PAVEMENT PRESERVATION PEER EXCHANGE

SPRING 2023 | LAKEWOOD, COLORADO

TECHNICAL REPORT

MAY 16-17, 2023

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U.S. Department of Transportation
Federal Highway Administration

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LIST OF ACRONYMS

- **AASHTO:** American Association of State Highway and Transportation Officials
- **ACP:** Asphalt Concrete Pavement
- **ADA:** Americans with Disabilities Act
- **ADT:** Average Daily Traffic
- **APCS:** Automated Pavement Condition Survey
- **AR:** Asphalt-Rubber
- **BST:** Bituminous Surface Treatment
- **BWC:** Bonded Wearing Course
- **CCPR:** Cold Central Plant Recycling
- **CIR:** Cold In-Place Recycling
- **CPM:** Capital Preventative Maintenance
- **CPR:** Concrete Pavement Restoration
- **CRS:** Condition Rating System
- **CRS-2P:** Cationic Rapid Setting Polymer-Modified Asphalt Emulsion
- **CSA:** Calcium Sulfoaluminate
- **DBR:** Dowel Bar Retrofit
- **DOT:** Department of Transportation
- **dTIMS:** Deighton Total Infrastructure Management System
- **EDC-4:** Every Day Counts Round Four Program
- **EDC-6:** Every Day Counts Round Six Program
- **FDR:** Full Depth Reclamation
- **FHWA:** Federal Highway Administration
- **FTC:** Freeze-Thaw Cycle
- **FWD:** Falling Weight Deflectometer
- **FWDUG:** Falling Weigh Deflectometer Users Group
- **GPR:** Ground Penetrating Radar
- **HFST:** High Friction Surface Treatments
- **HIR:** Hot In-Place Recycling
- **HM:** Highway Maintenance
- **HMA:** Hot Mix Asphalt
- **HPMS:** Highway Performance Monitoring System
- **HPTO:** High-Performance Thin Overlays
- **HSIP:** Highway Safety Improvement Program
- **IDIQ:** Indefinite Delivery/Indefinite Quantity
- **IRI:** International Roughness Index
- **IRRS:** Interregional Road System
- **LCCA:** Life Cycle Cost Analysis
- **LCMS:** Laser Crack Measurement System
- **LTAP:** Local Technical Assistance Program
- **LTPP:** Long-Term Pavement Performance
- **NCPP:** National Center for Pavement Preservation
- **NHS:** National Highway Systems
- **NWPMA:** Northwest Pavement Management Association
- **OGFC:** Open Graded Friction Course
- **PACT:** Program Area Collaboration Team
- **PCI:** Pavement Condition Index
- **PDR:** Partial-Depth Repairs
- **PF:** Public Facilities
- **PMS:** Pavement Management System
- **PPM:** Pavement Preservation Management
- **PPRA:** Pavement Preservation & Recycling Alliance
- **QA:** Quality Assurance
- **QC:** Quality Control
- **R&R:** Reconstruction & Rehabilitation
- **RAP:** Reclaimed Asphalt Pavement
- **RFP:** Request for Proposal
- **RQFS:** Road Quality Forecasting System

- **RSL:** Remaining Service Life
- **SFDR:** Stabilized Full Depth Reclamation
- **SHA:** State Highway Administration
- **SHOPP:** State Highway Operation and Protection Program
- **SMA:** Stone Matrix Asphalt
- **STIC:** State Transportation Innovation Councils
- **STIP:** Statewide Transportation Improvement Program
- **STRAHNET:** Strategic Highway Network
- **TAMP:** Transportation Asset Management Plans
- **TAP:** Technical Assistance Panel
- **TLN:** Training Learning Network
- **TNZ:** Transit New Zealand
- **TOPS:** Targeted Overlay Pavement Solutions
- **TPF:** Transportation Pooled Fund
- **TPM:** Transportation Performance Management
- **TRB:** Transportation Research Board
- **TSD:** Traffic Speed Deflectometer
- **TSE:** Transit Systems Engineer
- **UBWC:** Ultra-Thin Bonded Wearing Course
- **UV:** Ultraviolet

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- Colorado
- Hawaii
- Idaho
- Illinois
- Indiana
- Iowa
- Kansas
- Louisiana
- Manitoba – *Province of Canada*
- Maryland
- Michigan
- Minnesota
- Missouri
- Nebraska
- Nevada
- North Dakota
- Oklahoma
- Oregon
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TECHNICAL REPORT

DAY 1 – TUESDAY, MAY 16

1. OPENING SESSION

1.1. FHWA Welcome and Peer Exchange Scope and Objectives

Antonio Nieves Torres, FHWA Office of Infrastructure
Antonio Nieves Torres welcomed participants to the Department of Transportation (DOT) Lakewood Building on behalf of the Federal Highway Administration (FHWA). He shared that FHWA's goal in hosting this Peer Exchange is to learn about the design and inspection challenges that State DOTs and local agencies are faced with regarding pavement preservation. During the Every Day Counts Round Four (EDC-4) Program hosted in 2017-2018, FHWA discovered that a number of associations encounter problems with design and inspection. He asked that participants share their challenges, solutions found, and encouraged everyone to participate in an open discussion.

Jason Dietz, FHWA Resource Center
Jason Dietz welcomed participants and echoed encouragement for everyone to participate in an open discussion as the Peer Exchange is not a recorded session. He thanked everyone for taking time away from their offices to participate in the dialogue to address issues with pavement preservation. He shared that FHWA has seen increased growth in pavement preservation programs in western states, many of which have utilized Federal funding to help ensure that treatments can be completed on the right pavements at the right time.

Dietz began his career as an intern for Nevada DOT. At that time, he completed testing on preservation treatments. That experience has served him well in his current position at the FHWA Resource Center where he is providing trainings to agencies looking to gain more experience with preservation treatments. He encouraged participants to utilize trainings and Transportation Pooled Fund (TPF) studies to learn which materials and treatments will work best for their states and contractors. FHWA will be utilizing the resulting Technical Reports to assist the Program Area Collaboration Team (PACT) in facilitating pavement preservation efforts from the feedback received at the Peer Exchanges being held in Atlanta, Georgia (May 9-10, 2023) and Lakewood, Colorado (May 16-17, 2023).

1.2. Moderator Introduction

Shree Rao, ARA, Inc.

Shree Rao introduced himself and his role as moderator of the Peer Exchange. He shared that this Peer Exchange is not only beneficial for information sharing with FHWA, but it is also beneficial for information sharing between all the different states present. He called attention to the meeting agenda, then shared that the listed discussion questions are not required topics to be covered but are meant to be used to aid conversation.

1.3. Opening Remarks

Laura Conroy, Colorado DOT

Laura Conroy welcomed participants to Lakewood, Colorado, and introduced herself as the Pavement Management Services Manager for Colorado DOT.

She began her remarks with facts on Colorado's pavements. Mount Evans Highway, located approximately 45 minutes from the meeting facility, is the highest paved road in North America with a maximum elevation of 14,106 feet. The highway is only open to the public in the summertime. The Eisenhower Johnson Memorial Tunnel, located approximately one hour from the meeting facility, is the highest vehicular tunnel in North America. When the tunnel opened in the 1970s it was the highest vehicular tunnel in the world. The tunnel crosses the Continental Divide and has a maximum elevation of 11,155 feet. Loveland Pass, on US Route 6, is located near the Eisenhower Johnson Memorial Tunnel with a maximum elevation of 11,990 feet. The road is open year-round; however, it does experience temporary closures due to winter storms and avalanche mitigation. Berthoud Pass, which carries US Route 40 over the Continental Divide, has a maximum elevation of 11,307 feet. Colorado's mountain highway pavement surfaces have experienced a significant amount of wear and tear from snowplows and tire chains; most of Colorado's rutting is caused by tire chains.

Elevation of the Denver metropolitan area is 5,280 feet, which gives the area its status as the "Mile High City." With most of the area's population located in its cities, its roads do not experience the same chain wear as the mountain highway systems. The Denver area experiences many freeze-thaw cycles (FTCs) where temperatures are above freezing during the day and drop below freezing at night. The area also experiences frequent temperature swings between days. On September 7, 2020, Denver had a temperature of 93 degrees Fahrenheit. The next day, September 8, 2020, Denver had a temperature of 31 degrees Fahrenheit and an inch of snow on the ground. According to the University of Denver, Denver has 26% higher ultraviolet (UV) radiation than is present at sea level.

Colorado's pavement network has approximately 23,000 lane miles. Asphalt pavements account for 87% of those lane miles, concrete pavements account for the remaining 13%. The asphalt pavement preservation methods used by Colorado are crack seals, chip seals, double chip seals, micro surfacing, and cape seals. The concrete pavement preservation methods used by Colorado are crack seals, joint seals, diamond grinding, and concrete slab replacement.

1.4. Introductions – All

The following is a summary of the introductions given by Peer Exchange participants. All were asked to state their name, affiliation, involvement with pavement preservation, and desired experiences of the Peer Exchange.

Karen Strauss, Washington State DOT
Works as Washington State DOT's Pavement Management Engineer. Has worked in pavement engineering since 2008 in Idaho, Oregon, and Washington. Looking to learn about other states' successes in pavement preservation.

Karen Carlie, Washington State DOT
Works as Washington State DOT's State Pavement Design Engineer, and currently working as the acting State Pavement Engineer. Has been involved in pavement management for ten years through the Northwest Pavement Management Association (NWPMA). Looking forward to learning from the group.

Srikanth Holikatti, California DOT
Works within California DOT's (Caltrans) Office of Asphalt Pavement's Pavement Management Program. Responsibilities include assisting with pavement preservation efforts and pavement problem solving. Looking to learn about other states' pavement preservation efforts.

Brandon Trent, California DOT
Works with pavement management for Caltrans. Has worked for Caltrans for 16 years with a focus on pavement management in the last two years. Responsibilities include managing pavements, bridges, and facilities in California's District Two. Looking to learn about other states' pavement preservation efforts.

Kayleigh Cowles, Indiana DOT
Works as Indiana DOT's Pavement Asset Manager. Responsibilities include reviewing the pavement condition data within the Pavement Management System (PMS). Previously worked in selecting pavement treatments and collaborating with maintenance and construction teams to keep Indiana's pavements in good condition.

William Flora, Indiana DOT
Has worked for Indiana DOT for 38 years. Estimates 15-20 of those years have focused on pavement management. Current responsibilities include working with Indiana's districts on their pavement issues and selecting pavement programs. Indiana begins selecting projects six years prior to letting, then the projects are officially brought into the program five years prior to letting. The DOT is currently performing a lot of network level Falling Weight Deflectometer (FWD) tests and is working toward gaining a better understanding of the structural conditions of its roadway network to assist in improved treatment selection.

Margaret Szajner, Michigan DOT
Works as a Pavement Management Engineer for Michigan DOT in the state's northern region. Has worked for Michigan DOT for 20 years and current responsibilities include selecting the northern region's new pavement projects. Looking to learn about other states' successes in pavement preservation.

Kristy Rizek, Kansas DOT
Works as a Pavement Management Engineer for Kansas DOT. Has worked for Kansas DOT for 20 years, with a focus in pavement management for the past five to seven years. Responsibilities include reviewing Kansas' databases to prepare them for input into the PMS report.

Ryan Thompson, Manitoba Transportation and Infrastructure
Works as a Pavement Management Engineer for Manitoba Transportation and Infrastructure. Responsibilities include pavement management, working with PMS, data collection, and in the administration of chip seal and micro surfacing projects.

Andre Dupuis, Manitoba Transportation and Infrastructure
Works as Manitoba Transportation and Infrastructure's Surfacing Program Manager within the Pavement and Materials Section. Work performed primarily focuses on the design side of materials and some pavement design as well.

David Holmgren, Utah DOT
Works as a Pavement Engineer for one of Utah DOT's Region Offices. Has worked with pavement design and management for 16 years. Looking to learn about other states' successes in pavement preservation.

Jason Simmons, Utah DOT
Works as Utah DOT's Statewide Pavement Engineer. Utah DOT has a Pavement and Materials Division which allows for collaboration with the Pavement Manager working with materials. Responsibilities include coordinating with pavement management data and the Pavement Management Engineer, setting design policy and treatment selection policy, working with regional Pavement Engineers, and writing specifications. Looking to find new ideas to implement in Utah's pavement preservation efforts.

Praveen Desaraju, Maryland DOT – State Highway Administration
Works as Maryland DOT – State Highway Administration's (SHA) Pavement and Geotechnical Division Chief. Has worked for Maryland DOT for five years. Responsibilities include overseeing pavement design, geotechnical design, and pavement asset management.

Mir Tamim, Idaho Transportation Department
Works as Idaho Transportation Department's Manager of Pavement Asset Management. Shared that Idaho has realized there is a gap between pavement preservation and pavement management through a lack of optimized funds, which has led the DOT to work toward improving its decision

trees by analyzing better utilization strategies of performance metrics. Looking to learn about other states' pavement preservation efforts.

John Arambarri, Idaho Transportation Department
Works as a Pavement Engineer for Idaho Transportation Department's Construction and Materials Section. Has worked in materials selection and pavement project programming for the last decade. Idaho has received an increased interest in urban pavement preservation and is working on how to best manage nighttime operations to minimize public disturbance.

Timothy Earnest, Oregon DOT
Has worked as Oregon DOT's Assistant Pavement Materials Engineer for eight and a half years. Responsibilities include materials testing and pavement design. In the past four years, the focus has been on reconstruction materials and pavement preservation. Looking to learn about other states' pavement preservation efforts.

Kyle Creswell, Wyoming DOT
Works as Wyoming DOT's Assistant Pavement Management Systems Engineer. Responsibilities include analyzing Wyoming's collected data to improve the implementation of that knowledge within pavement projects. Looking to learn about the systems and data other states are using within their pavement preservation programs.

Emiliano Martinez, Wyoming DOT
Works as Wyoming DOT's Pavement Design Engineer. Responsibilities include finding solutions for optimized pavement design. Looking to learn about other states' pavement preservation design.

Todd Huju, Iowa DOT
Works within Iowa DOT's Northwest District as a Staff Engineer. Responsibilities include leading the DOT's pavement design group, pavement asset management, and pavement preservation efforts. Over the past 30 years, Huju has worked in maintenance, construction, inspection, administration, design, and project selection. Looking to learn about preservation treatments being used by other states.

Joel Ulring, Minnesota DOT
Works as Minnesota DOT's State Pavement Preservation Engineer. Responsibilities include collaborating with Minnesota's District Materials Engineers and maintenance staff in the selection of preservation treatments. Works closely with Minnesota DOT's pavement preservation research projects and is working toward how to implement some of their promising research findings. Looking to learn about other states' pavement preservation efforts and successful treatments.

