Design of LTPP Pavement Preservation Experiments

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Federal Highway Administration

LTPP
LONG TERM Pavement PERFORMANCE

Agenda

1. Background
2. Overview of Experiment Approach
3. Key Considerations
4. Experimental Designs & Project Layouts
5. Getting Word Out

1. Background

LTPP Mission

Increase pavement life by investigation of various designs of pavement structures and rehabilitated pavement structures, using different materials and under different loads, environments, subgrade soil, and maintenance practices

“Understand how pavements behave and why they behave as they do”

Project Objective

Design pavement preservation experiments for the LTPP program

- Enable LTPP to provide short- and long-term performance data on pavements relative to preservation technology
- Verify preservation as a viable technology in extending pavement life
- Document impacts of preservation to enable development and implementation of important products and tools

Project Phases & Tasks

PHASE I:

6. Expert Task Group (ETG)
1. Experiment Design
2. Materials Testing Plan

PHASE II:

3. Performance Monitoring Requirements
4. Construction Requirements for RSCs
5. Other Data Collection Needs
7. Marketing and Technical Support

Expert Task Group (ETG)

Provide review/feedback throughout development of experiment

- Anita Bush (Nevada DOT)
- Colin Franco (Rhode Island DOT)
- Morgan Kessler (FHWA)
- David Luhr (Washington State DOT)
- Magdy Mikhail (Texas DOT)
- Jim Moulthrop (FP^2)
- Larry Scofield (IGGA)
- Roger Smith (Texas A&M University)
- Ben Worel (MnROAD)

ETG Phase I Activities

- January 22, 2015 kick-off webinar
- April 23, 2015 face-to-face meeting in Reno, NV
- July 28, 2015 webinar
- September 11 and 14, 2015 webinars

