

Candidates for Funding As New Problems

Candidate Problem and Title		Item	Ranking	
		Number	R&I	RAC
<u>A - Administration</u>				
A-01	Workforce 2030: Recruiting and Training the Next Generation Transportation Construction Workforce (\$500,000)	14	11	16
A-02	Managing the Effects of Uncertain Federal Funding (\$400,000)	30	36	24
A-03	Assessing Practices for Right of Way Acquisition and Reimbursement in Utility Relocations (\$300,000)	67	72	58
A-04	Managing Utility Facilities Taken Out of Service (OOS) within Public Right of Way (\$300,000)	76	74	79
A-05	Flash Tracking for Accelerated Project Delivery (\$560,000)	88	76	92
A-06	Implementation of Programmatic Life Cycle Cost Analysis in a Transportation Asset Management Framework (\$350,000)	16	14	17
A-07	Organizational and Cultural Factors for Successful Transportation Asset Management Integration (\$270,000)	91	91	93
A-08	Risk Assessment Techniques for Transportation Asset Management (\$600,000)	20	15	22
A-09	Making Targets Matter: Effective Practices by Transportation Agencies to Establish, Monitor and Adjust Performance Targets (\$650,000)	7	7	10
A-10	A New Tool Assessing the Value of Resiliency Alternatives by State DOTs (\$500,000)	77	82	73
A-11	Building a Resilient Work Force in State DOTs (\$350,000)	35	38	31
A-12	Deploying Transportation Security Practices in State DOTs (\$750,000)	59	45	77
A-13	Improving Data and Information Sharing for Collaborative Regional Operations and Traveler Information (\$600,000)	19	20	18
A-14	Strategies for Incorporating Resilience into Transportation Networks (\$600,000)	49	35	69
<u>B - Transportation Planning</u>				
B-01	Tool and Guidebook to Identify Commercial Delivery Parking Needs for Loading and Unloading in Metropolitan Areas (\$450,000)	101	103	99
B-02	Environmental Impacts of Access Management (\$450,000)	110	110	107
B-03	Initiating the Systems Engineering Process for Rural Connected Vehicle Corridors (\$350,000)	69	81	48
B-04	Operationalizing Accessibility Metrics to Support Transportation Planning and Performance Management (\$500,000)	65	70	54

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<u>B - Transportation Planning</u>				
B-05	Data and Information Sharing Gaps and Practices for Coordinated Operations and Traveler Information for Integrated Corridor Management (\$600,000)	43	41	46
B-06	Measuring Economic Benefits and Costs for the Inclusion of Sustainable Elements on Aging Transportation Systems (\$450,000)	90	90	91
B-07	Metropolitan Planning Organizations: Transportation Partnerships for the 21st Century (\$390,000)	92	93	89
B-08	Quantifying and Estimating VMT Reduction from Transportation Demand Management Measures in Rural Communities (\$300,000)	85	75	88
B-09	Sources of Zinc in Highway Runoff (\$750,000)	97	94	100
B-10	Innovative Mitigation Strategies for Highway Noise (\$250,000)	54	51	62
B-11	Practitioners Handbook for the Noise Analysis Process for Design Build Projects (\$250,000)	86	80	87
B-12	Census Transportation Data Use and Application Field Guide (\$375,000)	56	57	53
B-13	Developing Data Standards and Guidance for Transportation Planning and Traffic Operations - Phase 1 (\$500,000)	55	52	63
B-14	Best Practices Guide for State Department of Transportation and Economic Development Collaboration on Site Selection (\$280,000)	96	98	94
B-15	Development of Programmatic Agreements for Project-level Particulate Matter "Hot-Spot" Air Quality Analyses (\$300,000)	99	96	104
B-16	Methodology for Analyzing Noise and Vibration Impacts on Different Terrestrial Species (\$249,000)	103	99	106
B-17	Post-World War II Commercial Properties and Transportation Project Development: Historic Context and National Guidance on Evaluation of National Register of Historic Places Eligibility (\$295,000)	87	89	76
B-18	Regional Guidebooks of Current Practices for Roadside Pollinator Conservation and Endangered Species Act Compliance (\$500,000)	48	55	38
B-19	Streamlining Data Collection and Analysis for Project Level Air Quality Modeling (\$300,000)	83	83	81
B-20	Watershed Approach to Mitigating Hydrologic Impacts of Highway Projects (\$500,000)	72	73	72
<u>C - Design</u>				
C-01	Managing Speed: Self-Enforcing Roadways for Two Lane Rural Highways (\$900,000)	81	54	97

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<u>C - Design</u>			
C-02 Access Control Techniques to Reduce Wrong-Way Entries from Freeway Exit Ramps (\$450,000)	29	22	49
C-03 Design Specifications for the Static and Seismic Design of Piles for Downdrag (\$500,000)	47	50	42
C-04 Deceleration Rates for Design and Arterial Access Management (\$750,000)	94	92	98
C-05 Highway Capacity Manual Methodologies for Analyzing Freeway Merging and Diverging Bottlenecks Considering Different Geometrics Characteristics and Mitigation Strategies (\$500,000)	44	34	55
C-06 Strategic Plan Development for Improvement of Roadside Safety Computer Simulation (\$200,000)	61	58	65
C-07 Developing Endurance Characterization Curves for GFRP Reinforcing Bars (\$400,000)	102	102	103
C-08 Defining Geotechnical Test and Performance Data for Asset Management and Accelerated Design Benefits (\$300,000)	104	109	95
C-09 An update of the Green Book Design Vehicles and Minimum Turning Paths (\$400,000)	34	33	36
C-10 Determination of Encroachment Conditions in Work Zones (\$500,000)	31	37	27
C-11 Development of a Barrier Design to Accommodate Vehicles, Pedestrians, and Cyclists (\$500,000)	39	39	40
C-12 Development of MASH TL-3 Deflection Reduction Guidance for 31-inch Guardrail (\$500,000)	21	16	26
C-13 Guardrail Performance at Various Offsets from Curb for MASH TL-3 Applications (\$600,000)	8	8	14
C-14 Validation of Roadside Crash Injury Metrics in Real World Crashes (Correlation of Actual Injury Outcomes to Those Predicted During Crash Testing) (\$300,000)	50	48	52
C-15 Highway Network Alternatives to Determining High Stress Pavement Safety Hotspots (\$350,000)	73	60	84
C-16 Surface Property Data Requirements for AASHTO's Highway Safety Manual (\$250,000)	108	105	109
C-17 Wrong-Way Driving (WWD) Solutions, Policy and Guidance (\$600,000)	22	10	43
C-18 Submittal and Review Process of Roadside Safety Products for Inclusion on State DOT Qualified Products Lists (QPL) (\$150,000)	80	85	75
C-19 Assessing the Impacts of Connected, Automated and Autonomous Vehicles on the Future of Transportation Safety (\$450,000)	41	40	45

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<u>C - Design</u>				
C-20	Assessing the Impacts of Turn Lanes in Different Contexts and Modal Considerations to Increase Safety Performance (\$650,000)	46	44	51
C-21	Developing Safety Performance Functions for Rural Two-Lane Highways that Incorporate Speed Measures (\$500,000)	53	68	34
C-22	Updating Safety Performance Functions for Data-Driven Safety Analysis (\$500,000)	37	46	30
<u>D - Materials and Construction</u>				
D-01	Corrosion Rates for Uncoated Weathering Steel Bridges (\$1,000,000)	57	64	41
D-02	Developing High Strength Corrosion Resistant Steel Strands for Prestressing (\$600,000)	62	59	66
D-03	Effective Use of Duplex Coating Systems to improve Steel Bridge Structure Durability (\$500,000)	26	30	23
D-04	Updating Load and Resistance Factors for the AASHTO LRFD Bridge Design Specifications (\$425,000)	25	29	21
D-05	Development of a Pavement Surface Image Library for the Evaluation of Image Processing Algorithms for Automated Pavement Condition Survey (\$400,000)	36	18	68
D-06	Guidelines for Using Sacrificial Coatings to Protect Equipment Assets from Corrosion (\$400,000)	89	86	86
D-07	Rubberized Hot Mix Asphalt v. Hot Mix Asphalt Lifespan study - A mechanistic empirical study (\$400,000)	105	108	102
D-08	Update to AASHTO M180 and Associated Material Specifications (\$300,000)	45	49	37
D-09	A Guidebook for Risk-Based Construction Inspection (\$400,000)	12	13	13
D-10	Structural Design and Analysis of Post-Tensioned Concrete Structures with Flexible Fillers (\$600,000)	79	67	85
D-11	Benchmarking Accelerated Laboratory Tests for ASR to Field Performance: Consideration of Cement and Alkali Contents and Influence of SCMs (\$650,000)	24	21	29
D-12	Design Guidelines For Alternative Lightweight Backfill For Mechanically Stabilized Earth Walls (\$300,000)	58	62	50
D-13	Evaluating Use of Unconventional Fly Ash Sources in Highway Concrete (\$400,000)	17	26	15
D-14	Rating Concrete Permeability Based on Resistivity Measurements (\$500,000)	27	31	28

Candidates for Funding As New Problems

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		Number	R&I	RAC
<u>D - Materials and Construction</u>				
D-15	Thermal Cracking Resistance of Asphalt Binders (\$600,000)	52	56	47
D-16	Determination of the Impacts of Connected and Automated Vehicles (CAV) on Pavement Design, Rehabilitation, and Materials Selection (\$400,000)	78	79	78
D-17	Development of a Practitioners Handbook for Noise Wall Inspection Procedures During and Post Construction (\$150,000)	107	106	105
D-18	Statistical Inspection Procedures for Transportation Projects (\$350,000)	75	87	59
D-19	RSAP Update (No funds stipulated)	109	107	108
D-20	Use of Fibers in Asphalt Concrete to Enhance Material Performance (\$500,000)	70	66	70
D-21	Development of a National Performance-Related Specification for Emulsified Asphalt Binder (\$950,000)	32	42	25
<u>E - Soils and Geology</u>				
E-01	Field Guidance for Developing Expedient Spatial Infiltration Test (\$200,000)	111	111	111
E-02	Develop Guidelines for Estimating the Spatial Variability of Scour around Bridge Foundations (\$500,000)	63	63	64
E-03	Mitigation of Pressure Flow Scour by Improving the Hydrodynamic Conditions at the Upstream of The Bridge Superstructure (\$500,000)	100	104	96
E-04	Protecting Bridge Approaches during Flooding Events (\$300,000)	82	88	71
E-05	Development of High-Quality Databases of Deep Foundations Load Tests (\$400,000)	93	100	83
E-06	Deterioration Rates and Unit Costs for Geotechnical Assets (\$300,000)	74	78	74
<u>F - Maintenance</u>				
F-01	Impacts of Connected and Autonomous Vehicles on Winter Maintenance (\$320,000)	66	71	57
F-02	Determining Pavement Preservation Treatment Lives and Related Pavement Life Extension (\$350,000)	51	61	39
F-03	Determining State DOT Maintenance Program Implications of Connected and Automated Vehicles (CAV) (\$300,000)	23	27	19
F-04	Guideline for Decision Making for Repair vs. Replacement of Highway Maintenance Equipment (\$350,000)	71	77	60
F-05	Update the AASHTO Guide for Snow and Ice Control (\$225,000)	38	43	33

Candidates for Funding As New Problems

Candidate Problem and Title	Item Number	Ranking	
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<u>G - Traffic</u>			
G-01 Lane-Keeping Practices Characterizations (\$300,000)	106	101	110
G-02 Assessing Pedestrian Crashes on the Freeway System: Analysis and Prevention (\$250,000)	98	95	101
G-03 Evaluating the Performance of Right-Turn-On-Red Operation at Signalized Intersections (with single and dual right-turn lanes) (\$300,000)	33	32	35
G-04 Holistic Analysis of Detection and Controller Operations at Signalized Intersections (\$600,000)	84	84	82
G-05 Tactile Walking Surface Indicators To Aid Wayfinding For Visually Impaired Travelers In Multimodal Travel (\$600,000)	68	53	80
G-06 Temporary Traffic Control at Driveways within a One-Lane, Two-Way Section (\$300,000)	64	65	56
G-07 Algorithms to Convert Basic Safety Messages into Traffic Measures (\$400,000)	42	28	67

Summary of Comments

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Reviewer Comments

Distribution of Ratings

Item #1: Synthesis of Information Related to Highway Problems 20-05

	NR	0	1	2	3	4	5
(17) R&I						3	16
(46) RAC	2			1	4	13	25

Special Committee on Research and Innovation

- [Rating: 5] This is a cost-effective way to bring together useful knowledge and practice in a well-recognized format and series. Continuation of this effort is supported.
- This is very helpful research and should be continued. NCHRP should look at combining this with 20-24.
- This seems to be the highest demand, "how are states doing..."

Research Advisory Committee

- Continue funding.
- The synthesis program is in integral part of the national research program, and provides useful information to the state DOTs.
- correlating existing research and BP's to prepare state of knowledge and practice reports is highly needed.
- AASHTO Sponsored. Ongoing, multi-year project for hot topics
- NCHRP annual program.
- These syntheses have proven to be extremely valuable over the years.
- Continuing Program

Item #2: Impacts of Connected Vehicles and Automated Vehicles 20-102 on State and Local Transportation Agencies

	NR	0	1	2	3	4	5
(17) R&I						5	14
(46) RAC			1	1	2	13	28

Special Committee on Research and Innovation

- [Rating: 5] This project is looking at policy aspects of Connected Vehicles and the impact on a local level (states and local) jurisdictions. No other project is looking at the impact of connected vehicles on policy in a comprehensive way as this project does.
- There are lots of unknowns as we move forward in these technologies, and studies like these will benefit all transportation agencies and help us plan for the future.
- Could be valuable
- A lot of money for this project but ongoing national importance

Research Advisory Committee

- The impacts to the DOT's are still unknown, but the deployment of CAV's is quickly approaching. We need to leverage available resources to get out in front of the evolving technology. This topic is of high concern to ADOT and the local agencies within Arizona. There is a need to understand the full implications of CV/AV to jurisdictions as they plan and prepare for the future; especially considering planning, design, construction, operations, maintenance, and funding of the transportation system.
- No Comments
- We support NCHRP's efforts to conduct research to prepare states for CV/AVs and V2I communications. We think it

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Reviewer **Comments**

Distribution of Ratings

makes a lot of sense to have a clear and up-to-date research roadmap in this area and to have a panel to prioritize research needs. This year there were a number of problem statements submitted dealing with CV/AVs that don't fall under the 20-102 umbrella. We have a couple questions:

- Are these problem statements consistent with the TRB's research roadmap?
- Is the panel looking at these problem statements to assess how they should be prioritized relative to the needs identified in the roadmap?

- This is technology is coming and will impact both DOTs and local agencies.

We would also like to add that hopefully this project is evaluating the benefits of integrating Roadway Lighting Control Systems.

- Important area for MnDOT and all DOTs. Connected and automated vehicles are going to be upon us faster than we realize and being prepared is critical.
- Impacts to travel, the system and safety are still to be determined. AV/CV is listed in our Long Range Transportation Plan and this research will provide additional guidance. There will continue to be a big push for legislation (at national or state level) to allow automated vehicles to operate on public; how they will be taxed; and so on. As an example, platooning for commercial trucks is being heavily considered in the Missouri legislature again this session.
- This focused and consistent investment in CV/AV is critical and we fully support this.
- Considering that over \$5 MMMMM has been allocated to this one project. It's time to take stock and see what the end game is as this has now become a PROGRAM!
- Recommended continuation of existing research by project panel and NCHRP program officer.
- The proposed program of projects seems to be very relevant to existing discussions happening locally. Past studies have been very relevant and useful.
- The objectives of NCHRP Project 20-102 are to (1) identify critical issues associated with connected and automated vehicles that state and local transportation agencies and AASHTO will face, (2) conduct research to address those issues, and (3) conduct related technology transfer and information exchange activities. The initial report from this project (NCHRP 845) has assisted agencies with exploring actions that might increase the likelihood that AV and CV technologies will have beneficial impacts on traffic crashes, congestion, pollution, land development, and mobility. Continued funding is recommended.

**Item #3: Accelerating the Application of NCHRP Research
20-44 Results**

	NR	0	1	2	3	4	5
(17) R&I					2	4	13
(46) RAC	1			1	5	12	26

Special Committee on Research and Innovation

- Consider reduction in budget.
- [Rating: 5] This project is being more effectively marketed and has high potential for advancing NCHRP products in to practice.

Research Advisory Committee

- Continuing project.
- We strongly support allocating a portion of NCHRP funding for implementation activities requested by AASHTO committees and State DOTs.
- Implementation is paramount, and national level implementation efforts and support for implementation are necessary.

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Reviewer Comments

Distribution of Ratings

- Low cost, high benefit implementation activities to get completed NCHRP results into practice.
- This is the start of an effort to begin supporting the implementation of NCHRP Research Results.
- AASHTO Sponsored Ongoing, multi-year project. Tracking and dissemination of information for implementation.
- NCHRP annual program.
- Continuing Program

Item #4: Administration of Highway and Transportation Agencies 20-24

	NR	0	1	2	3	4	5
(17) R&I					2	5	12
(46) RAC	1			1	11	12	20

Special Committee on Research and Innovation

- [Rating: 5]
- NCHRP should look at combining this with 20-05.

Research Advisory Committee

- I feel this topic is critical due to the evolution of transportation related to technologh advances, funding constraints, and sustainability. State transportation agencies need to evolve along with industry.
- Continue funding.
- This 20-24 research has funded performance measures research in the past and it would be good to continue. Especially since the Committee on Performance Based Management does not have its own pot like other committees listed further below.
- AASHTO Sponsored. Ongoing, multi-year project for hot topics
- NCHRP annual program.
- Continuing Program

Item #5: NCHRP-IDEA Program 20-30

	NR	0	1	2	3	4	5
(17) R&I					4	4	11
(46) RAC	1			1	8	12	23

Special Committee on Research and Innovation

- [Rating: 5] The Program has a demonstrated a high rate of return on investment with over two dozen past projects now used by DOTs.

Research Advisory Committee

- CTDOT has participated in supporting IDEA program products and considers this an important program.
- Seed money for groundbreaking, innovative research approaches.
- AASHTO Sponsored. Ongoing, multi-year project marketplace innovations for Inventors/Entrepreneurs.
- NCHRP annual program.
- Continuing Program

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Distribution of Ratings

Item #6: U. S. Domestic Scan Program 20-68

	NR	0	1	2	3	4	5
(17) R&I					3	6	10
(46) RAC	1			2	10	12	20

Special Committee on Research and Innovation

- [Rating: 5] This continues to be a highly effective project.
- Should continue

Research Advisory Committee

- CTDOT staff have participated and benefited from Scan programs.
- Information sharing and best practices gained through the domestic scan is valuable to all state DOTs.
- AASHTO Sponsored Ongoing, multi-year project. Visit states for best practices.
- NCHRP annual program.
- Continuing Program

Item #7: Making Targets Matter: Effective Practices by A-09 Transportation Agencies to Establish, Monitor and Adjust Performance Targets

	NR	0	1	2	3	4	5
(17) R&I					5	4	10
(46) RAC				4	10	12	19

Special Committee on Research and Innovation

- The overall project design seems sound in objectives and approach. The larger concern is timing. Agencies like FDOT are deep in the throes of meeting MAP 21 and FAST Act requirements. This continues for a while. The concern is in seeking to “focus on agency experience with target setting: a) challenges (e.g., lack of forecasting tools), b) benefits (e.g., collaborating with stakeholders), c) keys to success (e.g., new data sources identified) and d) how targets are linked to agency decision making.” The process of working through setting targets for the federal requirements in collaboration with our partners, such as the MPOs, is ongoing, and it may be that not many agencies will be far enough along and have enough experience under belt to fully address the range of questions that will be asked in this study.
- [Rating: 5] Research outcomes are important to effective implementation of Transportation Performance Management.
- Based on feedback at various conferences throughout the country, there is a significant need for guidance to DOTs on establishing strategic performance measures beyond the required federal measures. UDOT is well evolved in this arena but continues to seek improvement/refinements. It would be good to benchmark with other states to identify some of those opportunities for improvement.
- This research will help support our agency's use of performance management principles and practices, not just for the federal TPM process but (more importantly) as relates to asset management and operations.
- This has been studied enough at this time. Need actual practice for awhile.
- This topic should be of interest nationally, with DOTs and MPOs.
- C on PBM #1
- The topic is valuable and challenging, implementation will be difficult. Cost seems high for the activity.
- Supported by AASHTO's Committee on Performance-based Mgmt; also supported by the Committee on Planning (2nd highest ranking)

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Distribution of Ratings

Research Advisory Committee

- The title implies an emphasis on current practice, i.e. a synthesis, but the write-up itself is an excellent research needs statement. It is suggested that the title be changed to: Making Targets Matter: Developing effective practices to establish, monitor and adjust Performance Targets in Transportation Agencies.
- As IDOT implements TPM, it is important to understand how it can be woven into decision making instead of just implementing TPM because FHWA says that we must. This research project will identify how other states are integrating TPM into their decision making.
- MnDOT is way ahead of this already. How we define and set targets requires additional thought. This research is critical given the new federal performance requirements. We have been setting our own targets in the past and now we must set them for measures that are similar but not the same as our historic measures. Federal targets also have different timeframes and it is leading to questions about what the new targets mean and how do they relate to our historic targets. Additionally, there are federal measures we don't understand how to affect, we have very little data for, but we must set targets. We need research on these and other questions. MPPM-Supported by AASHTO's Committee on Performance-based Management; also supported by the Committee on Planning (2nd highest ranking)
- This could be very useful nationwide in supporting state DOTs to more effectively monitor, communicate, and modify targets.
- Funding seems high for value of research project
- Valuable information to understand best practices.
- K Viani interested in panel
- The topic is very relevant and timely to State DOTs, MPOs and local agencies. But (1) What is left out in the scope is the areas that will be addressed. Will the study include all areas in MAP-21, such as safety, asset management, bridges and pavement, transit, congestion/reliability? If so, the budget and timeline are fine. If only a few of these areas will be addressed, the budget should be revised down accordingly. (2) The scope should also include complex interactions such as - (2a) how work zones meant for future traffic problem alleviation and future infrastructure needs are currently impacting congestion and safety negatively; (2b) impacts of agency actions such as incident management, traffic demand management, technology (both traditional and Connected-Automated vehicles) on congestion/reliability, safety etc.. (2c) Major external/political factors impacting targets and performance measures include Legislative changes, upcoming technology changes, policy changes, funding availability and changes in community goals. (3) Suggest including a survey/focus-interview component to gather more information than possible through face-to-face workshops.
- The proposed study is of significant importance to WSDOT due to the MAP-21 rule implementation and lack of resources at WSDOT to delve deep into the area in such a way this study intends to perform. NCHRP is the right place for this study to be conducted with the support from AASHTO, FHWA, and appropriate TRB committees. This topic is of national interest and all DOTs and MPOs across the nation would benefit from the results of this study. I personally am not aware of any other studies that try to gauge the efficacy of the target setting exercise while providing a framework for feedback loop at every step of the process. As the need is high that emerged from a federal mandate I have every confidence that this research would be successful. The anticipated return from the \$650K spent on this study would be great as every transportation agency that manages NHS will benefit from the recommendations that this study is going to propose.

**Item #8: Guardrail Performance at Various Offsets from Curb
C-13 for MASH TL-3 Applications**

	NR	0	1	2	3	4	5
(17) R&I				1	3	5	10
(46) RAC	2			7	8	10	18

Special Committee on Research and Innovation

- This research is needed to update/expand the guidance for the combination of guardrail and curb for speeds greater than 45 MPH.

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Reviewer Comments

Distribution of Ratings

- Good timing with respect to end treatment performance issues. #1/6 AASHTO SCOD.
- [Rating: 3] The most common offsets (zero and beyond a standard width sidewalk) have already been crash tested, so we don't see this as a high priority. However, since MASH requires every variation of a guardrail design to be crash-tested, some additional information or guidelines would be helpful to agencies for different curb combinations and offsets.
- This is very much needed to meet FHWA Mash requirements by 2020.
- Guardrail in front of curbs is an issue we run into on a regular basis.
- Good project but pretty well understood already
- We often rely on curb in combination with GR in some form, so this is also important information. C on D #1
- This is very critical for applications on reduced deflection needs and to validate the assumptions current being made

Research Advisory Committee

- On-Going evaluation of MASH Standards
- N/C
- ITD struggles with this concept: the tested curb location differs from our usual curb use.
- Placement of guardrail behind curb is fairly common, especially where sidewalks approach bridges on urban cross-sections. Sometimes in rural areas, curbs are used along the edge of shoulders to control drainage so some curb/guardrail combinations are needed there as well. the testing is for a common application, and has not been done.
- High priority in order to meet AASHTO MASH FHWA deadlines and also to update our current MASH guardrail standard plan in dealing with roadway curbs. I am a committee member of AASHTO TCRS that submitted this problem statement.
- This is important for us (the sooner, the better).
- Seems to be similar to C-11, if same type study then no need to duplicate
- The existing solution which is relatively well understood is placing the barrier at the curb. There's a desire to have other options but this needs to be weighed against other research priorities. Note that many applications of curb near the roadway are in low speed environments, so the occasion when you may need to apply TL-3 are less common (at least in WA).

**Item #9: Legal Problems Arising Out of Highway Programs
20-06**

		NR	0	1	2	3	4	5
(17)	R&I				2	4	4	9
(46)	RAC	1			4	9	12	19

Special Committee on Research and Innovation

- [Rating: 5]

Research Advisory Committee

- Very worthwhile for continued defense of the agency. Establishes National Standards of practice in the area.
- Continue funding.
- This title continues funding for publication of Legal Research Digests and Selected Studies in Transportation Law. Four new topics have been identified for study and publication. Many legal issues are state related but to get consistency on the interpretation of federal laws is important to state DOT's.

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Reviewer Comments

Distribution of Ratings

- Highest level of importance as this project funds legal projects selected for research that provide vital information of great use to state DOTs.
- NCHRP annual program.
- Continuing Program

**Item #10: Research for the AASHTO Standing Committee on
20-07 Highways**

	NR	0	1	2	3	4	5
(17) R&I	1	3			2	3	10
(46) RAC	4	2	2	1	3	10	23

Special Committee on Research and Innovation

- [Rating: NR] Defer to AASHTO.
- We realize these will be going away. When needs to be communicated.
- to be phased out
- This is extremely important to continue the this research to improve the safety of our roadways.
- Per recommendation of the R&I Committee, this project is proposed to end.