Trudy Elsner, Hennepin County (Minnesota)
Works as a Road and Bridge Operations Engineer for Hennepin County, Minnesota. Began working on pavement preservation with Minnesota DOT in 2009. Since joining Hennepin

County, Elsner has promoted the addition of more preservation and rehabilitation treatments into the county's pavement management order. Looking to learn about other states' pavement preservation efforts.

Ryan Percle, Louisiana DOT
Works for Louisiana DOT's Road Design Unit. Has focused on pavement preservation efforts for the past five years. Responsibilities are primarily concerned with project delivery, from project selection to letting, and scoping the DOT's budget program. Louisiana has a Data Collection Unit that gathers PMS data to assist with projects designed at the district level. Looking to learn about other states' approaches to project selection.

William Gauthier, Louisiana DOT
Works for Louisiana DOT's Road Design Unit. Shared that Louisiana moves around different funding programs and is working on how to best budget for interstate pavement preservation projects. Looking to learn about other states' pavement preservation efforts.

Stephanie Weigel, North Dakota DOT
Works as a Pavement Management Engineer for North Dakota DOT's Planning/Asset Management Division. Has worked for North Dakota DOT for 21 years with a large focus on pavement management. Responsibilities include overseeing data collection and the DOT's Deighton Total Infrastructure Management System (dTIMS), which supplies project recommendations to guide North Dakota's district offices' program plans.

Tyler Wollmuth, North Dakota DOT
Works as North Dakota DOT's Assistant Materials and Research Engineer. Responsibilities include working with materials specifications and testing. Looking to learn about other states' pavement preservation efforts.

Brady Dresselhaus, Nebraska DOT
Works as one of the three Pavement Designers for Nebraska DOT. Responsibilities include designing and strategizing resurfacing and new build projects across Nebraska. Has extensive experience with FWD testing and the Falling Weight Deflectometer Users Group (FWDUG). Looking forward to learning more about pavement preservation.

Andrew Pavey, Alaska DOT & Public Facilities
Works within Alaska DOT & Public Facilities' (PF) Pavement Management Unit. Responsibilities include building out Alaska's annual pavement preservation program. Looking to learn about other states' pavement preservation inspection processes.

Peter Schmalzer, Nevada DOT
Works as the Assistant Chief Materials Engineer for Nebraska DOT. Has also worked to support FHWA's Long-Term Pavement Performance (LTPP) Program. Responsibilities include overseeing pavement design, management, and materials. Nebraska DOT has two pavement programs: Pavement Maintenance Program and Pavement Improvement Program. Currently

working to improve project delivery in a timely manner and utilizing PMS to assist with treatment selections.

Laura Conroy, Colorado DOT
Works as Colorado DOT's Pavement Management Services Manager. Looking to learn about other states' pavement preservation design.

Ezekiel Wakefield, Colorado DOT
Has worked for Colorado DOT since May 2022. Responsibilities include reviewing condition data received by vendors and working with PMS. Looking forward to learning from the group.

Morgan Kessler, FHWA Office of Research, Development, and Technology
Leads several research projects focused on infrastructure and preservation efforts. Looking to learn about pavement preservation research needs.

Brian Dobling, FHWA Colorado Division
Works as FHWA Colorado Division's Senior Area Engineer/Pavements and Materials Engineer.

Ronald Andresen, FHWA Central Federal Lands Highway Division
Works as a Materials Engineer for FHWA Central Federal Lands Highway Division. The Division works throughout sixteen states west of the Missouri River. Its primary focus is on National parks and forests. The program budget is approximately $10-12M per year. Federal Lands' biggest challenge with pavement preservation is gathering new states' specifications and adopting them into its own specifications. Looking to learn about other states' pavement preservation efforts.

Bouzid Choubane, National Center for Pavement Preservation
The National Center for Pavement Preservation (NCPP) is involved in conducting research projects, providing and assisting with trainings, and performing outreach activities. Looking to learn how NCPP can further assist the Midwestern, Northeast, Southeast, and Rocky Mountain West States pavement preservation partnerships.

Deborah Walker, FHWA Office of Infrastructure Research and Development
Works as a Highway Research Engineer for FHWA Office of Infrastructure Research and Development. Collects and processes traffic data in support of FHWA's LTPP Program. Looking to learn about pavement preservation efforts and research needs.

Steve Bailor, FHWA Western Federal Lands Highway Division
Works as a Construction Operations Engineer for FHWA Western Federal Lands Highway Division. The Division has recently taken the lead on pavement preservation efforts throughout seven states, including Alaska, west of the Mississippi River. Its primary focus is on National parks. It has been using state specifications in conjunction with its own specifications. Looking to learn about other states' pavement preservation efforts.

Paul Denkler, Missouri DOT
Works as Missouri DOT's Maintenance Liaison (since 2017). Prior to working in maintenance, Denkler worked as a Pavement Engineer for Missouri DOT's Central Office. Missouri has seven districts which are all taking their own approach to pavement preservation. Recently received $100M in funding from the Governor to address low volume roads in significant need of treatment; the Governor has issued an additional $100M in funding to continue these efforts in the next fiscal year. Working toward developing a statewide pavement preservation program to ensure funds are allocated appropriately.

Kaupena "KJ" Villanueva-Kaeo, Missouri DOT
Works as a Pavement Specialist for Missouri DOT's Field Materials Office. Previously spent ten years working in construction materials for Alaska DOT. Responsibilities include assisting with pavement and treatment selection. Looking to learn about other states' pavement preservation efforts and treatments.

Kristi Grilho, Hawaii DOT
Works within the Bituminous Materials Section of Hawaii DOT's Materials Testing and Research Branch. Hawaii if working toward implementing more pavement preservation projects and developing treatment specifications. A lack of equipment needed for preservation treatments has made it difficult to increase the DOT's preservation efforts. Looking to learn about other states' pavement preservation efforts.

Mung Fa "Mel" Chung, Hawaii DOT
Works as the Engineering Program Manager for Hawaii DOT's Materials Testing and Research Branch. Hawaii's districts currently utilize PMS to decide their own pavement preservation projects, but the DOT is working toward creating a central pavement preservation program. Looking to learn about other states' pavement preservation programs and efforts.

Nichole Andre, Saskatchewan Ministry of Highways
Works as the Senior Asset Management Engineer Roads for Saskatchewan Ministry of Highways' Operation and Maintenance Division. Saskatchewan has a small population with many low traffic roads. It has municipalities, like other states' district systems, which primarily focus on maintaining their own gravel roads. Andre has been responsible for Saskatchewan's pavement preservation program for approximately three years. Previous responsibilities included pavement management, data collection, and pavement performance. Saskatchewan has recently implemented the use of dTIMS and now has its preservation treatment models uploaded to the system but is working to better understand how to utilize the complex system. It is also working on writing treatment specifications. Looking to learn about other states' pavement preservation experiences and tips for using dTIMS.

Luis Melgoza, FHWA New Mexico Division
Works as a Civil Engineer for FHWA New Mexico Division. Looking to learn about other states' pavement preservation efforts.

Taylor Henderson, Oklahoma DOT

Works as Oklahoma DOT's State Maintenance Engineer. Has worked for Oklahoma DOT for 26 years and has been the State Maintenance Engineer for the past six years. Oklahoma has a decentralized approach to pavement preservation; its districts submit projects to Henderson for approval. Oklahoma participated in the Every Day Counts Round Six (EDC-6) Targeted Overlay Pavement Solutions (TOPS) Program. Oklahoma has had some bad experiences with preservation treatments only serving as a band-aid rather than preserving pavements. The DOT is working toward finding the treatments that work best for its roadways.

Angel Gonzalez, Oklahoma DOT

Works as Oklahoma DOT's State Assistant Maintenance Engineer. Primary responsibility is overseeing pavement management. Oklahoma DOT has recently modernized its pavement management structure. Pavement management had previously been handled by its Asset and Performance Management Team; pavement management is now handled under maintenance. Oklahoma collects and analyzes data on pavement surface condition and is working toward implementing that data in pavement preservation activities. Looking to learn about other states' pavement preservation design.

2. PAVEMENT PRESERVATION DESIGN POLICIES AND INSPECTION PROCEDURES

2.1. DOT Presentation on Current State of Pavement Preservation Design

Timothy Earnest, Oregon DOT

The following is a summary of the presentation given by Timothy Earnest, Colorado DOT Assistant Pavement Materials Engineer.

Topics covered:

- Overview of program:
  - Oregon's highway network has approximately 18,200 lane miles.
    - Approximately 16,100 of those lane miles are asphalt pavements.
    - Approximately 800 of those lane miles are concrete pavements.
    - Approximately 1,250 of those lane miles are "oil mat," which is a thick Bituminous Surface Treatment (BST) that functions like a chip seal on lower volume roads.
    - Approximately 50 of those lane miles are gravel surfaces, located in very low traffic volume areas in the southeastern part of Oregon.
  - Region preservation program:
    - Accounts for approximately 37% of Oregon's lane miles.
    - Utilizes approximately 47% of Oregon's overall funding.
    - Balance available funding between Oregon's five regions by highway class and pavement condition.
    - Fix-it routes are the focus of this program.
    - Larger chip seal (50+ lane miles) and micro surfacing projects are funded through this program as well.
  - High volume chip seal program:
    - Projects in the program are anything over 5,000 average daily traffic (ADT).
    - Budget is provided by State funds; approximately $5M per year.
    - This program is used to supplement some of the larger chip seal projects that are not covered under the region preservation program funding.
    - Projects in the program are typically performed by maintenance personnel, but they have also been contracted out.
    - Projects in this program typically utilize higher polymer content in their emulsions.
  - Low volume program:
    - Projects in the program are anything under 5,000 ADT.
    - Oregon has very few high-volume roads. Paving all the lane miles on low volume roads is not a cost-effective priority.
    - This program has been proven to mitigate unnecessary costs by maintaining roads with chip seals and thin paving. Most of Oregon's low volume roads receive two to three chip seals before paving is considered.
    - 20+ year track record of success

        - Over 70% of Oregon's non-Interstate, low volume highways are in regions four and five on the eastern side of the state.
    - Building a preservation culture:
        - Typical treatments on asphalt surfaces include:
            - Chip seals (most used),
            - Micro surfacing,
            - Fog seals,
            - Crack seals,
            - And single lift Asphalt Concrete Pavement (ACP) inlays and overlays.
        - Typical treatments on concrete surfaces include:
            - Full depth patching,
            - Spall repair,
            - And diamond grinding.
- Current design methodology:
    - Research project with Iowa State University.
        - The goal was to improve the chip seal performance in Oregon.
        - Compared the DOT's standard method-based specification to a performance-based specification. Modeled after **Transit New Zealand (TNZ) P17: Notes for the Specification for Bituminous Reseals**.
    - Utilized a State Transportation Innovation Councils (STIC) grant to implement research findings.
    - Oregon DOT has developed its own performance-based specification:
        - Contractors are responsible for setting application rates,
        - Submitting designs (McLeod Method) two weeks prior to the project,
        - Placing and finishing the chip seal,
        - And making any replacements or repairs needed (bleeding, flushing, chip loss) within the one-year warranty.
        - After the warranty period is over, the contractors will have to meet a performance measurement. The results of this performance measurement can cause the contractors to receive a 5% incentive or disincentive.
            - The performance measurement uses the Sand Circle Test and/or the Sand Patch Test to evaluate macrotexture. The final measurement is the standard deviation of five tests performed at the location of the project.
    - McLeod Method:
        - Oregon's researchers performed a literature review on the McLeod Method and recommended it be utilized as it is a well-established chip seal design method.
            - Mitigates typical failure criteria seen with chip seals (bleeding, flushing, aggregate loss).
            - Provides recommended application rates for the contractors based on aggregate properties and correction factors.

- Earnest provided an example Excel spreadsheet that Oregon has developed for its performance-based specification; based on the McLeod Method and New Zealand's TNZ P17 document.
  - Two pilot projects have utilized this specification spreadsheet so far.
    - Oregon Route 99E.
    - US Route 730 and Oregon Route 11.
  - Future use of the performance-based specification depends on funding.
  - Many of Oregon's experienced maintenance staff have assisted in the development of the performance-based specification by utilizing the McLeod Method in the background of projects.
    - Documented numerous maintenance chip seal projects over the last three years to compare actual application rates to the McLeod Method's suggested application rates.
    - Findings:
      - Actual emulsion application rates ~.03 Gal/Sy Higher.
      - Actual aggregate application rates ~3 Lbs./Sy Lower.
- Usage
  - Oregon State University is working to develop an assessment tool that reads macrotexture for high-speed surface profiling.
  - OR looking at using Reclaimed Asphalt Pavement (RAP) in chip seals, but not slag

Questions

The following is a summary of the discussion following the presentation given by Timothy Earnest.

- Missouri has utilized the McLeod Method as well. It has found that maintenance staff outperforms contractors. The contractors will submit one design based on one quarry stockpile, but the maintenance staff will sample every stock they are going to pull. This often led to the contractors' rates being "off" and the inspectors are not knowledgeable enough to notice at the project site.
- Manitoba has faced problems with lowering contractor rates. When looking at the mat with a lower design rate, it can be uncomfortable to see a large amount of emulsion showing a lot of black.
- Michigan has three-year chip seal warranties, but often run into contractors using excuses as to why it is not their responsibility to come back and fix the pavement (e.g., "snowplow damage").
- Utah performed a research project to correlate skid number to macrotexture and did not find a correlation between the two.
- Did Oregon's payout change after the development of the performance-based specification?
  - Yes. Previously Oregon was paying everything by weight, which encouraged contractors to over apply. Oregon has left asphalt to be paid for by the ton due to its large escalation clause, but placement is now being paid for by the square yard.
- How difficult was it to get Oregon's contracting firms on board with the chip seal warranty?

- While Oregon was still in the research phase of developing the performance-based specification, the DOT communicated and involved its contractors in the process. Iowa State University hosted contractor events and visited project sites for six to seven years prior to implementation, so its contractors were not caught off guard by the warranty.

2.2. Group Discussion on Pavement Preservation Design

Proposed Discussion Questions from the Meeting Agenda

- *Do you have pavement preservation included within your normal design manual? Do you use it? When was it last updated?*
- *What pavement preservation design methodology does your state use?*
- *What types of preventive maintenance treatments require a pavement design? Is this specified in your manual?*
- *Who performs the pavement designs (state forces or contractors)? Are designs performed at District/Regional Offices or at your Central Office?*
- *When is the pavement preservation design performed? Submitted? Approved? Who does the approvals (District/Regional Offices or your Central Office)?*
- *How do you ensure a cost-effective design? Is there guidance in your pavement design manual?*
- *Do you have environmental/geographical considerations in selecting preventive maintenance treatments?*
- *What are some of the challenges/barriers to pavement preservation design?*
- *Are contractor quality control (QC) plans required?*
- *What is one thing you could improve about your policies/procedures?*

Group Discussion

The following is a summary of the group discussion moderated by Thomas Van, FHWA Headquarters Offices, and Timothy Earnest, Oregon DOT.