2. Overview of Experiment Approach

LTPP Pavement Preservation Experiments

- SPS-11 AC Pavement Preservation Study
- SPS-12 PCC Pavement Preservation Study

Two experiments; consistent with other LTPP experiments

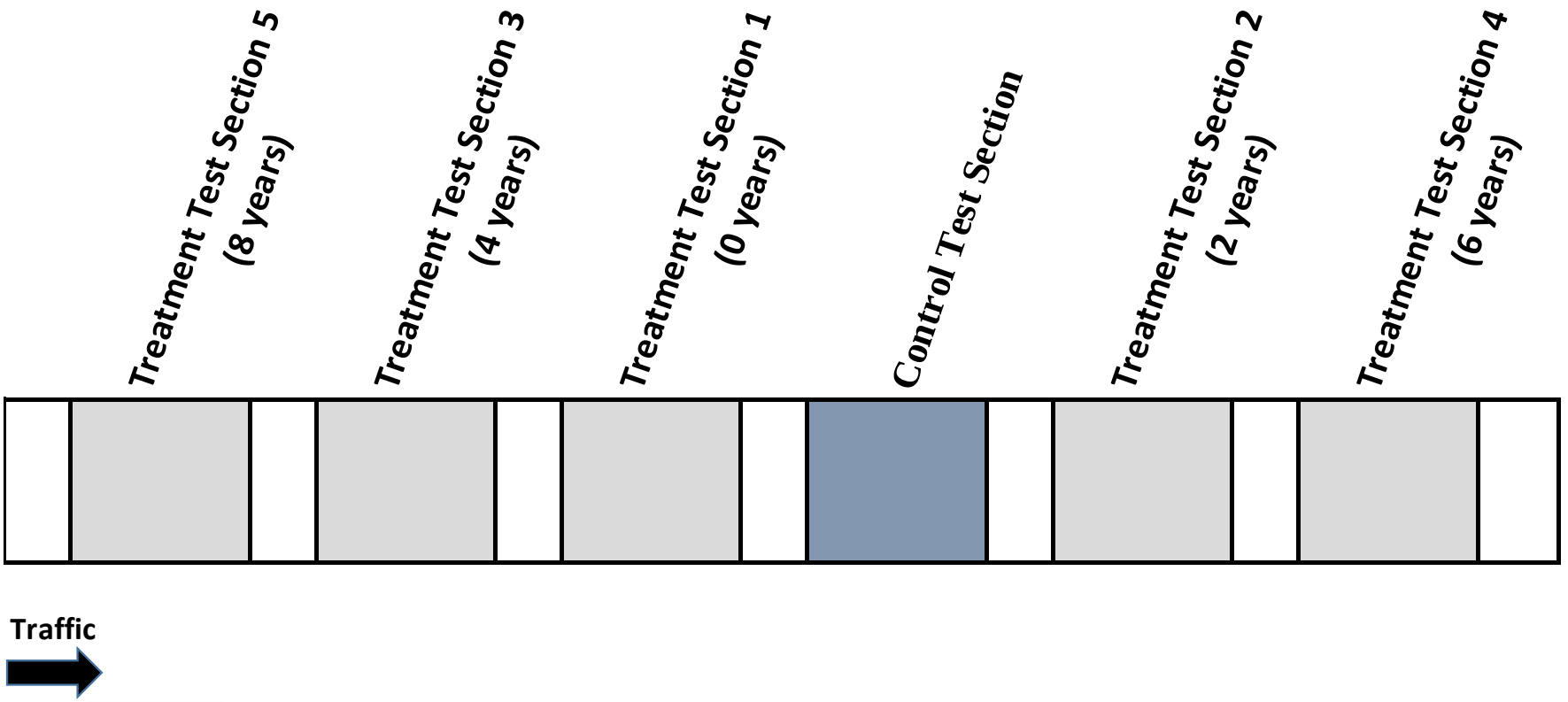
Experimental Approach

- Segregate treatment types and pavement project locations into discrete groups
- Apply same preservation treatment, at different times, on same pavement structure
- LTPP focus is on timing/distress propagation rates, while NCAT/MnROAD studies and others focus on treatment comparisons…

LTPP and NCAT/MnROAD studies complement / supplement each other

Example SPS-11 Project

6 test sections – 1 control (no overlay) and 5 treatment sections:



Approach Motivations

- Each pavement has unique distress propagation rate
- Only one treatment required per project:
  - Reduce number of test sections required
  - Tailoring timing of treatments
  - Enhance implementation (agencies with experience with specific treatment more willing to participate)
- Meaningful results not reliant on other project sites, etc.

Approach Shortcomings

- Materials (aggregate source, binder type, etc.), equipment and/or contractor responsible for placement of treatment may vary from one year to another

  As along as changes are captured by LTPP, benefits outweigh negatives

- Uncertainty as to State DOTs' level of comfort with approach

  Reaction to date has been very good

3. Key Considerations

Key Experiment Factors

- Pavement preservation treatments
- Pavement type and age
- Climate
- Traffic
- Replicate and repeat test sections
- Supplemental test sections

Preservation Treatments

AC Pavements (SPS-11)

- **Thin HMA overlays (< 1 inch thick)**
- **Chip seals**
- **Micro Surfacing**
- ~~Crack seals~~
- ~~Fog seals~~
- ~~Slurry seals~~
- ~~Other seals~~
- ~~Mill & fill~~
- ~~Patching~~
- ~~Nova Chip~~

Preservation Treatments

PCC Pavements (SPS-12)

- **Diamond grinding & dowel bar retrofit**
- **Joint sealants**
- **Joint penetrating sealers**
- ~~Concrete surface hardeners~~
- ~~Partial depth patching~~
- ~~Full depth patching~~
- ~~Crack sealing~~
- ~~Slab repair/replacement~~

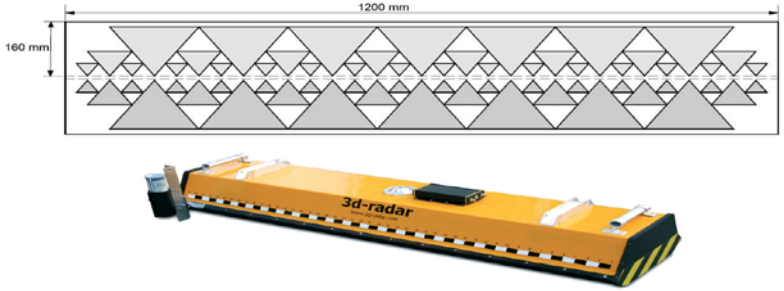
Pavement Types

- SPS-11:
  - ~~Original AC pavement~~
  - **AC overlay of existing AC pavement (AC/AC)**
  - ~~AC overlay of existing PCC pavement AC/PCC)~~
- SPS-12 :
  - **Original jointed plain concrete pavement (JPCP)**
  - ~~Original reinforced concrete pavement (JRCP)~~
  - ~~Original CRCP pavement~~
  - ~~PCC overlay of existing PCC pavement (PCC/PCC)~~

