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TRANSPORTATION RESEARCH BOARD

Beyond Volume: Investment Prioritization Methods for Low-Volume Roads

Wednesday, August 29, 2018
1:00-2:30 PM ET

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REGISTERED CONTINUING EDUCATION PROGRAM

Purpose

Discuss NCHRP Research Synthesis 521: Investment Prioritization Methods for Low-Volume Roads.

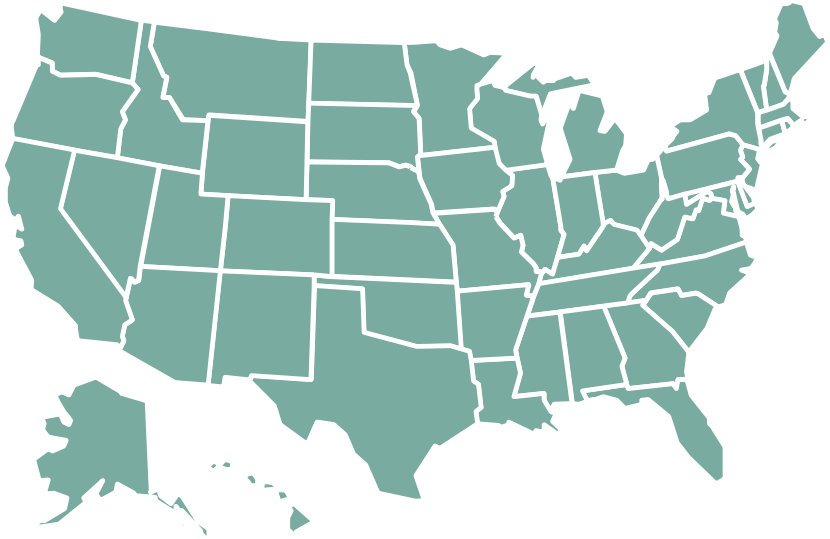
Learning Objectives

At the end of this webinar, you will be able to:

- Define low volume roads, and describe the reasons for creating separate classes of facilities or separate funding programs
- Identify the unique ways in which low volume roads serve communities as a justification for maintaining low volume roads
- Understand prioritization approaches that supplement core quantitative data
- Discuss emerging issues in low volume road planning and management, including funding constraints, the influence of asset/performance management requirements, and issues of jurisdictional responsibility

NCHRP is a State-Driven Program

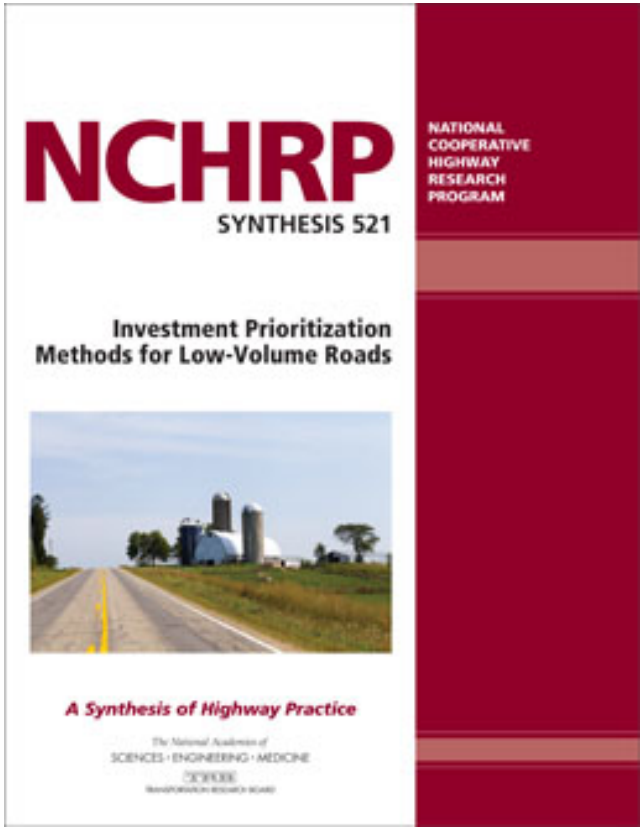
- Sponsored by individual state DOTs who
  - Suggest research of national interest
  - Serve on oversight panels that guide the research.



- Administered by TRB in cooperation with the Federal Highway Administration.