Do you have pavement preservation included within your normal design manual? Do you use it? When was it last updated?

INDIANA

Indiana has an agency-wide design manual that directs treatment selection and application. Indiana DOT had performed a research project with Purdue University to develop a pavement preservation initiative. Indiana has always done chip seal, but through this project it began completing more chip seal projects and worked to improve chip seal application. It has also performed Ultra-Thin Bonded Wearing Course (UBWC) and micro surfacing projects.

ALASKA

Alaska has a design manual, which is split into preventive maintenance and resurfacing categories to further assess pavement design and safety analysis.

North Dakota

North Dakota has an overall design manual, but it only lists which treatments are included under preservation. Its districts decide which projects they would like to perform and then the DOT's Programming Division will review and prioritize all project submissions and make project approvals based on the budget.

Oklahoma

Oklahoma has a similar program. Oklahoma DOT allocates its budget for each of its districts at the beginning of each year. The districts have autonomy to choose which projects they would like to complete, they are to follow some loose specifications set by Oklahoma DOT, then their project submissions are approved by Taylor Henderson, Oklahoma DOT's State Maintenance Engineer.

Michigan

Michigan has a Capital Preventative Maintenance (CPM) Manual that includes all its CPM treatments and their criteria. Each year Michigan DOT makes a call for projects. Funding is divided between the Reconstruction and Rehabilitation (R&R) Program and the CPM program. Then information on pavement remaining service life (RSL) is provided to the Lansing Central Office. The DOT's Planning Department then designates how much funding will be allocated toward the Reconstruction and Rehabilitation Program and the CPM Program. The Planning Department then provides a breakdown of funding for each region and a suggested list of projects based on budget and surface conditions.

Minnesota

Minnesota has a pavement preservation manual that was developed approximately four years ago. It includes all preservation treatments regardless of if they require pavement design. Minnesota also has a seal coat handbook that was updated two years ago, which utilizes the McLeod Method to assist with design efforts. Minnesota has found that placing a fog seal over chip seals has been highly effective in prolonging service life. Additionally, Minnesota has a maintenance manual that includes one chapter on pavement preservation, which was developed ahead of its pavement preservation manual.

Minnesota's Pavement Management Program suggests projects for each of its districts. Its funding program has a greater focus on maintenance rather than construction. Whatever funds are left over are given to preservation, but it can be a challenge to complete those projects with no dedicated funds. This challenge leads to preservation projects being completed at varying rates for each district.

California

Caltrans has a maintenance technical advisory guide manual which covers the preservation and maintenance treatments used by the DOT. Caltrans' most popular pavement preservation treatment is rubber chip seals with some polymer modified chip seals. The DOT also performs micro surfacing, slurry seals, fog seals, and double chip seals. California's twelve districts have autonomy over their own pavement design.

How do you ensure cost effectiveness?

MINNESOTA

Minnesota has been tracking its costs and reporting them back to the districts to show what the findings are in terms of treatment longevity and performance versus cost; somewhat of an unofficial Life Cycle Cost Analysis (LCCA). This information has aided its districts in making informed decisions when it comes to future projects and treatment selection.

WYOMING

Wyoming uses degradation curves to look eight years ahead when defining future pavement preservation projects. This process is meant to predict when a project would become a new candidate as opposed to a rework. Wyoming has not seen anything tied back to the type of repair and what its real longevity is per the annual collection system. The DOT has run into some issues with inflation in planning its preservation projects eight years in advance. Its districts use a six-year plan, which can negatively impact the effectiveness of the DOT's eight-year plan as well.

OREGON

Oregon's low-volume and high-volume programs both utilize a two-year plan when the DOT is setting future preservation projects. Since Oregon will chip seal a road two or three times before considering pavement, the DOT looks at surface condition via percent cracking to determine when the next chip seal should be placed. The maintenance crews are very good at identifying transverse cracking and crack sealing to ensure roads stay in good condition.

MICHIGAN

Michigan plans its preservation treatments on a five-year plan, but it realistically functions closer to a two-year plan.

CALIFORNIA

California has a Highway Maintenance Program and a Capital Improvements Program. The DOT's preservation projects are funded under the Highway Maintenance Program and function on a two-year plan. Caltrans has a limit on pavement preservation treatments; larger projects need to go through Cabinetry for approval. Mill and fills have been more popular than pavement preservation since 2018.

WASHINGTON

A bill was passed last year which indicated that $1.5B of funding would be allocated to preservation to help reduce the DOT's backlog. When the funding was initially indicated for preservation, the workforce and planning departments were not prepared to deliver $1.5B in preservation projects over a six-year period. This has led legislature to push the availability of that funding back until 2030. Washington is not currently programming any preservation projects for 2024 because of this pushback on funding.

MICHIGAN

Michigan receives disproportionate funds for its R&R and CPM Programs. Across its seven districts, R&R receives approximately $500M annually and CPM receives approximately $87M annually. Michigan is currently pushing for a bigger budget for CPM. Margaret Szajner's region has been able to shift funds between R&R and CPM. With an inadequate amount of funds allocated to maintenance, regions are now faced with having to perform reconstruction projects that could have been maintained.

WASHINGTON

Washington typically receives $1B in funding per year to be allocated toward preservation of its 18,500 lane miles, but the DOT has an enormous backlog which accounts for 40% of its projects. The new pivot in legislature this year has reduced the DOT's annual funding to $750M which risks the backlog getting even worse. The leftover $250M has been granted to capital improvements. Washington's preservationists worry that those working with capital improvement projects will run into the same staffing, contractor availability, materials, and planning issues that the DOT experienced in trying to plan for an increased number of projects with the new budget.

Pavement engineers look five to ten years in the future to anticipate when a pavement is going to need treatment. Washington has noticed that trying to receive cooperation for future needs has possibly caused those in legislature to see the DOT as "alarmists" and that they perhaps do not feel a strong need to plan as they may not be reelected when those plans come to fruition.

MICHIGAN

Michigan is currently conducting a research project in collaboration with HNTB to develop software to track jobs, funding, and resource availability to assist in project planning. The need for this software stemmed from the Rebuilding Michigan Program, which provided an increased amount of funding, leaving the DOT scrambling to figure out if it had the appropriate resources to complete the projects for which it had received increased funding.

NEVADA

Nevada has two main programs, maintenance and improvement, both of which include a scope that can be argued as pavement preservation. The maintenance program receives an approximate $35M of funding per year; one dollar spent in the maintenance program is one dollar spent on pavements. The improvements program receives an approximate $300M of funding per year; one dollar spent in the improvements program is 50 cents spent on pavements. Funding provided for the maintenance program goes a lot further regarding pavements. Funding provided for the improvements program serves as a delivery method to complete projects needed for the Americans with Disabilities Act (ADA), barrier rails, hydraulics, etc.

How do you deal with environmental and geographical differences for pavement preservation?

CALIFORNIA
California's paving is predominantly done at night. There are multiple climate regions: high elevation deserts, low elevation deserts, mountain regions, and others. Those different climate regions require different designs. Some of the preservation treatments are not applicable in certain regions. Since the DOT's designs focus on temperature, its twelve districts have the autonomy to modify designs as needed.

IDAHO
Idaho deals with geographical issues. For instance, the DOT must occasionally delay preservation projects in urban areas due to mobility concerns when working with emulsion-based chip seals. The DOT is trying to increase the use of micro surfacing treatments because those can be completed at night.

NEBRASKA
Nebraska's geographical differences are mostly based on traffic volumes in rural versus urban areas. Most of its urban areas are 5,000 ADT or less. Those areas are more willing to receive micro surfacing or armor coats. An armor coat is like a chip seal; it utilizes a cost-effective, readily available pea gravel from Flat River. Nebraska uses a Cationic Rapid Setting Polymer-Modified Asphalt Emulsion (CRS-2P) as well as a chip seal containing crushed limestone.

MANITOBA
Manitoba has different end of year dates for chip seals to stop projects before temperatures drop. The southern area will typically chip seal until the end of August and the northern area will chip seal until mid-August. Manitoba often utilizes micro surfacing treatments in its urban areas, as well as two types of chip seals. The two chip seals include: a chip seal with a medium set emulsion and a single chip seal with CRS-2P.

SASKATCHEWAN
Saskatchewan will typically crack seal prior to micro surfacing. Saskatchewan has noticed this process can lead to reflective cracking and delamination at those cracks. It is working to reverse this process by micro surfacing first and then waiting a few winters before crack sealing.

2.3. DOT Presentation on Current State of Pavement Preventative Maintenance Treatment Inspection Process

Kristy Rizek, Kansas DOT
The following is a summary of the presentation given by Kristy Rizek, Kansas DOT Pavement Management Engineer.

Topics covered:
- Resources produced by Kansas DOT:
  - Kansas DOT Standard Specifications for State Road & Bridge Construction (2015)

  - Kansas DOT 2015 Special Provisions
  - Kansas DOT Construction Checklists
  - Kansas DOT Construction Manual
  - Kansas DOT Documentation Manual
  - Kansas DOT Technical Advisories & Policies
  - Kansas DOT Chip Seal Manual (2014)
- How to improve the pavement preventative maintenance inspection process:
  - Investigate and implement more performance-based inspection.
  - Contractor ratings.

Questions

The following is a summary of questions asked following the presentation given by Kristy Rizek.

- Who do the inspectors report to in Kansas?
  - Inspectors either report to the District Engineers or the District Construction Engineers.

2.4. Small Group Discussion on the Pavement Preventive Maintenance Treatment Inspection Process

Proposed Discussion Questions from the Meeting Agenda

- *Who performs the inspection (state forces or contractors)? Are inspections performed at District/Regional Offices?*
- *Does your state have a listing of things that need to be inspected?*
- *What are some of the challenges/barriers to inspection?*
- *Anything missing from the specifications that should be added?*
- *What is one thing you could improve about your policies/procedures?*

Breakout Group 1

The following is a summary of the breakout group discussion moderated by Shree Rao, Moderator.

Who performs the inspection (state forces or contractors)? Are inspections performed at District/Regional Offices?

Minnesota

Minnesota has a split inspection process between State forces and contractors. The DOT also performs multiple test strips at 500 feet.

California

California has experienced issues with getting inspectors to test strips in a timely manner. By the time samples are procured from the test strips and undergo testing, the actual pavement has already been laid. This situation often happens when emulsions are being tested ahead of projects.

A possible solution to this problem could be the utilization of a roofing sheet or something that could be laid on the ground prior to performing the chip seal. Once the chip seal has been laid, the sheet could be removed and inspected.

Oregon

Oregon performs 200-foot test strips and completes its inspections in-house. It has found that hosting annual trainings on chip seals are highly effective and is planning to implement Just-In-Time trainings for micro surfacing projects.

Idaho

Idaho relies on warranty-based seal coats and does not require the documentation of aggregate and emulsion application rates. Its asset management system lacks project-specific data to aid the DOT in evaluating specific preservation materials and methods for preservation throughout the pavement life cycle. The DOT utilizes a warranty system with contractors; QC provided by contractors is not verified. NCPP has delivered helpful trainings on micro surfacing for Idaho in the past.

Warranty seal coat inspection work is often assigned to operations or other staff with limited experience as they rely on performance and not a method specification. The results of this process are a noticeable decrease in state inspectors' skill level.

Maryland

Maryland utilizes its maintenance staff, and some staff from other departments, to perform inspections.

Michigan

Warranties could become a money drain if the risk involved is not placed on the contractor. If the risk is placed on a third-party performing inspection, the State can become isolated and unable to ensure that the warranty is upheld.

Michigan suggests that inspectors be present during the construction process to record weather and timings, which could increase the effectiveness of warranties when contractors avoid responsibility. On-site inspectors could also increase effective communication of expectations and needs. Sometimes inspectors can relay information to the foreman after the fact but there is no guarantee that the information is passed down to the contractors performing the work.

Washington

Washington has found it difficult to exercise its warranties due to unaccountability from contractors.

Louisiana

Louisiana's experience at the district level is low, especially with chip seal projects. This can lead to inspectors not knowing what to look for in an inspection.

Utah
Utah is struggling with an unqualified workforce. The DOT has utilized FHWA guides to adjust its internal manuals to provide its workforce with an increased number of resources.

Manitoba
Manitoba has a dedicated group of in-house inspectors and managers within its Headquarters to check the preservation treatments being completed by contractors. Since Manitoba only performs a few preservation treatments per year in house, it finds it is important to have a dedicated group for those treatments so that staff are not tasked with inspections on top of their current workloads.

Kansas
Kansas has lost much of its legacy knowledge with the bulk of its senior personnel retiring and leaving the DOT. This has caused the DOT to lose a lot of its central training, and it feels that increased training is needed to bridge the knowledge gap.

Indiana
Indiana shared that its cracked concrete pavements are much more difficult to repair and preserve than its asphalt pavements. It had utilized dowel bar retrofit (DBR) in concrete pavements. If DBR is disturbed it could ruin the structural integrity of the slab. Indiana has begun performing partial-depth repairs (PDRs) to preserve some of its concrete pavements. Contractors on these PDR projects are allowed to work from 10:00 PM to 6:00 AM, which has led them to utilize rapid set concrete to complete work within this time window. Indiana also places epoxy on the PDR to ensure it is wet.

Utah
Utah performs preservation treatments on its concrete pavements. The primary treatment used by the DOT is PDR with polymer, which the DOT has found minimizes the need for inspection. If concrete is used instead of polymer, the inspection process is much longer.

Utah has been using rapid set concrete for three to four years as a patch for PDRs. It took a long time to receive cooperation from contractors to use volumetric mixers. Utah has been using mastic pavement repair materials (Fibrecrete and TechCrete) for corner breaks. When using mastic, the DOT has found it to be beneficial to place the material higher than the existing pavement since it sinks over time. This has not been an issue since mastic is not typically used in the wheel path, but it has been a slight issue with motorcyclists when a larger patch is placed along curves.

Minnesota
Minnesota performs diamond grinds and corner repairs to proactively address estimated future distresses. The DOT aims to perform these treatments while the pavement is in good condition; typically, within ten years of paving. Evaluations on ride and surface condition help the DOT to determine distresses.

IOWA
Iowa has a lot of concrete pavements. The DOT is working toward addressing distresses earlier in pavements' lives, while the roads are still in good condition. These treatments include full depth and partial patching with Hot Mix Asphalt (HMA).

CALIFORNIA
California has had an interesting difficulty with tomato juice ruining pavement surfaces. Power washing to remove the tomato juice does not work, so milling repairs must be performed.

OREGON
Oregon places mastic directly over punchouts. Only loose rubble needs to be cleared out of the punchout prior to performance of this treatment.