Pavement Age

- SPS-11:
  - AC overlays of AC pavements ≤ 4 years
- SPS-12:
  - Original jointed plain PCC pavements ≤ 4 to 10 years

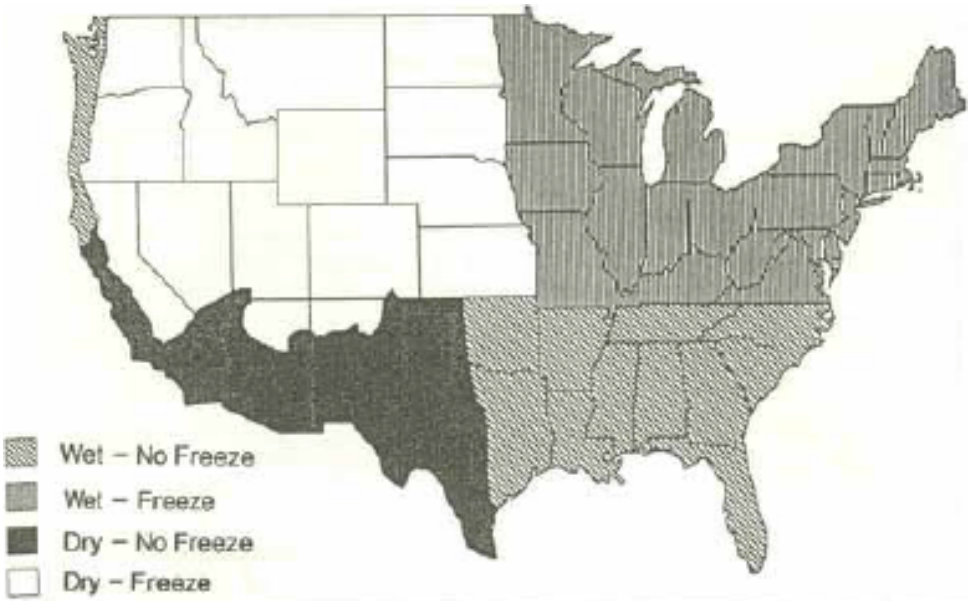
Pavement in "good" condition



Climate

Thresholds:

- Precipitation of 20 inches/year
- Freezing Index of 150°F-days/year



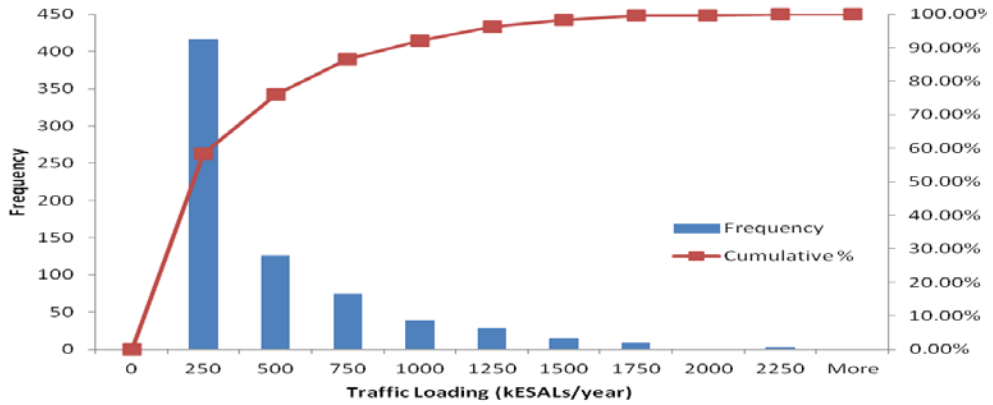
MERRA data

Traffic: Volumes

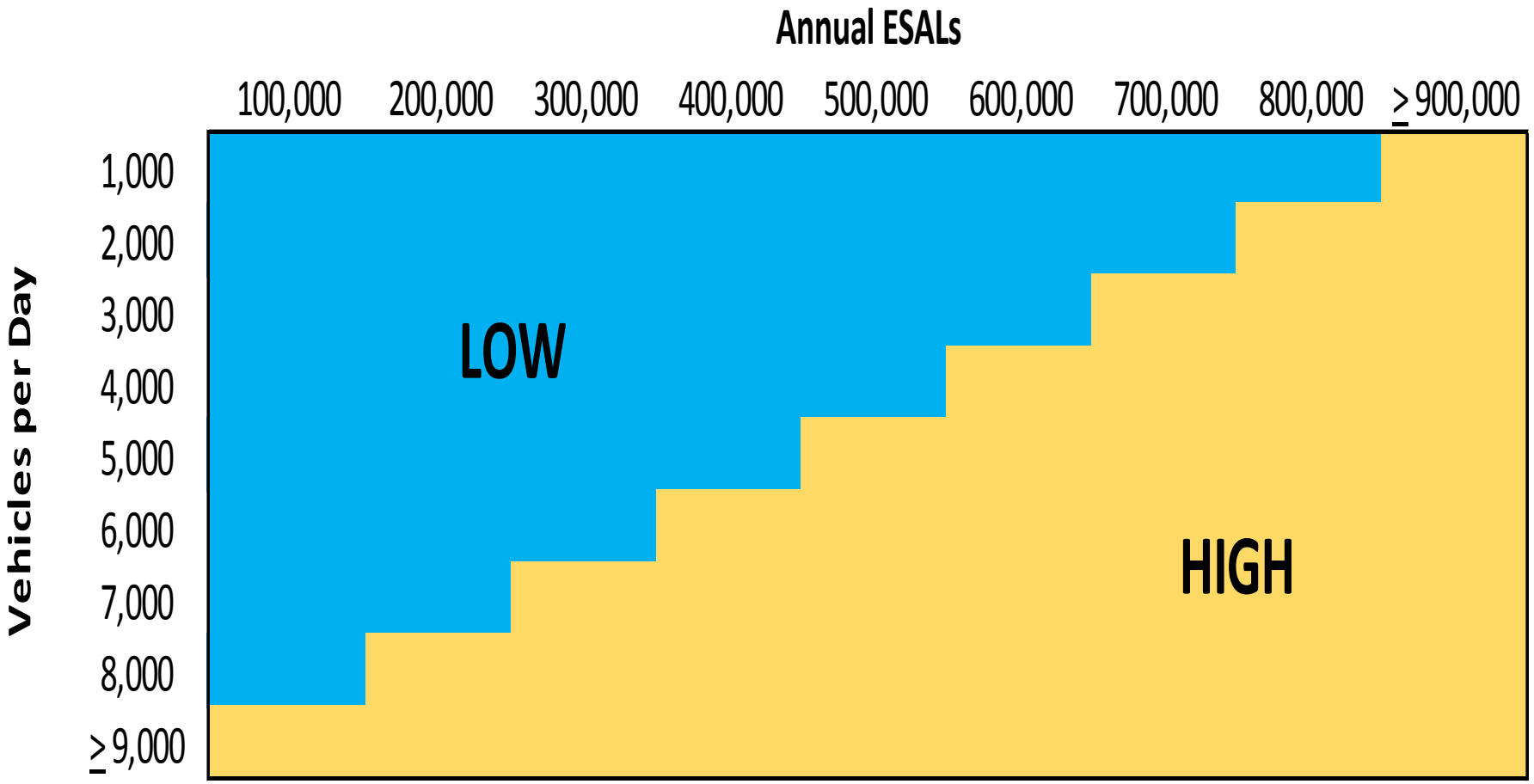
- SPS-11 experiment considers both volumes and ESALs, while SPS-12 only considers ESALs
- SHRP Report No. R26-RR-2 “Guidelines for the Preservation of High-Traffic-Volume Roadways”
  - Low ≤ 5,000 vpd
  - High > 5,000 vpd

Traffic: ESALs

- Same approach and threshold value as in SPS-10 WMA experiment for both SPS-11 and -12 experiments
  - Low – less than 500,000 ESALs per year
  - High – greater than 500,000 ESALs per year



SPS-11 Traffic Levels



Replicates, Repeats & Supplemental

Replicates:

- Two per experimental cell; will depend on funding

Repeat:

- Control test section plus test sections that have not received treatment

Supplemental:

- Highly encouraged; will be supported and monitored by LTPP

4. Experimental Designs & Project Layouts

SPS-11 Matrix

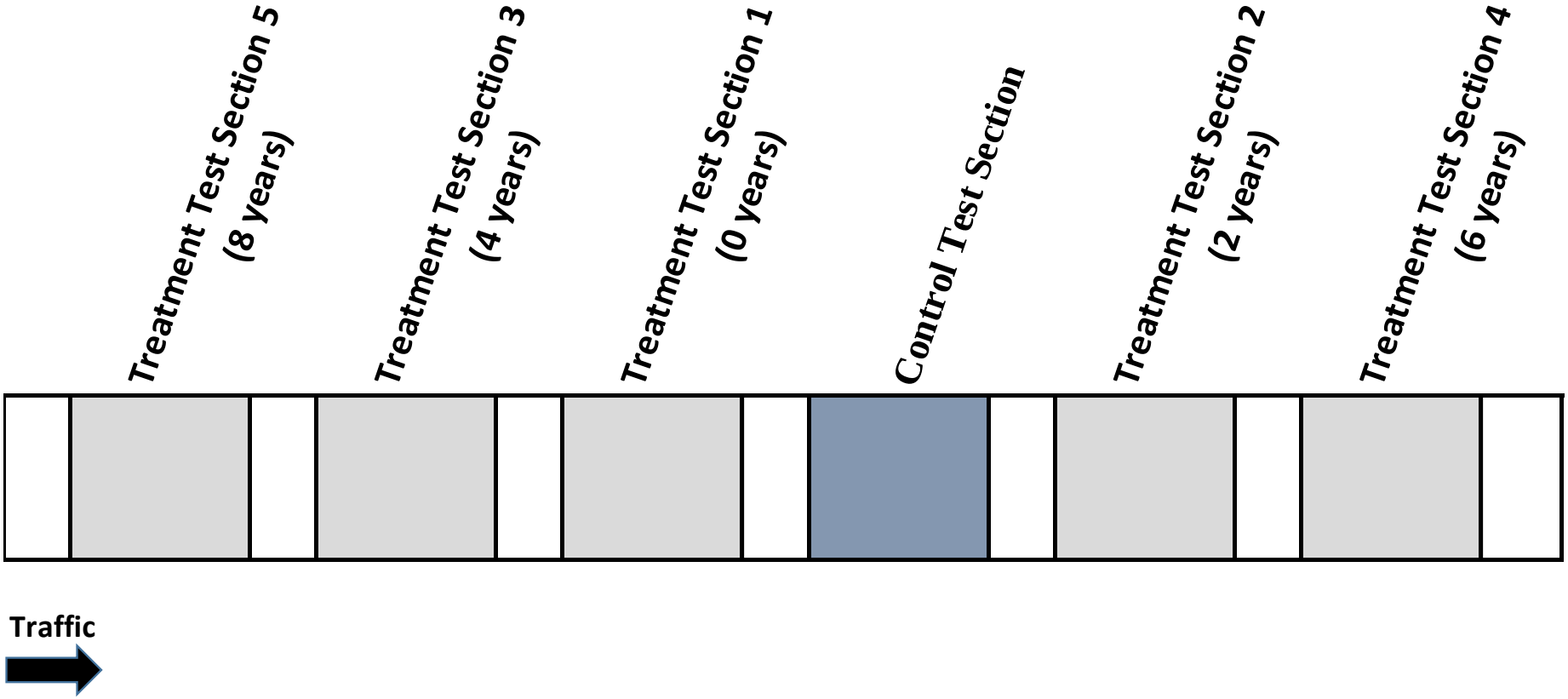
	Wet				Dry			
	Freeze		No Freeze		Freeze		No Freeze	
Sub-Experiment / Treatment	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**
Thin AC Overlay								
Chip Seal								
Micro-Surfacing								

Moisture

Temperature

Traffic

Typical SPS-11 Layout



Timing of Treatments

- Treatment Section 1 – 0 years from inclusion
- Treatment Section 2 – 2 years from inclusion
- Treatment Section 3 – 4 years from inclusion
- Treatment Section 4 – 6 years from inclusion
- Treatment Section 5 – 8 years from inclusion

Schedule can be changed:

- Accelerated (e.g., 0, 2, 3, 4 and 5 years) if deterioration rate is higher than anticipated
- Decelerated (e.g., 0, 2, 5, 9 and 12) if condition of pavement remains stable