Research Advisory Committee

- This covers research in many areas including bridge, traffic, materials, etc.
- Continue funding.
- We support R&I's recommendation to replace these allocations to specific committees with an allocation of funds for research-related activities that would be available to all AASHTO councils and committees with funding decisions made by a panel drawn from the Transportation Policy Forum.
- Many 20-07 tasks have produced important research, including recently Task 395 addressing MASH equivalency for NCHRP 350 bridge barriers
- Safety items in particular are a priority for us.
- NCHRP/AASHTO annual program continuation. Now known as the Highway and Streets Council.
- The work products from this program are relatively low cost and readily implemented by AASHTO committees and DOTs.
- Continuing Program

**Item #11: Research for the AASHTO Standing Committee on
08-36 Planning**

	NR	0	1	2	3	4	5
(17) R&I	1	3		1	1	2	11
(46) RAC	3	2	2	1	4	11	22

Special Committee on Research and Innovation

- [Rating: NR] Defer to AASHTO.
- We realize these will be going away. When needs to be communicated.
- Work of the Standing Committee is always very important
- Per recommendation of the R&I Committee, this project is proposed to end.

Summary of Comments

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Research Advisory Committee

- Continue funding.
- We support R&I's recommendation to replace these allocations to specific committees with an allocation of funds for research-related activities that would be available to all AASHTO councils and committees with funding decisions made by a panel drawn from the Transportation Policy Forum.
- The AASHTO SCOP provides regular relevant research in assisting state DOT's planning initiatives. The IDOT Bureau of Planning is attempting to develop capacity in scenario planning, economic development and data. This problem statement seeks to address all of those topics.
- This has been a critical part of planning related research. MPPM-per recommendation of the R&I committee
- This is a great resource to SCOP and has historically produced useful research.
- Timely, useful and applicable information on transportation planning topics.
- It is a good expenditure but it needs to be focused on things other than asset management and performance management unless there are some exceptionally good topics that need the attention.
- NCHRP/AASHTO annual program continuation. Now known as the Planning Committee.
- Very useful rapid-response program.
- Continuing Program. This panel should be continued as a primary path to conducting needed quick-response planning research across modes and performance objectives. This research often provides initial insight into issues that can then be more strategically and efficiently carried into in-depth research. It advances the Research Map developed by the Committee on Planning and provides an ideal venue to engage numerous member agencies (a key goal of AASHTO) in research that will assist the State DOTs and MPOs and others.

Item #12: A Guidebook for Risk-Based Construction Inspection D-09

	NR	0	1	2	3	4	5
(17) R&I		1		1	1	11	5
(46) RAC	1	1		4	6	19	14

Special Committee on Research and Innovation

- This topic has come up the past couple years at the AASHTO Committee on Construction. Many DOTs are faced with the same workforce issues such as staff reductions and inexperienced staff, who don't have 20 years of experience. May be needful to investigate industry and international experience in RBCI.
- AASHTO Construction Committee #1.
- This research would provide big benefits via an industry standard on items where inspection could be reduced.
- [Rating: 4] A timely and worthwhile project.
- With limited number of inspection resources, this research would or should provide methods we can use to make sure that we are using these resources effectively.
- Better suited for synthesis project.
- This guidance has a high degree of potential to be a valuable tool for developing emerging workforce focus and consistency in assuring quality of our work products.
- Construction #1

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- Probably worthwhile research given the pressures to reduce STA staff.

Research Advisory Committee

- Fiscal restraints and workforce challenges make it essential for a shift from inspecting everything to risk based inspection.
- This proposal would provide significant benefit to the transportation community. Experienced staff is difficult to recruit and providing guidelines for new staff who will inspect construction projects will be broadly useful. If selected for funding, we recommend the scope be narrowed and refined.
- IDOT struggles to have inspectors on site during all work activities. It is no secret that department headcount has reduced over 35% over the last 20 years, but our inspection requirements have remained the same or increased. To cover the shortfall the department expends considerable dollars to hire consultant inspectors. This research could provide cost reduction to the department. The 3 construction engineers that provided the problem statement are excellent engineers and fully understand the issue and risks involved.
- The issue of not having experienced DOTD construction engineering staff is also affecting the quality of our field inspections with more of our staff retiring each year. This may be a possible help to our problem but in the long run, we still need to maintain qualified staff and pay them a decent wage to retain them.
- Would be beneficial to MnDOT
- "This should be combined with D-18.

This is very important to us. The main deliverable would be a guide document which would be very useful. "

- Agree with FHWA and NCHRP reviewers. To synthesize existing knowledge of inspection practices with existing knowledge of risk-based optimization to recommend some guidelines sounds feasible. \$400K seems a little high: \$300K?
- This guidance has a high degree of potential to be a valuable tool for developing emerging workforce focus and consistency in assuring quality of our work products.

Item #13: Research for the AASHTO Standing Committee on 20-65 Public Transportation

	NR	0	1	2	3	4	5
(17) R&I	1	3			2	2	11
(46) RAC	3	2	2	2	5	10	21

Special Committee on Research and Innovation

- Previous research projects have provided valuable comparative data for peer states and for rural and metro operations.
- [Rating: NR] Defer to AASHTO.
- We realize these will be going away. When needs to be communicated.
- to be phased out
- AASHTO's SCoPT does great work that is reviewed and is of value to NHDOT's transit section.
- Per recommendation of the R&I Committee, this project is proposed to end.

Research Advisory Committee

- There are many developments ongoing in the public transportation sector that are non-standard in their implementation time curve because they are being driven by large cash and technology infusions from the private sector. The include Connected & Autonomous Vehicles, Vehicle Electrification for Public Transit, and Shared Vehicle Mobility. Many of these items are becoming new economic drivers for the U.S. economy. This funding will allow for flexible and quick-response research needs to be addressed without regard for funding constraints.

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- We support R&I's recommendation to replace these allocations to specific committees with an allocation of funds for research-related activities that would be available to all AASHTO councils and committees with funding decisions made by a panel drawn from the Transportation Policy Forum.
- Relates to technical assistance and resources provided to state DOTs. It is directly applicable and highly relied upon by MoDOT staff and transit partners statewide.
- NCHRP/AASHTO annual program continuation. Now known as the Public Transportation Council.
- This program has a long history of delivering useful products that are directly relevant to states/localities/transit agencies.
- Continuing Program

**Item #14: Workforce 2030: Recruiting and Training the Next
A-01 Generation Transportation Construction Workforce**

	NR	0	1	2	3	4	5
(17) R&I		1		1	3	6	8
(46) RAC	1	1	1	5	8	12	17

Special Committee on Research and Innovation

- This topic has been at the forefront with the AASHTO Committee on Construction. It's a nationwide issue for which DOTs struggle to implement a road map to deal with the inexperienced workforce.
- Consider reduction in budget if approved to \$250k. Should also consider means to retain skilled employees..
- This research could be very beneficial.
- [Rating: 5] Industry data indicates tremendous challenge to develop a skilled highway construction industry. A better understanding of efforts to recruit and train the next generation of the highway construction workforce will help with investment of funding, training, and workforce development resources.
- Workforce is one of the most critical items we will be facing in Construction in the next 5 years. This seems important to many DOTs at this time. We see value in this proposal and believe the ROI will be high.
- All states are dealing with this issue
- Include A11
- Workforce shortage, attracting quality talent and pay scale discrepancies are a nationwide problem

Research Advisory Committee

- This is a critical need. There is a key shortage of qualified workers. Workforce retention and development is key and this research would help develop tools for this.
- Return will be preparedness and Quality Workforce.
- This is a really important issue for DOTs. All of us across the country face the same hiring challenges.
- Hiring in some technical areas has been challenging. Surveying is one specific area.
- Lots of implications nationwide from this research
- Both VTTC and Civil Rights will likely have interest in this. Civil Rights for recruiting and VTTC for training.
- Important topic however reviewer comments regarding scope should be considered. Budget seems high for current scope, given related work already completed.

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- "This is a current challenge within State DOT's. Recruitment, retention and development of technical knowledge within State DOT's workforce are critical elements to the successful development and delivery of the future transportation infrastructure. The return on the investment into the development of the workforce in State DOT's is exponential and has the greatest potential to determine the success or failure of DOT's."

**Item #15: Research for the AASHTO Standing Committee on the
25-25 Environment**

	NR	0	1	2	3	4	5
(17) R&I	1	3			2	3	10
(46) RAC	4	2	2	1	7	7	22

Special Committee on Research and Innovation

- Technical assistance provided by AASHTO is invaluable.
- [Rating: NR] Defer to AASHTO.
- We realize these will be going away. When needs to be communicated.
- to be phased out
- Per recommendation of the R&I Committee, this project is proposed to end.

Research Advisory Committee

- We support R&I's recommendation to replace these allocations to specific committees with an allocation of funds for research-related activities that would be available to all AASHTO councils and committees with funding decisions made by a panel drawn from the Transportation Policy Forum.
- Continuing funding is needed to carry on various environmental needs that are not always anticipated.
- NCHRP/AASHTO annual program continuation. Now known as the Environment and Sustainability Committee.
- Since 2003, 25-25 has been an essential tool for state DOTs to conduct small-scope, quick-response tasks that respond to immediate environmental research needs. It's effective, responsive, and nimble - a crucial sub-allocation of NCHRP funds.
- Continuing Program

**Item #16: Implementation of Programmatic Life Cycle Cost
A-06 Analysis in a Transportation Asset Management
 Framework**

	NR	0	1	2	3	4	5
(17) R&I				1	5	8	5
(46) RAC	2		1	3	11	18	10

Special Committee on Research and Innovation

- Wide ranging project, probably would need more funds than requested. This would have been more helpful if done earlier.
- [Rating: 5] A timely and important topic. Problem statement is more ambitious than can be accomplished within the suggested budget; consider increasing to \$500,000.
- This study is important in aiding DOTs in developing an asset management/life cycle cost management approach to all asset types. While many DOTs have well developed pavement and structure asset management programs, there exists a need to develop this approach for other types of assets (signs, culverts, barriers, traffic signals, geotechnical elements, etc.). If signals are included, ITS is or should also be included.
- The problem statement is related to a critical area, but I recommend we send this back for re-focus on the life-cycle planning concepts as set forward by FHWA in their TAM guidance. This RNS has high potential to be caught in the

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confusion between the concept of Life Cycle Cost Analysis (usually project-level and done at the time of construction or heavy rehab), and Life-Cycle Planning (LCP) which by the FHWA definition is more network-level and ongoing.

- Expanding this out beyond pavement and bridge may be of value.
- This is a good project, but the problem statement is a bit broad and could be refined
- We do need to incorporate life-cycle costs and I have not seen a good consistent framework
- Supported by AASHTO's Committee on Performance-based Mgmt

Research Advisory Committee

- A very basic life cycle planning tool has been developed for IDOT to use for pavements and bridges in the TAMP, but it could use improvement This effort could further assist in the development in IDOT's tool.
- This would be valuable for investment planning of the roadside infrastructure investment category. MN-Life cycle analysis is an area that can be refined. Good for asset management planning. DB-If we are to preserve and maintain our assets we must be able to predict life cycle costs for those assets. MPPM-Supported by AASHTO's Committee on Performance-based Mgmt
- Try and combine at least a couple of the projects A-6,7,8,9
- Agree it is underfunded at \$350,000. This is a giant trade-off analysis and the essence of the DOT business of cross-asset funding allocation. It would be extremely complicated and data intensive to achieve this level of optimization insight better than some of the simple, existing tools in use now.
- Somewhat related to Statement A-02. Research objective -- LCCA + valid PMs + multiple objectives + multiple asset classes -- is rather broad. Contribution to PMs or to balancing competing goals is doubtful. Expect that the revealing research on LCCA will be pursued at a finer level of asset specificity.
- This addresses the question of how to implement an agency-wide process to assess short term efficiencies in the design or construction phase alongside long term impacts for operations and maintenance, evaluate ROI of initial cost savings versus depreciation curve, and ultimate replacement date. The problem statement and objective are broad and complex. It may be difficult to successfully meet all aspirations and lead to a report that does not advance the state of the practice in life cycle cost analysis. However, the topic is of importance to WSDOT. Regarding geotechnical assets, this research could provide WSDOT additional techniques in determining the life cycle costs of our unstable slopes and our constructed rock fall fences, slope drapery, and horizontal drains. We should support this research.

**Item #17: Evaluating Use of Unconventional Fly Ash Sources in
D-13 Highway Concrete**

	NR	0	1	2	3	4	5
(17) R&I				1	8	5	5
(46) RAC	2		2	4	9	10	18

Special Committee on Research and Innovation

- Florida has done a great deal of research on addition of alternative materials to fly ash. When it comes to evaluating beneficiated ash from dumps sites, it may be more appropriate for the concrete industry to perform specific source research. Not knowing which dump sites would be selected for beneficiation, the research may not be representative of a particular deposit.
- Good opportunity to stay ahead of the curve on material shortages.
- [Rating: 4] Addresses a long-standing need for updated fly ash specifications.
- It is becoming clear nation-wide that viable fly ash sources acceptable in concrete mix designs are becoming scarce. Utah is uniquely situated to be able to take advantage of nearby sources. It is recognized, however, that those sources are not inexhaustible, and alternative types and sources will need to be identified if the concrete industry wishes to take

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advantage of fly ash as an SCM.

- There is a need to increase use of fly ash from unconventional sources to increase supply. It should be noted that Class F should be the only type allowed to be reclaimed, but was not noted in the research plan. Currently, there is a ballot to ASTM 1697 to allow blending of marginal fly ashes with another source to create a blend that would meet specifications.
- Class-F fly-ash is scarce with the burning of coal becoming less environmentally acceptable. Alternative sources of fly-ash are needed.
- The supply of good quality Class F fly ash is shrinking due to reduction in coal-fired electricity generation. Need to study ways to maximize use of lesser-quality ash.
- Using high quality flyash as a cementitious replacement has been very successful in abating the effects of ASR. However, changes in the cost of fuels has caused occasional shortages in the flyash supply. Improving the stability of these supplies would be a significant benefit to the industry.

Research Advisory Committee

- Important subject that needs to be looked into.
- Fly ash supplies in Idaho will be changing in the near term increasing our need to find sources of materials to mitigate.
- IDOT is interested in this as fly ash supplies have been becoming more limited in recent years.
- MassDOT has been experience fly ash shortages for a few years and this would help in finding new sources. This is something we need to know and would help us resolve our issue, thus an absolute need.
- MnDOT has recently started allowing supplementary cementitious materials in concrete, and our Class C fly ash supply is limited.
- Our current fly ash sources are not very consistent and supply may not last.
- We will eventually have less usable fly ash. As a result, this study could be important for our State and others.
- Fly Ash supplies have become very limited and it would be very beneficial to identify if ash currently not being used could provide a beneficial use.
- This is an important and urgent topic for both DOTs and private industry.
- Could have direct benefit to Vtrans and regional concrete producers, very worthwhile
- Recovery and use of stockpiled or stored fly ash is very important both from the construction material resource perspective and the environmental viewpoint. Would recommend that the scope be widened to include all potential uses of fly ash in transportation infrastructure rather than the narrow focus on its use in concrete.
- WSDOT uses fly-ash in concrete bridge deck overlays. WSDOT also utilizes alternatives to fly-ash such as slag for alkali-silica reaction (ASR) Mitigation. Class-F fly-ash is scarce with the burning of coal becoming less environmentally acceptable. Alternative sources of fly-ash are needed.

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Item #18: Guidelines for Solid-State Roadway Lighting 05-22

	NR	0	1	2	3	4	5
(17) R&I				1	5	7	6
(46) RAC	1	1	1	4	14	14	10

Special Committee on Research and Innovation

- This project complements the existing AASHTO Roadway Lighting guide. It provides very good information and tools to help DOTs and Local Agencies transitioning from HPS to LEDs. Roadway, intersection, environmental and maintenance best practices, criteria and guidelines for LEDs are developed in this project.
- [Rating: 5] The additional topics as outlined in the scope of research were identified by the panel members as important issues related to LED lighting and, while beyond the original scope under the problem statement for 5-22 developed in 2016, will aid in further the development of LED lighting related effect on safety.
- Initial research was of a high value, but with the additional topics covered by the continuation request the value seems more marginal. Real time adaption would be of the most interest. Asset management and useful life are of interest but can be calculated with metrics from vendors. We have not seen the effect of headlights to be an issue.
- good project with all the lighting changes
- This is need research but has a lower priority

Research Advisory Committee

- No Comment
- Recommended continuation of existing research by project panel and NCHRP program officer.
- This affects VTrans directly, as we have been converting some of our streetlights to LED
- It is important to WSDOT that this research be continued to develop guidelines that address all aspects of the application of solid state lighting to roadways.

Item #19: Improving Data and Information Sharing for A-13 Collaborative Regional Operations and Traveler Information

	NR	0	1	2	3	4	5
(17) R&I				2	5	7	5
(46) RAC	2		3	5	6	17	12

Special Committee on Research and Innovation

- The scope for this is identical to B-05. We agree and support the FHWA recommendation to merge B-05 and A-13.
- Could have future implications with respect to AV. Combine with B-05 if approved.
- [Rating: 5] There is an urgent need for this research to support traveler information, gap filling for the Integrated Corridor Management, next generation of TMC operations, and active traffic monitoring.
- Collaborative operations is an area of need nationally. As we increase our collection and use of data, common data structures are becoming increasingly important. We shouldn't all have to invent our own wheel.
- Somewhat interesting.
- A-13 and B-05 are so similar (nearly identical) that they should be combined. The outreach to ridesharing companies, the navigation management industry, freight management and smart cars in Section VII of B-05 should be added to A-13. Or the inclusion of public safety and emergency management agencies, and the proposed data sharing between mobile devices and connected vehicles in Section V, Task 2, in A-13 should be added to B-05. Either way A-13 and B-05 are both incomplete as written. Combining the two problems into one statement will create a valuable problem statement that

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will potentially provide a nice comprehensive project that will look at data sharing with more stakeholders than either project will accomplish on its own.

- C on TSS&R #1 ??

Research Advisory Committee

- Support proposed joining of A-13 and B-05
- Data standardization and architecture across ITS, data warehousing and asset management systems is a focus within our ITD operational units. Likewise we are seeing the sharing of information across these units both within the agency and across agencies with B2B requests for information sharing in addition to the B2C information sharing.
- The overall idea of the problem statement of figuring out the stakeholders, understanding data requirements, and processing the data is definitely worthwhile and essential for Integrated Corridor Management (ICM) for it to be successful for a specific corridor. This would be timely as IDOT-D1 is wrapping up a Phase I study for essentially an ICM project in coordination with Cook and DuPage Counties.
- Identifying the current issues with information and data sharing and improving the data and information standards would help achieve MDOT's mission and commitment to its internal and external customers.
- This project is very important given the move toward big data and the corresponding big appetite for it among our customers.
- Very important to MnDOT's TSMO. Interested in BMPs with other agencies to share info.
- This should be combined with B-05.

Expands existing standards and practices for sharing data. This is an important initiative and we need to take advantage of developments as continual improvement is necessary.

- It is the same content as B-5
- Problem statement identifies a key issue, that legacy standards need to be retooled for current state of the practice applications.
- First, A-13 and B-05 are very similar and from the same patrons; and should be merged. (2) ICM and Smart Cities are important, emerging topics. But a quick look at Task 2 shows that there is no mention of what data will be shared by travelers, ride sharing companies, navigation management companies and freight management companies. Are they even willing to share anything with the public sector? If yes, at what cost? So the scope needs to be tightened. (3) Research period is okay; but funding of \$600K is very high for the current scope.
- A-13 and B-05 are so similar (nearly identical) that they should be combined. The outreach to ridesharing companies, the navigation management industry, freight management and smart cars in Section VII of B-05 should be added to A-13. Or the inclusion of public safety and emergency management agencies, and the proposed data sharing between mobile devices and connected vehicles in Section V, Task 2, in A-13 should be added to B-05. Either way A-13 and B-05 are both incomplete as written. Combining the two problems into one statement will create a valuable problem statement that will potentially provide a nice comprehensive project that will look at data sharing with more stakeholders than either project will accomplish on its own.

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**Item #20: Risk Assessment Techniques for Transportation Asset
A-08 Management**

	NR	0	1	2	3	4	5
(17) R&I				1	7	4	7
(46) RAC	2		2	4	14	14	9

Special Committee on Research and Innovation

- This project appears worthwhile, and results may be useful down the road, but there are other on-going projects that should be completed before this is started, viz., NCHRP 08-113, on Integrating Effective Transportation Performance, Risk, and Asset Management Practices, which could influence this proposed project.
- [Rating: 4] The proposed study focuses on risk assessment processes to support assessment of a range of risks, and less on any individual risk, which is a strength of the proposal as few States are comfortable addressing risks to their network and developing their processes. It also recognizes the roll of uncertainty and the need to consider uncertainty in decision making. We suggest that the lit review be broadened to include other reports, including: NCHRP 25-25(94) Integrating extreme weather into TAMPs. (2015); and the ongoing FHWA project "Integrating Emergency Response into Transportation Asset Management."
- There is a great need for defining comprehensive approaches and methodologies for assessing, quantifying, evaluating trade off analysis and mitigating risk within/to DOT assets. This problem statement accurately identifies challenges that most states are trying to get a handle on. Sharing of successful methodologies and the objective to define measures of asset resiliency for performance measures is especially intriguing.
- Risk is about future uncertainty, and given the pace of change it is more important than ever that we get better at managing risk. Although there are some other resources out there on risk, this one seems like it would pay off quickly by giving more focus on HOW we should develop this critical skill area.
- the description looks too narrow for this cost
- Very important topic in asset management that is reletively new to most states. This project could have significant benefits
- C on PBM #2, see NCHRP 08-113
- This can continue to evolve, but there is not an urgency. We understand basic risks and analysis currently.
- Supported by AASHTO's Committee on Performance-based management

Research Advisory Committee

- We support this effort as long as the project does not try to define yet another approach to or framework for conducting risk assessment (that's well established), and instead focuses on 1) how to evaluate the likelihood of occurrence and/or magnitude of consequences for asset management-related risks, and 2) how specifically to manage asset-related risks, this could be helpful to all state DOTs.
- This looks valuable for MnSHIP also. This could be useful State DOTs must do risk based asset management plans, so research to help with the risk assessment techniques is needed. MPPM-Supported by AASHTO's Committee on Performance-based Mgmt
- "It is important to explore the risks to financial stability of DOTs. This fits into our specific ERM survey results.
- Wait for NCHRP 08-113
- Valuable to understand how to assign risks to prioritize asset management.
- The research is focused on an important part of Transportation Asset Management (TAM); namely risk assessment. A

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critical review of current practice and preparation of practical approaches would be of value to further WSDOT's risk-based TAM. The department has specific interest in how to use risk assessment in prioritization and resource allocation, as well as comparison of WSDOT versus other's risk practice. This research will arrive too late to inform our initial statewide Asset Management Plan.

**Item #21: Development of MASH TL-3 Deflection Reduction
C-12 Guidance for 31-inch Guardrail**

	NR	0	1	2	3	4	5
(17) R&I		1		1	4	5	8
(46) RAC	2	2	2	5	11	10	13

Special Committee on Research and Innovation

- This research would duplicate a task already approved for funding with the Roadside Safety Pooled Fund (RSFP with TTI/WSDOT). There also is a follow-on task proposed with the Midwest States Pooled Fund (MwSRF/Nebraska DOT) to cover any items not addressed by the RSPF.
- Good timing with respect to end treatment performance issues.
- [Rating: 1] This is an important project, but it is already scheduled to be studied by the Roadside Safety Pooled Fund program.
- This is very much needed to meet FHWA Mash requirements by 2020.
- We frequently run into situations that require limited deflection designs. It would be especially nice to have guidance on how to transition into and out of stiffened sections.
- It appears this problem statement is being undertaken by a Pooled Fund. Otherwise it would have a higher priority.
- good project that could be combined with pooled fund efforts
- We often rely on the ability to reduce deflection for various reasons, so this is important information. Comm on Design #2
- This is very critical for applications on reduced deflection needs and to validate the assumptions current being made

Research Advisory Committee

- On-Going evaluation of MASH Standards
- Duplication w/PFS
- High priority in order to meet AASHTO MASH FHWA implementation deadlines and also to update our current MASH guardrail standard plans. I am a committee member of AASHTO TCRS that submitted this problem statement. Our Highway Pooled fund group also rated this a high priority and voted to fund a similar project also.
- We need a MASH solution for this issue of deflection reduction in tight areas. This is important but industry may be able to provide necessary protections through their own development.
- This research has the potential to provide something beneficial to Vermont
- This gets out ahead of the Manual for Assessing Safety Hardware (MASH) 2020 implementation date and relieves pooled funds from this responsibility.