MICHIGAN
Michigan is only allowed to diamond grind once, then diamond grooving is allowed if a second pass is needed. Its Pavement Management Engineers have been struggling with how to grade concrete pavements.

Michigan has a concrete pavement from 1947 that has undergone three rounds of Full Depth Reclamation (FDR) and is still in decent condition. The concrete pavement does have some friction issues, but those issues have not been the cause of any accidents.

Michigan has had a high number of run-off road crashes, which has led to an increased public interest in rumble lanes being placed down center lanes as well as on the shoulders. This has helped people to identify where the road is during heavy snowfall.

Some of Michigan's concrete pavements have had their top layer milled off and replaced with an asphalt overlay. The DOT has had a much easier time sealing asphalt cracks than concrete cracks.

IDAHO
Idaho asked the group how they handle rutting with their concrete pavements. Currently, Idaho does not consider rutting in its concrete pavement evaluations.

WASHINGTON
Washington looks at flexible and rigid rutting separately. These measures have a threshold that can trigger a project. The DOT believes its new budget restrictions will cause rutting projects above the threshold to wait until cracking is present as well.

Breakout Group 2
The following is a summary of the breakout group discussion moderated by Thomas Van, FHWA Headquarters Offices.

What does inspection look like in your state?
- Every state indicated that they have internal inspectors at the district level.

Hawaii
Hawaii is limited in inspection.

Saskatchewan
Saskatchewan utilizes contractors as inspectors, but their capabilities are limited. Saskatchewan has a one-year warranty in place for chip seal treatments (does not include snowplow damage), which includes an inspection to be completed at the one-year mark. Saskatchewan does not perform test strips ahead of projects.

Missouri
Missouri is working toward establishing inspectors with separate focuses on treatments (micro surfacing, chip seals, etc.); this has been a difficult task.

FHWA Western Federal Lands Highway Division
Federal Lands requires its contracted inspectors to be certified through NICET. Federal Lands utilizes contracted inspectors for Quality Assurance (QA) and state inspectors for QC.

Oklahoma
Oklahoma utilizes a list of qualified contracted inspectors that have met all of Oklahoma's specifications and requirements; the contracted inspectors are held to the same requirements as Oklahoma DOT's internal inspectors. 70-80% of Oklahoma's inspections are performed internally.

North Dakota
North Dakota's districts have the autonomy to choose inspections or warranties to be done on its chip seals. The DOT's warranties are one-year programs where chip seals are compared to test strips.

Colorado
Colorado utilizes internal inspectors and external consultants. Inspections completed internally are performed by maintenance and engineering staff. Inspections completed externally are performed by consultants with project experience.

Nebraska
Nebraska has one district that performs micro surfacing treatments; these treatments are discouraged by Nebraska DOT. The inspection done on these micro surfacing treatments is performed by state inspectors.

For armor coats, Nebraska utilizes its maintenance staff to perform materials testing on test strips.

New Mexico
New Mexico has developed inspector trainings to be given to contractors and DOT staff. Contracted inspectors are utilized as a supplement to DOT inspectors. DOT projects have minimum testing requirements, which are more lenient on local projects.

What is your greatest risk/challenge relating to pavement preservation?

OKLAHOMA
Oklahoma's biggest challenge is applying maintenance on the right pavements at the right time. Although the DOT is granted a large amount of funding, it can be difficult to allocate money to the appropriate projects.

Oklahoma has received a significant amount of public criticism for micro surfacing treatments.

MISSOURI
Missouri struggles to identify and select project sites.

Missouri's district level engineers have also received public criticism for micro surfacing treatments. The public often confuses micro surfacing with receiving a new overlay and are disappointed by the results.

NEBRASKA
Nebraska's oil prices are most likely the cause of increased costs for micro surfacing treatments. The DOT does not perform slurry seals but have found fog sealing to perform similarly.

Nebraska is having difficulty filling vacant positions.

NEVADA
Nevada has had issues with the short season available for chip seals to be performed. The DOT is looking for better temperature resistant chip oils to potentially expand that window.

Who do you use for training? How do you think training should be done?

ALASKA
Alaska does not have a training program. Suggestions have been made to begin a program that would perform trainings once per year and then later progress to perform trainings once every three years.

MISSOURI
Missouri suggests the development and requirement of a national standardized training program. The DOT would like to have a resource listing required contractor certifications which it could implement in its specifications.

Missouri does not have the funding to pay for many inspectors, which has led to a lack in inspector availability. The DOT would like to utilize Just-In-Time trainings for high priority projects versus using funds to support inspector trainings.

NEBRASKA
Nebraska would like to utilize virtual or in-state trainings; these would best work for its budget. Nebraska has been receiving trainings from its central lab and project managers, but the

strategies for these trainings are limited and cheap. The DOT suggests hosting a maintenance conference that would provide trainings.

COLORADO

Colorado would like to utilize virtual or in-state trainings.

HAWAII

Hawaii would like to utilize virtual trainings as the DOT has had difficulty with getting people to attend in-person. The DOT is interested in receiving slurry seal trainings, and has addressed Just-In-Time trainings as a potential framework for this training.

Maui has a workshop on pavement preservation efforts and performance. Oahu would like to develop a similar workshop.

NORTH DAKOTA

North Dakota utilizes the Minnesota DOT's guide for chip seals. The DOT has partnered with Montana, Wyoming, and South Dakota to create a training learning network (TLN). North Dakota has also developed new specifications from test sections.

North Dakota would benefit from Just-In-Time trainings.

OKLAHOMA

Oklahoma retains inspectors well but has experienced a high turnover of its heavy equipment operators. Most of the training is passed down from experienced staff, which can be an issue when dealing with turnover.

SASKATCHEWAN

Saskatchewan has training slide decks, videos, and case studies that it provides to crew supervisors.

3. PAVEMENT PRESERVATION KEYS TO SUCCESS

3.1. FHWA Presentation on Pavement Preservation Keys to Success

Jason Dietz, FHWA Resource Center
The following is a summary of the presentation given by Jason Dietz, FHWA Resource Center.

Topics covered:

- Preventive maintenance:
  - Proactive interaction with the contractor/owner.
  - Follow standard test methods.
  - Keeping up with the slurry trucks and tracking the loads of materials.
    - Obtaining street measurements.
    - Collecting tickets and date slips.
    - Photos and videos.
  - Be prepared and keep testing equipment clean.
  - Providing the contractor with clear direction in situations where an immediate change is needed.
    - A common example is adjusting limits and covering berm areas.
  - Remaining in communication with the project engineer, contractor, and the technician.
- Production inspection:
  - Is the street preparation acceptable?
  - Is someone doing product inspection and taking samples of asphalt emulsions or performance grade asphalt?
  - Is someone verifying the appropriate type/quantity of on-site materials?
  - Is the proper operational equipment on-site?
  - Is the aggregate spread rate verified?
  - Is the set time verified?
- Aggregate quality summary:
  - Durable,
  - Sound,
  - Abrasion resistant,
  - Polishing (friction),
  - Clean,
  - Angularity,
  - Consistent,
  - And segregation.
- Field sampling and fabrication preparation:
  - Parking and fabrication location.
  - Equipment cleaned and organized.
  - Communication with pugmill operator.
  - Level fabrication work area.

- Equipment staged at sample location.
- Understanding typical pull patters and routes:
  - Pulling slurry field samples:
    - Safety first.
    - Obtain sample directly from mixer discharge.
    - Typically obtain two samples per mixer, from separate loads, per shift.
  - Knowing what types of tests are needed:
    - Wet Track Abrasion Test.
    - Aggregate testing:
      - Sieve.
      - Sand Equivalent.
      - Other.
    - Constancy testing:
      - Flow Test.
      - Optimum mix design proportions.
    - Residual Asphalt and Water Content Sampling.

4. PAVEMENT PRESERVATION PROGRAM AND TREATMENT SELECTION

4.1. DOT Presentation on Current State of Pavement Preservation Program

Srikanth Holikatti, Caltrans

The following is a summary of the presentation given by Srikanth Holikatti, Caltrans Transportation Engineer.

Topics covered:

- Caltrans' pavement preservation is part of Highway Maintenance (HM)-1 Program under Roadway Maintenance in the Division of Maintenance.
- Roadway Maintenance is organized into both the HM-1 Program and the State Highway Operation and Protection Program (SHOPP).
- HM-1 Program includes:
  - No distress.
  - Minor surface distresses.
- SHOPP Program includes:
  - Everything else.
- California performs many double chip seals. Prior to 2017, only 0.10 feet could be done for preservation.
- California uses a significant number of rubber hot mixes, which have become a large part of its preservation efforts.
- Caltrans' treatment selection process:
  - Utilize an Automated Pavement Condition Survey (APCS) as a baseline for distress levels, and conduct field visits to ensure the appropriate treatment strategy is selected based on available funding.
  - California's roadway system is divided into three classifications.
    - **Roadway Class 1:**
      - Contains route segments classified as Interstate and other principal arterials.
      - Includes Freight Network Tier I and II, and the Strategic Highway Network (STRAHNET) routes.
      - *Preservation is not allowed on Class 1 items.*
    - **Roadway Class 2:**
      - Contains route segments classified as non-Interstate National Highway Systems (NHS) and Interregional Road System (IRRS).
      - Includes Freight Network Tier 3.
    - **Roadway Class 3:**
      - Contains all other routes not included in Classes 1 and 2.
- Caltrans' budget is $220M, which is double the funding received prior to 2019.
- Cold in Place Recycling (CIR) is now included under HM-1. There has been discourse on whether CIR should be considered preservation.
- California has 18-19 preservation projects slated for 2023.

- Caltrans is placing a few aramid fiber modified thin HMA overlay pilot projects as part of its preservation efforts.

Questions

The following is a summary of questions asked following the presentation given by Srikanth Holikatti.

- Does California use rubber in its thin overlays?
  - For HMA overlays, asphalt-rubber (AR) content is anywhere between 18-20%. For chip seals, AR content can be as high as 21%.
- Does California feel that its increased budget ($220M) has led to a decrease in project optimization?
  - No. Caltrans' Headquarters Office provides project recommendations to its district representatives. The districts have autonomy over whether they will add those recommendations to their project plans; the districts usually add all recommendations into their programs.
  - Idaho has faced difficulty with project optimization due to a disconnect between the DOT and the districts. Its Headquarters Office will provide the districts with project recommendations, but the districts do not like to build out their project plans years in advance.
  - Michigan had a similar experience to Idaho. Michigan's districts previously selected their own projects. When the DOT made its initial push for the districts to follow the DOT's project recommendations, the DOT had to take a step back. Over the past three years, the DOT has hosted trainings for its districts to better understand why the DOT has chosen the recommended projects and to teach the districts what to look for when making their own project selections. This effort has built trust between the DOT and the districts to collaborate on project selections.
  - Idaho DOT is putting together a training for district representatives and contractors to attend and learn how to interpret their PMS to aid in the buildout of their programs.
- What is California's threshold for dig outs? How did you decide on that threshold?
  - If longitudinal cracking exceeds 20%, then a dig out project is needed. If longitudinal cracking is less than 20%, the labor-intensive dig outs are not economical.

4.2. Small Group Discussion on Pavement Preservation Programs

Proposed Discussion Questions from the Meeting Agenda

- *Does your DOT have a formal pavement preservation policy?*
- *Is it documented well or not?*
- *How many years has your DOT reported having a pavement preservation program?*
- *What is your DOT description of preservation maturity (somewhat mature, improving, fully mature, relatively immature)?*
- *What are your DOT sources of preservation funding?*
- *Who is responsible for preventive maintenance treatments and project selection (Central Office and local input, local level, Central Office, other)?*

- *What methods are being used to construct preservation treatments (both by contractors and in-house forces, constructed by contractors, constructed by in-house forces)?*
- *Are your DOT documenting benefits of pavement preservation (improved performance, reduced the overall cost, achieved system performance targets, increased the number or miles that can treat, reduced crashes or fatalities)?*
- *What additional guidance would your DOT desire (improved performance, reduced overall cost, achieved system performance targets, increased number of miles that are able to treat, reduced crashes or fatalities)?*
- *How do you determine "what," "when," and "where"? Is decision-making centralized or de-centralized?*
- *What techniques/tools do you use to evaluate the existing pavement condition and subsurface investigation prior to rehabilitation or preservation treatments?*
- *How do you design preventive maintenance treatments? Are there certain roadway/traffic levels you use a certain treatment for? Materials requirements? Is guidance provided in your pavement design manual?*
- *Is the use of recycled materials considered as early as possible in the development of every project?*
- *How does one handle the failure of a pavement preservation treatment?*

Breakout Group 1

The following is a summary of the breakout group discussion moderated by Srikanth Holikatti, Caltrans, and Shree Rao, Moderator.

Does your DOT have a formal pavement preservation policy?

MARYLAND

Maryland "kind of" has a formal pavement preservation policy. All its districts have set amounts of funding to be spent on pavement preservation per year. Pavement preservation typically accounts for 15-20% of the annual budget. Maryland's preservation projects are comprehensively documented, and the DOT has an incentive program for preservation treatments.

MANITOBA

Manitoba has a fixed dollar amount to be spent on pavement preservation each year.

IDAHO

Idaho allocates 30% of its annual pavement program funding for preservation treatments. The DOT is working toward shifting the program to a combination of baseline, need-based, and performance-based funding using PMS measures and findings. This would require decision trees within PMS to be updated annually.

UTAH
Utah's PMS awards more funding to roads in good condition than the ones that need preservation treatments. The DOT has one large preservation and rehabilitation fund with no individual silos for regions, Interstates, etc.

WYOMING
Wyoming lumps preservation treatments in with its surface level treatments. Its districts submit candidate projects, then Wyoming DOT weighs the number of sections per district to ensure performed work and funding are on track.

MICHIGAN
Michigan has a similar system. Its regions submit their lists of desired work and then Michigan DOT staff will accompany regional staff to each of the desired routes. Once these visits are complete, DOT staff will relay their projects suggestions on how to best prioritize funds to their DOT Headquarters.

Michigan utilizes decision trees to assist in treatment selection.

CALIFORNIA
California's districts submit their project lists to Caltrans' Headquarters for approval. Headquarters rarely disapproves of the districts' project lists.

California utilizes decision trees to assist in treatment selection.

WASHINGTON
Washington has a staff member with a statewide view of current and desired pavement projects. Having this staff member review potential projects with a knowledge of all statewide activities has been very beneficial in providing feedback on regional project submissions.

Washington utilizes decision trees to assist in treatment selection.

Is anyone documenting treatments? Design?

MICHIGAN
Michigan has been utilizing PaveTrack to record when pavements are built, rebuilt, and receive preservation treatments.

MINNESOTA
Minnesota has been documenting its preservation treatments through PMS.

Breakout Group 2
The following is a summary of the breakout group discussion moderated by Jason Dietz, FHWA Resource Center.

Does your DOT have a formal pavement preservation policy?

