versus Curing: Where, When and Why

- The objective of this research project is to determine where, when, and why a prime or cure is needed for a pavement layer.
- Guidance is needed to help designers, inspectors and construction personnel understand the materials and where, when, and why to use them.

0-7105, “Measuring Seal Coat Rate Field Adjustments"

- The objective of this research project is to develop measurable and repeatable adjustment criteria for **seal coat** application rates based on pavement condition, traffic and material properties.

0-7106, “Quantify Maximum Accumulated Seal Coat Layers for Stability"

- The objective of this research is to determine the maximum number of **seal** coats that can be applied to a pavement surface before the accumulated layers of **seal** coats become unstable.

Thank you!