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Item #22: Wrong-Way Driving (WWD) Solutions, Policy and C-17 Guidance

	NR	0	1	2	3	4	5
(17) R&I				1	6	3	9
(46) RAC			4	9	11	11	10

Special Committee on Research and Innovation

- A couple years ago the FDOT implemented signing and pavement marking enhancements to discourage wrong way entrance on interstate ramps. This was based on best practices from Texas and California. However, this still continues to be an issue and should be studied to determine what is most effective.
This is similar to Problem Statement C-02.
- Combine with C-02.
- [Rating: 2] Due to the higher proposed cost, this one should be merged with C2.
- This proposal is similar to C-02, but larger. The two should be combined. The issue of WWD is a national issue and many states are making changes to detect the drivers and to prevent the WWD maneuver. This research can help focus those efforts.
- This problem statement is more comprehensive than C-02. It will look into geometric issues, traffic control devices, and ITS issues and solutions related to WWD crashes. Current efforts to reduce WWD crashes are typically addressed by looking at one solution approaches.
- Strong CEO support
- Include C02
- This is a big safety benefit

Research Advisory Committee

- No Comments
- We believe research is needed to provide guidance on retrofitting existing interchanges to minimize WWD and to evaluate the potential for active WWD warning systems to reduce WWD incidents and crashes. Idaho and several of the other states sponsoring this problem statement are willing to support the field testing and provide field sites for the study.
- This has some similarities to C-02. As newer technologies become available to address WWD, IDOT would be interested in evaluating applicability to Illinois interchanges.
- Consider Combining with C-02.
- Consideration should be given to combine C-02 and C-17 to make it more efficient and higher ranking.
- Research geared toward active wrong-way driving notification will not produce any meaningful results. However, research to look at retrofitting existing locations with static systems has promise in getting enhancements deployed. BD-I've had discussions with State Patrol recently about concerns of wrong way drivers.
- WWD remains to be a problem with often catastrophic outcomes.
- Wrong way driving is a top concern for MoDOT and research would provide additional information to correct the situation.
- Better research on the various active WWD mitigation measures would be beneficial.
- NCDOT consensus is that this project should be combined with C-02

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- This problem statement would definitely help provide further guidance on address WWD via geometric designs.
- See C-02 for WWD project. Wider scope here to include active warning devices. A synthesis may be appropriate and is recommended. The other option is combining with C-02 for a broader effort but this could lower C-02 rating.
- This problem statement is more comprehensive than C-02. It will look into geometric issues, traffic control devices, and ITS issues and solutions related to WWD crashes. Current efforts to reduce WWD crashes are typically addressed by looking at one solution approaches.

Item #23: Determining State DOT Maintenance Program
F-03 Implications of Connected and Automated Vehicles
(CAV)

	NR	0	1	2	3	4	5
(17) R&I				2	7	5	5
(46) RAC	3			6	15	12	9

Special Committee on Research and Innovation

- Assess within/against 20-102 roadmap and funded priorities.
- [Rating: 5] A timely and important topic.
- The requirements that are needed to maintain the functionality for connected and automated vehicles need to be identified. This problem statement may be premature. We don't yet have definitive information on what assets (stripes, etc) are crucial to AVs. There are a couple of other studies out there that might shed light on this, and then we can think about the needs stated in this problem.
- This has been a focus with our WASHTO SCOM. Could have huge impacts to winter maint.
- Suggest combining this project and F-01, with additional funding to address issues in general terms with this project and mountainous areas with F-01. If not combined, then fund this project over F-01, as the results here will drive the research suggested for F-01.
- 20-102. comm on maint #2
- This seems like it is short money for what could be very involved research. One of the things I don't see in the problem statement is a discussion of the work being done by the auto industry to develop navigation systems. There is a chicken and egg aspect of this subject and it seems the auto industry is not waiting for underfunded highway agencies to resolve the condition issues. It may be that the research is irrelevant if the industry finds other means to navigate highway infrastructure.

Research Advisory Committee

- This statement needs to made consistent with F-01.
- This is similar but broader than F-01. Connected vehicles will have a large impact on maintenance operations in the next decade.
- NCHRP 20-102(06) is a current study on "Road Markings for Machine Vision."
- combine with F-01
- Very timely topic.
- This feels more urgent every year...
- This is useful, and not explicitly covered in other work. This will be a key issue for state DOTs moving forward. I'm not clear what the project objectives are. The main question seems to be how much traffic control infrastructure can deteriorate before AVs are affected. There's a lot of research in this area, and this proposal seems to want to make a case

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for more infrastructure funding rather than answer a research question.

- Suggest combining this project and F-01, with additional funding to address issues in general terms with this project and mountainous areas with F-01. If not combined, then fund this project over F-01, as the results here will drive the research suggested for F-01.

**Item #24: Benchmarking Accelerated Laboratory Tests for ASR
D-11 to Field Performance: Consideration of Cement and
 Alkali Contents and Influence of SCMs**

	NR	0	1	2	3	4	5
(17) R&I				3	6	2	8
(46) RAC	1		1	10	13	8	12

Special Committee on Research and Innovation

- While Florida does not have an ASR problem, we feel this project would have significant value to those states that do have it. A robust, faster test to identify the potential at the mix design stage would be a real advantage. \$650K seems a little high.
- [Rating: 4] A worthwhile project that builds upon recent ASR research.
- There are multiple test methods to determine susceptibility to ASR. The rapid tests such as 1260 and 1567 are frequently used, but their reliability is often in question. It is valuable to verify current tests and seek improved tests that validate the flow chart proposed in R 80. However, strictly from a UDOT perspective, ASR is simply not a significant problem, whether that is due to climate, aggregate sources, or success of testing. We do recognize the significance of the issue nationally, however.
- Many of the ASR tests produce false positives, which may cause extra cost for projects requiring extra supplementary materials or even require an aggregate change.
- The current alkali-silica reaction (ASR) testing regime utilizes ASTM test standards that can produce conservative results and could be requiring mitigation for ASR that is not needed, so having more accurate testing would be beneficial.
- ASR is a critical problem. Need improved test methods with correlation to actual concrete performance through exposure monitoring.
- For some time now, there has been movement toward extending the design life of concrete structures to 75 and 100 years. The greater understanding of destructive mechanisms such as ASR support that trend and the life cost of these critical structures.

Research Advisory Committee

- CT has not experienced many ASR issues, but when they occur, testing would be important.
- This has a huge effect on ITD. Idaho has some of the most reactive aggregates in the US. Currently it appears past research has not led us fully to the answers and while ASR has been delayed it will still occur.
- Very important project for getting to the next level of assessing alkali-aggregate reactivity. IDOT has been interested in and following these efforts for quite some time.
- MassDOT is included as an interested state based on our extensive work in ASR. This is important research so we (MassDOT) can utilize other states information as we try and benchmark our ASR test results. This is very important in what we are trying to do @ MassDOT.
- We still see too much distress in our concrete pavements too early in their life cycle.
- The current test is slow and difficult
- ASR is not currently an issue in Montana. It is a significant issue in areas where it exists and Montana has a lot of

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potential for it to develop if conditions change so the research could be useful, it's just not a priority.

- This is an important, and insufficiently understood problem. The reaction time involved makes research on the topic costly.
- This is needed research on a national level.
- The manner in which this statement is presented will make it extremely difficult for NCHRP to administer a truly objective study. Much concrete has been placed over the last 25 years that could serve to verify appropriate levels of mitigation. If the previous field studies by the researchers has taken 15 years to show discordance with laboratory tests, the proposed study will take longer before an outcome is known. Several years ago a survey was done to see how many state DOTs were using PP65. It did now seem as if many were. Perhaps a new survey should be conducted to gauge the use of R80.
- The current alkali-silica reaction (ASR) testing regime utilizes ASTM test standards that can produce conservative results and could be requiring mitigation for ASR that is not needed, so having more accurate testing would be beneficial.

**Item #25: Updating Load and Resistance Factors for the AASHTO
D-04 LRFD Bridge Design Specifications**

	NR	0	1	2	3	4	5
(17) R&I		1		2	3	9	4
(46) RAC	1	1	2	3	14	13	11

Special Committee on Research and Innovation

- This effort is not required at this time. Also, the efforts of data collection could be state specific and result in increased factors for certain states that are unwarranted. The result is likely to be minor effects that create more of a logistics problem than a safety concern.
- [Rating: 2] This project would be a disruptive effort with a low likelihood of success. Also, fix the typo in the comments section...”bridge” instead of “brid”.
- This research is needed to help maintain the design code.
- Although there is a need to update the AASHTO LRFD specification we need to address more critical issues related to durability first.
- A new update has limited value
- how does this align with the AASHTO TSP for LRFD?
- This is the work that I believe AASHTO should be pursuing as it is key to all we do.

Research Advisory Committee

- Calibrating the load and resistance factors to trucks more common in traffic streams would be beneficial to designing Idaho's bridges.
- High priority to update load and resistance factors. Our Bridge Design Section recently updated our Live load vehicle based on WIM data. We plan to relook at this once every 10 years. However, we did not look at the resistance factors which probably may go higher based on the problem statement discussions.
- This research is needed to address changes in bridge construction material quality and consistency and their reliability as well as truck fleet sizes and weights by re-examining and re-evaluating the bridge load and resistance factors. By doing so, bridge designers will be able to optimize their designs and make them more efficient while at the same time maintaining bridge structural reliability.
- A more accurate calibration would be good for designing bridges with uniform reliability; however, the amount of change from where we stand now is likely fairly small.

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- Load and resistance factors have undergone little change since the original code. An updated database of factors is needed.
- Both materials and loads have changed since factors were developed.
- This research would be the first step in a drastic positive change to the ACI code.
- Don't see this as very beneficial
- As indicated in the problem statement, data regarding truck loads was last collected in 1978. Given the change in loads since then, and especially considering the fact that federal and Virginia legislatures are considering even heavier vehicles beyond the recently mandated specialized hauling vehicles (SHV), there is a dire need to better understand the loads that are currently traveling across our bridges. Also as mentioned in the problem statement, design practices and material qualities have changed such that today's bridges may be stronger than what we've constructed in the past. We just don't know, and it's imperative that we have greater certainty and understanding as to the reliability of the design of our structures.
- AASHTO has gone through few calibration studies so far. A new update is not as critical for our practice.

**Item #26: Effective Use of Duplex Coating Systems to improve
D-03 Steel Bridge Structure Durability**

	NR	0	1	2	3	4	5
(17) R&I				5	4	3	7
(46) RAC	2		2	7	12	11	11

Special Committee on Research and Innovation

- This is highly important research, and has the potential to save agencies significant funds by reducing future recoatings of structural steel bridges. This research was ranked no. 2 by the AASHTO Subcommittee on Bridges and Structures (SCOBS), is supported by the Subcommittee on Maintenance, all four TSP-2 National Bridge Preservation Partnerships (NBPP), and the TRB AHD 30, Standing Committee on Structures Maintenance. SCOBS T-9 and T-18 also supported.
- AASHTO SCOBS #2.
- [Rating: 3] Recommend reducing research scope to focus on unbonded external tendons and combination of unbonded external and bonded internal tendons. The topic of unbonded internal PT needs significant research and is better suited as a separate research project.
- There is not a significant demand for this coatings research.
- This research is an important step toward finding more durable protective coating system for steel structures. Steel corrosion continues to be a problem affecting service life of bridges.
- High cost application where other methods have performed as well
- SCOBS #2
- This research would be useful to begin to establish the most useful coating procedures.
- Caltrans is doing this and would be ideal to assist.

Research Advisory Committee

- Is this not a proprietary coating system?
- This effort is supported by AASHTO Technical Committees that IDOT's Bureau of Bridges and Structures is involved with. Both weathering and low-alloy carbon steels have better longevity than uncoated versions. When weathering steels are painted, their durability is much greater than painted non-copper bearing low-alloy carbon steels like A572 Grade 50 (the

most widely used bridge steel). Hot-dip galvanizing of long bridge girders, especially those with welds, is undesirable because of the distortion created by immersion in a zinc bath at 900⁰F. Metallizing with zinc and zinc alloys is much more favorable because zinc thickness can be varied and the rougher surface provides an excellent anchor surface for paint.

However, preparation of the surface of the steel substrate is important so that the thermally sprayed zinc/zinc alloys have good adherence to the steel girders. The extent of grit blasting of existing steels and weathering steels needs examination so that the metallized surface is properly anchored and the applied coatings are good sealants and have long term durability. Duplex coatings can be used on new and existing bridges and structures. Because this technical area of organic coatings applied over metallized coatings has been studied to some extent, the research objectives are appropriately described.

- We do have some need for this research in Massachusetts.
- The effective use of this coating could be a good alternative for extending the bridge service life.
- Improvement in coating systems could be cost effective.
- The results of this research will help aid TxDOT in selecting appropriate coating systems.
- Duplex coatings have demonstrated beneficial results when used in the auto industry. My concern with this project is not the topic but that the funding and time required to meet the objectives listed might be difficult when trying to cover two different mechanisms for applying metallic coatings to steel, galvanizing and metalizing. If this can be done, however, this would be a very useful research effort.
- WSDOT has not used metalizing on steel bridges due to the cost. Zinc-Moistured urethane paint systems on new bridges have performed very well (30+ years of service).

**Item #27: Rating Concrete Permeability Based on Resistivity
D-14 Measurements**

	NR	0	1	2	3	4	5
(17) R&I		1	1	1	2	10	4
(46) RAC	1	1	4	4	9	16	10

Special Committee on Research and Innovation

- This is an electrical test. Florida would benefit from the clarification of whether the resistivity test can be reliably correlated to water permeability and perhaps in the future to other concrete characteristics. Budget seems high.
- [Rating: 5] An important effort to advance improved standards for concrete materials.
- As DOT's move toward Performance Engineered Mixes, durability testing becomes more critical. Permeability is an important consideration in the durability of pavements and other concrete products. C1202 is a reliable but difficult and time consuming test for permeability. Validating electrical resistivity testing which is easier and immediate by proposing the formation factor would greatly improve the use of this type of test for permeability durability testing. This research is already a part of the AASHTO provisional standard PP84 for PEMs.
- It would be good to have a method of determining actual permeability of concrete pavement with a simple method. There is a small flaw with the resistivity method when aggregates with higher absorption causes a lower reading. Otherwise, should be a good project.
- This research would allow DOT's to move ahead with using resistivity measurement to assess permeability. If this technology is going to be used recommendations for rating concrete water permeability based on electrical resistivity measurements are needed.
- Project will improve the way surface resistivity is used for assessing concrete performance through correlation to water permeability
- NH has been using Surface Resistivity Testing to measure permeability properties for several years, based on in-house

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testing and similar work by FL and LA. While correlations were very good, the NH study was limited to typical mixes created for NHDOT projects. SRT is a significant advancement over the previous method. We support the expansion of its use and confidence with alternate aggregates.

Research Advisory Committee

- I fully support the AASHTO Committee on Materials and Pavements No. 1 recommendation
- States that use road salts to keep roadways safe in icy conditions would benefit the most from low permeability concrete. Structures in marine environments would also benefit. Rating concrete permeability based on resistivity is not always a useful approach. Some admixtures reduce permeability only after they react with water or other substances that begin to penetrate the concrete. For these situations, an absorption test may be performed instead of the resistivity test. It would be helpful to investigate alternate tests and provide guidance for each. If the specimen is ponded with water for an extended time to saturate it first, the resistivity test may be an option. The research should address the age of the concrete at the time of testing. Tests may not yield accurate results if performed before 56 days. This poses a hardship for decision-making on construction projects.
- This will aid in determining resistance to freeze thaw damage and other durability issues.
- We are interested in this as IDOT moves towards Performance Based Mix Design Specifications.
- Louisiana has implemented surface resistivity as a pay factor since 2016.
- MassDOT has had 2 FHWA presentations on concrete and we have bought into how fast, easy and beneficial it is to do concrete resistivity testing. In the last 10 months R&M has been doing some of this testing to get a better handle on results. This research would be very beneficial in filling in missing gaps on determining concrete permeability.
- We have already been looking at this. Looking at the formation factor would be very useful.
- Resistivity measurement can replace a difficult test procedure and may lead to insights on the impact of permeability on concrete durability.
- This topic is not of national interest.
- Extensive work has been done. There was an AASHTO round robin. Need for more work is questionable.
- This research would allow DOT's to move ahead with using resistivity measurement to assess permeability. If this technology is going to be used recommendations for rating concrete water permeability based on electrical resistivity measurements are needed.

**Item #28: Proposed Practices for the Application of Dynamic Lane
03-123 Use Control**

	NR	0	1	2	3	4	5
(17) R&I				1	7	4	7
(46) RAC	1	3	3	3	17	10	8

Special Committee on Research and Innovation

- This is a low cost continuation project and the recommended computer-based testing to supplement the driver simulator results is appropriate to increase the confidence in the research results.
- [Rating: 5]
- This is a big city issue. We can take concepts used and apply in NH but not a critical need

Research Advisory Committee

- DC runs reversible lane operations without overhead signage and are interested in alternatives for communicating that information; similarly would seek applications to transit-only lanes

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- Dynamic lanes as defined in the problem statement are not currently utilized; however, the practices may be applied to bus on shoulder restrictions, the reversible lane operation, and to evaluate the IL State Toll Highway Authority's use of dynamic lanes on I90. Falls under adaptive traffic management.

Additionally, this is a constant struggle for us, as we have equipment that we don't believe we should put more \$\$ into, but we cannot do without it, and a replacement is not on order. This could help with decision making.

- focuses on hot lanes and toll facilities - NA in NM
- Good extension project
- Recommended continuation of existing research by project panel and NCHRP program officer.
- Benefits of signal indications have been seen but anecdotal results have been difficult to verify with data. More research to create national level consistency would be useful, and this extension appears to be reasonable in terms of cost.
- This continuation of research will move us towards a more consistent application of dynamic lane use signing. WA is mentioned in the description as having a particular approach that is unique. We should be able to learn from this work.

**Item #29: Access Control Techniques to Reduce Wrong-Way
C-02 Entries from Freeway Exit Ramps**

	NR	0	1	2	3	4	5
(17) R&I		1		3	1	7	7
(46) RAC	1	1	4	7	10	15	7

Special Committee on Research and Innovation

- A couple years ago, FDOT implemented signing and pavement marking enhancements to discourage wrong-way entrance on interstate ramps, based on best practices from Texas and California. But continues to be an issue and should be studied to determine solutions most effective. Similar to C-17. Budget may be high given prior work.
- Make sure this isn't redundant with prior research. Combine with C-17.
- [Rating: 4] WWD continues to be an important topic, and the National Summit from 2013 has spun off many research and ITS-based treatments. However, the fundamental geometric design parameters have not been as thoroughly researched, and this would be a worthy project. Most of the funding should be used for data collection and interpretation.
- Wrong way driving research benefits all states (and even internationally). Specific research is difficult and can be lengthy, however research such as this (where the treatments have extremely low maintenance and can be applied systemically) changes engineer's attitudes and gives validation that subtle design changes can have a big effect on a type of driver that is not normally considered during the design process.
- A lot of research on this topic
- Combine with C-17
- With C17
- When this does happen it is real bad. NH needs to be more proactive in this.

Research Advisory Committee

- This overlaps with C-17 and could be combined with that problem statement.
- WWD countermeasures were implemented at many interchanges across the state of IL 3-4 years ago. Evaluation of their effectiveness will be conducted when at least 3 years of crash data becomes available. We are aware of other technologies considered/implemented in other states, but some may have limited application in Illinois. We would be

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interested in the results of this research if it moves forward.

- Consider combining with C-17.
- Consideration should be given to combine C-02 and C-17 to make it more efficient and higher ranking.
- This would be good research to have ramps designed to reduce WW movement from happening
- NCDOT consensus is that this project should be combined with C-17
- Should review several states' WWD research and be sure not to duplicate.
- Some of the tasks might be combined with project C-17. Both project propose to study the geometry design and detection technologies for WWD. There are also ongoing research projects by state DOT that investigate the WWD countermeasures, e.g., Iowa DOT (<https://trid.trb.org/View/1485635>), Florida DOT (<https://trid.trb.org/View/1460977>), and North Carolina DOT(<https://trid.trb.org/View/1423760>). The problem statement needs to be revised not to duplicate the work in the ongoing efforts.
- The purpose is to get to specific guidance which is good. I think we're close based on other recent work there's a chance this can bring it home. It seems a little expensive given there should be good previous work to draw on. This Problem Statement could potentially be coordinated with C-17.

Item #30: **Managing the Effects of Uncertain Federal Funding** A-02

	NR	0	1	2	3	4	5
(17) R&I		1		3	3	8	4
(46) RAC	1	4	1	5	7	13	14

Special Committee on Research and Innovation

- Would be more amenable to approving as a synthesis of what states are doing to mitigate financial uncertainty at \$50k.
- [Rating: 4] Under section V. 3rd bullet, recommend adding "governments" after "state and local" - this would highlight what lawmakers are doing, such as raising gas taxes, tolls, state infrastructure banks, etc. Under Section IV, there have been some reports on the influence of funding uncertainty, such as <http://bipartisanpolicy.org/wp-content/uploads/sites/default/files/BPC-Eno%20Transportation%20Report.pdf>
[http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24\(81\)_Workshop-Draft-Final-Report-BL.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-24(81)_Workshop-Draft-Final-Report-BL.pdf).
- This appears to be a nationally important research need. However, the usefulness of the expected study results should be further considered and defined in the research scope.
- Uncertain funding causes a variety of planning, budgeting, public expectation and other issues that have been a problem for a number of years. Being able to accurately predict funding levels is essential to allow transportation agencies to accurately advocate and plan for adequate transportation needs to assure safe infrastructure for the future.
- It may be of use when considering future grant funds. The big risk is the uncertainty and its impacts. The public is not that aware of the actual problems this causes.
- Timely and clear but most states will have to come up with their own means to deal with these issues
- Endorsed by Comm of Finance/Funding
- This would be an good report to aid in communicating issues to our Legislature and other elected officials. It would also benefit the States to understand what other States are doing to mitigate the effects and provide some tools others may not be using.

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- Helping to mitigate the impact of uncertainty of federal funding or exacerbating the problem by adding uncertainty about state funds.
- I concur with Mr. Lemer's comments.
- Whether or not Minnesota receives timely federal funding is critical across both the TH and local transportation systems. It becomes increasingly difficult to manage the program and to plan for future projects when the timing and levels of funding are in question. I would push this research towards looking at the level of risk MnDOT, MPOs and local agencies should accept. I would also like the research to identify the costs associated with uncertainty.
- Important management decisions are linked to unreliable federal transportation funding, creating substantial risk for forecasting outcomes. Federal rescissions, obligation limits less than apportionments, and continuing extensions instead of long-term appropriations bills cause federal funding uncertainty. A research project could generate information detailing the negative impacts of delivering transportation projects and services with uncertain federal funding. Understanding these effects and successful approaches to mitigate the impacts would be of interest to members of congress and national transportation trade associations. Having a document that clearly articulates the impacts of uncertain federal funds may be helpful in educating and persuading Congress in taking the necessary action to remedy this situation.
- Budget is too high.
- It's not clear what practical value this study will add to general knowledge that isn't already known to DOTs given that federal funding has been uncertain for decades.
- The topic is very timely and relevant right now. However, it is unclear what WSDOT would gain from the research. We already have well established strategies for dealing with federal funding uncertainty. It would be interesting to review the impacts to other state's federal-aid highway programs contained in this proposed research. If the scope of the research could be refined, we would suggest expanding the research area to include the impact of federal uncertainty on the bond rates of GARVEEs. If this research scope was slightly altered and more broadly focused, we would rank the proposal with a 4. Otherwise, as currently written, our ranking is a 3.

**Item #31: Determination of Encroachment Conditions in Work
C-10 Zones**

	NR	0	1	2	3	4	5
(17) R&I			1	3	4	7	4
(46) RAC	2	1	3	4	10	16	9

Special Committee on Research and Innovation

- Data on work zone departures has never been researched in any detail and would go a long way in determining better clear zone and crash testing requirements. The Problem Statement is valid but the concern would be that the majority of the stated objectives will not provide the results desired for the Problem Statement.
- [Rating: 3] Consideration should be given to adding this to Project 17-88, or at least coordinating with that project. Also, the results of NCHRP Report 869 needs to be reviewed to see if it has already completed a substantial part of the literature review. Either way, the funding should be reduced, \$300,000.
- This problem will address real concerns of the work zone community. It is important to understand that field deployment of work zone devices is quite different from accepted test conditions required in either NCHRP 350 or current MASH suite of tests. Currently there is no recommendations available for temporary situations. Most states rely on their anecdotal experience when it comes to acceptable work zone deployment.
- Important workzone issue, and bringing MASH and WZ devices would be valuable. Emerging interest in the area.
- Work zone safety is always important.

Research Advisory Committee

- Great emphasis for effective WZ crashes analysis and need for appropriate countermeasures.

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- IDOT expends considerable resources to pin temporary barrier wall to limit deflections. The Bureau of Constructions observation is in line with this problem statement. The deflection criteria utilized to established policy is conservative. An impact at 25 degrees within a workzone is not reality. This research could potentially shave the department hundreds of thousands of dollars every year WITHOUT causing harm to the public.
- improve safety of work zones
- Work zone safety is a priority for Department. We could benefit from this.
- The AASHTO committee that submitted this list it as #5 of 5 submitted. The info would be useful to have but it is difficult to collect encroachment data.
It is noted in the problem statement that current data are based on freeways (and are dated). There may be some value in expanding the scope beyond work zones. Should not be funded until a clear plan is available on how the data will be collected.
- Of the work zone problem statements, this is considered our priority, to mesh with MASH work and crash testing of WZ devices. There is a lot of interest in the safety community about the characteristics of work zone crashes, and this is one of them. We may be overdesigning because of the higher impact angles in current test criteria. I think this basic research about encroachments is important in terms of where we're heading for risk based approaches. I'm not sure about how they are going to capture all this though so I've scored it lower for potential success.

**Item #32: Development of a National Performance-Related
D-21 Specification for Emulsified Asphalt Binder**

	NR	0	1	2	3	4	5
(17) R&I		1		1	7	7	3
(46) RAC	1	2	2	3	10	19	8

Special Committee on Research and Innovation

- FDOT does not currently specify chip seals. This project has merit for local agencies in Florida and other states that use this pavement preservation strategy.
- [Rating: 4] A logical follow-on to NCHRP 9-50.
- This is needed research for a more standardized approach to emulsions.
- Improvements in chip seal performance is a worthwhile goal and the combination of laboratory and field studies has the potential to accomplish that.
- A Performance Related Specification for emulsified asphalt binders would aid all DOT's with the selection of emulsified binders for chip seal applications. Emulsion use would be more systematic across the united states, chip seal performance would improve with binders that were selected on rational material properties.
- Committee support??
- It is time for emulsion testing and grading to catch up to the advances in asphalt binder grading and testing.

Research Advisory Committee

- This is needed and might help us improve the success of our chipseal program.
- MnDOT uses a lot of emulsion materials for various applications, and our use will only increase with time.
- We have had some recent challenges on chip seal projects and this may eliminate some of our problems.
- MDT's emulsion specifications need to be evaluated so the timing of this research is perfect and it would be very useful.
- Better quality control on emulsions could lead to improved performance of AST, and HMA pavements.