Alaska
Alaska has a design manual that includes an outline of pavement preservation. It breaks preservation into three sections and provides a guide for project selection.

Nevada
Nevada does not explicitly utilize a definition for pavement preservation but has pavement performance and improvement separated into two programs.

Missouri
Missouri has an engineering policy guide that outlines pavement maintenance and preservation, but it does not include details on when preservation should be utilized.

Hawaii
Hawaii has a three-pager on preservation procedures, titled "Preventative Pavement Preservation Management (PPM)."

Colorado
Colorado has a pavement design manual that includes a chapter on pavement maintenance and preservation. The DOT also has a policy memo on where funding for surface treatments should be prioritized, which states that a minimum of 5% of the surface treatment funding should be allocated toward preservation.

North Dakota
North Dakota has a design manual that outlines pavement maintenance and potential treatments, but it does not include triggers for those potential treatments. The DOT's seal treatments are not included in PMS.

Oklahoma
Oklahoma does not have any manuals or formal policy. The DOT does have a flow chart to assist with pavement management.

Where does your funding come from for preservation treatments?

Alaska
Alaska utilizes Federal funds for most of its preservation treatments.

Nevada
Nevada utilizes State funds for 100% of its maintenance improvement projects.

Saskatchewan
Saskatchewan utilizes Provincial funds for most of its preservation treatments. Some of its projects utilize Federal funds.

FHWA Western Federal Lands Highway Division
Federal Lands utilizes National Park funds.

Missouri
Missouri utilizes an 80/20 split of Federal and State funds for its contracted projects. Its maintenance projects are mostly completed with State funds.

Oklahoma
Oklahoma utilizes a 70/30 split of Federal and State funds and feels that its funding parameters are defined well.

North Dakota
North Dakota utilizes an 80/20 split of Federal and State funds for chip seals and micro surfacing treatments.

Colorado
Colorado utilizes State funds for most of its preservation treatments when done by internal DOT Maintenance Forces. For engineering delivered projects, it is typically an 80/20 split of federal and State funds.

Hawaii
Hawaii utilizes State funds for 100% of its preservation treatments.

Are your construction projects completed internally or are they contracted out?

Alaska
Alaska's construction projects are completed both internally and externally by contractors.

Nevada
Nevada's chip seals are completed both internally and externally by contractors. The DOT utilizes external contracts for other maintenance improvement projects such as crack seals, patching, etc.

Saskatchewan
Saskatchewan's patching and other related maintenance projects are completed internally. All other construction projects are completed by external contractors.

FHWA Western Federal Lands Highway Division
Federal Lands' construction projects are completed by external contractors.

Missouri
Missouri's construction projects are completed both internally and externally by contractors; roads with a high volume of ADT are completed by contractors.

Oklahoma
Oklahoma's armor coats are completed internally. Everything else, not including routine maintenance, is contracted out.

North Dakota
North Dakota's construction projects are completed both internally and externally by contractors. Most of the DOT's projects are completed by contractors.

Colorado
Colorado's chip seals, crack seals, and thin overlays are completed both internally by DOT Maintenance Forces and externally by contractors.

Hawaii
Hawaii's potholes are completed internally; all other construction projects are completed by external contractors.

Nebraska
Nebraska's armor coats are completed internally; most other construction projects are completed by external contractors.

4.3. DOT Presentation on Types of Surface Treatments, Expected Performance, and Contracting

William Flora, Indiana DOT
The following is a summary of the presentation given by William Flora, Indiana DOT Pavement Area Engineer.

Topics covered:
- Overview:
  - Indiana DOT works with 6 districts on pavement issues.
  - Indiana State Road Network has a total of 96,000 centerline miles.
  - 29,000 lane miles are overseen by Indiana DOT.
  - Indiana DOT maintains 11,400 centerline miles; state law allows the DOT to maintain a maximum of 12,000 centerline miles.
- Indiana's pavement types:
  - Asphalt surfaces make up most of Indiana's pavements.
  - Concrete surfaces account for approximately 10% of Indiana's pavements.
  - Composite pavement is present at a large, unknown amount.
    - Most are 18 feet of concrete with two to four feet of widen with asphalt.
- Indiana's pavements function through the collaboration of two main parts, Indiana DOT's Central Office and its districts.
  - Indiana DOT Central Office:
    - Run by Director, Data Engineer, Data Analyst, and three Area Engineers.
    - Set pavement asset policy and oversee the execution of policy.
    - Utilize dTIMS as its PMS for project recommendations.
    - Oversee change management if changes (cost, dates, etc.) to a project need to be made during the development phase.

        - Indiana has a 20-year plan, begin programming six years ahead, and projects are put in five years out.
    - Oversee data management with a focus on condition data [International Roughness Index (IRI), rutting, faulting, FWD, cores, ground penetrating radar (GPR), and three-dimensional GPR].
        - Utilize condition data to paint a picture of the structural integrity of its pavements.
        - Process data and develop reports.
- Indiana's six districts:
    - Run by Pavement Asset Engineers. Some districts have Assistant Pavement Asset Engineers as well.
    - Employ District Experts on pavements.
    - Assist in selecting and programming pavement projects.
    - Work with construction and maintenance teams on pavement problems/issues.
- Indiana DOT Pavement:
    - Program all pavement projects and assist on pavement for other projects.
    - Assist in the scoping of pavement projects.
    - Assist in pavement maintenance done by in-house forces.
        - Chip seals,
        - Crack seals,
        - Fog seals,
        - Patching,
        - And underdrain locating, repair, and cleaning.
    - Road categories:
        - Category A: Interstates.
        - Category B: Freeways and principal arterials.
        - Category C: All remaining low-volume ADT roads (under 5,000 vehicles per day).
    - Pavement preservation:
        - Pavement Preservation Initiative (HMA):
            - Primarily chip seals completed in-house for low-volume ADT roads (under 5,000 vehicles per day),
            - Fog seals,
            - Scrub seals,
            - Micro surfacing,
            - UBWCs,
            - And thin HMA overlays.
        - Concrete Preservation:
            - Joint sealing for longitudinal and transverse cracking,
            - DBR,
            - Partial depth patching,
            - Full depth patching with Calcium Sulfoaluminate (CSA) concrete,
            - And milling.

Questions

The following is a summary of questions asked following the presentation given by William Flora.

- Does Indiana indicate a time span that crack sealing extends the life of its pavements?
  - No, but Indiana will not crack seal more than three times before planning a new project to be done to the pavement surface. Too much crack sealing can present friction issues.

4.4. Group Discussion on Types of Surface Treatments, Expected Performance, and Contracting

Proposed Discussion Questions from the Meeting Agenda

- *What types of surface treatments do you use? Rehab? Preservation? Recycling?*
- *What performance do you expect from your surface treatments?*
- *Is there any feedback from the materials group on whether treatments are being selected and designed properly?*
- *Do you utilize any special/unique contracting mechanisms for preservation or recycling work?*
- *What are some of the challenges/barriers to effective pavement evaluation and treatment selection?*

Group Discussion

The following is a summary of the group discussion moderated by Shree Rao, Moderator.

What types of surface treatments do you use? What is your expected performance of those treatments? Do you have any specific contracting mechanisms for preservation projects?

OKLAHOMA

Oklahoma uses a lot of Hot In-Place Recycling (HIR), and the DOT is hoping for technology to improve to a point of less rutting. The DOT is expected to perform preservation projects on 10% of its pavements each year; this includes all eight districts. Each of Oklahoma's districts completes preservation projects for approximately 100 lane miles each year. Armor coats have become critical to the DOT's preservation program due to their low cost and effectiveness (eight years life expectancy). The districts perform their own two-inch overlays with mill and fills (ten to fifteen years). The DOT's contracting mechanisms include statewide contracts for concrete rehabilitation (e.g., panel replacements), statewide contracts for asphalt pavements with a two-inch overlay, and statewide contracts for aggregates and oil for in-house projects.

SASKATCHEWAN

Saskatchewan uses a lot of seal coating and racked in chip seals. The process of racking in chip seals takes two passes of the chipper spreader: the first with a larger stone, then the second with a smaller stone. Other preservation treatments include micro surfacing, and Saskatchewan is beginning to perform thin overlays again after experiencing delamination in the past. Saskatchewan has written specifications for CIR but has not implemented it into the program yet.

Saskatchewan's contracting mechanisms include utilizing performance-based specifications for two-year contractor warranties.

Hawaii

Hawaii conducts crack sealing, and sometimes slurry seals, in-house. The DOT utilizes external contractors for thin overlays, DBR, diamond grinding, and sometimes for concrete preservation. The DOT is currently collecting data to begin implementing RSL measurements into project recommendations and is conducting pilot projects for micro surfacing and RAP pavements. The DOT's contracting mechanisms include Indefinite Delivery/Indefinite Quantity (IDIQ) contracts for each of the islands.

Missouri

Missouri has been using chip seals (five to seven years life expectancy), scrub seals (five to seven years), crack seals, micro surfacing, thin overlays (eight years), scratch and seals, and rejuvenators. The DOT previously utilized CIR and HIR as preservation treatments but has stopped because the program only allows the DOT to perform single lift HMA overlays below two inches. The DOT provides guidance to its districts on treatment selection, but the districts have the autonomy to choose their own treatments. The DOT's contracting mechanisms include specifying materials quantities.

Colorado

Colorado mostly uses chip seals (five years life expectancy) and crack seals for preventive maintenance. The DOT has completed recycling treatments but is very selective with those projects. The DOT's contracting mechanisms include regular contracts placed out for external bids and an IDIQ contract for thin overlays in Region One.

Nevada

For asphalt pavements, Nevada has been using crack seals, chip seals, scrub seals, slurry seals, micro surfacing, and two-inch overlays. The DOT previously utilized CIR but has had poor experiences with its performance. The DOT has begun to complete profile mill projects where no dip depth is specified on the mill ahead of time; pavements are profiled before and after project completion to specify the percentage of treatment. For concrete pavements, the DOT has been using profile grinds, DBR, crumb rubber in southern Nevada, bonded wearing course (BWC) in northern Nevada, slide replacements, and spall repairs. Most of the DOT's preservation surface treatments have a life expectancy of eight to twelve years.

Nevada DOT's contracting mechanisms include both in-house efforts and external contractors (crack seals, sometimes chip seals, spall repairs). The districts produce project lists, which the DOT provides feedback on. The DOT also provides the districts a recommended project list derived from PMS, which the districts will review and provide feedback on.

Alaska

Alaska uses chip seals (five to seven years life expectancy), mill and fills, and thin overlays. The DOT is working to implement the use of more GSB-78 to mitigate aggregate loss. The DOT

does not have any special tracking mechanisms, which has led to a lack of performance feedback.

Nebraska

Nebraska has been using external contractors for two-inch mill and fills (10 years life expectancy), crack seals, joint seals, micro surfacing (four to five years), and concrete repairs. The DOT performs HMA patching and armor coats (four to six years) in-house. The DOT's only contracting mechanism requires that if its maintenance team is to perform work, there needs to be a nearby contracted project that the team can obtain HMA from.

North Dakota

North Dakota has been primarily using chip seals and micro surfacing (seven to ten years life expectancy for both treatments). The DOT also uses mill and fills (ten to twelve years) and has completed RAP chip seal and RAP micro surfacing treatments. The DOT's contracting mechanisms include warranties on 50% of chip seals where pavement performance is compared to an approved test section after one year.

North Dakota DOT is building a pavement preservation test section containing eight sections at three miles each. The entire test section will be micro-milled, and the millings will be placed on three of the sections as a RAP cape seal, RAP double micro surfacing, and a RAP double chip seal.

Louisiana

Louisiana has been using medium overlays (over two inches), thin overlays (less than two inches), patching, joint sealing, and a few chip seals. The DOT performed its first scrub seal in 2022, which has not held up well because the DOT did not have a fog seal developed at that time. The DOT has recently finished putting together its fog seal specification and has drafted a slurry seal specification. Its districts would like their chip and scrub seals to have a life expectancy of five to seven years.

Minnesota

Hennepin County, Minnesota, uses a lot of two-inch mill and fills (twelve to fifteen years life expectancy) and crack sealing, and has added chip seals, micro surfacing, FDR, and CIR to its program. Hennepin County is working to add UBWC as a treatment; historically, the county has been using it as a band aid. The county's contracting mechanisms include external contractors for all preservation treatments aside from in-house crack sealing, which will soon be completed with an IDIQ contract.

Minnesota DOT has been using mill and fills, stabilized full depth reclamation (SFDR), CIR, and has begun testing HIR for rehabilitation projects; the life expectancy of all these treatments is ten to fifteen years. For preservation, the DOT has been using chip seals (eight to ten years life expectancy), micro surfacing (eight to ten years), UBWC (ten to twelve years). For concrete, the DOT has been using concrete pavement restoration (CPR) which has a life expectancy of 20 years. The DOT's contracting mechanisms include most treatments being completed by an

external contractor, some of Minnesota's districts perform in-house micro surfacing treatments on ramps and service roads, and an IDIQ contract for larger preservation projects.

Iowa

Iowa has been primarily using mill and fills, CIR, and three-inch overlays for asphalt pavement rehabilitation projects; the life expectancy of all these treatments is twelve to fifteen years. For preservation projects, the DOT has been using micro surfacing (seven to ten years life expectancy), thin overlays, and one of its districts uses chip seals (five to seven years). The DOT is working to implement scrub seals and cape seals into its program as well.

Wyoming

Wyoming has been primarily using chip seals (five to seven years life expectancy) and sometimes micro surfacing and scrub seals for its preservation treatments. For rehabilitation projects, the DOT has been using mill and fills (ten to twelve years), HIR, FDR, and SFDR. All the DOT's treatments are completed by external contractors.

Oregon

Oregon has been using chip seals, micro surfacing, fog seals, crack seals, and single lift ACP inlays and overlays. The DOT has completed some CIR and HIR projects as well. Over the last nine years, the DOT has completed FDR projects with cement, and has had a project with 90 lane miles, which is being treated like a new pavement with a life expectancy of 20 years, perform very well. The DOT's contracting mechanism includes its performance-based specifications.

Idaho

Idaho's primary preservation treatment is a warranty seal coat (seven years life expectancy), with a winter performance period evaluated in April of the following year. The seal coat is supplemented with micro surfacing (five years) in urban areas. Approximately ten years ago, Idaho completed three to four FiberMat chip seal projects (spun glass fiber reinforced), and they typically hold up well. The DOT is looking to implement scrub seals into its program as well.

Idaho has had difficulties with micro surfacing projects that have been completed with substandard aggregate. This may be a result of out of state contractors, specializing in micro surfacing, obtaining aggregates from competing local asphalt mix suppliers.