Practical, ready-to-use results

- Applied research aimed at state DOT practitioners
- Often become AASHTO standards, specifications, guides, syntheses
- Can be applied in planning, design, construction, operations, maintenance, safety, environment



Beyond Volume

How to More Completely Capture the Importance of Low Volume Road Investments in Agency Prioritization Practice

Findings from
NCHRP Synthesis 20-05/Topic 48-07

Naomi Stein, EDR Group

Mark Hoffman, Arizona Department of Transportation

Outline for Today's Webinar

- Introduction: Research Motivation & Approach
- Summary of Practice (Survey Findings)
- Overview of Case Examples
- Detailed Look: Arizona Low Volume State Routes – Mark Hoffman
- Conclusions

INTRODUCTION

Research Motivation

- Low volume roads (LVR) are at a **disadvantage** in prioritization processes that focus on **volume-based metrics** of benefit and impact
- However, LVR can also create **significant value for the wider economy and society**

→ Need to more completely capture the importance of low volume road investments in agency prioritization practice

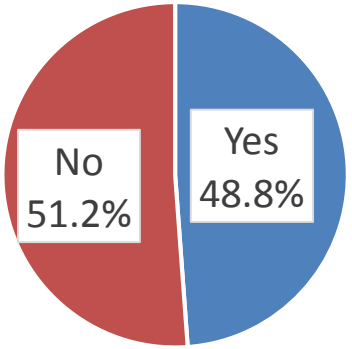
Approach

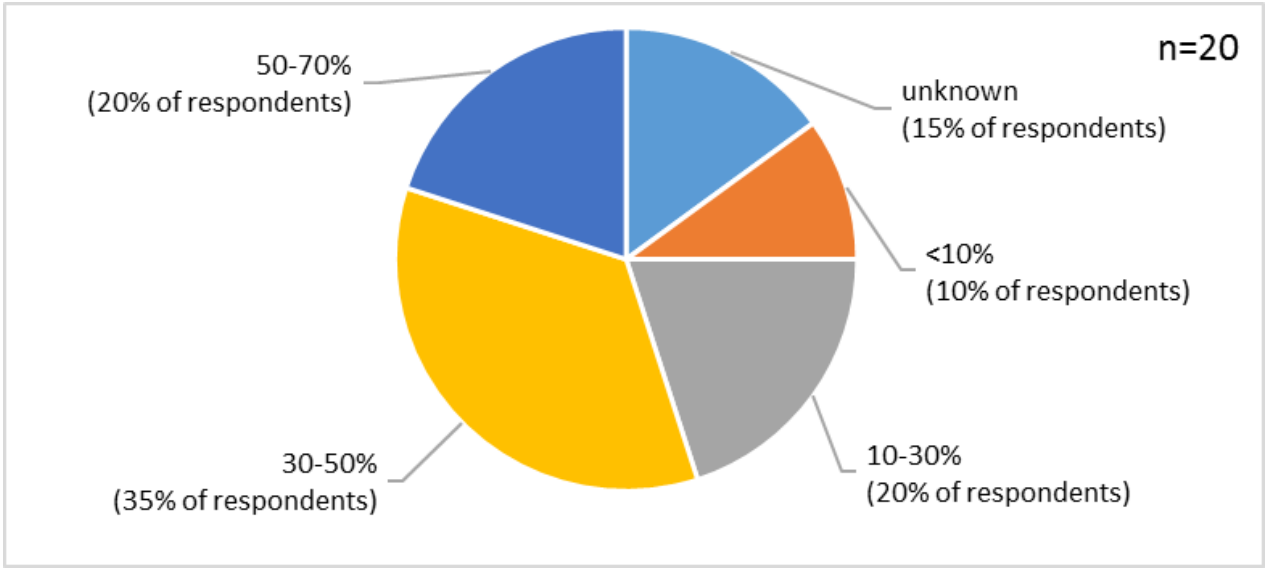
- **Literature review** – International & North America
- **Survey** of State DOTs & Canadian Provincial Transportation Agencies (40/50 states + 3 provinces responded)
- **Case Examples** – Focused on how critical strategic issues, i.e., the broader social, economic, and environmental importance of low volume roads, are considered within an agency's process.
- **Target Audience:** State DOTs – Balancing LVR roads against others (May also be relevant to Municipalities & Counties)

SUMMARY OF PRACTICE

Defining Low Volume Roads

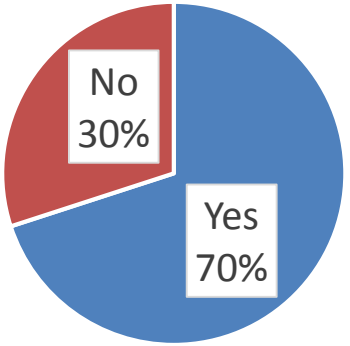
- Does your agency make a distinction between low volume roads and other roads for the purposes of planning, funding, or design?
- What percentage of your system is classified as low volume, or equivalent?