SPS-12 Matrix

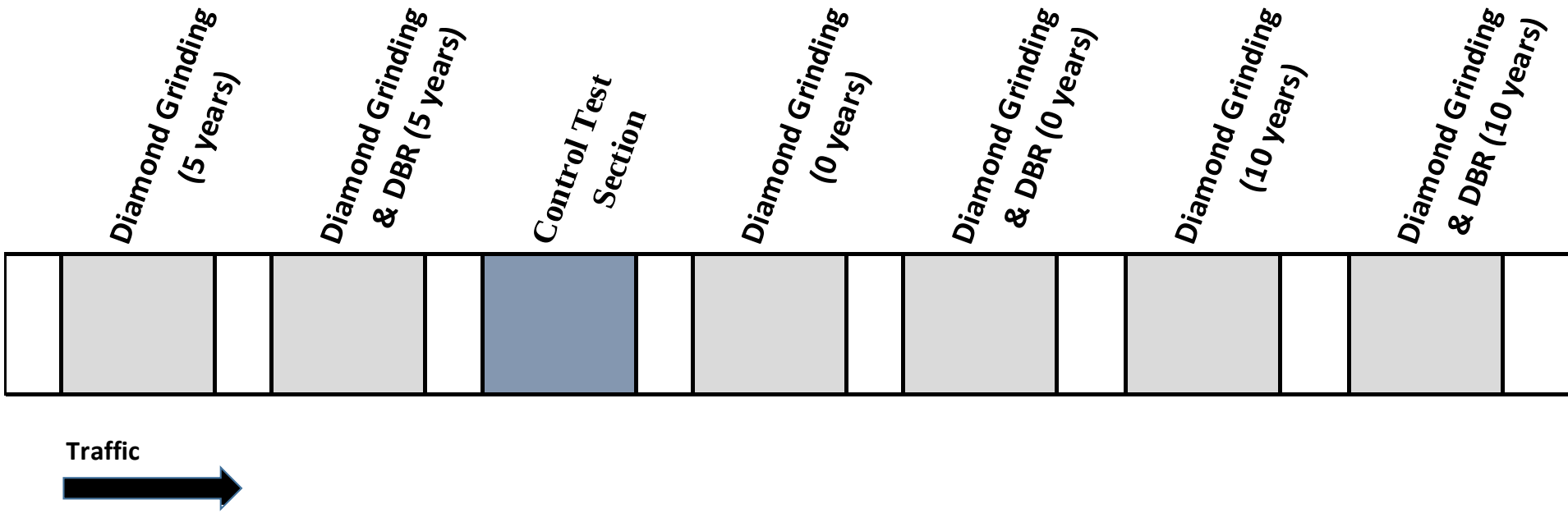
	Wet				Dry			
	Freeze		No Freeze		Freeze		No Freeze	
Treatment	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**
Diamond Grinding & Dowel Bar Retrofit								
Joint Sealant								
Joint Penetrating Sealers								