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- This project should have a implementable outcome in the form of a purchase specification for emulsions that could improve VDOT's maintenance programs. Currently, there is no performance-based specification in use by VDOT for emulsions, although two recent documents have been introduced (NCHRP 9-50 and TXDOT Project 5-6616-01) but have inconsistencies and limitations. This project would resolve those as well as provide national validation and momentum for adoption of a performance-based purchase spec allowing VDOT to have greater confidence in the use and lifespan of emulsions in maintenance treatments.
- A Performance Related Specification for emulsified asphalt binders would aid all DOT's with the selection of emulsified binders for chip seal applications. Emulsion use would be more systematic across the United States, chip seal performance would improve with binders that were selected on rational material properties.

**Item #33: Evaluating the Performance of Right-Turn-On-Red
G-03 Operation at Signalized Intersections (with single and
 dual right-turn lanes)**

	NR	0	1	2	3	4	5
(17) R&I		1	1		4	10	3
(46) RAC	1	1	4	3	13	15	8

Special Committee on Research and Innovation

- [Rating: 0] The HCM already has a computation for adjusting the demand flow rate when ROR is restricted.
- This will be beneficial in calculating delay and level of service.
- There's an important connection to pedestrian safety better methods on Right-turn-on-red (RTOR) capacity might better explain tradeoffs in vehicle throughput where innovative treatments or restrictions to improve pedestrian safety are considered.
- traffic eng #1, safety #4
- While I believe this project has merit, I don't see much benefit for our state as RTOR is so common, it is almost our standard practice. In addition, I believe the pedestrian concerns can be mitigated by blank out NO RIGHT ON RED signs during the WALK phase.

Research Advisory Committee

- Highly contentious practice (permitting or prohibiting) with little published guidance. High value with immediate use.
- RTOR is a widely-used control strategy, without solid methodology and guidelines in HCM. The result of the study could be very useful.
- OTAT supports this research statement. The State Non-Motorized Transportation Committee that staff support and facilitate recently sent a letter to MnDOT Commissioner asking for MnDOT to, "Re-evaluate the guidelines governing when "No Right Turn on Red" signs are appropriate. We request they be implemented more often to increase pedestrian safety, especially where pedestrians have a leading interval." JH-Sounds like a research project that will end in needing further research.
- This research would be beneficial - there are citizen requests to restrict this movement.
- Information is needed; I would have expected some research over the 40+ years of RTOR operation.
- The research looks appropriate and addresses a short coming in the Highway Capacity Manual.
- Very long overdue project.
- This looks like a pretty cost effective study to fill a gap related to old or incomplete data. There's an important connection to pedestrian safety better methods on Right-turn-on-red (RTOR) capacity might better explain tradeoffs in vehicle throughput where innovative treatments or restrictions to improve pedestrian safety are considered.

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**Item #34: An update of the Green Book Design Vehicles and
C-09 Minimum Turning Paths**

	NR	0	1	2	3	4	5
(17) R&I				2	7	7	3
(46) RAC	3		2	7	14	11	8

Special Committee on Research and Innovation

- This could provide valuable input as the Department defines the use of design vehicles verses vehicle accommodation.
- Critical to good roundabout design.
- [Rating: 5] Research is needed to update the Green Book.
- The conservative lengths and turning paths are the basis for more advanced evaluations and provide a reasonable standard for design. An update to the design vehicles is not nearly as critical as other elements.
- Of particular interest is ground clearance heights.
- High cost with limited value.
- We frequently question that maybe we are overdesigning, but generally can never verify...
- This would be nice but not a must

Research Advisory Committee

- We are required to optimize design of intersections and interchanges. Most benefit would come from our roundabout and innovative intersection design.
- High priority - keeping current on various vehicle designs and the software parameters results in better designed projects.
- This is an expensive project. There are only a couple vehicles listed in the proposal but the objective is stated more generally than that. The only caveat is indicators about the significance of this are only anecdotal, and I'm not aware of any issues in WA.

**Item #35: Building a Resilient Work Force in State DOTs
A-11**

	NR	0	1	2	3	4	5
(17) R&I				4	6	4	5
(46) RAC	1		1	9	15	9	10

Special Committee on Research and Innovation

- While this is viable, not all agencies nationwide—or event statewide—are equal with respect to workforce resiliency. For the recommended funding of this project, there should also be a focus on maintaining a resilient workforce along with building one.
- The heart of any organization is it's personnel. Most important but often ignored. Good proposal. Budget appears appropriate for scope.
- [Rating: 5] The State DOTs are a centerpiece for highway program delivery and currently challenged with increasing responsibilities and limited resources. A better understanding of policies and programs to enhance State DOT workforce development will improve efficiency and program delivery.
- There is value in this proposal, and we believe there will be some good ROI with this research.
- This RNS addresses a critical gap in current resilience planning efforts. That said, I'm not sure that enough attention has been given to the tasks being specified for this project, and I would encourage the developers of this RNS to flesh out particularly Task 3 and Task 4 a bit further. Not seeing a strong connection between the bullets at the top of the Research

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Objective section and the four tasks listed.

- Workforce is critical to DOTs
- With A01
- Only slightly different from A-01 with the long-term effort of employee/leadership resilience

Research Advisory Committee

- May provide some guidelines of interest to be shared with CT DESPP
- This is important to the health and welfare of all State DOT's.
- This will be very valuable for out DOT.
- Once I know more, we can decide if the new soon to be hired Emergency Management Director for AOT will also have a role.
- As WSDOT continues to invest in our people, this research can definitely help our current efforts. This is the AASHTO Special Committee on Transportation Security & Emergency Management's No. 4 priority.

**Item #36: Development of a Pavement Surface Image Library for
D-05 the Evaluation of Image Processing Algorithms for
Automated Pavement Condition Survey**

	NR	0	1	2	3	4	5
(17) R&I				2	7	2	8
(46) RAC	2	2	5	8	9	10	9

Special Committee on Research and Innovation

- Worthwhile and much needed effort as it is a standard approach in other image-based practices like the medical field. Issue is the sequencing of efforts. There must first be a sine qua non method or "ground truth" procedure to use in building the proposed image library, to assure these surface images are standardized, calibrated, and verified. The recently initiated NCHRP 01-60 project on "Measuring the Characteristics of Pavement Surface Images and Developing Standard Practices for Calibration, Certification, and Verification of Imaging Systems" is the first step in the sequence.
- TPF-5(299) [Pavement Surface Data Condition and Analysis] panel supports this project.
- [Rating: 0] Proposed project is premature.
- This is a very timely effort as almost all pavement condition distress ratings nationwide are being made using automated analysis of images with proprietary software.
- "There is another national research project dealing with the evaluation of automated distress collection systems, so this problem statement is premature.
The problem statement sounds like a good idea, however I am not sure if it is implementable. The larger issue is that each vendor can have their own image collection system (line scan laser, camera, or 3D) and their algorithms are built to work with their images. Can standard images be developed to work with all vendor's software?"
- Would allow DOTs to calibrate pavement distress surveys. The current process is disjointed. Would create common process
- would be helpful to those who use ARAN and other similar vehicles
- High priority. Creating a benchmark or standard for automated crack detection equipment would be useful. May also help NHDOT with next vehicle purchase in 2019?

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- Potential benefit to other states. CTDOT already has a long history of work with pavement images for the state roadway network, including quality management. This recommended research would be putting the cart before the horse for standard pavement cracking practices. After the completion of NCHRP 01-57 this research could be useful to local MPOS's and COG's, especially with the new MAP21 requirements (imposed on MPO) for pavement condition data. Their timing is a little pre-mature.
- Objective is just to develop an image library - not to develop the algorithms? Seems not to go far enough
- This is a very interesting idea and there is some fascinating work being conducted already. This could be very beneficial to Illinois with our CRS system.
- What organization would be responsible for housing and maintaining the database?
- MnDOT has new pavement management vans with software that automatically counts distresses. It's been calibrated against human crack counts.
- This study is very important to pavement management systems and the federal rulemakings about pavement performance. Putting in a plug for this one!
- Not a priority.
- This would be very useful. MDT will need to replace our existing Pavement Image collection equipment relatively soon and this information would be very helpful.
- Research is needed to develop better understanding and improving image processing algorithms.
- This is needed for a calibration standard.
- This research would provide standard pavement surface images to which all DOT's calibrate automated pavement distress surveys. The current process is disjointed nationwide. This study would begin to bring all state DOT's to a standard practice.

Item #37: Updating Safety Performance Functions for Data-Driven Safety Analysis
C-22

	NR	0	1	2	3	4	5
(17) R&I				4	8	2	5
(46) RAC	1		1	11	10	11	11

Special Committee on Research and Innovation

- Future-oriented, long-term, but needed effort to support updating national models that used dated data. Addresses a required element of the continued use of the Highway Safety manual
- [Rating: 4] The HSM 2nd edition currently under development is adding additional models for conditions not covered in the 1st edition (e.g. roundabouts), but many of the 1st edition models are based on data as old as 1993. A plan for updating the safety performance functions in the HSM and related tools is needed. \$500K is a little high to develop a plan on how to best sustain or update the HSM models into the future.
- A thoughtfully developed plan is critical in order to get a handle on all the various needs and updates that are occurring in the DDSA arena. Most importantly, it must be ensured that funds are not being wasted and efforts being duplicated.
- This research proposes the update of tools to improve the reliability and use of safety performance functions that are being used in safety estimation. This change will improve WSDOT decision making older models more reliable in their estimation of potential crashes. The result means higher quality decisions with a greater likelihood on return on crash reduction investments. This was the AASHTO Committee on Safety's third priority.
- Predictive methods are in our future (but not our present) in NH. Crash data is accumulating quickly, so this study would help bring order to the multitude of data.

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- Research would be of nationwide interest, as it would be important to know how often is necessary to re-assess updates for SPFs, SDFs, and CMFs. Appropriate for NCHRP research. Unsure if enough time has transpired to pose this research problem. Publications and software (SafetyAnalyst, IHSDM, and HSM) are relatively new. State agencies still incorporating initial crash prediction models and updating safety engineering practices
- This is a high need to better understand how and when the SPF models need to be updated. I disagree slightly with the reviewer who stated this research project should be delayed until after publication of the HSM. The reason I disagree is that this will not produce new models, rather it will provide guidance when new models should be developed. Based on timing, if the HSM2 is published in 2020, this research project may be just about wrapping up which means then research for the new models can be proposed. So timing actually makes sense to start this earlier than 2020. My one issue with this is the recommended funding of \$500,000. That seems high if the deliverable is guidance on when to update.
- Have some concerns about the development of this SPF... speed is so much more than a number.
- Help improve the veracity of the HSM
- As we continue using HSM, we plan to develop Missouri specific SPFs but there is still a value with this research.
- Updated data and SPF's are always a great idea.
- Any potential use of traffic data we are developing for this effort?
- Timing not correct for this. HSM will be updated.
- I view this as a low priority. The 2nd edition HSM will cover some of this, and this is a lot of money to come up with a scheme to recalibrate models, which should be happening anyway.
- This is WSDOT proposed research. This research proposes the update of tools to improve the reliability and use of safety performance functions that are being used in safety estimation. This change will improve WSDOT decision making older models more reliable in their estimation of potential crashes. The result means higher quality decisions with a greater likelihood on return on crash reduction investments. This was the AASHTO Committee on Safety's third priority.

Item #38: Update the AASHTO Guide for Snow and Ice Control F-05

	NR	0	1	2	3	4	5
(17) R&I		2		1	5	6	5
(46) RAC		3	2	4	11	15	10

Special Committee on Research and Innovation

- [Rating: 5] The update to the 1999 AASHTO Guide for Snow and Ice Control is long overdue. As stated in the Problem Statement, the guide needs to incorporate more advanced and effective practices and technologies used by agencies for winter maintenance operations, as well as be more inclusive of regions in the country that are not in the snow-belt but experience snow and ice weather events. The proposed research period and cost to complete the update seem reasonable and adequate.
- The understanding of new technologies and what other state DOTs are using needs to be addressed.
- This would be a very useful document to get updated to current trends and technology.
- Important to update the AASHTO Guide on Snow and Ice Control. There is a definite need for the update as there have been advancements made in many areas.
- This guide is a staple for winter maintenance that was developed almost 20 years ago, updated 10 years ago and now should be updated again in light of the continued advancements and changes in the snow and ice control arena.

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- As a member of the national winter maintenance community I have first hand knowledge of the need and scope for this project.
- Would be a good update since it hasn't been rev. since 1999.
- Winter operations consumes approximately 50% of ITD's operating budget. Any gains in efficiency in this area have the potential to provide a significant impact to ITD. Updating the guide to reflect current practices of states would be very beneficial.
- This resource is quite dated, especially given advancements in deicing options and new technologies available for snowfighting. Much of this information could probably be gathered from the participants in the Clear Roads Pooled Fund, expediting the timing of this project, and decreasing the cost.
- Snow and Ice control is a top priority for MnDOT. SL-This needs statement is supported by AASHTO and the Winter Technical Service Program.
- Updating this manual is critical especially with the new products and processes available for winter operations.
- Very outdated guidance- there has been a great deal of improvements to SIC to be captured.
- The AASHTO Guide for Snow and Ice control certainly warrants updating. As is clearly outlined in the research problem statement, significant advancements have been made in both research related to winter maintenance and what is considered state of the practice. What is missing, however, is that the new guidelines need to not only take into account advancements with respect to equipment and technology, but also – and arguably more importantly – potential constraints related to environmental concerns. Updating the guidelines without acknowledging the pressure on DOTs to reduce chloride loading would be irresponsible and short-sighted.
- Important to update the AASHTO Guide on Snow and Ice Control. There is a definite need for the update as there have been advancements made in many areas.

**Item #39: Development of a Barrier Design to Accommodate
C-11 Vehicles, Pedestrians, and Cyclists**

	NR	0	1	2	3	4	5
(17) R&I		1		2	6	5	5
(46) RAC	1	1		10	12	14	7

Special Committee on Research and Innovation

- The application of this type of barrier on the Florida SHS would be very minimal. Placing barriers to separate automobile traffic from pedestrians and cyclists could contribute to an increase of crashes and possible injury for motorists. Analysis would need to be evaluated when the risk to automobile occupants outweighs the benefit to ped./cyclists. In most cases in Florida, an existing barrier could be used if needed.
- [Rating: 3] If this is funded, we recommend significantly reducing the scope to find solutions that use or modify barriers that are already known to perform well under MASH criteria, and have the actual crash testing submitted to one of the pooled fund programs.
- We could see this being a great benefit for growing population centers, including some areas of Utah.
- This is an issue we are running into more and more often.
- Good topic with national interest
- This is critical for developing specific for barrier and peds/bikes
- Caltrans has already addressed this issue and uses TL 4.

Research Advisory Committee

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- N/C
- From a CSS, complete streets and PBPD perspective, a high need. Will be new Bike and Pedestrian Safety Engineer (position currently posted).
- We need a MASH Br barrier design going forward. This is important but industry may be able to provide necessary protections through their own development. At present it's hard for multiple states to agree on a single design.
- Not sure of the value of this research - barrier designed for all three of these users might be difficult .
- Seems to be similar to C-13, if same type study then no need to duplicate
- A real problem, but the problem statement is confusing. The literature summary is about handrail height, yet the research proposes to develop an entirely new safety barrier. The statement does not explain what the expected cost savings would be over the current option (combination traffic-ped-bike concrete barrier). Perhaps a lower-cost initial phase could be funded to do what the FHWA commenters suggested (develop criteria and a decision support tool to help practitioners design barriers).
Not clear if the intent is to evaluate a prototype or design a new system from scratch.
- This one has national interest although I haven't heard much yet from our own agency about the need. We have a couple examples where precast barrier was used and this is expensive. I'm rating this high because I think it will gain traction as it becomes better known as an option and we move into more multimodal situations.

**Item #40: FloodCast: A Framework for Enhanced Flood Event
20-59(53) Decision Making for Transportation Resilience**

	NR	0	1	2	3	4	5
(17) R&I				5	5	5	4
(46) RAC	1	1	2	8	11	11	11

Special Committee on Research and Innovation

- There would be benefits gained through a more robust forecasting system. As with most States, Florida has a very unpredictable weather system, which can produce rainfall in short time periods and within a limited area. If this proposed work is modified to account for region specific conditions, this research would be helpful as a screening tool to identify those areas of specific need. My concern is that the work will be more generalized and limit the effectiveness of this tool for Florida.
- Good complement to FHWA TAMP Risk Management requirements.
- [Rating: 5] The project team has made strong progress, and is well positioned to take on the added work of incorporating the National Water Model into the system.
- Keep in mind that during an event, the Incident Command System (ICS) is used to create tactical and strategic objectives for how to respond and recover from the event. During a mitigation and protection phase of Emergency Management, it is important to work with local officials and help provide solutions to the situation from a DOT perspective, all the while operating with the understanding that emergencies are always local issues.
- Not an issue here, but may be in coastal areas.
- value related to flood plain mitigation planning and response particularly for those state dealing with these issues
- Needed to come up with a standard way of evaluating flooding potential

Research Advisory Committee

- Not certain that the research would be successful in terms of accuracy of results and usefulness to ConnDOT.
- Since the development and promoting of a sound decision making process during real events, especially with people retiring with decades of experience on a regular basis, is critical when responding to and recovering from any of the

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hazards that impact IDOT, we support this effort.

- Absolute need for an integrated suite of tools to enhance flood protection, event decision making and resilience.
- Research would provide improved preparation for enhanced flood event.
- Research may significantly help FIMAN and Improve Safety
- Recommended continuation of existing research by project panel and NCHRP program officer.
- It is difficult to see how this effort will replace those necessary at the state (or possibly regional) level to accurately model inundation resulting from flooding events. Given that this modeling effort will still be necessary at the state level, the cost and risk associated with developing a national framework that will take this state-collected information and make it useful as a planning tool seems very high.
- Great potential to assist WSDOT in flood mitigation, planning, and response.

**Item #41: Assessing the Impacts of Connected, Automated and
C-19 Autonomous Vehicles on the Future of Transportation
 Safety**

	NR	0	1	2	3	4	5
(17) R&I		1	1	3	2	6	6
(46) RAC	2	1	3	7	12	11	9

Special Committee on Research and Innovation

- Vehicle manufacturers are moving ahead with making cars safer using available technologies. The transportation community should learn from these initial efforts and investigate best practices that can be implemented at a state and local level. Focus, could extend into operations and deployment.
- Good timing. Carefully coordinate with 20-102 to avoid redundant study.
- [Rating: 3] Scope is too general, not enough AVs and CVs to assess their impacts to future design changes.
- This is an interesting approach to a long-term issue. It might be a little ahead of its time, but this could shed some light on the issue and begin to answer some important questions about resource allocation.
- Not sure of the national need for this research, the autonomous vehicles are still under development so there will be many assumptions made as to the capabilities of the vehicles and how they will impact safety. They also need to look at how the mixed fleet of the current non-autonomous vehicles will mix with the autonomous vehicles. Changes in design priorities will need to consider both types of vehicles for many years.
- I view this as a high risk, but needs to be combined with D-16.
- Research evaluates how changes in CV/AV will impact future geometric and roadside design. If crash reduction benefits from CV/AV are likely to occur as in-vehicle systems increase in number and effectiveness, then this change might allow for reduced and more practical design criteria (narrower lanes, sharper curves). Most research in this area relates to the roadway and roadside electronic systems that we need in place, not how we might design our road system in the future. Potential design and operational policy changes could save significant resources for WSDOT and other State DOTs. This was the AASHTO Committee on Safety's first priority out of 19 proposals.
- C on Safety #1, include in 20-102(15)
- Because the technology is in its early stages and evolving quickly, the research may be devoting study to technologies that are superseded before the research is completed.

Research Advisory Committee

- Understanding the safety nexus with CAV is a critical topic.

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- Connected and automated vehicles are predicted to reduce vehicle crashes and fatalities. However, to date, minimal quantitative research has been conducted to support this prediction. In order to increase public acceptance more research into the safety of these vehicles is necessary.

Hopefully this project is evaluating the benefits of integrating Roadway Lighting Control Systems. If not, we strongly encourage that to be added to this project.

- Which comes first; safety protocols or the new technologies and their faults?
- It is agreed that CAV-related issues are important. This proposal, however, does not show its uniqueness. If the research findings, i.e., a list of priority areas and strategic plans, cannot be accepted/adopted by most DOTs, it would not bring much benefit to this already-hot research area.
- A better emphasis would be determining the safety impacts that will arise from having a mixed fleet consisting of human drivers and semi-autonomous vehicles on a system very similar to the existing infrastructure
- Implementation of AV/CV remains challenging due to the lack of standards and direction. AV/CV is listed in our Long Range Transportation Plan and this research will provide additional guidance. However, it seems a bit premature to assess this.
- Automation is coming - research to inform states of the upcoming impacts would be good. Although by the time the research is completed, this technology might have changed again.
- Is this similar to 20-102?
- State DOT's need researched based guidance on any MUTCD related modifications to infrastructure that will be needed to support CAV technology.
- Issue is worthy of study, but I think this is redundant with other efforts in process or proposed. Suggest rolling this into 20-102 or other ongoing study.
Certainly an important problem, but perhaps a bit preliminary. I'm not sure a literature review will give an accurate idea of how AVs will likely crash, let alone make intelligent infrastructure decisions.
- This is WSDOT proposed research to evaluate how changes in CV/AV will impact future geometric and roadside design. If crash reduction benefits from CV/AV are likely to occur as in-vehicle systems increase in number and effectiveness, then this change might allow for reduced and more practical design criteria (narrower lanes, sharper curves). Most research in this area relates to the roadway and roadside electronic systems that we need in place, not how we might design our road system in the future. Potential design and operational policy changes could save significant resources for WSDOT and other State DOTs. This was the AASHTO Committee on Safety's first priority out of 19 proposals.

Item #42: Algorithms to Convert Basic Safety Messages into Traffic Measures
G-07

	NR	0	1	2	3	4	5
(17) R&I		1	1	2	3	4	8
(46) RAC	1	1	4	11	9	10	9

Special Committee on Research and Innovation

- Good scope but the implementation potential is unclear. While simulations are effective for validation, their real-time application is uncertain the way the scope is designed. That said, the need for algorithms to convert basic safety measures to traffic measures is real and a useful exercise.
- [Rating: 4] This study provides an opportunity to develop new algorithms and tools for processing the extremely large amount of BSM data into industry accepted estimation of traffic measures. The level of funding appears adequate to conduct the level of work proposed.
- This research is important and timely for DOTs.

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- Submitted by Iowa DOT's Scott Marler, we support this research. It has a national perspective and will assist transportation agencies in utilizing the vast amounts of data that will be available once the V2I is implemented into the vehicle fleet. This will help to agencies prepare for the future V2I data needs.
- We're well ahead of this project so unlikely to benefit.
- This study provides an opportunity to develop new algorithms and tools for processing the extremely large amount of BSM data into industry accepted estimations of traffic measures.

Research Advisory Committee

- High value if research can deliver States with algorithm for data management. Anderson - There is opportunity to develop consistency in the algorithms used currently to assess traffic conditions and congestion. And then the process of relaying important messages to the public to address safety concerns and improve operations.
- With emerging technologies validating and publishing algorithms that agencies and vendors can incorporate into software to estimate the traffic measures could be of significant value in the future. (In order to use the results of this research project, it is assumed that IDOT would need to provide considerable investment in systems and software in order for the gathered data to be used.)
- Research on converting the BSM to algorithms that provide information on travel time and starting location of congestion would aid with managing the roadway network more efficiently. Knowing the estimated travel time or starting location of congestion might help in providing alternate routes to the travelling public to display messages on DMSs or to better coordinate traffic signal systems. It is important to invest and learn from V2I data early on to fully understand the capabilities and functionalities of the CAV system, especially when considering the use of available data for performance measures and the resulting decision-making processes.
- The value of proposed work is high, especially when more and more CV deployments are ongoing.
- While relevant, there has already been a great deal of work in this area. Many of the algorithms used in Bluetooth reidentification can be applied to BSMs.
- This study provides an opportunity to develop new algorithms and tools for processing the extremely large amount of BSM data into industry accepted estimations of traffic measures.

**Item #43: Data and Information Sharing Gaps and Practices for
B-05 Coordinated Operations and Traveler Information for
 Integrated Corridor Management**

	NR	0	1	2	3	4	5
(17) R&I				3	7	5	4
(46) RAC	2		3	6	16	12	6

Special Committee on Research and Innovation

- The guidance provided by this research will be very beneficial for future Integrated Corridor Management Software Projects in Florida. The vendor community does not have the interfaces in place that can share all of the information needed for an ICM project. Having standardized data sharing protocols that provide the information needed by multiple agencies on an ICM project will be very beneficial.
- Combine with A-13.
- [Rating: 0] B-05 is a draft version of the A-13. No need to carry out both A-13 and B-05.
- This could be more focused. This is very similar to A-13 and has some of the same authors. These should be combined.
- The problem statement identifies an issue that needs research and is of national interest and appropriate for NCHRP. FHWA and TRB committees identified this has a high priority. A literature review yielded minimal results on extending relationships between public agencies and private industry for operational real time planning data moving from government to industry. Given the identification of need coupled with a well identified research objective, it's believed

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this effort will be successful.

- This project should be combined with A-13, both projects seem incomplete and could be much better as a single project
- We recommend combining with A-13 and make one study.

Research Advisory Committee

- Support proposed joining of A-13 and B-05
- The overall idea of the problem statement of figuring out the stakeholders, understanding data requirements, and processing the data is definitely worthwhile and essential for Integrated Corridor Management (ICM) for it to be successful for a specific corridor. This would be timely as IDOT-D1 is wrapping up a Phase I study for essentially an ICM project in coordination with Cook and DuPage Counties.
- Agree that this should be added to A-13.
- Improved data sharing to establish a common data elements would ensure better data consistency and data maintenance. Having a comprehensive data set without any data gaps would help all agencies involved to communicate and coordinate more efficiently to provide better guidance on traveler information and ICM to the roadway users.
- "This should be combined with A-13.