Defining Low Volume Roads

- Does your agency use a volume threshold to define low volume roads?
- Thresholds reported:



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Threshold*	Count
<300 CAADT	1
<400 AADT	5
<500 AADT	1
<1000 AADT	1
<1500 rural, <5000 urban AADT	1
<2000 AADT	3
<2500 AADT	1
<8000 AADT	1

*AADT = Annual Average Daily Traffic.
CAADT = Commercial Annual Average Daily Traffic.

Some agencies have other classification structures that map largely to the lower volume part of the network and influence resource allocation (e.g. local; non-NHS)

Why Are Low Volumes Roads Important?

Purpose	Weighted Score (0-3)
Access for rural areas or isolated towns and cities	2.48
Access for farming, logging, mining, or other industry	2.30
Network coverage/function (e.g., collectors)	2.14
Access to tourist/recreational areas	2.10
Access to infrastructure (e.g., reservoirs, pipelines, power plants/transmission, military facilities)	1.70
Access in case of disasters/crisis (e.g., road redundancy)	1.70

Low Volume Road Projects

- Greater emphasis for LVR investments on social, economic, and environmental objectives
- In contrast to achieving marginal travel time or cost savings for a large user group on higher volume roads.

Planning & Prioritization

- Approaches to granting special consideration:
  - Defining a specific funding program
  - Applying separate or adjusted criteria
  - Incorporating criteria within all prioritization processes that would tend to capture the strategic social and economic objectives of low volume roads.
- Typical prioritization:
  - I) Core engineering data (PMS/BMS)
  - II) Supplementary process to address broader objectives

OVERVIEW OF CASE EXAMPLES

Case Examples – State of Practice

- LVR defined to:
  - to support the resource allocation and prioritization process
  - to facilitate planning about future investment and management strategies.
- Agencies are balancing life cycle costs and investment needs with the overall value provided to society by LVRs

Case Examples

Missouri DOT	Nevada DOT	Idaho DOT
• Insufficient funds • Restrict use of STIP funds on <400 AADT roads (33% state miles; 2% of VMT) • Only operational funds for LVR • Still using STIP funds on LVR bridges (outsize cost of detours)	• Roads <400 AADT maintained w/ set aside budget to ensure some $s invested • LVR must be in a worse condition for priority repair than a higher classification facilities (threshold)	• Non-commerce roads: <300 CAADT (47% of state system) • Focus on trucking because of economic importance • Earmarked funds for non-commerce roads – stopgap preservation only

Consideration of strategic issues (social, economic, environmental) through qualitative input / informal “checklists” at the district level (leverage local knowledge)

Case Example: South Carolina

No formal definition, but LVR funded through three programs:

- Non-Federal Aid Secondary Pavement Improvement Program
- Non-NHS Bridge Replacement Program
- Load Restricted Bridge Replacement Program

Each has a two-part prioritization process:

1. **Quantitative scores** from pavement and bridge management systems
2. **"Field Review Criteria"** to raise or lower score based on strategic considerations

Case Example: South Carolina

Priority Ranking Score (PRS) Criteria (0 to 1,000)	Field Review Criteria (-100 to 400)
Scores assigned by the pavement management system. Routes that pass a certain threshold become eligible project candidates that are sent to field engineers for additional scoring.	Scores assigned by field engineers at the county or district level; Points added to PRS result in final score used in ranking. Districts asked to score projects for 2-3 times the amount of funds available (to support transparency).
Condition: (600 max) – Pavement Quality Index (PQI) – International Roughness Index (IRI) – Percent Patching Volume: (200 max) – Average Daily Traffic (ADT) – Average Daily Truck Traffic (ADTT) Role within network: (150 max) – State Freight Network – Strategic Corridor Network – Functional Classification Coordination with other programs: (50 max) – State Safety Programs	Relative Condition (minus 100 to 100 points) – Used to lower or raise score based on actual condition (e.g., better/worse than last measured) Corridor Continuity (0 to 100 points) – For segments that would help complete the resurfacing of a corridor through a county or district Connectivity (0 to 100 points) – "For routes that provide connectivity to economic centers, schools, emergency facilities or other key points of public interest." Contractibility (0 to 100 points) – For grouping projects in a given area or within like treatments to reduce costs

International Research: Transportation need index (TNI)

- Approach proposed by the ROADEX Research Program in Northern Europe
- Prioritizing maintenance decisions for LVRs, focusing on social benefits from having roads in rural areas in good condition
- Scores for: fragility, lifeline urgency, and the road user needs for people and business.