Maryland

Maryland has been using mill and fills, overlays (twelve to fifteen years life expectancy), High-Performance Thin Overlays (HPTO; ten to twelve years), and UBWC (twelve years) for rehabilitation projects. For preservation projects, the DOT has been using crack seals (four years), micro surfacing, high friction surface treatments (HFST; ten to fifteen years), surface abrasion (three to five years), and fog seals (mainly on shoulders; three to five years). The DOT has completed a few pilot projects with CIR and FDR.

Maryland DOT's contracting mechanisms include applying for Highway Safety Improvement Program (HSIP) funding for HFST and surface abrasion and utilizing area-wide contracts for remaining treatments.

California

California has been using pavement replacement for rehabilitation projects. For preservation projects, the DOT has been using AR chip seals. The DOT has been completing recycling projects and is conducting a pilot project with Cold Central Plant Recycling (CCPR). California has had issues with its cross-slope elevations with CIR in the past, so the pilot project will allow the DOT to make corrections on its profiles. There is pressure on California to move more toward recycling as its quarries are dwindling. The DOT is planning to complete a few chip seals, slurry seals, and micro surfacing treatments with 100% RAP soon.

Utah

Utah has been primarily using mill and fills (twelve to fifteen years life expectancy) for rehabilitation projects. The DOT has been capping its rehabilitation projects with Stone Matrix Asphalt (SMA) everywhere besides large urban areas, which has been working very well. For preservation projects, the DOT has been primarily using chip seals (seven years) and micro surfacing (falling short of its seven-year life expectancy). For longer lasting preservation projects, the DOT has been using BWC, Open Graded Friction Course (OGFC), and SMA; the life expectancy for all these treatments is ten years. The DOT has also been using CR (ten to twelve years).

Manitoba

Manitoba has been using mill and two-inch overlay for rehabilitation projects. For preservation projects, Manitoba has been using crack seals, crack fills, micro surfacing (five to twelve years life expectancy), and chip seals (five to ten years). Some of Manitoba's micro surfacing projects have not held up well, but some of its low-volume ADT roads with micro surfacing treatments look good after twelve years. Manitoba's micro surfacing contracts have emulsion as the only bid item, which may be why some richer treatments are seemingly outperforming. Manitoba has been utilizing two types of graded aggregate for chip seals, a high float emulsion and a CRS-2P. In 2022, Manitoba conducted an 80,000-ton CIR project through CCPR which was successful, and are anticipating another CIR project to begin soon. Manitoba has also experimented with a few test sections of thin overlays.

Manitoba has recently replaced its PMS and is hoping this change will improve the ability to measure and utilize performance data in future project selections.

Kansas

Kansas has been primarily using mill and overlay at less than two inches. Treatment performance is the same as in other states. The DOT has no special contracting mechanisms.

Michigan

Michigan has been using chip seals with a fog seal (six years life expectancy) and UBWC for surface treatments. The DOT has previously used micro surfacing but has had difficulties with

delamination. Under functional enhancements, the DOT has been using mill and fills, two course mill and fills, and mill and overlays at an inch and a half. The DOT's contracting mechanisms include an innovative contracting method, which has been used successfully for crack seals on a fixed price variable scope. The innovative contracting method may be implemented for chip seals as well in the future.

INDIANA

Indiana has completed approximately 20 FDR projects (based on FWD); a few of these projects were combined with CCPR to remove and process the surface layer (six to eight inches), then FDR was conducted on the lower surface layer to build up the area. These pavements have been operating very well.

Around 2018, Indiana DOT conducted a study of four FDR projects to measure the effectiveness of the treatment. The results positively showed the effectiveness of FDR. The DOT is hoping to revisit the four project sites to reevaluate and measure if their deflection curves are staying the same or decreasing.

WASHINGTON

Washington has been using crack seals, chip seals (six to ten years life expectancy, if emulsion based with a fog seal), fog seals on shoulders, mill and fills (ten to fifteen years) for asphalt pavements. For concrete pavements, the DOT has been using diamond grinding, slab replacements, partial slab replacement, spall repairs, and DBR. The DOT has also been using CIR, crack seals, and overlays for recycling; the life expectancy of these treatments is 50 years.

5. DAY 1 WRAP UP

Antonio Nieves Torres, FHWA Office of Infrastructure

Antonio Nieves Torres thanked participants for their open discussion on pavement preservation design, design policy, and inspection for a successful first day of the Peer Exchange. Regarding design, he asked the group to question if their preservation design is leading to their desired outcome. Regarding inspection, he stated that the lack of inspector availability, the high turnover rate of inspectors, and/or the lack of a formal inspection program that many of the participants have shared are the same experiences he had heard from participants at the Atlanta, Georgia, Pavement Preservation Peer Exchange the week prior. He asked participants to think on how FHWA could best support them in bridging their gaps in their preservation design and inspection efforts. He encouraged participants to continue their conversations outside of the meeting and expressed excitement for the discussions to be had on the second day pertaining to obstacles faced in pavement preservation.

Jason Dietz, FHWA Resource Center

Thanked everyone for their participation and asked that everyone come ready for further discussion tomorrow.

PAVEMENT PRESERVATION PEER EXCHANGE
SPRING 2023 | LAKEWOOD, CO

TECHNICAL REPORT

DAY 2 – WEDNESDAY, MAY 17

1. OPENING SESSION

1.1. FHWA Welcome

Antonio Nieves Torres, FHWA Office of Infrastructure
Antonio Nieves Torres welcomed participants back the Peer Exchange. He expressed that FHWA would like to further learn how the states are performing their pavement preservation treatments. Those answers could provide solutions for states that are having difficulty navigating new treatments and communicating best implementation practices to their districts, contractors, and inspectors.

During this Peer Exchange, participants have confirmed that their issues are not specific to their state, but are universal experiences being crossed over state lines. Torres encouraged all participants to read the FHWA Pavement Preservation Roadmap and to review tech briefs and the four webinars released in collaboration with the roadmap's update during EDC-4.

2. LINKING PAVEMENT PRESERVATION TO PAVEMENT MANAGEMENT

2.1. State DOT Presentation on Linkages Between Pavement Preservation Design and Pavement Management

Jason Simmons, Utah DOT
The following is a summary of the presentation given by Jason Simmons, Utah DOT Statewide Pavement Engineer.

Topics covered:
- Utah DOT's pavement program funding for 2023:
  - $160M allocated for high-volume pavements; 23,000 surface areas.
  - $35M allocated for low-volume pavements; 4,600 surface areas.
  - $50M allocated for reconstruction projects.
  - Additional maintenance funds available for in-house chip seals.
  - Approximately $10k of funding is spent on each surface area each year.
- Utah DOT's Pavement Management Construction Program:
  - The Central Office runs its PMS, data collection, model updating, and the reporting of information to dTIMS.
  - Its districts program and build out projects.

- Utah DOT uses a vendor to collect pavement condition data and photographs annually, driving in the outside lane in the positive direction. Pavement condition data is collected in the negative direction biennially.
  - Highly suggest collecting pavement condition data every year as it will make the data increasingly useful in years to come.
- Once data collection is complete, it is analyzed and input into the dTIMS model along with the awarded cost to the contractor (not the total project cost), construction history, project commitments, etc.
  - A markup is placed on the closed project cost approximately two years later.
- Utah has chosen to keep its PMS simple:
  - "Low seals" include chip seals and micro surfacing.
  - "High seals" include BWC, OGFC, etc. (most common in large urban areas).
  - "Functional repairs" include overlays at an inch a half.
  - "Minor rehabs."
  - "Major rehabs."
- PMS then chooses treatment recommendations based on the above groups; it does not recommend a specific treatment.
- Utah will run the model once at the statewide level for the next ten years and will use that data to request funding and to allocate funding to its districts based on the system recommendations.
- Utah will then run the model a second time at the district level, with the funding received, to produce a list of project recommendations that can be passed to the districts.
  - Utah DOT's goal is to maintain existing pavement condition. It costs more money to raise pavement condition than it does to keep it steady.
- Workflow Manager software is used to connect the pavement section data to the project data.
  - The project recommendations made by dTIMS to be completed within the next three years is input into the Workflow Manager. Pavements that have not had a project completed within the last seven years are also included.
  - Then the Region Project Management Engineers can add their own projects if they feel something is missing from the list.
  - All these ideas are then moved forward as candidate projects; they receive a project scope and estimate.
  - The region then ranks the candidate projects within Workflow Manager as "high," "medium," "low," or "no need for a project." The regions then move on to build out their three-year program plan.
    - Rehabilitation projects are often ranked at the top, which is when preservation projects need to be picked out of the group so that the roads can remain in good condition.
  - Once the regions build out their three-year plans, the DOT Central Office will approve their projects through Workflow Manager.

    - As a project is completed and data is entered, it is creating a project history log within the system that can be referenced for future program plans.
- The pavement management data and project history are then broken down into 0.10-mile segments, which will produce a high volume of data utilized to determine treatment life.
    - Those results are populated into a histogram that can be provided to a pavement investigator that can identify why a certain treatment has succeeded and the same treatment in another area has failed.
- Utah DOT is working toward adding its Maintenance Management System (MMS) into this process. The goal is to have the Region Pavement Engineers program the maintenance treatments into the software, those maintenance treatments will be notified to the DOT Central Office, and then the DOT will pass the work orders directly to the maintenance teams. Once the maintenance teams have completed a project, then they will send the order back to the Workflow Manager and it can be included in the pavement history.
- 60% of Utah's projects are from dTIMS recommendations.

Questions

The following is a summary of questions asked following the presentation given by Jason Simmons.

- When Utah sends project recommendations to its districts, is funding divided for NHS versus non-NHS?
    - No, there are no limits placed. The funding provided is for preservation and rehabilitation projects which they have the autonomy to choose. When Utah is planning these programs, it does not have to look at the percentage of funding to be spent on the NHS because a process that takes care of itself has been institutionalized. The NHS is made up of high priority routes that will get fixed regardless of this system.
- What data does Utah collect at the 0.10-mile segments?
    - It includes all of the Laser Crack Measurement System (LCMS) data, including rutting, cracking, ride, etc. Utah collects GPR data but uses it separately on a project-by-project basis.

2.2. Group Discussion on Linkages Between Pavement Preservation Design and Pavement Management

Proposed Discussion Questions from the Meeting Agenda

- *How are pavement preservation design and pavement management organized within your state?*
- *How is the PMS used as a tactical tool to select projects? How should it be used? Pavement condition triggers used for preventive maintenance treatments [IRI or Pavement Condition Index (PCI) as a rating system for good, fair, poor]?*
- *How does pavement preservation design impact your plans to meet Transportation Performance Management (TPM) rules?*

- *How is pavement preservation design used in your Transportation Asset Management Plans (TAMP)?*
- *What feedback loops exist between pavement preservation and pavement management?*
- *How are you tracking pavement performance (type of treatment, methodologies, materials)? Does performance get communicated back to pavement preservation design unit?*
- *What are some of the biggest challenges/barriers to making use of your PMS and linking pavement preservation design and pavement management?*
- *Are your pavement management performance models linked to pavement preservation design?*
- *Is your PMS able to determine network level and project level RSL?*
- *Is RSL being used as a factor in your decision making?*
- *Is your PMS capable of supporting project level LCCA?*
- *What are your immediate needs in this area?*
- *Please list the product (data, reports, applications) that your PMS is currently capable of producing.*
- *Please list the products that you would like to produce with your PMS.*
- *Is PMS used to conduct engineering analysis?*
- *What information are top DOT decision makers looking for that they cannot obtain from the PMS?*
- *Do you use PMS information to help evaluate the performance of your preservation programs?*
- *Please share any successes as they related to the use of PMS (i.e., improved ride quality on roadways, longer periods between rehabilitation, lower operations and maintenance costs, justifying increased levels of funding, etc.).*

Group Discussion

The following is a summary of the group discussion moderated by Jason Dietz, FHWA Resource Center, and Jason Simmons, Utah DOT.

How is your pavement preservation design and pavement preservation management organized within your state?

UTAH

Utah's pavement preservation projects utilize a three-year plan. Project plans are presented to its commission as a list, which the commission then needs to approve. Its reconstruction projects utilize a five-year plan. Its regions have the autonomy to add their desired sections and projects to these plans. Since the DOT only analyzes surface conditions, its regions can provide better insight on necessary treatments. Utah DOT utilizes the following ranking order for its project plans: 50% region ranking, 40% dTIMS suggestions, and 10% pavement age.

OKLAHOMA

Oklahoma has had issues running projections in dTIMS.

California
Caltrans does not use dTIMS. The DOT has set up its own management system with its districts, which have autonomy of their own preservation design and management. Caltrans Headquarters collects data from the districts, but a lack of communication has been experienced between the DOT and districts.

Colorado
Colorado DOT Headquarters runs a statewide model in which data is received from its regions. The DOT's system currently does not receive automated input data on maintenance and capital projects; the DOT is working toward incorporating these into the system. Colorado's rehabilitation projects are typically bundled with other projects (e.g., bridge repair).

- Many participants indicated that their PMS do not track maintenance projects.

Utah
Utah DOT disperses its advertised projects to its managers and regions. Once projects are awarded, Jason Simmons will input the projects to the system, which takes approximately one hour every month to input.

How does your pavement preservation design and management interact?

Alaska
Alaska's regions complete project selection. Alaska DOT & PF will suggest projects to the regions, but the regions have final approval of these projects.

Michigan
Michigan has a Region Prioritization team that meets with their Transit Systems Engineers (TSEs) for each of their regions. This meeting occurs after touring the State to discuss potential programs to be included within the year. Michigan also has a QA Engineer to review program scopes to ensure its regions are operating within their designated scopes and budgets.

Oklahoma
Oklahoma's pavement management and design are separate. The DOT has not utilized pavement design on its preservation projects.

Nevada
Nevada DOT's Headquarters office handles pavement management and design. Headquarters shares recommended projects with the DOT, the DOT will visit the recommended project sites with district personnel, and then the DOT will set the final project list.

Indiana
Indiana's pavement management and design are separate. The DOT utilizes dTIMS for project recommendations.

MISSOURI
Missouri's pavement management and design work in collaboration. The DOT has Pavement Specialists for project delivery and maintenance management. Its Pavement Engineers share recommended project sites with the design team.

IDAHO
Idaho's pavement management and design function separately most of the time. This has worked well since its districts have a better sense of their own pavement conditions, but this system has presented a gap when it comes to pavement management. The districts have the autonomy to choose their projects from a list of suggestions provided by pavement management. The DOT plans projects seven years ahead, which can lead to a preservation project getting reclassified as rehabilitation by the time the project begins. Pavement management is trying to minimize the gap by collaborating with district program managers during the planning phase.

MARYLAND
Maryland's districts tour their roads to collect data for PMS. Maryland's pavement condition data is one fiscal year behind and projects are planned one fiscal year ahead. To mitigate the issues presented by this data gap, the DOT sends recommended project lists to each of its districts, which are reviewed and returned to the DOT with the districts' feedback.