Expands existing standards and practices for sharing data. This is an important initiative and we need to take advantage of developments as continual improvement is necessary. "

- It is the same content as A-13
- This statement seems quite similar to A-13
- This problem statement seems to be similar to A-13. Would recommend consolidating these two into a single problem statement.
- First, A-13 and B-05 are very similar and from the same patrons; and should be merged. (2) ICM and Smart Cities are important, emerging topics. But a quick look at Task 2 shows that there is no mention of what data will be shared by travelers, ride sharing companies, navigation management companies and freight management companies. Are they even willing to share anything with the public sector? If yes, at what cost? So the scope needs to be tightened. (3) Research period is okay; but funding of \$600K is very high for the current scope.
- A-13 and B-05 are so similar (nearly identical) that they should be combined. The outreach to ridesharing companies, the navigation management industry, freight management and smart cars in Section VII of B-05 should be added to A-13. Or the inclusion of public safety and emergency management agencies, and the proposed data sharing between mobile devices and connected vehicles in Section V, Task 2, in A-13 should be added to B-05. Either way A-13 and B-05 are both incomplete as written. Combining the two problems into one statement will create a valuable problem statement that will potentially provide a nice comprehensive project that will look at data sharing with more stakeholders than either project will accomplish on its own.

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**Item #44: Highway Capacity Manual Methodologies for Analyzing
C-05 Freeway Merging and Diverging Bottlenecks
 Considering Different Geometrics Characteristics and
 Mitigation Strategies**

	NR	0	1	2	3	4	5
(17) R&I				3	6	6	4
(46) RAC	3		5	5	15	10	7

Special Committee on Research and Innovation

- The methodology overestimates the capacity values at both merge and diverge segments. HCM does not offer any methodology for lane drops or additions, which often occur in the vicinity of freeway merge/diverge segments. HCM also has limitations in the current methodology, such as high occupancy vehicle (HOV) lanes, ramp metering, and active traffic management operational strategies.
- [Rating: 5] This is important research that will enhance a widely-used analytic methodology (HCM) and will serve state DOTs to better understand bottleneck causes and locations, as well as the impacts of geometric and operational mitigations.
- This research appears to be too theoretical to benefit state DOTs.
- Current methodology is definitely due for review.
- Does not clearly articulate value.

Research Advisory Committee

- Adjustments to our measurements is needed as we get closer to capacity
- Problem focus is relevant and timely. Given the increasing emphasis on travel time reliability by USDOT, reliability related performance measures should also be included in the statement.
- Although they cite the age of existing guidance, they do not indicate specific and significant shortcomings at least with respect to safety. It's hard to gauge what the potential value of this update is based on the information provided. This is another one where a community of practice has probably already come up with the best practices at least in terms of operations. Some value could come from an update to geometrics which is part of this.

**Item #45: Update to AASHTO M180 and Associated Material
D-08 Specifications**

	NR	0	1	2	3	4	5
(17) R&I				2	9	7	1
(46) RAC	1		1	10	12	14	7

Special Committee on Research and Innovation

- It is important update this Specification to current standards. A finished draft revision to AASHTO M180 should be a deliverable.
- [Rating: 3] We have heard of some concerns about hardware components supplied not being what is tested because of dated specifications.
- This research is needed but not as much as some of the other topics.
- Iowa specifies M180 and having an up-to-date standard is important.
- M180 is a standard spec in some states and updates could help standardize guardrail specs
- Project will provide needed updates to guardrail specification to help assure that supplied materials are adequate and consistent.
- Standardization of review and testing evaluation for safety products would be a great benefit, especially for smaller states

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with more limited budgets and staff. The benefits parallel those of NTPEP and similar programs, which allow the evaluation of trusted data generated by others.

Research Advisory Committee

- N/C
- The findings will help streamline our acceptance process and reduce the possibility of the wrong materials being used on projects.
- Need for a update to the AASHTO standard.
- MDT would benefit from this effort. We are such a small market we have no influence on the industry otherwise.
- M180 is currently used in the WSDOT Standard Specification for galvanization requirements only, and if updated and expanded as this research notes, could used more extensively. This would help standardize guardrail standards.

**Item #46: Assessing the Impacts of Turn Lanes in Different
C-20 Contexts and Modal Considerations to Increase Safety
 Performance**

	NR	0	1	2	3	4	5
(17) R&I		1		1	8	5	4
(46) RAC	2	1	1	9	14	12	6

Special Committee on Research and Innovation

- The design of auxiliary lanes has been mostly based on operational capacity, movements, and storage for vehicles. The development of models for turn lanes may provide more flexibility to designers in lower speed urban contexts while also ensuring safety benefits based on expected safety performance. Establishing models that tie context into design criteria will ultimately address transportation safety for all road users.
- The impact of turn lanes as they pertain to Intersection Control Evaluation is an ongoing discussion.
- [Rating: 2] Possible Synthesis topic looking at how state DOTs are designing turn lanes and what volume and crash thresholds might be driving the addition and design of the turn lanes.
- Not sure that this is a national issue.
- Not rated to high by design. Safety is not much higher.
- Research evaluates multimodal and land use considerations related to turn lane applications. Most of previous research has been related to motor vehicle safety, not other modes. The implementation of the research will occur within the HSM and other data driven safety analysis tools and procedures. For WSDOT this means better tradeoff decisions in designs. This was the AASHTO Committee on Safety fourth priority.
- Turn lanes are a customary safety feature. Better information on safety benefits would be helpful in evaluating alternatives.

Research Advisory Committee

- Pedestrian and multi-modal impacts of turn lanes are typically focused on intersections. Not completely understanding scope of work on turn lane design and impact.
- Research would be of nationwide interest. Appropriate for NCHRP research. Extensive research has been performed on the development of CMFs for the installation of turn lanes. Operations-Safety interaction makes research unique. Research would successfully provide additional information (i.e. CMFs) for state practitioners.
- Consider Turn lane widths. We have found that narrower turn lanes are better than no turn lane.

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- This proposal presents an interesting and essential issue toward the design of turn lanes. The proposed methodology does not involve empirical/field study nor discuss potential human-factor analysis. Those empirical data may be of great importance, especially when different transportation modes are involved. The research tasks do not seem to answer those aforementioned questions.

- Very relevant, especially as it relates to how we can improve safety and comfort for people biking and walking.

With the advancement of Healthy Transportation in MA, treatments of turn lanes are of interest to us and this research could be helpful. This is perfect for NCHRP to undertake because of the wide ranging need for MA and other states and jurisdictions. There are numerous CMFs that could relate to this but a comprehensive research of the treatments would be an improvement. It is reasonable to assume this could result in an implementable well-defined product.

- From a CSS, complete streets and PBPD perspective, a high need. MPPM-Not in the AASHTO Committee on Planning's top 3, but this research would be of high interest to DOTs and local governments.

- This is of minor value to decision making process.

- This research is high priority for MDT; aux lane design for improve safety would be very beneficial.

- The project seeks to develop CMFs for turn lanes at a more granular level. There could be significant data challenges. The project scope and potential implementation are not clear. To conduct the proposed microscopic study and develop the CMFs, it is necessary to create a large dataset with great details, but none of the tasks mention how to achieve this.

- This is WSDOT proposed research to evaluate multimodal and land use considerations related to turn lane applications. Most of previous research has been related to motor vehicle safety, not other modes. The implementation of the research will occur within the HSM and other data driven safety analysis tools and procedures. For WSDOT this means better tradeoff decisions in designs. This was the AASHTO Committee on Safety fourth priority.

Item #47: Design Specifications for the Static and Seismic Design of Piles for Downdrag C-03

	NR	0	1	2	3	4	5
(17) R&I				5	6	4	4
(46) RAC	1	1		13	9	12	9

Special Committee on Research and Innovation

- [Rating: 4] The expected outcome of the proposed research would be, if adopted, a worthwhile addition to available AASHTO guidance.
- The current AASHTO Bridge Design Specification code is interpreted that drag load be analyzed for the strength load condition, sometimes requiring a heavier pile section than is needed. This can cause an unnecessary expense to projects. Clarifying the drag load to be analyzed for the service condition is needed. This is accomplished by codifying the proposed method of analyzing drag load. The proposed method is only mentioned in the code as a method that may be considered.
- This research has the potential of producing more economical pile design specification as the current methodology for designing for down drag under static condition may be considered overly conservative.
- Number 1 project by AASHTO Bridge Committee
- SCOBS #1
- This is not a tremendous concern for NH.

Research Advisory Committee

- Having better downdrag guidelines in the AASHTO LRFD Bridge Design Specifications would be beneficial to accurately determining substructure designs.

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- Not of interest in states where seismic activity is not a major consideration.
- Not aware of any concerns or difficulties within VDOT in designing pile foundations. However, the potential for liquefaction during seismic activity could be a concern. Improved design specifications for piles in weak and seismically unstable soils is important and appropriate for NCHRP study. This was the 3rd highest RNS from TRB's Geotechnical Engineering Section.
- This research proposal was given a No. 1 ranking by the AASHTO Bridge Committee and addresses work that my technical committee (T15 Substructures and Retaining Walls) has requested be done. There is currently significant disagreement nationally regarding how deep foundations should be designed for downdrag, and when downdrag is likely, current methods tend to have a strong effect on the size and depth of foundations needed. Therefore, it should be given a high recommendation by WSDOT.

**Item #48: Regional Guidebooks of Current Practices for Roadside
B-18 Pollinator Conservation and Endangered Species Act
 Compliance**

	NR	0	1	2	3	4	5
(17) R&I		1	1	1	8	4	4
(46) RAC	1	1	3	5	13	14	8

Special Committee on Research and Innovation

- The information proposed for the guidebooks is not available from AASHTO, FHWA, and other transportation related sources.
- Should build on NCHRP 20-119/Monarch Butterflies
- Applicable to project delivery, it proposes to create regional guidebooks for roadside pollinator conservation. State DOT's would have a guide to show them how to utilize roadsides to promote pollinators. Planting for pollinators is a hot topic these days and can aid in Section 7 consultation (as insects are starting to be listed), possibly support state DOT efforts with a programmatic buffer variance approach, and could also possibly help with bat conservation (as some pollinators are food for bats).
- [Rating: 5] FHWA is aware of some of the challenges State DOTs face related to protecting listed species and considering candidate species. However, there is no comprehensive nationwide study of this topic to inform FHWA on the range of issues facing SDOTs and Division offices responsible for ESA compliance.
- Need to consider direct impacts from putting habitat next to high collision potential
- A good first step on the pollinator issues
- This is extremely "regional" and may not fit NCHRP well

Research Advisory Committee

- This could certainly be a hot topic if some current candidate species become listed. We have little to no existing guidance
- Results of this study would be critical for streamlining IDOT's project planning and guiding maintenance activities, and would assist IDOT's involvement in the monarch butterfly CCAA process. This is timely given that the monarch could be listed in 2020.

FHWA-HEP-16-059 Roadside Best Management Practices that Benefit Pollinators...and FHWA-HEP-16-020 Pollinators and Roadsides: BMP for Managers and Decision Makers are both excellent publications, however, the need for regional guidebooks is urgent and very needed.

- Having a consistent process within DOTs for reviewing roadside products does not seem achievable.
- There is an increasing need to understand this from a transportation engineering and environmental site assessment (ESA), stormwater management and permitting perspective as decline can be in part contributed to climate change

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effects; also can be applicable to project construct-ability regarding the use of certain chemicals during construction adjacent to pollinator habitat.

- MnDOT's wildlife ecologist states this is not a high need in MN but may be of value to local gov's.
- We know that U.S. Fish & Wildlife Service will require consultation on pollinators in the future and there has been little research to determine what mitigation is effective.
- Research intends to identify/recover pollinators that are in decline.
- Quite an important topic nation-wide. Could help to inform VTrans veg management plan that is currently under review
- This problem statement is looking for ways to further encourage pollinators along roadsides which we do not support, as they are more likely to be struck by vehicles. I would give this a 1. This was the fourth lowest of the six problem statements submitted by SCOE, with lower value for VDOT.
- Some states are way ahead of others in terms of protecting pollinators and this NCHRP problem statement is a good step in promoting pollinator conservation with a survey, peer exchange & regional guidebooks. We think the research effort should only look a broad brush about ESA regulations concerning pollinators at this time.

Item #49: Strategies for Incorporating Resilience into A-14 Transportation Networks

	NR	0	1	2	3	4	5
(17) R&I				2	7	7	3
(46) RAC	1		4	6	20	10	4

Special Committee on Research and Innovation

-
- While of interest, it's questionable whether this effort can provide actionable results.
- [Rating: 3]
- Better understanding of the impact of congestion on commerce would be helpful in this research.
- This RNS points out an important gap, and the research objective and tasks seem well thought-out and reasonable. Our DOT has worked with a consultant (Quetica) to develop supply chain models, although these have not specifically been used to look at network resilience.
- For Wyoming this would be of minor value. Also, since it appears to focus on supply chain, will it only apply to small regions?
- beneficial to supply side resiliency
- Freight resiliency is important, but the type of discussion in this does not seem like it fits NH
- Committee on Planning's 3rd highest ranking

Research Advisory Committee

- Of little benefit to ConnDOT's primary focus of highway infrastructure.
- Focuses on supply chain freight movement, which is important, but not DDOT's prime focus regarding freight
- This research would be beneficial to Idaho as we are a freight reliant state with approximately 48% of our gross state product coming from freight reliant industries compared to a nationwide average of approximately 38%. Supply chain analysis and resiliency would benefit considering land slides, earthquakes and other phenomenon potentially blocking freight routes to rural and mountainous regions in the state.

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Distribution of Ratings

- Usefulness for Missouri is in doubt except for possible applicability for disruptions to goods movement system, particularly for water transportation.
- Combine A10,A14
- Compare Statement A-10, which asks similar questions from a system operator's point of view. This RNS has a more precise focus, but ... \$600K to "identify gaps in supply chain modeling and propose research plan to fill these gaps"? The problem statement should accomplish these things! And then offer maybe \$300K to carry out the research plan.
- Good potential for learning more about supply chain resiliency.

**Item #50: Validation of Roadside Crash Injury Metrics in Real
C-14 World Crashes (Correlation of Actual Injury Outcomes
 to Those Predicted During Crash Testing)**

	NR	0	1	2	3	4	5
(17) R&I				4	8	2	5
(46) RAC	1		4	7	14	13	6

Special Committee on Research and Innovation

- [Rating: 5] NHTSA verified that new generation test dummy works better at lower delta V, although there are still limitations. A lot of questions have been raised about injury risk metrics currently used in MASH. Good project with potential valuable results.
- Money would be better spent on achieving Mash testing to meet FHWA mandated dates for roadside safety hardware.
- Interesting topic, but we have other issues we more interested in addressing.
- Not a particularly high priority here.
- This issue is important from a safety perspective
- Another important GR topic.
- This is very critical for validation of MASH crash criteria and continued development of improved crash standards in MASH.

Research Advisory Committee

- On-Going evaluation of MASH Standards
- Re-assessment of MASH occupant risk procedures developed in 1980s important, though not as high priority as reducing overall crashes. Appropriate for NCHRP research. Potential for nationwide interest. There is probability of success in comparing predicted severity with real-world data, but impactful contribution may be lower than other problems. May help in development of hardware that will reduce crash severity
- this would help to continue to develop reliable crash modification factors in the HSM
- Agree with need for research.
The project addresses an important problem. May help better align simulated injury risk to actual crash outcomes. It is unclear how this will be implemented / how much value it will add to current practice.
- The relationship between passenger injury and crash test criteria is the kind of thing that has been ignored for too long. This is an opportunity to update the existing simplistic approach and address the thing we are actually trying to get at which is injury.

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Item #51: **Determining Pavement Preservation Treatment Lives F-02 and Related Pavement Life Extension**

	NR	0	1	2	3	4	5
(17) R&I		1		4	5	6	3
(46) RAC	2	1	1	8	11	16	6

Special Committee on Research and Innovation

- This project as described in the title and objectives appears misleading. It seems solely related to concrete pavements. As such, the title should read "Determining Pavement Preservation Treatment Lives and Related "Concrete" Pavement Life Extension". Further, I am not sure there is robust long term field performance database under controlled conditions with all necessary information to develop appropriate performance curves.
- FHWA TAMP requirements make this very timely and potentially useful.
- [Rating: 0] At least partially duplicative of NCHRP 14-38 "Guide for Timing of Asphalt-Surfaced Pavements Preservation.
- This research seems very worthwhile, but it also appears to be redundant with the current NCAT surface testing and other research by state DOTs, including some in Utah.
- Beneficial to have a method to determine extended service life due to treatment used.
- Regional variations with the environmental and traffic will likely make this research challenging.
- good work needed through pavement preservation
- Many have tried and will be difficult to develop on a national level. Should be performed on the State or Regional level to support PMS.

Research Advisory Committee

- N/C
- This is where the IDOT is headed and there is a major question that yet needs to be answered - "How long did it extend the life of the pavement?" This is pertinent to all related research.
- We know intuitively that pavement preservation extends pavement life, but we don't have a clear sense of how much. This needs statement has support of the AASHTO Committee on Maintenance, but should be consistent with current efforts of MnROAD, NRRRA and NCAT.
- The return on investment for our pavement preservation efforts is an important component since most of our investments are on pavements.
- This would be very helpful in selecting appropriate treatments and estimating future funding needs.
- NCHRP 14-38 shouldn't affect the outcome of this study.
- I think the existing data on this topic is meager, and the impact of better data could be high. I'm not sure if we are currently over- or under-estimating the impact of these treatments on pavement life extension.
- A lot of research projects on pavement preservation were funded by NCHRP. The lack of data available limits the outcome from these projects.
- We already do this but would be interested in the results
- State DOT's will benefit from this research. Predicting treatment performance, life extension of existing pavements due to several preservation treatments and most importantly related cost savings with each treatments will help state DOT's to pick the right preservation treatment for a particular project.

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- This project will be difficult due to regional variations with the environment and additionally traffic. However, the end result would be useful to predict the performance lives for various treatments.

Item #52: Thermal Cracking Resistance of Asphalt Binders D-15

	NR	0	1	2	3	4	5
(17) R&I		1		2	8	5	3
(46) RAC	2	1	3	6	14	12	7

Special Committee on Research and Innovation

- Florida does not currently have the thermal cracking issues experienced by many other states. However, the research is of interest since it will include the binder additives and extenders that are used regularly today, but were not considered during Superpave’s development.
- Cracking is a primary mode of asphalt distress if it occurs.
- [Rating: 4] Addresses a current shortcoming in asphalt binders specification.
- Research in this area will help refine the current binder tests for cold weather cracking.
- Thermal Cracking at one time was a serious problem for Iowa. As the author notes there is the potential for a return to those days with the modifiers if a reliable test is not available. Use of higher RAM contents may also contribute but were not listed as a study factor.
- This has a potential to develop a more accurate test to identify thermal cracking potential in binders. The benefit of this research is it could build upon existing testing equipment, rather than developing new testing equipment. While this research is important it is not vital to the success of WSDOT's Preservation/Mobility programs.
- Thermal cracking of binder is a widespread problem that needs to be addressed more effectively. Only hesitation is that it might be too early for this research based upon the other binder research ongoing
- Thermal cracking is the greatest distress suffered by NH pavements. Any advances in methods to reduce it is supported.

Research Advisory Committee

- This is a regional issue, not a national issue.
- Very important in a cold weather state like MN. This research would logically follow up recent work on rutting and fatigue cracking.
- It's hard to know which is the right test to use. Anything studying thermal crack resistance would be useful to us.
- Very timely study.
- While this issue is not of direct high importance to Virginia, it is an issue that widely impacts cold climate states, and the outcomes should provide improvements in the PG binder grading specifications that would be of benefit to Virginia. There has been a need for this work for some time, as the shortcomings of the low temperature cracking evaluation in the PG binder spec have been well-documented. Several researchers have made efforts to address these shortcomings, but a national study is likely needed to provide full assessment of the issue along with recommendations and momentum to implement nationally.
- This has a potential to develop a more accurate test to identify thermal cracking potential in binders. The benefit of this research is it could build upon existing testing equipment, rather than developing new testing equipment. While this research is important it is not vital to the success of WSDOT's Preservation/Mobility programs.

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**Item #53: Developing Safety Performance Functions for Rural
C-21 Two-Lane Highways that Incorporate Speed Measures**

	NR	0	1	2	3	4	5
(17) R&I		1		5	6	3	4
(46) RAC	2	1	2	7	12	11	10

Special Committee on Research and Innovation

- Speed-based safety performance functions would provide much deeper insight into the relationship between speed and crashes/severity. While AADT is a good tool, speed-based functions would help designers and policy makers better decide on the appropriate design speed for a facility. Current HSM does not include speed as a factor, perhaps assuming that rural 2-lane roadways are inherently high-speed and thus speed variables would have little effect on safety evaluation. This topic is worthy of study to see if there is a difference in safety performance between different posted speeds, and what speed should be used - design, posted or operating.
- Distraction, impairment, and speed appear to be contributing factors in about 70% of fatal crashes in Georgia. This research could help weigh the impact of speed as it relates to safety.
- [Rating: 3] The timing is not ideal and should wait for results from NCHRP project 17-85 (where much of the concern may be addressed), and wait to see if SHRP2 projects find correlations between safety and speeding. Would prefer the focus be on urban/suburban arterials rather than rural two-lane, since rural two-lane roads are typically consistent within a state, and therefore can be adequately handled by state calibration. Urban/suburban arterials, where there is a large range of speed limits and cross sections, would be a better focus for an NCHRP study.
- This is a relatively low priority, considering the results of this research wouldn't be available until after publication of the 2nd edition of the HSM. Furthermore, it seems as though this issue could be handled through calibration of existing two-lane highway SPFs to local conditions.
- Supported by Safety and Design.
- research recommends the use of speed in estimating safety performance on rural facilities. Currently, AADT is primary measure for determining expected crashes. However this approach limits the explicit consideration of speed and its potential impacts on crash outcomes. This is particularly important in the rural context since AADT estimates may not be as reliable as desired. Further, the over representation of speed related crashes on rural two lane is higher than normal for states like Washington. WSDOT is currently a high risk rural road state. This was the AASHTO Committee on Safety's second priority.
- Speed should be considered in evaluating safety performance of a roadway.

Research Advisory Committee

- Research would be of nationwide interest, as there are limited SPFs for rural roads. Speed measures are particularly important. Appropriate for NCHRP research. Research would successful provide great contributions for state practitioners.
- Perhaps C-01 can be incorporated and considered as part of the CMFs for this SPF. This would help it to rank higher. Using Safety as one of the factors in the SPF would change the SPF but it could be used to find a better fit equation. This is important but our state has few rural roads so it loses some importance for us. Also will the results from the research on crash severity models use speed as a factor and therefore incorporate some of this research need? This should be answered before moving forward with this research project.
- Have some concerns about the development of this SPF... speed is so much more than a number.
- Could be beneficial given the mileage of two-lane highways in Miss.
- Incorporating speed in the HSM analysis would be very valuable.
- Low priority for Montana - not sure if you would be able to have enough data to have valid SPF numbers.

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- Agency interest in the topic, but concern about overlap with current NCHRP work.
- This is a timely topic, but I question whether developing new SPFs is a better solution than just creating new CMFs that could be applied with existing models. That would increase applicability of the work. Also, the research should consider the diversity of speed data sources that are available. Most states have sparse detector data, but private sector probe data may provide broad coverage at the expense of granularity. If this relies on point detector data, or data collected intermittently the usefulness may be limited. Also, the research should consider whether the speed was the cause of the crash or the result of the crash happening. Crash report time reporting and speed data granularity will have a significant effect on the work.
- This is WSDOT proposed research and recommends the use of speed in estimating safety performance on rural facilities. Currently, AADT is primary measure for determining expected crashes. However this approach limits the explicit consideration of speed and its potential impacts on crash outcomes. This is particularly important in the rural context since AADT estimates may not be as reliable as desired. Further, the over representation of speed related crashes on rural two lane is higher than normal for states like Washington. WSDOT is currently a high risk rural road state. This was the AASHTO Committee on Safety's second priority.

Item #54: Innovative Mitigation Strategies for Highway Noise B-10

	NR	0	1	2	3	4	5
(17) R&I		1		2	9	2	5
(46) RAC	1	1	2	7	19	8	7

Special Committee on Research and Innovation

- Good concept. We need an effective alternative to walls.
- [Rating: 3] The researcher may also consider examining other potential environmental benefits of these noise barriers. Several State DOTs, as well as USEPA, have conducted research on the potential of these noise barriers in reducing emissions and improving air quality in the near road environment.
- Having additional means for noise abatement would be good. Particularly where noise walls are not suited
- This proposal involves the identification of other non-traditional methods of noise abatement besides the installation of soundwalls and berms. The Department frequently finds itself in situations where noise impacts may exist but traditional noise abatement measures (soundwalls/berms) are either infeasible or unreasonable. If other alternative methods were available to reduce noise, it would provide the Department with additional tools to provide abatement, possibly at a reduced cost and in situations where abatement might otherwise be infeasible or unreasonable.

Research Advisory Committee

- Given our often tight ROW, innovations in noise mitigation would be helpful
- While noise barriers are a standard use for many projects new and/or innovative ways to mitigate noise would be of benefit. JP-MnDOT's interest in this subject is support by Land Management. Noise complaints are common while we undertake more nighttime construction. Calling it an absolute need as cop-proposer includes MnDOT.
- Innovative Strategies for reducing noise impact could reduce the cost of noise abatement.
- There are many instances where MT cannot mitigate noise through the construction of barriers. Alternatives rarely gain traction, but largely because we do not know what the alternatives are.
- Of high value to NCDOT
- NEPA Considerations; space constraints may make these options unlikely. VTRans is seldom looking at requirements to reduce noise from its projects.
- I would rate this a 5, as it was our highest rated project within our AASHTO noise group. This would evaluate potential alternative to noise barriers, including things such as solid safety barriers (in lieu of guard rails), quieter bridge decks,

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- rumble strips, joints, pavements, etc., sound absorbent surfaces adjacent to highway, and vegetated swales/retention basin location, and many other options.
- WSDOT frequently has to explain to communities who do not qualify for a noise wall what other options there are for reducing noise levels. Since the 2011 noise policy was published it is more difficult for some communities to qualify. Currently there is not a lot known about what can be done to abate traffic noise. Having additional options/tools to provide noise abatement to these communities would be very helpful. Other states have expressed an interest in this area as well.