Johansson, S. (2006). “Socio-Economic Impacts of Road Conditions on Low Volume Roads, Results of Literature Studies, Interviews and Calculations with a Model and some Proposals for Road Management Policies. Executive Summary,” ROADEX III Northern Periphery, Roadscanners Sweden. Available: http://www.roadex.org/wp-content/uploads/2014/01/Socio-economic_English.pdf.

Transportation need index (TNI)

Fragility

Identify areas in decline or in danger of decline, based on:

- Population trends
- Unemployment
- Accessibility to key services
- Remoteness

Lifeline Urgency

Range:

1. The road is not a lifeline road.
2. The road has a substitute that presents a minor increase in time and cost.
3. The road has a substitute that presents a major increase in time and cost.
4. The road has no substitute.

Transportation need index (TNI)

Transportation Need for People

1. Few road users, only temporary use
2. There are only a few permanent residents with no time-scheduled access need.
3. Schoolchildren and commuters
4. High priority use (schoolchildren, commuters, daily bus routes)

Transportation Need for Business

Range:

1. No business traffic
2. Only a few businesses with no need for regular daily transportation
3. Few businesses with needs for regular daily transportation
4. Several businesses requiring daily transportation service with high accessibility needs

DETAILED LOOK: ARIZONA LOW VOLUME STATE ROUTES

Arizona Low Volume State Routes

Mark Hoffman
Arizona Department of Transportation
Multimodal Planning Division

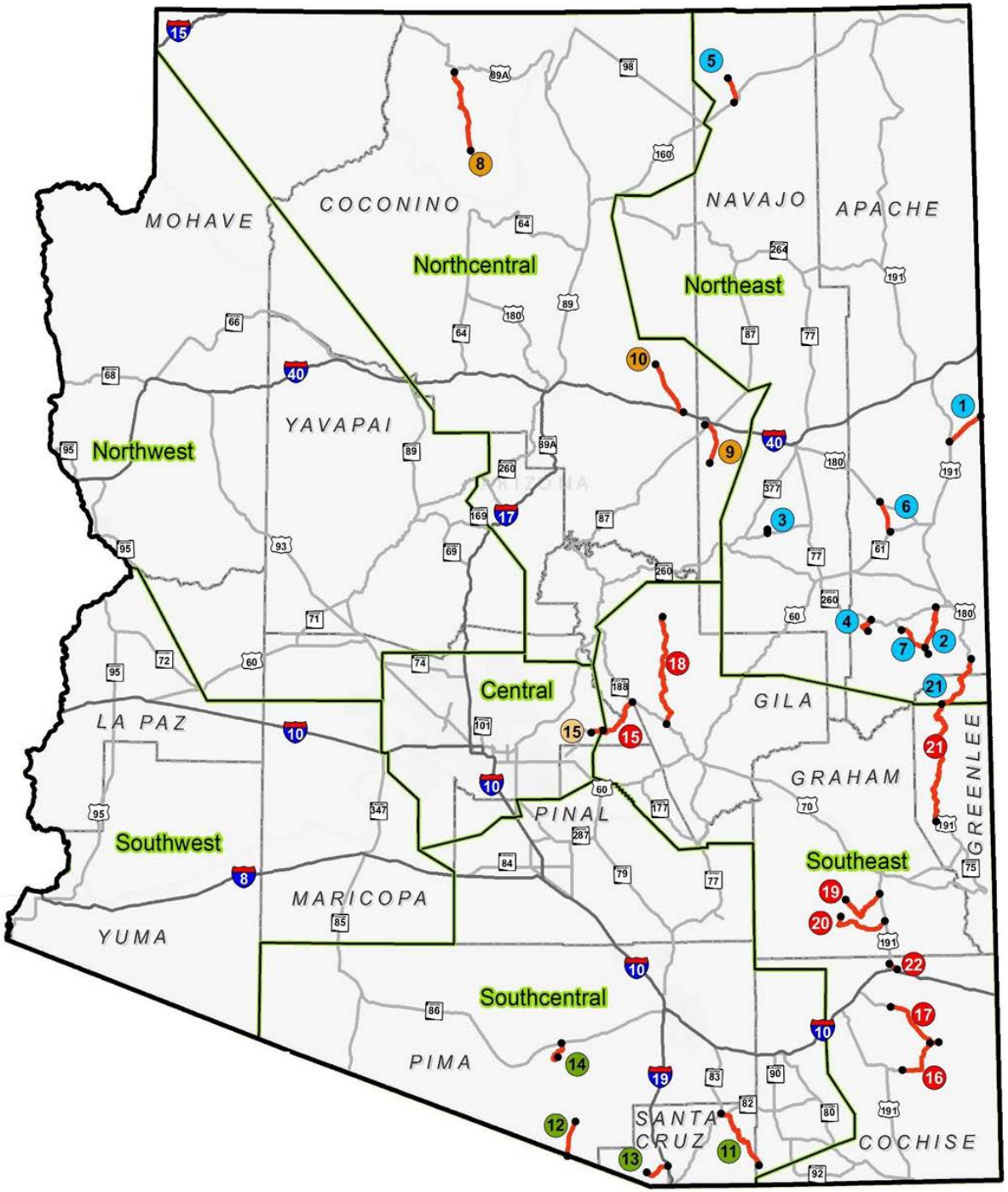
Low Volume State Route Study

- Study completed to identify low volume routes and document opportunities and limitations related to route management and route transfer opportunities

Defining Low Volume Routes

- Low Volume State Routes identified as a state facility with an annual average daily traffic of 400 vehicles per day or less.
- Includes 22 state routes and 457 center line miles of roadway
- Transportation Board policy that the state highway system consist primarily of routes necessary to provide a statewide network to serve interstate, statewide and regional movement of people and freight

22 Low Volume State Routes



Route Study Evaluation Criteria

- Evaluation criteria based on a low to high 5 point scale using Harvey Ball ideograms to display qualitative results
  - Route characteristics
  - Performance based analysis
  - Funding opportunities

Route Characteristics

- Essential for regional system connectivity (13%)
- Primarily serves local traffic need, provides access to private residences, ranches, farms, business or other abutting property (72%)
- Primary access to National Park/Monument (18%)
- Primary access to other recreational areas (72%)
- Primary access to educational/research facility (13%)
- Primary access as mail route/bus route (13%)
- Functional classification of major collector or higher (54%)

Performance Based Analysis

- Pavement performance
  - International Roughness Index (IRI) & Cracking Rating
- Bridge performance
  - Deck rating, substructure rating, superstructure rating and sufficiency rating
- Safety performance
  - 5 year crash data and emphasis areas from the State Strategic Highway Safety Plan
- Cost Summary
  - Maintenance cost over a five year period
- Existing and Future ADT

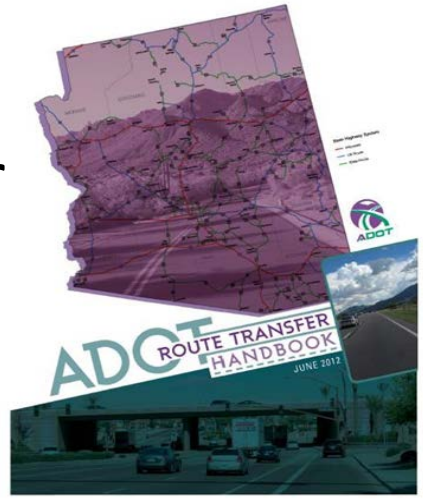
Route Evaluation Summary

Table 51: Summary of Route Recommendations (Segments 1 – 11)