Moisture

Temperature

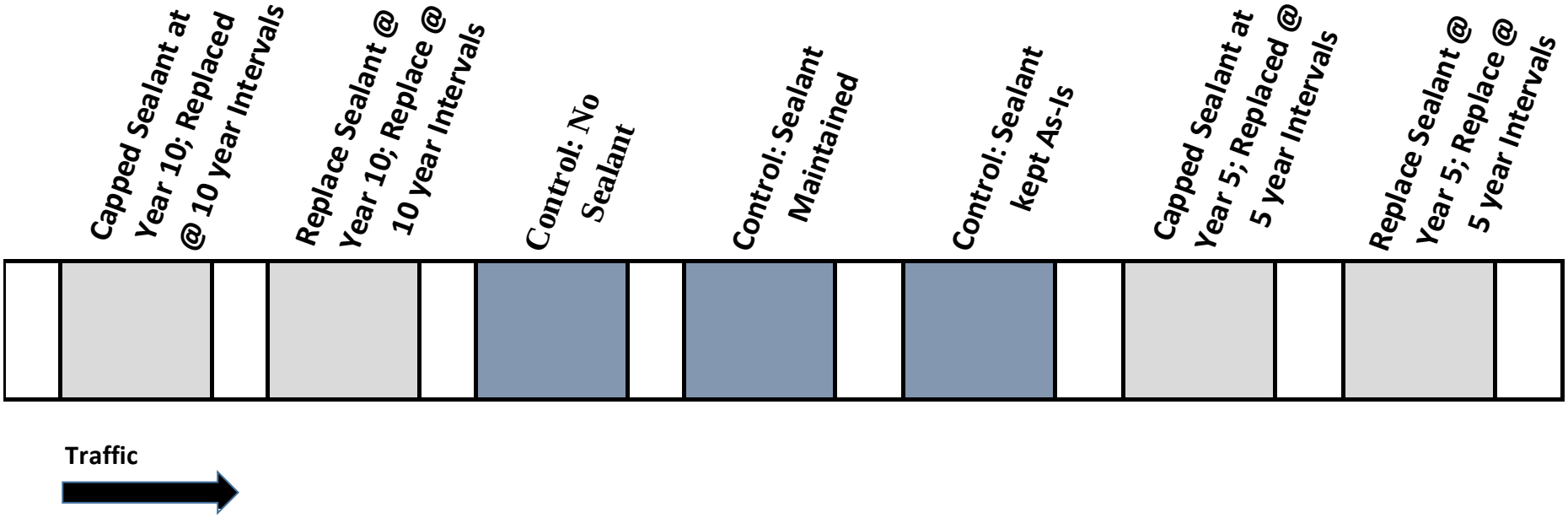
Traffic

Diamond Grinding & DBR

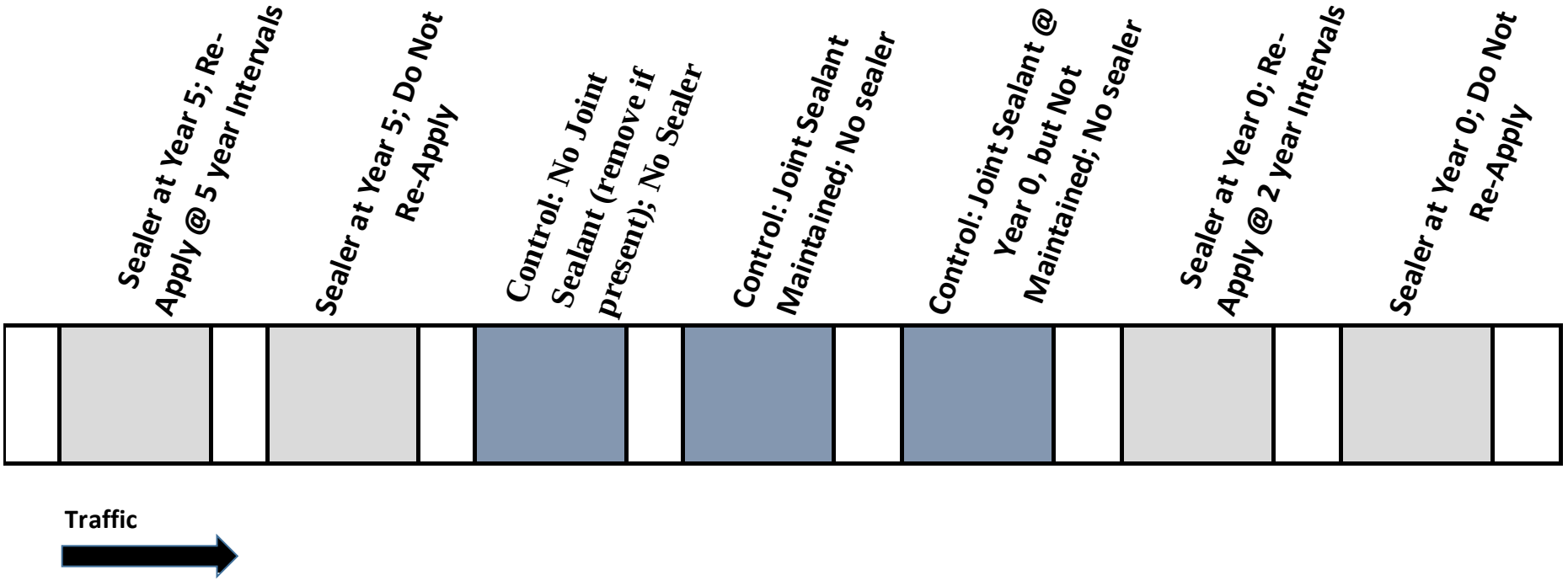


Joint Sealant

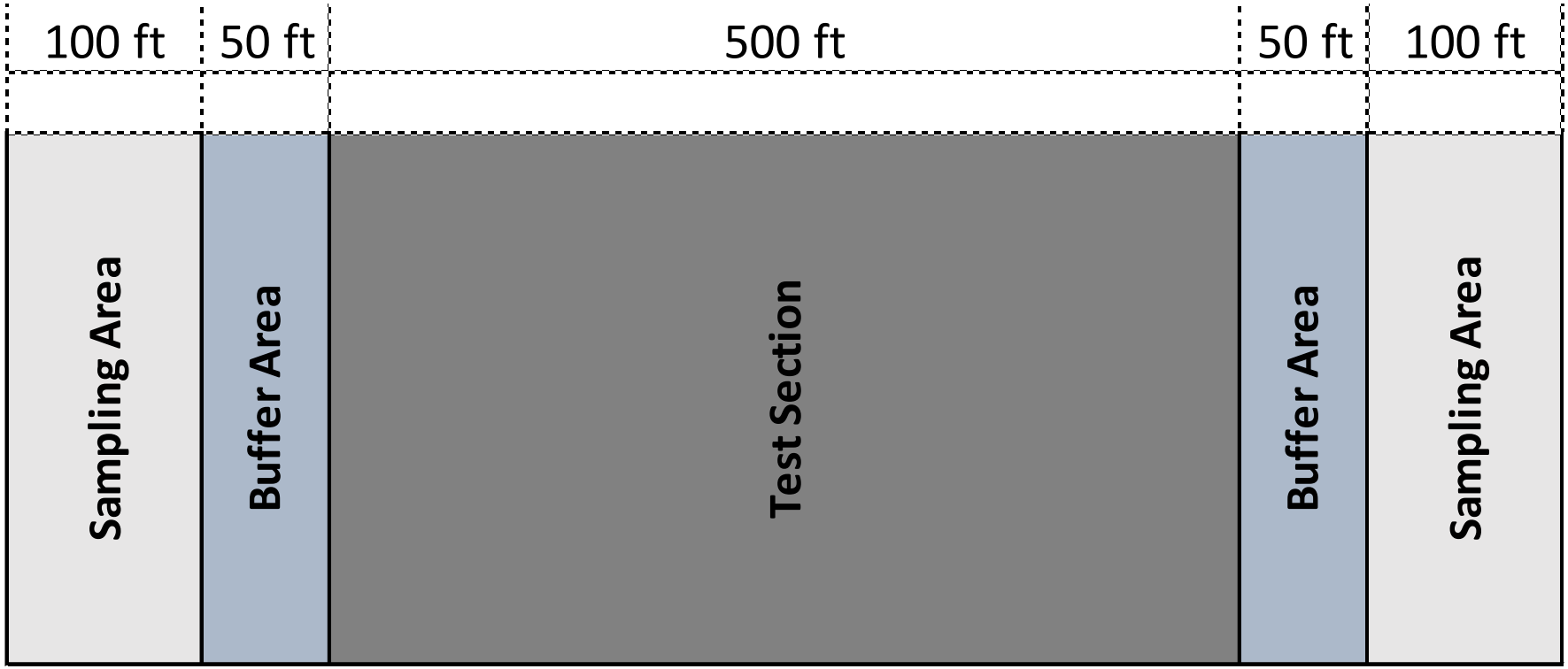
(Cap/Replace Sealant)



Penetrating Sealer
(Silanes or Siloxanes)



Typical Test Section



5. Getting Word Out

Meetings & Conferences

- FHWA LTPP Pavement Preservation ETG Webinar, January 2015 ✓
- FHWA LTPP Team Meeting, Reno, NV, April 2015 ✓
- FHWA LTPP Pavement Preservation ETG Meeting, Reno, NV, April 2015 ✓
- TRB LTPP Committee Meeting, Washington, D.C., May 2015 ✓
- FHWA Emulsion Task Force, Denver, CO, June 2015 ✓

Meetings & Conferences

- FHWA LTPP Pavement Preservation ETG Webinar, July 2015 ✓
- AASHTO Subcommittee on Materials Meeting, Pittsburg, PA, August 2015 ✓
- FHWA LTPP Pavement Preservation ETG Webinar, January 2015 ✓
- Midwestern Pavement Preservation Partnership, Kansas City, KS, September 2015 ✓
- TRB LSPEC Committee Meeting, Washington, D.C., October 2015 ✓

Meetings & Conferences

- Rocky Mountain West Pavement Preservation Partnership, Bozeman, MT, October 2015
- TRB LTPP State Coordinators Meeting, Washington, D.C., January 2016
- TRB LTPP Technical Session, Washington, D.C., January 2016
- TRB AHD20 Committee on Pavement Maintenance Meeting, Washington, D.C., January 2016
- TRB AHD18 Committee on Pavement Preservation Meeting, Washington, D.C., January 2016

Meetings & Conferences

- National Conference on Pavement Preservation, Nashville, TN, October 2016
- Others?