**Item #55: Developing Data Standards and Guidance for
B-13 Transportation Planning and Traffic Operations - Phase
 1**

	NR	0	1	2	3	4	5
(17) R&I		1	1	1	6	7	3
(46) RAC	1	1	5	6	11	15	6

Special Committee on Research and Innovation

- Even though the idea of creating standards is a good one, concur with FHWA that the project is too vague. This project should come back with a more focused approach or have a research project to prioritize which data sets would be good candidates for standards development.
- [Rating: 4] NCHRP 8-36/129 recommended further work on travel time, demand, incident and work zones, network and transit. As written, the project is too vague and open-ended (deferring, for example, the question of which of the five broad areas identified in NCHRP 8-36 Task 129 should be the focus of this effort).
- This would develop data standards that we can all learn from.
- Critical topic area and it seems that data standards would aid in interoperability, communication and data sharing across jurisdictions. One risk might be that technology might moot some of the standards, however by starting small with a focus on some high-value areas this risk is tolerable.
- The phase 1 scares me a little, since I can't understand phase 2. They are seeking ways to require data to be stored in a standard way.
- This project is fairly vague as to the approach to achieve standardization. Does not address differences between rural and urban areas.
- Data Mgmt #1, need to look to future of data in terms of automated vehicles – seems like a ripe place where a standard could be built and adopted prior to the wider spread use of the technologies
- Important to have consistent data available for performance measures and planning. This study is a step in that direction
- AASHTO Committee on Data Mgmt & Analytics #1 priority

Research Advisory Committee

- Seems like it's duplicating other work. No mention of the word 'metadata' has me concerned in a project about data specification/standards.
- Data standardization and architecture across traffic operations and ITS was a recent rapid improvement event. ITS systems are becoming more complex and we're seeing technology skillsets required at all levels in the organization. It was determined by the team that a more strategic focus on architecture, connectivity and integration of ITS systems was integral to ITD becoming the best transportation department in the country.
- Why is this limited to Planning and Traffic Operations? Quality Data Guidance is needed throughout DOTs.
- Having a standard data set would help all the agencies involved to communicate and coordinate to provide better guidance on traveler information and ICM to the roadway users.

- This should be handled by state DOTs in coordination with regional partners. MassDOT is currently undergoing a review of the data collection methodologies and type of data being collected by the RPAs within the Commonwealth through their yearly UPWPs in order to make these efforts cohesive and consistent.
- MPPM-AASHTO Committee on Data Mgmt & Analytics #1 priority
- There is always a need for further improvement of standards, guidance, and prioritization, but there are possible concerns of duplicating current efforts. Also, there seems to be a lack of any technical support to the study. Large data sizes usually need some sort of program, database, or tool to process the data and this study does not mention any use of one.
- This is good research that defines crucial needs.
- (1) As the problem statement says, while standards are very useful, they also have many challenges, many of which are pertinent to transportation field right now: reluctance, cost, complexity, too long to complete, moving targets, and obsolescence. (2) The statement confuses a lot of related topics. (a) Travel time and demand data for MAP-21 and FAST are already standardized via NPMRDS and HPMS. Incident and work zone data are not needed for those acts. (b) ATMS systems that collect the incident and work zone data are very costly to upgrade, and (c) States have not been able to come to consensus on the various definitions within Incident timeline, secondary incidents, weather impacts etc.. (3) The budget of \$250K per year seems very high. (4) Finally, any useful elements in this project are proposed to be combined with B-05/A-13, both of which need to be merged.
The standards and guidance proposed in this project might be informative but it might not be feasible for many agencies to implement at least in the near future. Agencies face different challenges in analyzing, managing, and exchanging large volumes of data and a standard application would not solve all the problems. For each of the five specific areas to be evaluated, agencies are not consistent in many practices. Part of the tasks can be combined with Project A-13/B-05.
- The standardization of transportation planning and traffic operations data is a high priority for WSDOT. It is essential for effective performance analysis in both planning and operations and currently lacks consistency of format and source. As written however, the project is fairly vague as to the approach to achieve standardization. It does not address differences that will certainly be a factor in such things as urban vs. rural areas, freeways vs. arterials, etc. Data standardization must account for the availability of data across all areas in a state. Also, it would be in WSDOT's interest that the project focus not necessarily on planning and operations but rather data standardization for all things under the TSMO 'umbrella' which includes those areas. The five measures listed (travel time, demand, incident and work zone, network and transit) are excellent measures to start with for data standardization. However, a status of other possible TSMO measures and how difficult it might be to standardize their data would be beneficial and set direction for future work in this area.

**Item #56: Census Transportation Data Use and Application Field
B-12 Guide**

		NR	0	1	2	3	4	5
(17)	R&I		1		3	6	6	3
(46)	RAC	1	1	1	11	13	10	8

Special Committee on Research and Innovation

- [Rating: 5] The project statement is well developed. The American Community Survey (ACS) and resulting Census Transportation Planning Products (CTPP) are the primary ground truth programs that support the U.S. transportation community providing the fundamental data in the journey to work calculations. FHWA is a major supporter of these programs and building this sort of "Data Use and Field Guide" is critical for introducing new practitioners to the field.
- A field guide will lead to greater use and induced advancement of the CTPP offerings. Deficiencies identified in the statement suggest that examples, guidance, and other expert analyses will help the user to best employ what is already offered, leading to more efficient use of what we already have. The CTPP video trainings are very helpful. These combined with a field guide would maximize the use of the data.
- Next step for deploying CTPP
- Data Mgmt #2
- Very important to have informed access to this powerful data set

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- AASHTO Committee on Data Mgmt & Analytics #2 priority

Research Advisory Committee

- Very useful for all state staff who use this data.
- The CTPP Field Guide will be very important to ITD because it is very confusing accessing and using the data. With the Census update pending and the development of the Long-Range Transportation and Corridor Plans, ITD would benefit from this data.
- IDOT's Bureau of Planning is attempting to grow its staff capacity for the use of more data, including census data. This would be a great product to assist the Bureau of Planning to build that capacity.
- Maryland fully supports this research.
- A field guide would benefit staff using census data for EJ/PE analysis but it would not be a high need. MPPM-AASHTO Committee on Data Management & Analytics #2 priority
- Census Data plays an important role in multiple fields especially the transportation planning. A Field Guide incorporating the latest changes to the CTPP and ACS and covering a range of applications will be beneficial for transportation agencies.
- Making census data easier to understand and use is a benefit to MoDOT. The data provided would be helpful in serving the public, especially with regard to public transportation.
- NCHRP 588--the predecessor back in 2007--was great: it could be used directly in the field or in the classroom and was self contained. That model should be continued for this project--what is needed is a document that gives a credible way of interpreting the findings (especially the use of confidence intervals given shrinking sample sizes)--without referring the reader to yet another source. As long as the Application Guide remains a relatively self-contained entity, this should be useful.
- Useful continuation and next steps for deploying/operationalizing Census Transportation Planning Products (CTPP).

**Item #57: Corrosion Rates for Uncoated Weathering Steel Bridges
D-01**

	NR	0	1	2	3	4	5
(17) R&I		2		3	4	7	3
(46) RAC	2	2	1	8	11	12	9

Special Committee on Research and Innovation

- Maybe a synthesis first. Florida has produced guidance on the use of weathering steel and conditions that will promote corrosion in weathering steel. This project would add to the base of the science, but may not produce results with direct utility to DOTs since the exact corrosion rates will vary based on site conditions. Design will still depend on well-known design practices. \$1,000,000 is a big ask without more detail.
- [Rating: 4] This topic has immediate value to engineering application, and is worthy of pursuit.
- As many states rely heavily on the use of uncoated weathering steel it is very important to accurately assess the performance of this material. Concerns about corrosion rate may force many bridge owners to take somewhat conservative measures. This research will provide a better understanding of weathering performance.
- Very high cost for relatively limited policy impact
- decrease budget to 500,000?. SCOBS #5 but this is a bridge maintenance concern
- I note that this is a very expensive project. While I also believe that such a study should be sponsored by industry to

show the benefit of their product, we as owners should be doing research to figure out the most appropriate places to use industry's product.

Research Advisory Committee

- This would be helpful to ITD. Understanding the chemical corrosion capabilities of weathering steel and when corrosion rates should be a concern would be beneficial.

- This project aims to determine the long term corrosion rate of weathering steels, particularly for weldments, bolt holes and expansion joints. Although these steels have 22 year exposure rates for flat panels, the complaint is that these are only approximations of long term conditions. The authors of this problem statement are not corrosion engineers. Actually weathering steels sustain higher increases in corrosion rate in the first 5-10 years, but then have a linear penetration rates in successive years. Pitting rates in these steels are known. Locations like bolt holes and weldments which pond water have corrosion rates similar to carbon steels, since no patina can develop. The other problem with this project is that the weathering steels of the past, such as A242, various compositions of A588, and other copper-bearing steels, are no longer produced. Values obtained from these bridges would not be applicable for new bridges, but could be useful if the compositions of the older bridges are known. Long term corrosion rates for A710 Grade B, HPS 50W and 70W, A606 Type 5 and other modern steels currently in production are not known. Accelerated tests are not always correlatable. This reviewer's opinion is that this project should be combined with 2019-D-03, whereby metallizing and paint systems would be applied to extend the life of weathering steels, rather than rely on weathering steel properties which vary with environment, composition, exposure and geometric details. These variables have been extensively described and quantized in ASTM G101.

Additionally, weathering steel highmast light towers may benefit from this work.

- Corrosion rates of weathering steel is an issue. MassDOT has already responded to these concerns by limiting the use of weathering steel, however having this information may result in our relaxing these limitations.

- Research is required to better predict corrosion rates for UWS bridges

- Although we like Weathering Steel, we are pleased with the guidance we have already.

- Weathering steel accounts for the vast majority of our new steel bridges.

- It's unlikely that TxDOT would change any design or construction practices based on the results of this research.

- Given our corrosive environment the knowledge gained from this research could provide us with some significant insight on these commonly used structures in Vermont

- Durability and corrosion of both steel and concrete bridges is a concern for VDOT. When it was first introduced, weathering steel was billed as the "one size fits all" solution for corrosion of steel bridges. This led to its use in environments in which it does not perform well, such as in areas with a high time of wetness. Its poor performance in such areas led some agencies to develop a negative opinion of its use. Weathering steel can, however, perform especially well in many applications. This dichotomy led FHWA to publish a Technical Advisory regarding the use of weathering steel. However, this Technical Advisory is relatively vague and lacks qualitative guidance about environments in which weathering steel can be successful. This research project would allow for a better understanding of the corrosion rates of weathering steel in various environments and could provide the background necessary for updating the FHWA Technical Advisory.

- WSDOT has 19 bridges built with unpainted weathering steel with the oldest one built in 1970 (Bridge 173/10 over the Col R near Brewster). WSDOT allows uncoated weathering steel in Eastern WA. This research would not likely affect our current policy.

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**Item #58: Design Guidelines For Alternative Lightweight Backfill
D-12 For Mechanically Stabilized Earth Walls**

	NR	0	1	2	3	4	5
(17) R&I				7	5	2	5
(46) RAC	1	1	1	10	15	8	9

Special Committee on Research and Innovation

- This would be an interesting project because it would validate or propose revisions to the way Florida already allows the use of some lightweight backfills in MSE walls. Having already implemented some of these components, this project is not considered urgent for FDOT.
- [Rating: 3] A worthwhile study, but not the most pressing need for advancement of MSE design.
- UDOT has many projects where lightweight fill may be needed to mitigate total and differential settlement. Design guidelines for the use of lightweight backfill with MSE walls is very needed as accelerated construction schedules and construction adjacent to existing facilities increase the need to use lightweight materials.
- already are using lightweight alternative backfill materials in Mechanically Stabilized Earth (MSE) walls where appropriate. To further develop this topic, the amount of long-term data required to make the results useful far exceed what is proposed, both in time and cost. I think the chances of success are low.
- These materials are not well understood for this application
- Has some but limited benefit for NH.

Research Advisory Committee

- Not recommended. Fundamentally, MSE wall design relies on the vertical (overburden) pressure to generate the pull-out resistance on each reinforcement which in term to hold the wall together. Using a lightweight backfill materials will significantly reduce this vertical pressure; thus, a much longer reinforcement is required (or much thicker wall is needed.) Therefore, the proposed research is not clear of its objective by mixing geofoam, flowable light weight concrete and light weight aggregates (such as cinder) as an single subject.
- N/C
- IDOT has been involved quite a bit with using lightweight concrete in MSE walls in the last 2-3 years. IDOT uses lightweight backfill in MSE walls and we are in need of better guidelines for their use and design.
- There sites where lightweight backfill for MSE walls would be very worthwhile. This is good research that will result in benefits in terms of ease of construction and lower costs.
- Interesting. With the increase of our design build program, contractors are often proposing MSE walls, especially over swamps and poor soils.
- Research is needed. As construction volumes increase it's becoming more difficult to obtain good quality backfill.
- To my knowledge this is not something that has been raised as a concern for Vtrans
- This is a timely and widespread issue with respect to both rehabilitation and expanding capacity of infrastructure that could minimize disruption and effort by providing guidance on the use lightweight alternatives to conventional fill material. This was the top-ranked RNS fro TRB's Geotechnical Engineering Section.
- While we have a mild interest in this proposal, we already are using lightweight alternative backfill materials in Mechanically Stabilized Earth (MSE) walls where appropriate. To further develop this topic, the amount of long-term data required to make the results useful far exceed what is proposed, both in time and cost. I think the chances of success are low.

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**Item #59: Deploying Transportation Security Practices in State
A-12 DOTs**

	NR	0	1	2	3	4	5
(17) R&I				4	6	5	4
(46) RAC	2		2	11	18	8	4

Special Committee on Research and Innovation

- Meaning of problem statement is not clear.
- [Rating: 1] Premature, given the status of ongoing, closely-related NCHRP research.
- Man-made/human delivered threats will rely greatly upon one mode of transportation or another: road, rail, air, maritime, pipeline. All DOT workers are potentially information liaisons to local intelligence fusion centers of their respective states, and as such law enforcement and the protection and prevention aspects of emergency management are greatly enhanced, especially when DOT personnel know how to interface with lateral public safety partners and understand the concepts behind Suspicious Activity Reporting (SAR).
- Just does not apply to our State that much.
- Probably some good information in the report but not sure how much we would use

Research Advisory Committee

- Transportation security practices has moved beyond simple confidentiality, integrity and availability considerations into a more complex maturity model. With the implementation of more advanced ITS systems, seamless integration and transportation as a service, security protections should keep pace with these advancements.
- Would support any initiative related to enhancing security measures, particularly related to cybersecurity. This provides resources and tools to follow up on security issues identified previously. This is typically a difficult issue if there are inadequate policies and procedures. Most staff don't understand how to address these issues without training or guidance.
- Important topic. But perhaps hard to prioritize over other things at this point.
- Good potential for enabling WSDOT to review security practices.

**Item #60: Command-Level Decision Making for Transportation
20-59(49) Emergency Managers**

	NR	0	1	2	3	4	5
(17) R&I				6	6	5	2
(46) RAC	3		1	10	14	9	8

Special Committee on Research and Innovation

- Add missile attached to DOT training & exercise scenarios. Recent experience in HI demonstrates that the need for this consideration is very real.
- [Rating: 4] The title should better reflect what this program is actually intended for – training. This is a free tool that provides for simulated exercises at no cost to the user, very few programs such as this are as specific to transportation which makes it a very valuable tool. An addition for consideration to provide a mechanism of outreach to gather metrics to determine actual usage by state DOTs, etc. would potentially enhance the effectiveness of this program.
- This would have to do with the National Incident Management System (NIMS) in order for transportation personnel to be totally integrated into an Incident Command System (ICS) and become part of the emergency management process for stakeholder agencies such as law enforcement and fire, whose officials already know how to operate under those auspices.
- Should be implementation funds, not research.

Research Advisory Committee

- Since the development and promoting of a sound decision making process during real events, especially with people

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retiring with decades of experience on a regular basis, is critical when responding to and recovering from any of the hazards that impact IDOT, we support this effort.

- This training resource is essential for highway operations/maintenance staff (especially at the field level) and it should be given the support needed.
- Title says "Transportation" but NCHRP report title says "Transit"
Believe NCEM should be consulted
Title says "Transportation" but NCHRP report title says "Transit"
- Recommended continuation of existing research by project panel and NCHRP program officer.
- This is an area where we have gaps...
- IM training is always beneficial but need to ensure that training is inter-agency. First Responders tell us that the biggest benefit is from meeting their counterparts in a non-emergency environment.
- The project is focused mainly on transit agencies and airports. There is limited utilization for WSDOT.

**Item #61: Strategic Plan Development for Improvement of
C-06 Roadside Safety Computer Simulation**

	NR	0	1	2	3	4	5
(17) R&I			1	3	8	3	4
(46) RAC	2	1	4	8	12	11	7

Special Committee on Research and Innovation

- While computer simulation has an important role in evaluating critical crash testing conditions and supplementing actual crash tests, shortcomings in tool capabilities might better be addressed by the industry that typically uses the software than the transportation agencies.
- Very pertinent to current and past issues with safety hardware and shortcomings of current crash test procedures.
- [Rating: 2] Based on the objective, it would seem to be more beneficial to have a strategic plan that looked at standardizing simulation efforts and model creation rather than prioritization of model improvements. This prioritization of improvements is already being looked at through the AFB20 meetings, and since 3 years ago there has been a ½ day workshop at TRB dedicated to this subject. We would also like to see more clarity in the expected outcome before we could support this.
- It is uncertain how much our designers would use this since it deals with wheel and tire behavior under crash loading, predicting accurate interaction between vehicles and roadside hardware, soil-post interaction for guardrail, soil-post interaction simulation of barriers on slopes and the influence of soil variation on barrier behavior and steel fracture. This would be very helpful, especially since states are now having to self certify by not running all the required tests.
- Improved computer simulation is a must in light of dwindling financial resources for crash testing.
- good project for lower cost
- Anything related to improving the crashworthiness of GR terminals seems of especial importance these days
- Info would be beneficial to those organizations doing the research.

Research Advisory Committee

- State uses TTI and other real world testing not software. Of little value to ADOT's current processes.
- N/C

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- This research should be done through the lens of the HSM so that its usefulness can be maximized.
- This could help with implementation of MASH
-
- Good idea - computer simulation could give answers for better roadside designs without having to physically crash test vehicles - time and money savings.
- Is development of a strategic plan enough? Should the project include modeling?
- The scope seems too broad to be useful.
- This is a low cost assessment of the need being driven by the changeover to the Manual for Assessing Safety Hardware(MASH).

**Item #62: Developing High Strength Corrosion Resistant Steel
D-02 Strands for Prestressing**

	NR	0	1	2	3	4	5
(17) R&I		1		2	7	7	2
(46) RAC	2	1	2	7	19	8	6

Special Committee on Research and Innovation

- Research has been conducted/implemented in a few states on the use of SS strand within concrete piling. However, further research in evaluating and developing design specifications for flexural/girder applications is needed. The research statement could likely be modified into more of a design guidance study rather than material development due to some recent preliminary efforts to evaluate the Duplex 2205. Further development of this corrosion resistant material will allow for increasing the service life and decreasing maintenance activities. The application is of interest to many states around the country.
- [Rating: 3] If funded, project should focus on design criteria for existing corrosion-resistant alloys.
- Corrosion continues to be the primary cause for deterioration in bridge components therefore it is very important to invest in corrosion resistance materials. The proposed research is an important step toward developing corrosion resistant prestressing strands that are used in bridge girders.
- Have used epoxy coated strands but see additional value in other types of strands
- I see the need, although it seems like industry would be developing this. I rate highly assuming industry is content, and it is up to owners to develop the product that we want to use.

Research Advisory Committee

- Coastal states have presented results at TRB for the use of 2205 duplex stainless steel for prestressing strands. There are a substantial number other high-tensile stainless steels that have high corrosion resistance in chlorides, but at somewhat greater expense, such as 2507, Zeron 100 and the 17-4 PH steels. It probably makes more sense to explore the chloride environments of prestressed deck panels and pilings in many other states where the continuous immersion in saline or ocean waters does not apply. Then the use of the PREN formula would apply in selecting the appropriate stainless steel. Presumably this research applies primarily to 7 wire strand, although strands with more than 7 wires could merit exploration. Lastly, comparison of the known longevity of epoxy-coated steel strand with that of bare stainless steel with respect to cost would be worthwhile for locations where chloride levels either fluctuate or are considerably less than in coastal locations.
- Corrosion of prestressing steel strands is a very serious problem that we are starting to see in Massachusetts. This will be of great benefit to MassDOT as well as the nation.
- A corrosion resistant steel strand would reduce maintenance costs and extend the bridge service life.

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- I see this mostly for post-tensioning applications. We don't see a lot corrosion issues in our prestress bridges.
- There has already been extensive research conducted in Virginia, Florida, and Georgia.
- Corrosion resistant prestress strands is something that Vermont is interested in exploring further.
- Industry is already producing a high strength corrosion resistant steel strand for prestressing. Industry is also working to improve this strand.
- We have used epoxy coated strands in the past, but interested in other corrosion resistant prestressing strands for coastal bridges.

**Item #63: Develop Guidelines for Estimating the Spatial
E-02 Variability of Scour around Bridge Foundations**

		NR	0	1	2	3	4	5
(17)	R&I			2	3	7	2	5
(46)	RAC	1		4	6	20	6	8

Special Committee on Research and Innovation

- Scour has and will continue to be an area that can be improved through research. This project proposes a spatial evaluation of scour across the bridge opening, which would help define (or identify) portions of the bridge that may be more of a concern as compared to the simple models currently used for scour assessments.
- [Rating: 4] Knowing the spatial variability of scour from experiments or field observations would help tremendously for calibration and validation of predictive models.
- This research could be useful for design of scour countermeasures.
- Spacial variability of scour is dependent upon site specific soil conditions.
- Scour calculations are typically over conservative and, in some cases, result in bridges rated as scour critical. Current practices apply the maximum scour depth across the entire pier. This study may reveal a more precise depth of scour along the length of the pier. We have seen a few bridges that have been partially scoured and/or partially undermined. This study may give better insight and guidance as to the criticality of such scour. It may allow structural analysis of the remaining capacity of the foundation to determine if the structure may become critically compromised during maximum scour event.
- Scour caused by typical high flow events is responsible for most sudden bridge failures. This appears to be well considered research to increase the understanding of the scour process.

Research Advisory Committee

- The described problem that this leads to overly conservative estimates is overly conservative for a reason - in the majority of waterways (at least in AZ) the channel geometry is not static. The conditions that exist today that could result in a decreased scour estimate based on the results of this study will not necessarily exist for the same channel in 10 years. It is safer to assume the maximum scour at all locations simply because during the lifetime of the structure the maximum scour, even using the data from the proposed study, could occur at any given location of the waterway. To reduce scour estimates based on a study like this could be dangerous - it is likely that bridge inspectors do not currently know any of the spatial variability factors, nor would they necessarily recognize when they have changed from one inspection to another.
- An improved understanding of scour variability would provide more accurate evaluations around bridge foundations.
- Agree with FHWA comments
- This topic should not be researched.
- Scour has been an issue for VDOT in the past, and presumably remains so. There have also been a number of small,

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older bridges that have been load-restricted because of the uncertainty of the foundation design and the effects of scour on that design. Improving the substructural capacity calculations could reduce the conservative nature of existing calculations and perhaps reduce the posting on some of Virginia's bridges. However, the budget for this project may not be sufficient to collect all of the desired information.

- Scour calculations are typically over conservative and, in some cases, result in bridges rated as scour critical. We (WSDOT, BPO) have 327 structures rated as scour critical. Local Programs have many more. Some of these may revert to a stable scour rating with a more refined method of calculating scour. Current practices apply the maximum scour depth across the entire pier. This study may reveal a more precise depth of scour along the length of the pier. We have seen a few bridges that have been partially scoured and/or partially undermined. This study may give better insight and guidance as to the criticality of such scour. It may allow structural analysis of the remaining capacity of the foundation to determine if the structure may become critically compromised during maximum scour event.

Item #64: Temporary Traffic Control at Driveways within a One-Lane, Two-Way Section
G-06

	NR	0	1	2	3	4	5
(17) R&I		1		4	5	7	2
(46) RAC	2	1	4	9	8	13	8

Special Committee on Research and Innovation

- Consistency with this type of application within work zones will be essential to effective implementation. The proposed research indicates that consistency would be established. The use of DADs provides the following benefits:
 - cost effective by reducing the need for a flagger
 - improved safety measure by reducing need for a flagger
 - valuable for wrong-way driving efforts/countermeasures
 - beneficial for increasing Smart Work Zone efforts
- [Rating: 3] It is not clear whether field evaluations will go through MUTCD experimental process. Real world field evaluations and documentation of findings will be critical for development of guidance and proposed language for MUTCD. There should be some coordination with recently approved NCHRP Project 03-132 "Guidelines for Safe and Efficient Temporary Traffic Control for Mobile Operations on Two-Lane Roadways".
- I see this device more useful in urban environments, where there are higher frequency of minor entrances as opposed to rural areas. I think that part of the development needs to be more sophistication in how the DAD units interact with each other and with the signals at either end of the one lane section. The goal should be to decrease wait times for vehicles at the driveways, which will decrease violations and improve traffic flow.
- Of the two work zone problem statements (see C-10), this issue was the lesser of the two in terms of need/probability of success.
- This project is long overdue and has a high chance of success (measured in producing results that can be quickly deployed). There are currently no cost-effective measures to notify traffic entering a highway during alternating one way traffic of the current direction of traffic flow. In many instances where the work zone segment is several miles long, this may not be self evident at driveways in the middle of the work zone. It is my understanding that the devices that are being evaluated have been developed by private sector manufacturers. It would be hoped that any recommended devices/applications be absolutely secured within the public domain, unlike the very effective RRFB's that have been taken out of the tool box.

Research Advisory Committee

- No Comments
- Great need in rural areas.
- For this design to be successful, empirical and human-factor studies should be conducted. It is not clear if those factors are considered in this study.
- We have considered the use of this measure. Other states have used it as well but almost all are doing so in their own

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unique manner. It would be good to develop a standard if possible, or, at a minimum, develop best practices.