		Low ○ ◔ ◑ ◕ ● High	Segment 1: SR 61 from US 191-Witch Well to New Mexico	Segment 2: SR 261 from SR 273 to Milepost 412.5	Segment 3: SR 277S from SR 277 to Old Paper Mill	Segment 4: SR 473 From SR 260 to Hawley Lake Dam	Segment 5: SR 564 from US 160 to Navajo National Monument	Segment 6: SR 180A from US 180 to SR 61-Concho	Segment 7: SR 273 from Sunrise Turnoff to Big Lake	Segment 8: SR 67 From Jacob Lake to North Rim	Segment 9: SR 99 From 15 Miles South of Winslow to SR 87-Winslow	Segment 10: SR 99 From I-40 to Leupp	Segment 11: SR 83 From Parker Canyon Lake to SR 82
			Northeast District	Northeast District	Northeast District	Northeast District	Northeast District	Northeast District	Northeast District	Northcentral District	Northcentral District	Northcentral District	Southcentral District
Roadway Characteristics	Essential for regional system connectivity							✓					
	Primarily serves local travel need, providing access to private residences, ranches, farms, business or other abutting property		✓	✓	✓	✓	✓	✓	✓		✓	✓	✓
	Primary access to National Park/Monument						✓			✓			
	Primary access to other recreation areas			✓		✓	✓		✓	✓	✓		✓
	Primary access to education/research facility												✓
	Primary route for safety/security												
	Primary mail route/bus route							✓			✓	✓	
	Functional Classification Major Collector or Higher				✓					✓			✓
	Subcategory Total		◔	◑	◔	◑	◑	◕	◑	◑	◑	◑	◕
	Existing ADT	<400 vpd	✓	✓	*	✓	✓	✓	✓		✓		✓
		400-1000 vpd										✓	
		>1000 vpd								✓			
	Future ADT	<400 vpd		✓	*	✓		✓			✓		✓
		400-1000 vpd	✓				✓		✓			✓	
		>1000 vpd								✓			

Study Recommendations

- Low volume road not serving regional travel; reduce the state's responsibility for operations and maintenance in cooperation with jurisdictions who benefit directly from the roadway
- Low volume road serving regional travel; adapt operations and maintenance practices to be consistent with the level of use
- Route Ownership and Guidelines; prioritized low volume route transfer opportunities and methodology specified in ADOT's Route Transfer Handbook



Programming Opportunities

- Minor Projects Program
- Planning to Programming; developing the Five-Year Transportation Facilities Construction Program