KANSAS
Kansas collects data between April and September of each year. Once data collection is completed, the DOT processes the data, runs QC, assimilates it for its Highway Performance Monitoring System (HPMS), and then completes project lists in January.

IDAHO
Idaho's climate makes data collection difficult. The DOT collects data between April and September of each year, then utilizes it to create a project candidate list apart from the approved Statewide Transportation Improvement Program (STIP). Its districts use the list to select potential projects. The districts have the autonomy to change their project lists if necessary.

MICHIGAN
Michigan DOT conducts van tours with its districts to assess pavement conditions every year. The DOT makes project suggestions to its districts, then the districts can decide to update their project lists to follow those suggestions.

Does your PMS track RSL or deeper distresses? Does your PMS contain a service interval?

UTAH
Utah's PMS does not track RSL. The DOT sets index values for distresses.

COLORADO
Colorado's PMS tracks RSL, called "drivability life," based on apparent age using distress index values. Drivability life is determined by plotting index values on pavement group curves.

NEVADA
Nevada measures cost benefit by measuring the area under index curves.

MARYLAND
Maryland's PMS tracks RSL condition. The performance measures pertaining to RSL condition are IRI, cracking, rutting, and surface condition. The controlling distress of a pavement becomes the distress with the shorter service life. RSL condition is determined by the time it takes for a pavement to return to its original condition levels once a distress has been fixed.

INDIANA
Indiana's PMS has timing and condition triggers. The timing triggers calculate a ratio to estimate when a pavement will need to be treated; the calculation also takes into account the treatment most likely to be performed on the pavement.

IDAHO
Idaho is concerned that distress indexes are unable to inform whether distress is coming from the top or bottom of a pavement. The DOT has been collecting Traffic Speed Deflectometer (TSD) data since 2018 and has recently been trying to use this information to aid in network level decision making and project selection.

CALIFORNIA
Caltrans completes dig out projects to remedy structural issues in underlying pavement layers. Since the DOT does not collect TSD data, these structural issues typically need to be addressed as soon as they are noticed.

NEVADA
Nevada collects TSD data. The DOT participated in a TPF for TSD and collected data over 500 lane miles. The data returned as unusable and the DOT turned back to its own FWD collection system, but the DOT has seen improvements in TSD data every year.

OKLAHOMA
Oklahoma is participating in a TPF for TSD data collection. The DOT has not implemented TSD data into project selection yet.

MICHIGAN
Michigan's PMS tracks RSL, which creates an index and timeframe of when reconstruction needs to be performed to extend the service life of a pavement. The DOT is currently rewriting its definition of RSL as it has found that its districts have different definitions and understandings of what RSL is. This new definition will aim to balance when the districts and the public will consider a pavement to be in poor condition.

Michigan is participating in a TPF for TSD data collection. So far, the DOT's Pavement Management Engineers have written Request for Proposals (RFPs) for their different regions. The DOT suggested a FHWA guidance be produced on how to best evaluate and utilize TSD data.

UTAH
Utah is interested in utilizing TSD data once for every five-year project plan.

INDIANA
Indiana collects FWD data and TSD data for Interstate-94, which is built around a swamp. FWD data shows conservatively higher distress, and the DOT has found that FWD had been better for separated deflections. The DOT is currently unsure on how it would like to move forward with implementing TSD data until it is further developed.

NEVADA
Nevada's comments are in response to Indiana's experience. Stiff pavement on a soft surface, such as a swamp, is the hardest environment for TSD to read and compute.

MARYLAND
Maryland has collected very limited TSD data and has found it to be most reliable with asphalt pavements. The DOT has not collected enough data to utilize it for project selection currently.

What information not obtained by PMS are DOT decision makers looking for?

- A consensus was shared that DOT decision makers are looking for information on RSL, which is not currently included in many states' PMS.

Question from Minnesota to the group: How do other states calculate and track life-cycle costs? Minnesota currently only tracks treatment costs.

MICHIGAN
Michigan utilizes a Road Quality Forecasting System (RQFS) to generate cost tables and an estimate on how much improvement can be made to a pavement, which is based on RSL.

COLORADO
Colorado leadership has expressed an interest in the prediction of HPMS performance measures (i.e., "good" condition, "fair" condition, and "poor" condition), but the DOT is not able to make these predictions with its current PMS. These predictions would require implementation of a new system.

MARYLAND
Maryland has found that national measures for cost analysis do not include friction, but its own state performance measures include friction. This has presented a challenge in satisfying national and State requirements and expectations simultaneously.

2.3. Presentations on Research Needs

Morgan Kessler, FHWA Office of Research, Technology, and Development
The following is a summary of the presentation given by Morgan Kessler.

Topics covered:

- FHWA has a Pavement Preservation Research Program that can conduct in-house, contracted research projects. Usually available to take on a maximum of three projects per year.
  - Some FHWA research products:
    - FHWA Pavement Preservation Research Roadmap, led by the National Concrete Pavement Technology Center.
    - Using RAP in Pavement Preservation Treatments, led by Applied Pavement Technology, Inc.
  - Research projects due for completion within the next year:
    - Pavement Preservation in the Urban Environment Context, led by ARA, Inc.
    - RAP Storage and Specifications for Preservation.
  - Additional resources:
    - Transportation System Preservation Research, Development, and Implementation Roadmap (2008), led by FP 2 Inc. and American Association of State Highway and Transportation Officials (AASHTO).
    - FHWA Pavement Preservation – All Research Projects website.
- **FHWA is looking for research topics from agencies on future research needs.**
  - Research needs can be input to the Live FHWA Pavement Preservation Research Roadmap Update.

Joel Ulring, Minnesota DOT

The following is a summary of the presentation given by Joel Ulring, Minnesota DOT's Pavement Preservation Engineer.

Topics covered:

- **TPF Solicitation #1581; titled "National Partnership to Improve the Quality of Preventive maintenance Treatment Construction and Data Collection Practices (PG Phase III)."**
  - Everyone has heard the statement "right treatment on the right road at the right time," but what about quality?
  - The objective of this TPF is to improve the quality of pavement treatments and data collection practices, as well as implementation of PG-I and PG-II knowledge gained.
  - How will this be accomplished?
    - Specifications:
      - Assist states in developing, reviewing, and enhancing their specifications for pavement preventive maintenance treatments.
      - National harmonization of treatment specifications.
      - Consideration for regional material/environmental conditions.
    - Construction:
      - Assist states in improving construction processes.
      - Training on calibration, inspection, and construction issues.
      - Inspection of treatments.

    - Performance monitoring:
        - FHWA will assist states in performing monitoring of performance.
        - States can utilize their own pavement management monitoring processes.
        - Collected data will be managed using InfoPave and the FHWA LTPP system.
- Pavement Preservation Partnership History:
    - 2012: Lee Road 159 in Alabama.
    - 2015: NCAT-MnROAD Partnership.
    - 2015: US-280 in Alabama.
    - 2016: US-169 and County State Aid Highways (CSAH)-8 in Minnesota.
    - 2019: 70th Street in Minnesota.
    - 2024-2028: Minnesota DOT will lead the PG3 effort.
- Solicitation #1581 background:
    - Minnesota was approached by FHWA to lead the effort.
    - Minnesota contacts:
        - Joel Ulring (joel.ulring@state.mn.us).
        - Ben Worel (ben.worel@state.mn.us).
    - FHWA contacts:
        - Deborah Walker (deborah.walker@dot.gov).
        - Jason Dietz (jason.dietz@dot.gov).
    - Duration is five years (Federal Fiscal Years 2024-2028).
    - Seeking 20-25 agencies to contribute $50,000 per year for a minimum of three years.
    - On April 27, 2023, HWA hosted a webinar presentation on Solicitation #1581.
- Partner requirements:
    - Join the Technical Assistance Panel (TAP).
    - Actively collaborate and partner with all TAP members to improve the construction and quality of pavement treatments and data collection practices.
    - Financial support and assist states in developing, reviewing and enhancing their specifications, training on calibration, inspection and construction issues for preventive maintenance treatments.
    - Propose and build one or more preventive maintenance treatments or test decks for the study (most states are doing this already) and monitor performance by SHA or by FHWA support. Collected data will be managed using InfoPave and the FHWA LTPP system.
    - Attend in-person meetings (two per year, expenses paid).
    - Attend virtual meetings (two per year).
- Phase III (January 2024 – December 2028):
    - TPF Solicitation #1581.
    - Focus on state implementation and documented agency demonstration projects.
    - TAP led 2022-2023 planning meetings, FHWA greater involvement, and additional input from agencies.
    - Transitioning to Joel Ulring as Minnesota DOT lead for this effort.
    - Texas, Illinois, and Minnesota are committed.

    - Currently have $650,000 committed of the $1.5M required.
- SPR Agency funding request:
    - Need other state's contributions.
    - Five years of SPR funding.
    - $50,000 per year (minimum three years - $150,000).
    - Federal Fiscal Years 2024-2028.
    - Minnesota DOT is the lead state.
    - Texas, Illinois, and Minnesota have contributed online.
- Timeline:
    - May 9-10, 2023: Connect at the FHWA Pavement Preservation Peer Exchange (Atlanta, Georgia).
    - May 9-11, 2023: Connect at the Spring Sponsor Meeting at NCAT (Auburn, Alabama).
    - May 16-17, 2023: Connect at the FHWA Pavement Preservation Peer Exchange (Lakewood, Colorado).
    - May 19, 2023: Online TAP Meeting (10:00 AM, Central Time).
    - June 9, 2023: Online TAP Meeting (10:00 AM, Central Time).
    - July 2023: Tasks and roles finalized by TAP; share with consultants for input and proposal; agencies need to provide funding feedback.
        - *If an agency has submitted an interest and is waiting for funding approval, please contact Joel Ulring so that he may make note of this status.*
    - August 2023: Minnesota DOT begins contracting with consultant(s).
    - January 2024: Contract(s) start.

2.4. Group Discussion on Identified Obstacles to the Effectiveness of Pavement Preservation Programs

Proposed Discussion Questions from the Meeting Agenda

- *Construction quality issues?*
- *Inadequate funding?*
- *Customer complaints?*
- *Contractor vulnerability?*
- *Pressure to address more urgent needs?*
- *Other?*

The following is a summary of the group discussion moderated by Dennis Bachman, FHWA Illinois Division, and Karen Strauss, Washington State DOT.

Dennis Bachman, FHWA Illinois Division

- Provided a rundown on Illinois' DOT's pavement preservation program.
- Illinois began preservation work in 2010. Its preservation dollars were coming out of maintenance funding around that time (around $7M statewide for preservation).

- In 2017-2018, EDC-4 and TAMP requirements helped to pick up the program.
- The DOT went to FHWA Illinois Division to find out what was federally eligible for pavement preservation. This led to the creation of guidance which is included in the DOT's Initial TAMP and programming of pavement preservation projects with Federal funds.
- Illinois uses a Condition Rating System (CRS) and limits on treatments to assist with selection. If the CRS rating is too low, then preservation will not work.
- FHWA's Jason Dietz taught many workshops in Illinois.
- Illinois had a committee to review submitted pavement preservation projects and provide feedback to the districts, as necessary, before approval. This became an education source for the districts as pavement preservation became a larger part of the program.
- The committee was a big-time commitment, so it disbanded around two years ago once Illinois felt comfortable with what the districts were putting forward as preservation projects.
- The guidance in the DOT's Initial TAMP became incorporated into the design manual, which includes decision trees and matrices that assist in treatment selection based on distresses.
  - Illinois DOT's Chapter 53 "Pavement Preservation and Rehabilitation Strategies" from its Bureau of Design and Environment Manual.
- When the TAMP was first initiated, there was a requirement that a minimum of 5% of the DOT's funding had to be spent on pavement and bridge preservation projects. That minimum is now up to 7%, but the most recent TAMP reflects that more than 7% of funding was spent on preservation.
- Illinois is now working on updating and tightening its preservation specifications.

Group Discussion

What are your construction quality issues?

California
California faces issues with inadequate application rates.

Maryland
Maryland faces issues with a high turnover rate of its inspectors, which has resulted in an increased need for trainings to mitigate the skill decrease faced with turnover. The DOT has found that hosting preconstruction meetings has helped to prepare new inspectors.

Indiana
Indiana faces issues with its inspectors and contractors not reading special provisions included in the contract documents which supplement the specifications. The DOT has also noticed that its inspectors and contractors do not read updated special provisions and will continue to use older versions, which can lead to pavements not being constructed correctly on the first attempt.

Michigan
Michigan suggests that Indiana change its delivery when providing inspectors and contractors with new specifications. This can be done by sending an email that establishes the important sections requiring their attention and then outlining the changes made and the reasons for those

changes. Repetition in delivery is key as not everyone will take the time to read through the new specification.

NEVADA

Nevada is at the end of a specification book cycle. The DOT recommends bolding and/or calling out important information and changes made to focus attention.

MINNESOTA

Minnesota does not have any major construction quality issues but believe the quality of its materials can be improved. The DOT has experienced situations where it has previously declined a contractor from using a certain aggregate and then the contractor has presented that aggregate to be used for local agencies' projects.

How are your contractors' abilities to perform pavement preservation? Do you have a hard time finding qualified pavement preservation contractors?

WASHINGTON

Washington has noticed that some areas are beginning to add funds to their contracts for contractors to receive training prior to the project.

MARYLAND

Maryland has had contractors decline work because they did not have a spray paver to complete the job.

NEVADA

Nevada has experienced a similar situation to Maryland. The DOT's solution was to purchase a spray paver for the contractor and allow them five years to perform work to pay off the cost.

INDIANA

Indiana has a smaller pool of contractors available to the DOT. The DOT has rarely had a fourth quarter letting (May/June) but is now dealing with contractors loading up on Fall projects. This situation has left the DOT with a more limited selection of contractors.

ILLINOIS

Illinois has a significant amount of small business contractors run by local families. These contractors typically only have project experience on low-volume roads. This shortcoming has led to issues with lack of experience with projects on high-volume roads.

MANITOBA

Manitoba has noticed that if it has a high capital program, it is difficult to get its local contractors to bid. Manitoba ends up using external contractors (from Alberta) that need to haul their own equipment to the project sites.

Nevada
Nevada's comments are in response to Manitoba's experience. The consistency of your program is important in getting local contractors and inspectors to commit to obtaining the necessary training and materials/equipment to perform preservation projects.

California
Caltrans has five to six contractors that complete most of its preservation projects. The DOT has noticed that these contractors have "claimed" territories. If a contractor bids on a project in "their" territory, then the other contractors will not compete for the project.

FHWA Central Federal Lands Highway Division
Federal Lands utilizes an IDIQ contract based on a five-year term. Once accepted into the IDIQ, Federal Lands will go out and qualify its contractors. These contractors will then submit an RFP; the contractor with the lowest RFP wins the bid.