- Addressing driveways within work zones is important. The driveway assistance devices (DAD) will be a great tool for work zones with T-intersections, business entrances, etc. We have been shown the technology and if possible would like to use it on a work zone. However, one drawback is this is usually a low speed approach with plenty of time for observation of the work zone and decision making for outbound vehicles, so issues do not arise as much as with the through traffic.
- Montana has many two lane highway miles - this would be good research.
- This research may have some relevance to and synergy with the ongoing development of ITS WZ standards.
- This has been of interest in VA, and VDOT has done a limited test. Consistency and guidance on usage is needed, but it also needs to be done so that it focuses on non-proprietary devcies. Right now, there are limited options in the marketplace.
This condition is a limited scenario. Maybe other funding options such as a pooled fund study are more appropriate.
- Of the two work zone problem statements (see C-10), this issue was the lesser of the two in terms of need/probability of success.

**Item #65: Operationalizing Accessibility Metrics to Support
B-04 Transportation Planning and Performance Management**

	NR	0	1	2	3	4	5
(17) R&I		1		4	7	4	3
(46) RAC	1	1	3	8	11	15	6

Special Committee on Research and Innovation

- [Rating: 4] Proposed research is needed to provide a better understanding of the state of practice in measuring and applying accessibility/connectivity measures to decision making.
- There is a lot of work going on in this topic area right now. UDOT has a research project looking into operationalizing accessibility measures.
- Little value to sparse rural areas, pertains more to large urban areas.
- Good project on accesibility metrics
- C on Planning #1, combine with A-13
- Accessibility metrics make our suite of performance measures so much more comprehensive, but to really utilize them to their fullest, we need this research on operationalizing them. MnDOT is the lead state for this proposal. This is the Committee on Planning's top ranking, and this is also supported by AASHTO's Committee on Performance-based Mgmt

Research Advisory Committee

- There is a danger in turning this into a synthesis report as well. An emphasis on implementation is critical. We strongly suggest that they avoid assuming that current best practices are enough to achieve outcomes.
- Mode neutral measures that we have been working toward. MnDOT Land Management supports this ps. Accessibility metrics make our suite of performance measures so much more comprehensive, but to really utilize them to their fullest, we need this research on operationalizing them. MPPM-MnDOT is the lead state for this proposal. This is the Committee on Planning's top ranking, and this is also supported by AASHTO's Committee on Performance-based Mgmt
- Information and tools developed through this project could be beneficial to transportation planners as they look at long-range needs at both the regional and statewide level.
- This topic is needed to provide a better understanding of the state of practice in measuring and applying accessibility measures to decision making.

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- this seems like a well written project that would build on a pooled fund study on accessibility that VDOT is funding. An explicit tie-in to the MAP-21 performance measures should be made if that is feasible (and Minnesota DOT has done good work in performance measures in the past so I think this is in good shape.
This is a logical next step now that we've gotten some experience developing accessibility metrics. The terminology issue (ADA accessibility vs. access to destinations) continues to confound. The cost seems a bit high.
- This is a much-needed project to evolve DOTs' understanding of and use of accessibility metrics

**Item #66: Impacts of Connected and Autonomous Vehicles on
F-01 Winter Maintenance**

	NR	0	1	2	3	4	5
(17) R&I			1	4	7	5	2
(46) RAC	1	1	3	8	13	12	7

Special Committee on Research and Innovation

- Assess within/against 20-102 roadmap and funded priorities.
- Good concept but seems premature. Need to first define how CV/AV will operate during winter conditions.
- Not certain how winter response for AV might differ from typical response.
- [Rating: 0] Closely related to F-03.
- Integration of this technology would help in improving UDOT's Snow and Ice Performance Measure. The aspect of how to use CV and AV as "probe vehicles" is something we are all interested in.
- This has been a focus with our WASHTO SCOM. Could have huge impacts to winter maint. Interesting to Traffic Mgmt.
- Suggest combining with F-03 (see notes in F-03). If not, fund F-03 first.
- 20-102
- Although the idea of what connected vehicles could provide the S&I in terms of road conditions has value, to determine what is needed by these vehicles is a bit backwards as they should be designed around what is available today. Currently there are a number of initiatives in progress, with I am sure more to come that will impact and provide answers. This part of the study seems premature at best

Research Advisory Committee

- There is concern on how CAVs will operate in winter conditions and this will impact State's winter maintenance programs.
- This project is important to the future MDSS EDC4 AID Demonstration project 170-3459 that CTDOT is working on
- Would this be more appropriate through the 20-102 series? Also, not sure the AV needs for winter maintenance are well known enough yet. But the CV side is interesting.
- Interesting possibilities with autonomous vehicles helping inform plowing operations of slippery roadway segments. Also for potential for appropriate plow following distance being an automated procedure, though this requires a very high level of autonomous operation given the poor weather conditions (technology has yet to achieve automation in inclement weather).
- This statement needs to be made consistent with F-03.
- This could have a major impact on our winter weather response over the next decade. However, pavement concerns are more important than winter weather concerns.
- combine with F-03

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- Interaction of CV/AV and winter weather and maintenance has not been addressed to any extent yet, but it needs to be.
- Possibly appropriate after F-03 below if not covered in the project.
- An interesting research topic not covered in 20-102. AVs struggle in snow, and this research could have near term implications.
- Suggest combining with F-03 (see notes in F-03). If not, fund F-03 first.

**Item #67: Assessing Practices for Right of Way Acquisition and
A-03 Reimbursement in Utility Relocations**

	NR	0	1	2	3	4	5
(17) R&I		1		6	4	4	4
(46) RAC	3	1	1	12	11	9	8

Special Committee on Research and Innovation

- Utilities have become more aggressive in their demands when relocation is required to the point that production schedules are at risk and costs to the transportation agency are rising. Any research that may stem this tide is welcomed.
- [Rating: 3] Emphasis should focus on the difference among states' definitions of utilities. However, it shouldn't be the sole objective.
- This research is beneficial to UDOT and other state transportation agencies because many states as well as utility companies do not have the authority to condemn for a utility easement needed for a highway project. In addition, there are disparate definitions of utility across the states that can create complexities when determining reimbursement rights and can lead to project delays or added project costs. The results of this study are intended to help expedite project execution by streamlining the acquisition process for utility easement replacement, therefore potentially saving time and money.
- This research project would be beneficial to states to help them move toward the most efficient system when easement purchase is required for utility relocation. The states that are not allowed to do efficient procurement of utility easements may be able to use this research to change the code or policy that limits their tools presently. The innovative practices and best practices would be utilized by many states. This research would have nationwide implications and be used by many states.
- state laws may dictate this issue
- This is a national problem. If there are ways to expedite Utility relocations they should be investigated. When a property is impacted by a project there is a need to communicate thoroughly with an owner. If multiple parties, for the same project, interact with an owner that can be difficult and confusing for an owner. By having the DOT participate with ROW discussions needed for a Utility this will be minimized. In addition this may streamline Utility relocations or as a minimal allow the Utility to start their work earlier than current practice may allow.

Research Advisory Committee

- IDOT just concluded a similar research project through ICT. The research essentially confirmed that the Department uses due diligence when coordinating utility relocation. Reimbursements would have been based on a benefit to cost which ICT has offered to develop as part II of the initial project. The department will not pursue that research at this time as reimbursement may require legislative action.
- Interesting, but we have always assumed the money would come and it has. This may be the future though.
- Appears to be an overall general study of utility relocation. I see nothing critical but could prove beneficial
- Currently, MDT handles r/w acquisition completely separate from utility relocations. Utility relocations needs to be considered earlier in design. The opportunity to see what other states are doing would be very beneficial.

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- Issues regarding this occur frequently
- This is important research.
- Important topic for all State DOTs but inherent differences may make success challenging.
- The reimbursement component of this problem is of lesser interest because reimbursement responsibilities are established under state law. For property acquisition, WSDOT sometimes takes the lead when a utility company is under easement and additional property must be acquired for relocation - otherwise, the utility is usually responsible for securing property rights required for relocation. Regardless of long-standing practices for property acquisition, WSDOT Utilities is open to more cooperative coordination for relocation options in the spirit of practical solutions/stakeholder engagement, and to identify opportunities for mutually beneficial solutions.

Item #68: Tactile Walking Surface Indicators To Aid Wayfinding G-05 For Visually Impaired Travelers In Multimodal Travel

	NR	0	1	2	3	4	5
(17) R&I		1		3	6	5	4
(46) RAC	1	1	5	6	19	9	4

Special Committee on Research and Innovation

- [Rating: 5] Research is needed. This project would be a major step forward in providing uniform tools that when applied consistently will provide critical information to visually-impaired travelers.
- Our biggest need in this area is a consistent, authoritative application of the standards we have, including updating and adopting the Accessibility Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG). This is useful and needed research, but not as high a priority as getting adopted rules for the standards we have.
- The results of this project would potentially influence standards to require/encourage use of detectable warnings to delineate paths in uncertain areas. This idea has merit in limited circumstances. Though this does not seem like it would be needed in most linear applications (crossing straight across a street at an identified crossing), it may be helpful in the locations cited where paths are uncertain and may be indirect. Some complicated intersections and other modal applications may benefit.
- Numerous large metropolitan areas use tactical walking surface indicators. This research would aid in developing national standards for tactile walking surface indicators (TWSI). This would allow for a more comprehensive and standard implementation of the ADA in the transportation industry. The results have a high probability of making a difference especially with the backing of interested organizations and DOTs. Also, if these techniques are being used in other countries there's a high probability of success in the work.
- TCRP providing match
- I have confidence in the project sponsors and persons developing the problem statement and note that this is a very real concern for persons with visual disabilities. I do have some concern that guidelines recommended through this type of research are often very difficult to implement within existing maintenance and capital improvement programs, often leading to legal action.

Research Advisory Committee

- N/C
- High priority.
- Good project. \$600,000 is too high. Recommend doubling TCRP contribution and doing full joint project (\$430K total).
- We're seeing more and more roundabouts, alternative intersections, shared streets, and sidewalk-level bike paths, but we don't have consistent guidance on how to provide consistent guidance for people with visual impairments. Assuming that the U.S. can't just adopt European practices and skip the research, we ought to initiate research to fill this gap, and this problem statement is well-written and comprehensive. This effort should be coordinated with the bike/ped pooled fund

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study that (I think) is looking at these tactile indicators. See the NCHRP note about funding (TCRP cost-sharing brings NCHRP funding request down to \$384k).

High cost project, possibly too broad in scope, since other funded projects are in progress (both FHWA and National Institute on Disability)

The problem statement presents a justifiable need for the research. Although TWSIs are extensively used in other countries, there still exists a need for standardization and consistency of application.

- Numerous large metropolitan areas use tactical walking surface indicators. This research would aid in developing national standards for tactile walking surface indicators (TWSI). This would allow for a more comprehensive and standard implementation of the ADA in the transportation industry. The results have a high probability of making a difference especially with the backing of interested organizations and DOTs. Also, if these techniques are being used in other countries there's a high probability of success in the work.

Item #69: Initiating the Systems Engineering Process for Rural B-03 Connected Vehicle Corridors

	NR	0	1	2	3	4	5
(17) R&I		1	1	3	7	5	2
(46) RAC	2	1	5	5	11	13	8

Special Committee on Research and Innovation

- Too early to say that "earlier studies focused on urban areas" because not many studies exist in urban or rural areas. The stated objectives are appropriate for both urban and rural areas it is unclear why this needs to be only for rural areas. As is, budget is high.
- If approved, the project should encompass AV.
- [Rating: 0] Recommend the proposal be considered for funding as a part of NCHRP Project 20-102 ranking and selection process.
- A rural connected vehicle concept of operations makes sense. We don't know of anything like that available today.
- The rural corridor aspect is critical for rural states to be able to start planning for the future of autonomous vehicles. As noted in the problem statement most of the research to date has been focused on the urban areas and with the rapid advancements in the CAV arena, the rural areas need to be focused on.
- This isn't terribly useful as we've already done this.
- Would like to see this project move towards application aspects, rather than a system engineering process.
- Include in 20-102 roadmap. : very high priority research topic, especially for rural areas with connectivity issues. I scored it a 4 instead of 5 because although it's really important (we get questions about this ALL the time), CAV technology hasn't been perfected in urban settings or on urban freeways yet either, and I think that when a lot of the urban issues are sorted out, a lot of the rural issues could be addressed at the same time.

Research Advisory Committee

- Connected vehicle corridors are becoming more important to identify and the rural areas of the state need to understand how to evaluate and assess routes.
- DDOT has no rural areas, so not a pressing need for us.
- This is an important project on a national scale, but particularly relevant to Idaho and other rural states. Connected Vehicle (CV) capability will ensure truckers have vital decision making information at the earliest possible point thereby increasing their overall efficiency.
- This technology is worth monitoring. It is a worthy project, but IDOT believes that 20-102 should be a higher priority.
- More research and development in rural areas is needed.

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- Is this just to continue funding for North/West Pasasage Pooled Fund? JH-Northwest Passage pooled fund project vetted the idea & supports. Concepts formed from this work should aid corridor states to determining future projects.
- Helps us anticipate the needs of connected vehicles on rural freeway corridors. However, automakers will drive infrastructure needs.
- This problem statement provides excellent insights into how multi-jurisdictional collaboration and coordination in managing traffic could be enabled by connected vehicle technologies.
- CV Deployment on rural corridors is very low priority, and may become irrelevant with increased 4G/5G access.
- Submitted by North/West Passage Pooled Fund Study, including WSDOT. WSDOT would like to see something more applied, with specific outcomes, rather than a systems engineering process.

Item #70: Use of Fibers in Asphalt Concrete to Enhance Material D-20 Performance

	NR	0	1	2	3	4	5
(17) R&I		1		3	9	2	4
(46) RAC	1	1	3	9	17	6	8

Special Committee on Research and Innovation

- Although there continues to be a constant effort to improve the performance of asphalt pavements in Florida (modification of the asphalt binder is one approach, for instance), cracking still remains its primary mode of failure. Use of fibers is gaining attention for its potential to improve performance. A national effort, such as the one being proposed, is needed to comprehensively investigate this potential. Also, the performance gains of fiber reinforcement of asphalt mixtures need to be quantified. The research should include performance comparisons with polymer modified mixtures and performance studies of mixtures with polymer modification and fiber reinforcement.
- [Rating: 1] Given declining use of fibers and past performance history, not a high priority.
- Research in this area would be helpful, but the scope of this proposal with the money involved doesn't attack the issue which is gathering/developing tests to assess the fibers' impact on mix performance.
- As noted by the reviewers, evaluation of the performance of fibers in field is what is needed. Iowa has a very high percentage of HMA overlays on jointed concrete and cracking and spalling at the joint is the predominate failure mode of these overlays. The state has conducted several field research projects in an attempt to delay the failure.
- Guidance and research is needed to validate the used of products to enhance fatigue resistance.
- Increase budget
- While it is a valid approach, adding fibers may be addressing the symptom, rather than the problem source (the degrading quality of asphalt binder).

Research Advisory Committee

- N/C
- Cracking of asphalt mixtures is a problem. However, research has been performed both in Idaho and nationally. The research performed in Idaho showed no benefit from the addition of small quantites of reinforcing fiber.
- If these fibers work even somewhat as well as promised, then they could save the Department millions of dollars. Our best mix to combat joint reflective cracking (when asphalt cracks because the concrete slabs underneath are moving) is gap-graded asphalt. However, that is more expensive than regular dense-graded Superpave by about \$30/ton. And, there are limited areas that gap-graded can be placed because of constructability issues. We understand that fibers add about \$5 to \$10 per ton to the cost of asphalt. If the fibers in dense-graded mixes can provide joint-reflective performance that is comparable to gap-graded mixes, then we can extend the life of many of our pavements in a cost-effective manner. Joint reflective cracking is the primary reason we resurfacing composite pavements (asphalt over concrete), and

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composite pavements make up about 40% of our network.

- -This seems like the "fad of the day", and I don't see fibers in bituminous mixes gaining widespread use.
- Feedback has been positive and if it could improve the mix then millions of dollars could be saved.
- This is a new technology to Montana that we are considering using so the research would be useful.
- Fibers appear to be one viable alternative to premature cracking of asphalt mixtures, although there is a lack of research directly addressing fibers for reinforcement, along with specifications or guidance for such usage. This project is proposed to address this need, and provide implementable outcomes in the form of guidance documents and specifications that can facilitate adoption.
- Guidance and research is needed to validate the used of products to enhance fatigue resistance.

**Item #71: Guideline for Decision Making for Repair vs.
F-04 Replacement of Highway Maintenance Equipment**

	NR	0	1	2	3	4	5
(17) R&I		1	1	3	7	4	3
(46) RAC	2	2	4	6	10	14	7

Special Committee on Research and Innovation

- There is other research that this builds on. This is becoming less important as the size of our fleet decreases.
- Seems timely with respect to FHWA TAMP requirements.
- Regulated by statewide policy and budget.
- [Rating: 3] An important issue that has been at least partially addressed by past work (see <http://www.dot.state.mn.us/research/TS/2015/201516.pdf>)
- UDOT has currently studied this topic and has a current plan.
- Corrosion study (D-06) is more important to Fleet Operations.
- comm on maint #1
- This is the #1 struggle amongst fleet managers and formal guidelines do not exist. This would also be helpful to defend replacement budget requests.

Research Advisory Committee

- Would be a good guideline for use in fleet maintenance. Budgets can dictate replacement or repair.
- This study would tie in with IDOT's I-55 managed lane project. The Tollway may benefit from it as well.
- LA DOTD could benefit from development of methodology and/or electronic tool for repair vs. replace decisions given the current age and condition of its fleet along with the inadequate level of funding for annual equipment acquisition.
- Fleet funding represents a large component to a DOT's overall budget. This problem statement addresses the issues of spending valuable resources repairing a unit vs buying a new or refurbishing a unit where cost effective vs. purchasing a new one. SL-Important effort as transportation agencies have significant funds tied up in existing fleet. Better decision making of repairs and life cycle will optimize resources. BD-40% of Metro Maintenance's equipment is beyond life cycle.
- The proper salvage age for equipment is critical in making decisions and defending those decisions.
- Statement writer must be aware of NCHRP 13-04, now complete. If that didn't address the need, not much reason to expect that another project will address it.

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- Corrosion study (D-06) is more important to Fleet Operations.

**Item #72: Watershed Approach to Mitigating Hydrologic Impacts
B-20 of Highway Projects**

	NR	0	1	2	3	4	5
(17) R&I		1	1	3	7	3	4
(46) RAC	1	2	3	9	13	10	7

Special Committee on Research and Innovation

- This research statement has a lot of merit, but the real hurdle to overcome is how receptive the Local Municipalities will be to watershed improvements. The Florida DOT is currently working on these types of projects out of need, due to the amount of growth our State is experiencing. The hardship for FDOT is the timing of projects and the support / endorsement of the Water Management Districts to grant permits for future work that is intended as compensatory mitigation for present work. Active partnerships with other stakeholders is really the key for this watershed design strategy.
- Very high priority; relevant to 404, Buffers, Section 7, MS 4, etc.
- [Rating: 0] Proposed approach is impractical, as evaluating watersheds will add additional requirements and require additional resources not available to projects and programs.
- Most highway project changes to a basin are small and would have negligible adverse "hydromodification" impacts to runoff volume.
- There is little guidance on watershed size approach to the hydrologic impacts on highway infrastructure. With more and more need to evaluate resilient infrastructure, the missing link is data. Precipitation on a water-shed base level would help minimize the conservancy on project specific feasibility studies.
- Comm on ENV & SUS #1
- NH would benefit but should not lead the way.

Research Advisory Committee

- CT is already largely developed as is our infrastructure. This is more of an issue in States where development is growing quickly
- This research will be useful if it comes with a practical aspect regarding percentage of infiltration vs land use and frequency
- Often times, on-site BMPs are located due to project vicinity and may not be the most applicable (or natural) as the research question indicates. A watershed approach could ultimately be the most cost effective and applicable to mitigation strategies for projects increasing impervious area, affecting wetlands, etc.
- High need
- This research could give us alternative BMPs to mitigate storm water runoff. Could be important in light of our recent consent decree.
- We could see some beneficial products
 - We could support the One Water approach NCDOT is currently developing
- J Armstrong panel member interest
- This was the highest ranked problem statement of the six submitted by SCOE. It should have benefit to VDOT, both for Environmental and L&D.

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- There is little guidance on watershed size approach to the hydrologic impacts on highway infrastructure. With more and more need to evaluate resilient infrastructure, the missing link is data. Precipitation on a water-shed base level would help minimize the conservancy on project specific feasibility studies.

**Item #73: Highway Network Alternatives to Determining High
C-15 Stress Pavement Safety Hotspots**

	NR	0	1	2	3	4	5
(17) R&I			2	4	4	4	5
(46) RAC	1	1	4	13	14	6	6

Special Committee on Research and Innovation

- The proposed effort has the potential to provide for a comprehensive and integrated approach to pavement performance data collection and analysis to identify areas of safety concerns. If successful, the ultimate result would be a data-driven approach for selecting the most appropriate remedial actions for reducing roadway departures and fatalities.
- [Rating: 4] A worthwhile project as it addresses safety and looks at various issues with friction data collection. If funded, this NCHRP project should also coordinate with FHWA's ongoing continuous friction measurement effort.
- This research would be great to help determine the value that pavement texture data could add to the pavement friction hot spots for skid resistance tests.
- Pavement friction testing with the locked wheel friction unit is a generalized statistical sampling of the roadway surface friction characteristics. It is conducted at an interval that does not allow location of specific trouble areas unless tested randomly by chance. It is relatively cost inefficient compared to comprehensive, complete coverage provided by video/laser scan evaluation. I feel there is value to be gained by developing a system-wide pavement friction evaluation process.
- There is a need to better understand friction management test methods and relationship to safety
- Low priority of NH as we don't collect friction data or macro texture data with our data collection vehicle. We also do not have the staff to collect and process the data.

Research Advisory Committee

- N/C
- If we could use the laser information we already collect to replace equipment that would be a cost savings, time savings, and give us more complete information. Idaho currently collects 1/2 the state friction data every other year. Idaho also operates our own profiler van. We welcome the opportunity to share data and assist.
- Methodologies to identify locations of friction "hot spots" on the roadway would be of value for correlating with high crash locations to determine if application of skid resistant surface treatments would be the appropriate countermeasure. This research project seems to focus on IDOT's Bureau of Research. Once physical conditions are determined, IDOT's Bureau of Safety Programs and Engineering could use such information in evaluating potential locations for appropriate counter measure implementation.
- Missouri is already spot checking but project may be worthwhile. The research would allow us to better target pavement friction issues to reduce runoff road crashes. Unsure if outcome would provide data of most use to our state.
- This can be a valuable project to help identify projects for safety improvement due to lack of micro- or macro-texture.
- This project would definitely benefit WSDOT, as we need to improve our Friction Management Program (as required by FHWA). Better understanding of which pavement test methods are most valuable related to determining friction safety levels is likely of interest to other states as well.

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**Item #74: Deterioration Rates and Unit Costs for Geotechnical
E-06 Assets**

	NR	0	1	2	3	4	5
(17) R&I		1		5	6	4	3
(46) RAC	4	3		10	12	11	5

Special Committee on Research and Innovation

- I am a member of the Geotechnical Project is a needed complement to the Geotechnical Asset Management (GAM)guidelines project. Once the GAM Guidelines are complete, GAM requirements will be pushed by an FHWA initiative. The results of this project would facilitate our compliance with that initiative.
- [Rating: 5] Addresses an important gap in the management of geotechnical assets.
- Additional tools such as deterioration rates and costs for Geotechnical Assets would be helpful as we move forward in our efforts to develop a Geotechnical Asset Management system at UDOT. We agree with the study's initial focus on retaining walls, embankments, and unstable slopes.
- Good topic area related to asset management. Cost data would be helpful. Deterioation and cost mosdels for these models will be helpful in LLCA
- Assets we could use more information on.

Research Advisory Committee

- Not recommended. Lack of implementation plan make this proposed research lost its focus--how to get there from where we are today is missing.
- This Geotechnical Asset Management needs more than just the Geotechnical Engineers in IDOT to address. Things like retaining wall tracking, etc.
- These assets are a threat to our asset management plans but they rarely require the expenditure of resources. However, it would be nice to know how long the assets are lasting out in the field.
- This research would be very useful as we look at more efficient and proactive ways to manage our Geotechnical Assets.
- This NCHRP and TRB Committee do not have a supporting committee in AASHTO, so it's important that a DOT supports it.
- This is a site-specific issue so a national study could be difficult.
- This would be great. A lot of talk at TRB about this. We have aging geotechnical assets, with very little information on service life and best practice for evaluating need for replacement or rehabilitation
- This proposal has potential for improving the state of the practice in geotechnical asset management. This is a critical area in need of NCHRP study since it is often overlooked by agencies until an individual geotechnical asset becomes a liability.
- With regard to geotechnical asset management, I could get behind this one, but I'd have concerns that the effort to quantify costs associated with asset deterioration and repair will be somewhat location or region dependent. On the other hand, some cost data is better than no cost data. So I am in favor of supporting this one. Using our own data, we already have a good start on costs for mitigating our unstable slopes and our constructed geotechnical assets. We have not yet developed a so-called cost model. This research would help us develop deterioration and cost models for these asset types, which would help us in our life cycle cost analyses. We should support this research.

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Item #75: Statistical Inspection Procedures for Transportation D-18 Projects

	NR	0	1	2	3	4	5
(17) R&I		1	1	5	5	5	2
(46) RAC	3	1	3	9	9	14	6

Special Committee on Research and Innovation

- This project is similar but not as well defined as D-09. Both methods should be evaluated, so not sure if the two projects could be combined into one project.
- Could potentially be expanded to other areas such as pavement data collection QA.
- [Rating: 1] Potentially duplicative of ongoing research.
- This would be helpful in bringing more consistency to the construction inspection process.
- The FHWA reviewer had some good points. One being experienced inspectors and engineers knew where the risks were and where and when to inspect. With fewer inspectors and engineers and even fewer experienced inspectors and engineers, some guidance would be beneficial. In addition, where consultant inspection is being used, additional guidance would be good to include in the contract documents.
- This research has the potential to add value to State DOT's current inspection programs outside the materials acceptance program currently being statistically evaluated.
- Project will improve the use of inspection data through use of statistical tools to measure specification conformance where applicable.
- Workmanship issues are not controlled/measured to the same degree as material quality. Attention to this area is overdue.