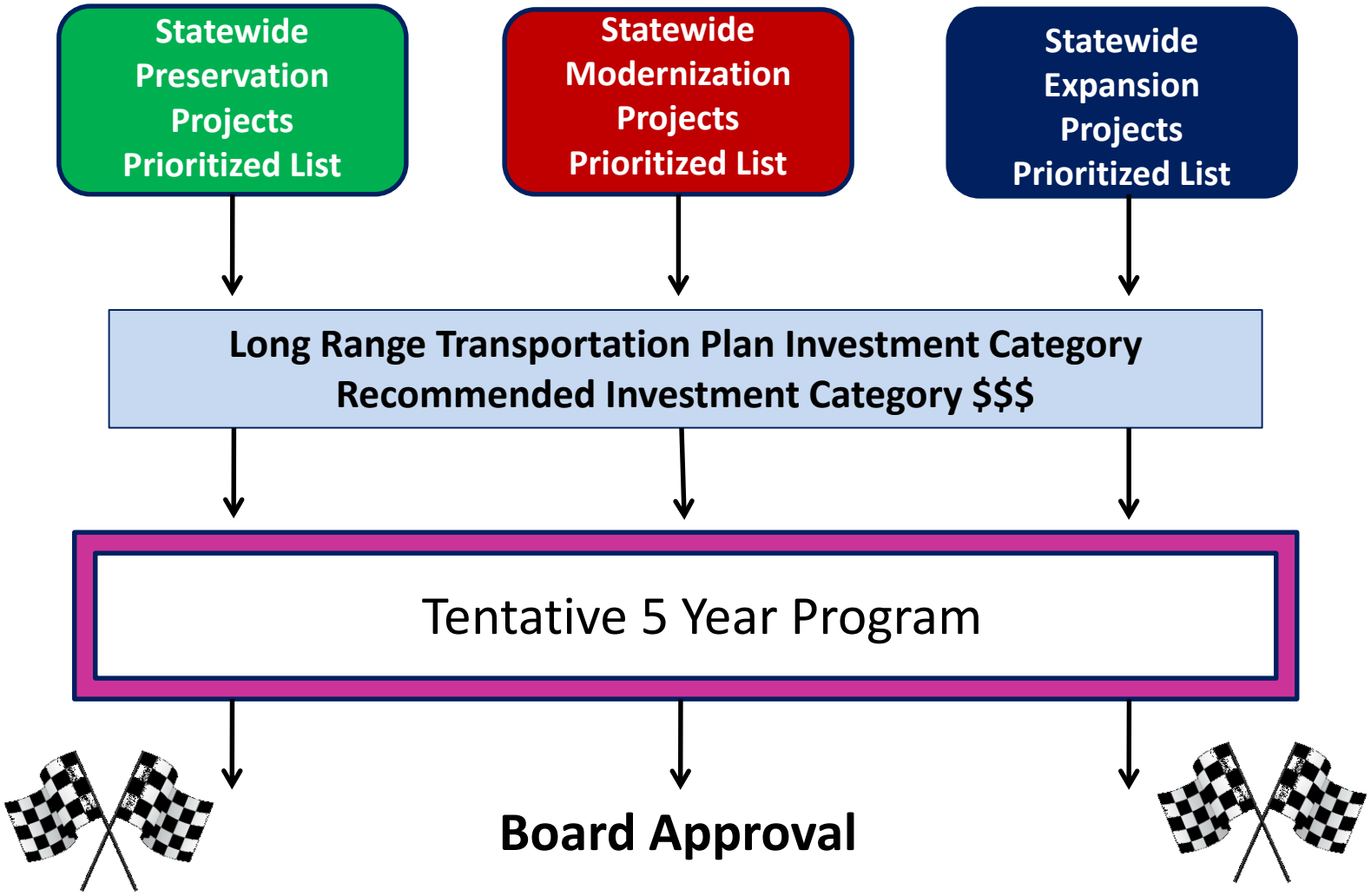
Minor Projects Program

- ADOT Maintenance Districts determine priority projects
- Annual program funding, $21 million - Individual project cost capped at $4 million
- Project evaluation criteria includes:
  - Vision and goals of the LRTP
  - Operational Improvement
  - Safety
  - Project support, collaboration and coordination
  - Budget Viability
  - Project risk

Planning to Programming (P2P)

- The P2P process is initiated annually to prioritize all prospective statewide facility improvements. The