Federal Lands has faced issues with finding quality inspectors.

What are your funding issues in relation to your preservation program?

Utah
Utah receives one large amount of funds within the DOT, which has developed a constant need for departments to protect their funds. Utah DOT leadership is pushing for a cross asset allocation of funds. This could work on a program level basis but is not functional on a project basis.

Washington
Washington previously received $1B in preservation funding annually. The DOT's preservation funding for this year has decreased to $750M.

Illinois
In 2019, Illinois passed a new capital program that included additional funding.

Idaho
Idaho expressed that the question being asked should be focused on how agencies are optimizing their allocated funds; every agency could benefit from additional funding. Communication and statewide planning need to be focused on the best allocation.

Michigan
Michigan receives "funny money" from leadership, which is unplanned additional funding provided in hopes that it will be put toward a big project. The DOT has asked if some of this money could be allocated for preservation projects, but these requests were rejected. It can be difficult to communicate to leadership that the DOT wants to utilize the money to perform a project that will not improve the overall system.

WASHINGTON
Washington is having a similar experience to Michigan. Additional funding is allocated to the exciting capital projects.

OREGON
Oregon has been put in a position where the DOT has had to delay its ADA ramp projects due to funding shortages. The DOT is now being sued for not completing these projects.

MICHIGAN
Michigan has had issues with its maintenance program placing limitations on projects (e.g., how many guard rails should be completed) and then deciding how much money should go back into preservation. An issue the DOT is currently dealing with is inadequate funds and knowledge of when to perform chip seal projects on two of its high friction pavement surfaces.

Question from Michigan to the group: Does anyone have a maintenance solution to correct delamination areas of a micro surfacing treatment without milling? Michigan has been utilizing Durapatch for these corrections but is looking for a more effective correction at a low cost.

NEVADA
Nevada has had issues with delamination when stacking two micro surfacing treatments. The DOT has utilized mastic to correct these issues, which is admittedly not the best correction as it is a temporary, smooth riding band aid.

UTAH
Utah utilizes a similar procedure to Nevada. The DOT uses the screed to drag mastic across pavement surfaces to address alligator cracking.

2.5. Group Discussion on Training Needs

Proposed Discussion Questions from the Meeting Agenda
- *Do you provide training on your pavement preservation policies and procedures described in your pavement design manual?*
- *What other types of training are available? For pavement design staff? For pavement management staff? (For both Central Office and District staff?)*
- *What is the frequency for training?*
- *Are there gaps? What are your future training needs over the next one to three years?*
- *What future research areas would be helpful in supporting your pavement management activities?*

Group Discussion
The following is a summary of the group discussion moderated by Antonio Nieves Torres, FHWA Office of Infrastructure, and Bouzid Choubane, National Center for Pavement Preservation.

- A show of hands was asked for those planning to attend the National Pavement Preservation Conference (NPPC) to be held in Indianapolis, Indiana, in September 2023. Most participants are planning to attend.
- NCPP has initiated an Education and Training Questionnaire to assess current available trainings to see if they are up-to-date and to see how they can be harmonized to address all pavement preservation needs. They will be conducting a gap analysis to see if current trainings can be updated instead of having to start new.
  - A survey was sent to training providers, state agencies, and the industry.
  - A show of hands was asked for those that have received the survey. There were not many participants that had received the survey.
- FHWA Pavement Preservation 2020 Webinar Series:
  - Emulsions 101
  - Milling Best Practices
  - Introduction to Slurry Systems
  - Crack Treatments (Series I)
  - Hot In-Place Recycling (HIR)
  - Engineered Emulsions
  - Chip Seal Introduction, Site Selection, Design, and Materials
  - Cold In-Place Recycling and Cold Central Plant Recycling (CCPR)
  - Tack Coat and Fog Seals
  - Micro and Slurry Mix Design and Material Testing
  - Full Depth Reclamation
- FHWA Pavement Preservation 2021 Webinar Series:
  - Need for Environmental Product Declarations (Asphalt Emulsions)
  - Instrumented Pavement Recycling Performance on 64 by VDOT
  - Crack Sealing (Series II)
  - Use of RAP in Pavement Preservation Treatments
  - Storage and Handling of Asphalt Emulsions
  - Chip Seal Equipment Calibration
  - Emerging Asphalt Emulsion Technologies
  - Construct High Quality Slurry/Micro Surfacing Treatments, Part I
  - Chemistry Formulation, Manuf. Precision and QC for Emulsions
  - CIR/CCPR Mix Design Guidelines and Practices
  - Construct High Quality Slurry/Micro Surfacing Treatments, Part II
- FHWA Pavement Preservation 2022 Webinar Series:
  - Asphalt Emulsions 102: Beyond the Basics
  - Mississippi DOT Micro Surfacing Project Yields High Return on Investment
  - Scrub Seal Pavement Treatments
  - Agency Experiences with Emulsion Preservation Treatments and Research
  - Project Selection and Design of In-Place Recycling
  - Proven Preservation Strategies for Your Network
  - Emulsions – What is it good for?

    - The Use of Cold In-Place Recycling as Innovative Solution for a Sustainable World
    - Introductions to the ISSA Inspectors and Designers Manual
- Other recommended training resources and materials:
    - Transportation Pooled Fund [TPF-5(478)]: Demonstration to Advance New Pavement Technologies
    - Grant Opportunity: Advancing Sustainability and Resilience in Pavements
    - FHWA Trainings on Pavement Preservation
    - AASHTO TC3 Training Courses
    - LTPP InfoPave
- FHWA would like to develop a pavement preservation agreement with each of the states. This would include a definition of what the states consider pavement preservation and how those projects are going to be completed and maintained.
- FHWA has partnered with ISSA for years to sponsor people to attend the Slurry Systems Workshop held in Las Vegas, Nevada, in January every year.
    - It had been held virtually throughout the COVID-19 pandemic.
    - The NCPP Certification exam is proctored on the last day of the workshop.
    - FHWA will announce in September/October if they will be sponsoring in-person candidates for the next workshop.
- FHWA's Thomas Van is in the process of working to create an NHI training on the design and inspection of pavement preservation treatments. Once it gets awarded, he will be looking for curriculum ideas.
- FHWA has been working with Arkansas DOT to update two web-based trainings on slurry seal and to create a third training focused on combination treatments.
- **FHWA would like to get into contact with all state training coordinators.**

What are the current training gaps? What trainings do you have and/or what trainings are you developing? Do you have suggestions on training that FHWA can assist with?

Maryland

Maryland has a need for trainings on micro surfacing and chip seals. The DOT has expressed an interest in having a "101" type training that could be held in its district offices or the DOT could host for district staff to attend. The DOT also suggested hosting a peer exchange for district staff to attend and communicate their training needs.

Michigan

Michigan asked the group if anyone has photos of different pavement conditions available as a resource and if those photos have been helpful in teaching new hires on how to identify the treatments needed for pavements.

Minnesota

Minnesota recommends utilizing the Pavement Preservation & Recycling Alliance's (PPRA) RoadResource.org.

NOTE FROM FHWA
FHWA suggests utilizing the FHWA LTPP Distress Identification Manual for the Long-Term Pavement Performance Program.

ILLINOIS
Illinois has conducted review groups where they look at images of potential projects to discuss possible treatments. The DOT has found these review groups to be very helpful.

MICHIGAN
Michigan has completed a statewide tour throughout its seven districts to evaluate their pavement preservation efforts and found that all its districts default to chip seals for their preservation treatments. The DOT is trying to move contractors away from choosing treatments based on what they believe the funding is going to be; the DOT would like to get to a point where its contractors are choosing treatments based on which will be the best to preserve their pavements.

MICHIGAN
Michigan would benefit from training on how to best use GPR data and on how often it should be gathered. A plan needs to be in place prior to receiving this data so that it is correctly managed, stored, and analyzed.

A suggestion was made to Michigan to possibly hire a graduate student to analyze GPR data.

MARYLAND
Maryland shared that it has received suggestions that each of its districts host their own peer exchanges for construction, project development, and other necessary groups to discuss their needs and training gaps.

NEVADA
Nevada expressed an interest in trainings for localized repairs. This could potentially include how to manage localized repairs throughout the construction process, how to select necessary repairs, and how to best communicate the need for those repairs to the contractor.

Does your State have a training coordinator?

NOTE FROM FHWA
A training coordinator serves as the forefront of your training programs. They are very effective in planning for necessary training by locating materials and programs to support those efforts.

NEVADA
Nevada has a training coordinator. The DOT has a structured training program that focuses on trainings that are always needed. Its Research Library would likely be tasked to locate additional training materials and programs for implementation, not its training coordinator.

Do many of you rely on Just-In-Time training?

CALIFORNIA

In recent years, Caltrans has hosted web-based trainings during the off season. The DOT has also utilized its Local Technical Assistance Program's (LTAP) mobile bus trainings.

HAWAII

Hawaii has utilized its LTAP mobile bus trainings.

3. DAY 2 WRAP UP

Antonio Nieves Torres, FHWA Office of Infrastructure

Antonio Nieves Torres thanked everyone for attending the Peer Exchange and for their active participation in providing the feedback loop FHWA was hoping to receive. He shared that the meeting had 22 States and two Canadian Provinces in attendance, and that his hope is for everyone from the group to continue their conversations and to look at their pavement preservation programs differently. He requested that participants share their feedback on the Peer Exchange, possible research topics, and further obstacles they are facing with pavement preservation with FHWA so that they can best support the efforts being made by the preservation community.

Jason Dietz, FHWA Resource Center

Jason Dietz thanked everyone for taking time away from their offices to participate in the Peer Exchange. He encouraged everyone to continue the discussions had through the contacts they have made.

APPENDIX A: MEMBER BULLETIN

The following is a list of resources shared by Peer Exchange participants for your reference.

Separate from this file:
Please send an email to Erin Murray (*erin.murray@weris-inc.com*) if you would like any of these files forwarded to you.

- Illinois DOT's Chapter 53 "Pavement Preservation and Rehabilitation Strategies" from its Bureau of Design and Environment Manual
  - *Shared by Dennis Bachman, FHWA Illinois Division*
- Oregon DOT's Chip Seal Design and Spreadsheet
  - *Shared by Timothy Earnest, Oregon DOT*
- Oregon DOT's Chip Seal Design and Specifications
  - *Shared by Timothy Earnest, Oregon DOT*

Webpage links:

- NCPP – Education and Training Questionnaire
  - *Shared by Bouzid Choubane, NCPP*
- RAP in Pavement Preservation
  - *Shared by Morgan Kessler, FHWA Office of Research, Development, and Technology*
- Pavement Preservation Roadmap
  - *Shared by Morgan Kessler, FHWA Office of Research, Development, and Technology*
- Transportation System Preservation Research, Development, and Implementation Roadmap (2008)
  - *Shared by Morgan Kessler, FHWA Office of Research, Development, and Technology*
- FHWA Pavement Preservation – All Research Projects
  - *Shared by Morgan Kessler, FHWA Office of Research, Development, and Technology*
- Transportation Pooled Fund (Solicitation #1581): National Partnership to Improve the Quality of Preventative Maintenance Treatment Construction and Data Collection Practices (PG Phase III)
  - *Shared by Joel Ulring, Minnesota DOT*
- RoadResource.org
  - *Shared by Joel Ulring, Minnesota DOT*
- Transportation Pooled Fund [TPF-5(478)]: Demonstration to Advance New Pavement Technologies
  - *Contains a small subgroup on pavement preservation.*
  - *Shared by Antonio Nieves Torres, FHWA Office of Infrastructure*
- Grant Opportunity: Advancing Sustainability and Resilience in Pavements
  - *Shared by Antonio Nieves Torres, FHWA Office of Infrastructure*
- FHWA Trainings on Pavement Preservation

  - *Shared by Antonio Nieves Torres, FHWA Office of Infrastructure*
- AASHTO TC3 Training Courses
  - *Shared by Antonio Nieves Torres, FHWA Office of Infrastructure*
- FHWA LTPP InfoPave
  - *Shared by Antonio Nieves Torres, FHWA Office of Infrastructure*
- FHWA LTPP Distress Identification Manual for the Long-Term Pavement Performance Program
  - *Shared by Antonio Nieves Torres, FHWA Office of Infrastructure*
- Kansas DOT Standard Specifications for State Road & Bridge Construction (2015)
  - *Shared by Kristy Rizek, Kansas DOT*
- Kansas DOT 2015 Special Provisions
  - *Shared by Kristy Rizek, Kansas DOT*
- Kansas DOT Construction Checklists
  - *Shared by Kristy Rizek, Kansas DOT*
- Kansas DOT Construction Manual
  - *Shared by Kristy Rizek, Kansas DOT*
- Kansas DOT Documentation Manual
  - *Shared by Kristy Rizek, Kansas DOT*
- Kansas DOT Technical Advisories & Policies
  - *Shared by Kristy Rizek, Kansas DOT*
- Kansas DOT Chip Seal Manual (2014)
  - *Shared by Kristy Rizek, Kansas DOT*
- FHWA Pavement Preservation 2020 Webinar Series:
  - Emulsions 101
  - Milling Best Practices
  - Introduction to Slurry Systems
  - Crack Treatments (Series I)
  - Hot In-Place Recycling (HIR)
  - Engineered Emulsions
  - Chip Seal Introduction, Site Selection, Design, and Materials
  - Cold In-Place Recycling and Cold Central Plant Recycling (CCPR)
  - Tack Coat and Fog Seals
  - Micro and Slurry Mix Design and Material Testing
  - Full Depth Reclamation
- FHWA Pavement Preservation 2021 Webinar Series:
  - Need for Environmental Product Declarations (Asphalt Emulsions)
  - Instrumented Pavement Recycling Performance on 64 by VDOT
  - Crack Sealing (Series II)
  - Use of RAP in Pavement Preservation Treatments
  - Storage and Handling of Asphalt Emulsions
  - Chip Seal Equipment Calibration

- Emerging Asphalt Emulsion Technologies
- Construct High Quality Slurry/Micro Surfacing Treatments, Part I
- Chemistry Formulation, Manuf. Precision and QC for Emulsions
- CIR/CCPR Mix Design Guidelines and Practices
- Construct High Quality Slurry/Micro Surfacing Treatments, Part II

- FHWA Pavement Preservation 2022 Webinar Series:
  - Asphalt Emulsions 102: Beyond the Basics
  - Mississippi DOT Micro Surfacing Project Yields High Return on Investment
  - Scrub Seal Pavement Treatments
  - Agency Experiences with Emulsion Preservation Treatments and Research
  - Project Selection and Design of In-Place Recycling
  - Proven Preservation Strategies for Your Network
  - Emulsions – What is it good for?
  - The Use of Cold In-Place Recycling as Innovative Solution for a Sustainable World
  - Introductions to the ISSA Inspectors and Designers Manual