P2P process provides a performance-based process resulting in the annual development of the Five-Year Transportation Facilities Construction Program.
- $411 Million programmed annually on the state highway system through the P2P process to include improvements on eligible low volume routes

Planning to Programming Overview



Project Nomination Process

Long Range Transportation Plan Investment Categories

Preservation

Modernization

Expansion

Develop a Pool of Projects

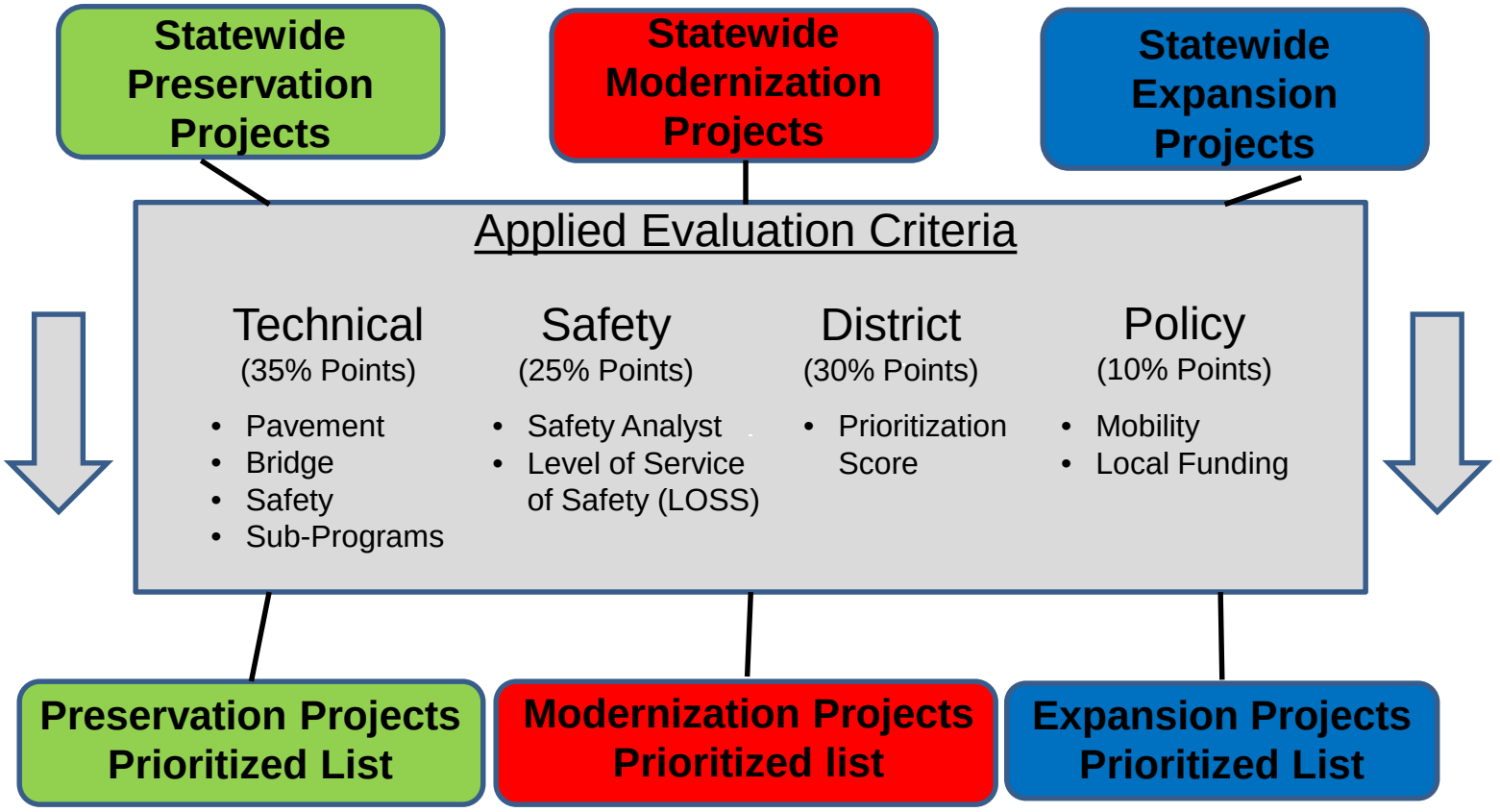
Technical Groups:

- Bridge
- Pavement
- Safety
- ITS
- Rest Areas
- Ports of Entry
- Geohazard

Plans and Studies:

- State Freight Plan
- Corridor Profile Studies
- Bicycle and Pedestrian Plan
- MPO / COG Coordination
- Safety Plans
- Statewide Planning Program
- Planning Assistance for Rural Areas (PARA)

Project Prioritization Process



CONCLUSIONS

Lessons from Current Practice

- Demonstrated success among DOTS identifying broader strategic issues to address within LVR prioritization
- Value of flexible approaches that can incorporate bottom-up input and local knowledge that may not be available through centralized data-driven processes alone
- Barriers still reported by DOTs: sufficiency of methods for capturing the (full) importance of LVR, data availability challenges, agency resource constraints, degree of buy-in

Evolving & Emerging Issues

- Funding constraints lead to both more and less attention paid to LVR – resources may be directed away, but may also be more scrutiny
- Increasing need to understand the value of ensuring minimum tolerable or basic access to remote communities
- Indirect Influence of federal requirements:
  - Asset management planning can improve understanding, lead to new policies about LVR (e.g. in the case of Missouri)
  - More than one state reported that NHS designation and associated federal performance management requirements have affected the level of emphasis on LVR.

Evolving & Emerging Issues

- Jurisdictional transfer of interest to states facing large preservation burdens – leads to questions about the appropriate size & scope of state systems
- The trend towards methods for incorporating broader strategic considerations (economic, social) is broader than just LVR

Knowledge Gaps – Suggestions for Future Research

- **Structured best-practice approaches** to incorporate broader strategic objectives of low volume road investments into decision-making:
  - Checklists of key strategic considerations that might elevate one low volume road improvement above another
  - Further development of quantitative metrics and methods
  - Approaches to identify and target areas with accessibility or economic disadvantages
  - Methods for addressing the concept of vulnerability, dependence, or criticality of infrastructure

Knowledge Gaps – Suggestions for Future Research

- Methods for **jurisdictional transfer evaluation** to support the goal of right-sizing highway networks;
- Guidance on **interjurisdictional partnering and coordination** in funding and prioritization of local low volume road improvements

  (e.g. opportunities for better decision making through state-local partnerships: technical assistance, incentives, requirements for state funds)

Knowledge Gaps – Suggestions for Future Research

- Approaches to optimizing **tiered level of service targets as a function of agency and societal costs**; and
- Understanding **threshold effects from long-term reductions in low volume road performance** (how much scaling back is “too much” and when, how, and who will those changes effect?)

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QUESTIONS?
THANKS!

Today's Speakers

- Anita Bush, *Nevada Department of Transportation*, abush@dot.state.nv.us
- Naomi Stein, *Economic Development Group, Inc.*, nstein@edrgroup.com
- Mark Hoffman, *Arizona Department of Transportation*, Mhoffman@azdot.gov

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