Research Advisory Committee

- This appears to overlap with D-09 it appears they could be combined
- This research speaks directly to the concerns of the asphalt paving industry. The research could lead to contracting techniques that lower risk to contracts, which in turn means better prices for the department.
- Current QA manuals already address a broad range of workmanship issues.
- "This should be combined with D-09.

This is very important to us. The main deliverable would be a guide document which would be very useful."

- I think there is room for and potential value in this topic. Greatest challenge might lie in developing a sufficient no. of inspection points that can be statistically tested to make the project worthwhile. Perhaps ones associated with high-dollar post-project claims, if any?
- This research has the potential to add value to State DOT's current inspection programs outside the materials acceptance program currently being statistically evaluated.

Item #76: Managing Utility Facilities Taken Out of Service (OOS) A-04 within Public Right of Way

	NR	0	1	2	3	4	5
(17) R&I		1	1	3	7	3	4
(46) RAC	4	1	5	10	10	8	7

Special Committee on Research and Innovation

- [Rating: 3] This study supports FHWA 18/19 SIP SO3 and National Initiative 4.4 to promote pre-construction utility coordination best practices that minimize utility relocation construction costs increases and project delays.

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- This research directly aligns with UDOT's plan to collect and store 3D spatial locations for all utilities within its ROW. During project design, subsurface utility engineering will be employed to identify all in-service and out of service facilities within a project footprint. These features and attributes will be entered into the repository for use by designers as well as construction crews.
- This project doesn't seem to be too necessary. Every state's process is so different and each has a way to deal with it presently. They may have trouble dealing with it but having a major study done to come up with a list of best practices doesn't seem justified. Coming up with the best practices is a great idea but a smaller project could do that with surveys and some technical committee assistance.
- Conflict issues with abandoned utilities are not frequent, but can be (and have been) significant contributors to project delay due to uncertainty of status and ownership.
- Comm on ROW #1 priority

Research Advisory Committee

- Not aware of this being an issue here
- Should be useful especially with the "abandoned" utility corridors that exist.
- This topic is becoming a bigger issue in MT as MDT is looking at potentially allowing more utility facilities within the r/w.
- Research is needed to enhance current methodologies for managing OOS utility facilities.
- Conflict issues with abandoned utilities are not frequent, but can be (and have been) significant contributors to project delay due to uncertainty of status and ownership.

**Item #77: A New Tool Assessing the Value of Resiliency
A-10 Alternatives by State DOTs**

	NR	0	1	2	3	4	5
(17) R&I		1	1	1	10	5	1
(46) RAC		1	2	7	23	7	5

Special Committee on Research and Innovation

- Resiliency, risk assessment research, and development of tools/concepts are already being done through the Department of Homeland Security. Challenge is new "tools" or tool revisions that come out annually and, despite the science, are still subjective.
- Great concept worth pursuing. Need to recognize the difficulty in costing mitigation options since each treatment is often site specific and unique.
- [Rating: 3] If this project is ultimately funded, it would be important to consider the full transportation life-cycle, including Operations and Maintenance, not just infrastructure (it's silent on this topic). It is unclear what form of tool/application is envisioned, but a web-based tool would have a limited shelf-life since there would need to be funding to host the software.
- Under NIMS/ICS this type of coordination happens during mitigation and protection and prevention phases. Local jurisdictions should always seek input from DOTs on techniques and strategies to improve community resilience. This also prevents over spending and can coordinate efforts so DOTs and locals can possibly share costs.
- Overall I think the concept is good. One major concern is the scope of this research, particularly the inclusion of the development of "Public Value Model" of infrastructure. TRB has had a special task force focused on the complex question of asset valuation, and there have been many other efforts as well. Suggest focusing the project on the relative value of project alternatives, to make things simpler. Also the points about MAU and AHP were not clear.
- We prefer this one to the A-14, however it would not change how we do business

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- Risk is an important consideration in risk based projects
- Incorporating public value is a good concept and one that needs more research. It will be difficult to implement and to create local/statewide figures for that value approach.

Research Advisory Committee

- There is a need for better understanding how resiliency can add or detract from a project. Additional upside resiliency, however, can become expensive and there is no guarantee the benefits will be fully captured especially under tight budget conditions. This would be nice to have but is by no means urgently needed.
- This research is too broad to be of much help to MoDOT but It is important to explore the risks to financial stability of DOTs.
- Important to resourcing decisions
- Multiple staff think important.
- Compare Statement A-14, which asks similar questions from a system user's point of view. Resiliency is an important goal, and a presently hot topic. Defined tasks in this RNS, however, don't focus on resiliency. Concept of a "common measure of public value" calls for advances in performance measurement and project prioritization that one project -- even a \$500K project -- can't be expected to make.
- Good potential for enabling WSDOT to make risk based decisions regarding resiliency projects. This would help to enhance our risk model by incorporating positive potential outcomes of risk acceptance and risk tolerance.

Item #78: Determination of the Impacts of Connected and D-16 Automated Vehicles (CAV) on Pavement Design, Rehabilitation, and Materials Selection

	NR	0	1	2	3	4	5
(17) R&I		1	1	3	7	4	3
(46) RAC	2	2	5	5	17	8	6

Special Committee on Research and Innovation

- Advancements in remote sensing, mapping, and connectivity technologies are placing the implementation predictions of connected vehicles including platoons of heavy trucks in the here and now. As a result, for instance, the wheel loading will be likely channelized and, due to the closer spacing between the vehicles, the asphalt pavement recovery time between applied axle loadings will be shorter. This will certainly impact the materials selection and the structural designs of our roadway infrastructure. Consequently, there is a need for a comprehensive national research effort on the implications on both materials selection and design of pavement structures.
- [Rating: 4] A timely topic and findings from this effort will help inform agencies to be strategic and proactive in pavement design, rehab and construction decisions moving forward as CAV share gradually increases in the network of pavements.
- This will get the process started of evaluating the impact of CAV on pavements.
- Important topic due to the number of unknown factors that may impact pavement performance/design due to CAVs. Tasks 3,4 refer to reviewing impacts, but clearly analysis is needed to really understand the significance of an impact. I assume that those tasks aren't limited to merely identifying impacts of CAVs. The problem statement only refers to identifying impacts to AASHTO 1993 procedure, I feel that without including Pavement ME the benefit of the research is limited.
- I view this as a high risk, but needs to be combined with C-19. Valuable Project
- CAV technology continues to advance faster than the known impacts to Pavement Design, Rehabilitation and Materials Selection. As an example, wheel wander with CAV is minimal to nonexistent compared to current pavement design practice. The result is that pavements will fatigue at a much faster rate. This research is needed.

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- Agencies will need to understand how CAVs will impact pavement design decisions. NCHRP 20-102
- Low priority. Don't see the need at this point.

Research Advisory Committee

- Check for overlap with 20-102 (as noted in lit review). The lit review on uptake of CAV should be more closely related to the scope.
- This is going to be the future and IDOT needs to stay on top of it so that we are not playing catch-up down the road.
- I'm uncertain about the importance of this research.
- CAV technology continues to advance faster than the known impacts to Pavement Design, Rehabilitation and Materials Selection. As an example, wheel wander with CAV is minimal to nonexistent compared to current pavement design practice. The result is that pavements will fatigue at a much faster rate. This research is needed.

**Item #79: Structural Design and Analysis of Post-Tensioned
D-10 Concrete Structures with Flexible Fillers**

	NR	0	1	2	3	4	5
(17) R&I		1	1	2	8	3	4
(46) RAC	1	1	3	9	22	6	3

Special Committee on Research and Innovation

- Florida has already moved towards use of flexible fillers for post-tensioning. As the technology gains interest there will continue to be a need to better understand and optimize unbonded systems that are utilized with bonded systems. This research will allow for enhanced design guidance such that these unbonded and unbonded/bonded systems can be more efficiently designed. The research funding could be light given the effort within the scope.
- [Rating: 4] An important study. If selected, the project panel should consider narrowing scope.
- This research may result in significant durability enhancement of post tensioned structures.
- The current alkali-silica reaction (ASR) testing regime utilizes ASTM test standards that can produce conservative results and could be requiring mitigation for ASR that is not needed, so having more accurate testing would be beneficial.
- NH does not use much post-tensioning & its use is limited to locations where strand contributes to serviceability. This research addresses a topic with little impact to us.

Research Advisory Committee

- IDOT has very few post-tensioned structures. The research is of interest, but would be useful for only a handful of structures.
- While there may be a national need, Massachusetts builds very few of these structures.
- Good for PT structures where future access to the strands is desired with higher durability than simply unbonded strands. We explored this option for use on the High bridge in St. Paul. More research is needed, especially for cold weather applications.
- Analysis and experimentation could extend service life and enhance structural systems.
- The better question would be to figure out how to make grout work better rather than just throwing it out.
- Not interested
- Flexible fillers is of some importance by the industry, and could be used for internal and external post-tensioning. This is one of the research proposals by AFF30 from Florida. Some interest from WA but not 5.

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**Item #80: Submittal and Review Process of Roadside Safety
C-18 Products for Inclusion on State DOT Qualified Products
 Lists (QPL)**

	NR	0	1	2	3	4	5
(17) R&I			4	3	4	5	3
(46) RAC	1	1	8	6	7	17	5

Special Committee on Research and Innovation

- Very important issue needing some sort of resolution. QPL not likely the path. Some sort of solution such as a NTPEP would be more likely.
- [Rating: 2] Recommend this be reclassified as a Synthesis. The method for State's deciding to include a product on their QPL is specific to each state that has a QPL. If it remains, we recommend removing the reference to QPLs from the problem statement and that Part III include the role of functional or performance specifications for certain installations where multiple products may satisfy the roadside safety requirement.
- This is very much needed to meet FHWA Mash requirements by 2020.
- We are developing a process of our own for roadside appurtenances.
- It will be a difficult process to get all 50 states into one standard process. This project appears to mostly be documenting the differences in the different DOTs.
- Start with NCHRP synthesis
- Standardization of review and testing evaluation for safety products would be a great benefit, especially for smaller states with more limited budgets and staff. The benefits parallel those of NTPEP and similar programs, which allow the evaluation of trusted data generated by others.

Research Advisory Committee

- N/C
- 24 month study is too late for MASH implementation.
- IDOT's Bureau of Safety Programs and Engineering understands the issues related to various DOT procedures for getting products reviewed and placed on QPLs/APLs. If there was more consistency across DOTs, manufacturers' cost and levels of effort could be reduced; however, it may be aspirational to think that even 50% of DOTs could agree to the same process.
- This is also a very important project since FHWA is now requiring states to do more approvals on highway safety hardware and not depend on FHWA products reviews and FHWA issuing hardware eligibility letters. This issues is that each state may have a different process instead of one entity(FHWA) providing reviews. This will cause problems in the future.
- Low cost and could be beneficial to how QPLs are managed by the various DOTs
- This problem statement is very important to safety for State DOTs. An element that is missing from this problem statement is the need for an overarching organization to review the MASH testing and confirm not only the MASH testing is complete but also determine whether the testing met MASH, also to determine whether a retest of MASH is warranted after a modification of the product. This will be important for the states because as written it is possible to have 50 different interpretations of the MASH results. We do like the research objectives to streamline the process and share best practices, policies, forms and experience of State DOTs. The funding seems low for the many different types of products that are being included.
- There is a definite need for this problem statement.
- VT is interested in this topic, but sensitive that a couple of the reviewers suggest that this is better as a synthesis project.

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- There is a need but this is atypical for NCHRP. Consider as a special study or synthesis?
- It will be a difficult process to get all 50 states into one standard process. This project appears to mostly be documenting the differences in the different DOTs.

**Item #81: Managing Speed: Self-Enforcing Roadways for Two
C-01 Lane Rural Highways**

	NR	0	1	2	3	4	5
(17) R&I		1	1	3	4	5	5
(46) RAC	2	4	4	12	11	9	3

Special Committee on Research and Innovation

- This is very important research and is directly related to recent discussions on speed. The outcome of this research could help with future changes in the FDOT Design Manual.
- [Rating: 5] This effort has great potential for improving highway design and supports the Road to Zero.
- Reduction of fatalities on rural roads nationally and in Utah, by refining geometric design, is a very high need that should be addressed.
- For rural 2-lane highways, speed management is not an issue that should be addressed by minimizing the design criteria. The speed limits are typically set by statute and not determined by the transportation agency. On roadways that have safety concerns, they can be evaluated individually and modifications made to improve the safety performance.
- This is a major issue and any insights would be valuable
- This would be a particularly relevant project in light of the recent NTSB "Reducing Speeding-Related Crashes Involving Passenger Vehicles" report (July, 2017); however, given that implementing any recommended changes will occur long after Connected/Autonomous Vehicles are deployed, there should be some discussion of how geometric features would be recognized by AV technology.

Research Advisory Committee

- Legislation for technology based enforcement in rural areas has not been approved in Illinois. Looking at current experience in states where this has been approved makes more sense that researching something that is not likely to be approved by the legislature or accepted by the public.
- This project has poor implementation potential, notwithstanding that it would be extremely controversial.
- Can some of this be incorporated into C21 and that while this is highly skewed to re-examine the standards in the Green Book, there are safety implications and these should be considered as well.
- From a CSS and complete streets PBPD perspective, a high need. Participating in NCHRP 17-76 on Speed limits. I have just reviewed their interim report, which included extensive research on available data used in speed evaluation. There is very limited available data sets that include any geometric design information. I think it would be premature to initiate this research. The concept of self regulation based on design may not be correct.
- This approach is contrary to our vision, mission, and goals.
- Interesting idea but way too much money/time. The big ask and 3 year period is not explained.
- This problem statement gets at some underlying assumptions in the Green Book and examines driver speed choice as a function of geometric elements. The project currently contains field, crash, and simulator studies, and the scope is extremely broad. While this is a good research topic, I would feel much more comfortable with breaking this into a series of smaller projects rather than issuing a \$900k RFP.
- This work will be very helpful and is needed to advance CSS design. Although this is an expensive project it will involve application of a range of different methods which is needed. There are smaller projects underway under other authorities

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and jurisdictions but this one looks to be comprehensive, and includes simulator work which is unique and may bring this question closer to a conclusion that the retrospective studies.

Item #82: Protecting Bridge Approaches during Flooding Events E-04

	NR	0	1	2	3	4	5
(17) R&I		1	3	1	8	4	2
(46) RAC	2	1	6	5	15	9	7

Special Committee on Research and Innovation

- Suggest synthesis to better understand the problem before moving toward and full NCHRP. There are several potential solutions or issues related to this statement. Are the known approach failures utilizing current design and hydraulic assessments? This may be a problem but it is unclear that the proposed research approach will solve the problem.
- [Rating: 0] Problem statement is duplicative and varies with accepted research and practice.
- This is a good research project with application for bridges in Utah as well as nationwide.
- Providing research to protect bridge approaches during flood events is needed.
- The results of this study may be used to improve current bridge design in scour prone areas
- While erosion of the bridge approach is a problem, it is not as urgent as scour of piers (E-02),

Research Advisory Committee

- Usually Idaho's bridges are founded on deep foundations, failure of the approach road way during flooding is concerning. We saw these type of issues during the 2017 flooding so it would benefit ITD.
- Methods and designs that provide protection for bridge approaches will extend the service life and be cost effective.
- We have had millions of dollars in flood damage to our bridge approaches and abutments over the last four years. Protection methods and guidance would be very beneficial and applicable to MoDOT.
- In overtopping conditions, preference is for the approach to be washed out before a bridge. So other than designing a failure keyway, this research is counter to preference. Problem statement mentions bridge as much as approaches. Better solution may be to prioritize corridors, and then protect bridge and approaches on key corridors.

Agree with FHWA comments

- This research has a high payoff potential if successful.
- Not aware of wash-outs being a significant problem in Virginia, but the problem could grow as the effects of climate change become more prevalent.
- WSDOT has over 300 bridges that have been classified "Scour Critical". The results from this research may be useful to improve current bridge design in scour prone areas.

Item #83: Streamlining Data Collection and Analysis for Project B-19 Level Air Quality Modeling

	NR	0	1	2	3	4	5
(17) R&I				8	5	3	3
(46) RAC	1		3	15	14	8	4

Special Committee on Research and Innovation

- [Rating: 3] The NCHRP Web Document 210 cited in the Literature Search Summary already has compiled several sensitivity analyses for MOVES inputs that help State DOTs decide where to direct their resources in terms of developing MOVES inputs from local data. However, dispersion model inputs were not covered by that study and it may be beneficial for this study to explore those to help State DOTs direct their resources for developing inputs for PM hotspot analyses.

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- Recommend that the research focus on mobile sources air toxics and particulate matter versus CO
- This proposal involves determining which air quality model inputs contribute the most heavily to demonstrating project level regulatory compliance as it relates to particulate matter (PM), mobile source air toxics (MSATs) and, if budget allows, carbon monoxide (CO). The results of this investigation would allow those investigating project level air quality impacts to focus on obtaining the data necessary to demonstrate compliance without gathering extraneous data and thus wasting time and resources. Having the results of this study would be particularly helpful in cases where the project is unlikely to actually result in air quality impacts or concern but that definitive data is necessary to demonstrate compliance with the applicable regulations.

Research Advisory Committee

- All states would benefit from guidance on the level of detail or degree of accuracy needed in NEPA documents
- MnDOT interest in this subject is support by Land Management. High need and MnDOT is an early adopter. In 2017, AASHTO SCOE ranked this as top ranked research.
- Might be of benefit to other states, but not to NC
- This research is not needed.
- To my knowledge this is not something that has been raised as a concern for Vtrans
- Streamlining efforts pertaining to the completion of air (and noise) studies would typically provide the most benefit to us, and this is no exception. This was the third ranked of six problem statements submitted by SCOE, though of much higher value to VDOT.
- The information that would be developed in this study support state DOT efforts to conduct useful, but not redundant, air quality studies. I would recommend that the research focus on mobile source air toxics (MSATs) and particulate matter (PM), not carbon monoxide (CO).

Item #84: Holistic Analysis of Detection and Controller G-04 Operations at Signalized Intersections

	NR	0	1	2	3	4	5
(17) R&I		1	1	4	7	2	4
(46) RAC	1	1	5	14	10	6	8

Special Committee on Research and Innovation

- [Rating: 4] This project builds on current, but often un-used, capabilities in today’s modern controllers and detectors. Using detectors to measure vehicle speed (versus only using vehicle presence) is proposed as a means to create more appropriate detector calls to increase efficiency at intersections.
- This research appears to have a low potential ROI.
- This will be beneficial on a national basis and will help to implement new signal controller and detection technologies.
- Looks like mostly a survey of existing technologies and practices but this is an expensive study so rated B/C low. There are a couple of interesting aspects to the potential outcomes. This could be coordinated with G-07.
- This seems to be a lot of money for a project that would likely be done entirely with traffic signal operation software. In fact, this would appear to be a software development project that belongs in the private sector research and development environment.

Research Advisory Committee

- Upgrading signalized equipment and configurations is a common debate with newer technology. Research should take into account future flexibility.

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- We have been utilizing traffic signal detector programming and placement recommendations that are over 20 years old. A refreshed look at optimum detector placement and new types of detector technology would be in order.
- This research has potential benefits but it may face lots of challenges. It may be difficult for all vendors to come to the consensus. Without vendors onboard, this research may not have meaningful results.
- Improvement of signal controllers could help us improve corridor monitoring & management
- Needed research - a major push in Montana to improve the operations of traffic signals.
- OK idea, not critical
- This would be good research as all detection technologies have pluses and minuses.
- Useful, but rather expensive for a project that is mostly leveraging existing technologies and studies. Sounds like the technologies are available and what is needed is training/transfer of knowledge. Not sure the proposed work addresses this need. The budget should probably be revised down.
- Looks like mostly a survey of existing technologies and practices but this is an expensive study so rated B/C low. There are a couple of interesting aspects to the potential outcomes. This could be coordinated with G-07.

**Item #85: Quantifying and Estimating VMT Reduction from
B-08 Transportation Demand Management Measures in
 Rural Communities**

		NR	0	1	2	3	4	5
(17)	R&I				6	8	1	4
(46)	RAC	2		5	17	11	3	7

Special Committee on Research and Innovation

- [Rating: 4] Good project, of great interest to California, but also of broad interest to agencies pursuing comprehensive performance management.
- This may be of interest to UDOT's recreation hot spots, especially getting locals to and from National Parks.
- The problem statement identifies an issue that warrants further investigation. Moreover, it aims to build on prior NCHRP research. The concern is the objective is limited in providing an explanation of how exactly the researcher aims to complete the study, identify Transportation Demand Management (TDM) measures, and provide guidance and methodologies to quantify and mitigate VMT reductions by the application of the TDM measures.
- Good project that considers rural issues related to TDM
- TDM measures within rural areas is not a major focus. TDM along highly traveled corridors would be.

Research Advisory Committee

- No additional comments.
- Not urgent for DC since we have no rural areas.
- This seems like it has been hanging around for a while. The write up indicates that it will be completed in 2010. Air quality and VMT are not typically issues in rural areas in Illinois. This project may fit CA, but I don't know how much value it provides Illinois.
- The 2000 and 2010 censuses demonstrated that Mississippi's rural population remained constant or decreased. In contrast population in several MPO areas showed an uptick in population. Reduction of VMT in rural areas is not a pressing issue for Mississippi, because the VMT is decreasing on its own.
-

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- Need to compare to WASHTO RUC pooled fund study and not duplicate research.
- topic is promising as more work on the impact of TDM is welcome, but quite a bit of work needs to be done to scope project out so that the Panel can successfully solicit RFPs. After developing a catalog of TDM practices in rural areas, for example, it is not clear if the intent is (a) to develop case-studies of actual impacts (maybe survey rural residents to see how TDM changed behavior) or (b) to apply sketch planning methods to estimate what those impacts could be. I suggest reviewing the FHWA response and then incorporate that into the problem statement---or perhaps the research is not needed given the FHWA response.
- Fills a key gap that is needed to advance two of WSDOT's three strategic priorities (Practical Solutions and inclusion). Approach aligns with WSDOT's successful efforts to quantify TDM performance on urban and suburban corridors.

Item #86: Practitioners Handbook for the Noise Analysis Process B-11 for Design Build Projects

	NR	0	1	2	3	4	5
(17) R&I		2		5	5	1	6
(46) RAC	1	2	4	12	16	2	8

Special Committee on Research and Innovation

- Top priority for GDOT Environmental Services. At present, all problems arising during construction require several meetings w/FHWA, but having a handbook that answers the most common questions without these meetings would be extra valuable.
- [Rating: 3] Should be coordinated with NCHRP 25-25 task 109 project. Consider adding a research objective to “Provide sample Request-for-proposal language to address noise abatement criteria and design performance criteria.” State policies for design-build vary significantly, and it will be good to include sample language for consistency purposes.
- These guidelines would be good for RFPs to guide DB projects on noise abatement. Projects sometimes oversimplify the issue
- This effort involves developing a handbook to provide noise practitioners with guidance on addressing noise impact assessment and abatement for design build projects. While design build projects currently only make up a handful of NHDOT projects, it is clear that design build is being utilized by other states on a more routine basis and as such may be more common in NH in the future. As such it would be extremely helpful to the Department to have a handbook to guide the Department through the design build process as it relates to noise impact abatement and assessment.

Research Advisory Committee

- These objectives coincide with our efforts in streamlining noise analyses in support of NEPA environmental documents and quality assurance practices.
- We are working toward DB projects.
- Not relevant.
- Noise for design build projects is always a concern. This handbook would be very helpful. MnDOT interest in this subject is support by Land Management. MB-Will aid our DB project spec writers. Calling it an absolute need as cop-proposer includes MnDOT.
- A handbook for the Noise Analysis Process for Design Build Project would be very helpful for State DOTs.
- Of high value to NCDOT
- No procedures currently exist for noise for design-build projects.
- Not often a high priority for VTrans projects
- I would rate a 3, as D-B projects are certainly challenging from a noise perspective, but I’m skeptical of the practical

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usefulness of this.

- WSDOT has developed some very simple guidelines for Design/Build (DB) projects which include noise walls. These guidelines are used in the RFP to guide the DB on what to do regarding noise and abatement if there are design changes. However, each project is somewhat unique and present new challenges. Some WSDOT project teams have simply stated that the DB contractor will build the walls they have designed to avoid some of these challenges. Having some guidance on what to do and using experience from other states would be valuable to have. With DB projects becoming more of the norm nationwide this will be of national interest.

**Item #87: Post-World War II Commercial Properties and
B-17 Transportation Project Development: Historic Context
 and National Guidance on Evaluation of National
 Register of Historic Places Eligibility**

	NR	0	1	2	3	4	5
(17) R&I		2	1	7	2	2	5
(46) RAC	1	3	5	9	8	8	11

Special Committee on Research and Innovation

- High need for this since mid-20th century commercial properties are aging to historic properties under Section 106.
- [Rating: 5] This research is vital for FHWA's ability to manage Section 106 compliance of the National Historic Preservation Act, knowing the quantity of mid 20th century commercial properties that may be impacted by federally funded actions.
- A national historic context covering commercial post WWII properties is overdue and would go a long way in developing a more consistent approach to evaluating for National Register eligibility. Currently there is inconsistency from consultant to consultant in evaluation standards and historic context development. With this uncertainty in approach, there is a tendency to air on the side of calling properties eligible instead of ineligible.
- good value
- Not a priority

Research Advisory Committee

- With the large amount of properties that are rapidly becoming 50 years of old, this is a problem and going to become a bigger one. There are few, if any, studies the we know of that address post-WWII commercial properties.
- While the number of projects we have with actual takes is limited, this topic has actually become an issue on a recent project. Guidance would be helpful
- Post-WWII commercial properties must be considered during Section 106 and Section 4(f) processes. Similar to other states, the current evaluation of these resources is inconsistent, which risks delaying projects. With a Post-WWII commercial properties historic context, all state DOTs (including ITD and our Consultants) will have a more streamlined and consistent approach to determine if these properties are significant and therefore need additional consideration under Section 106 and Section 4(f).
- This is relevant work to historical determination for all transpo projects, similar to agreements between FHWA and state partners with bridges that were over 50 years in age, hence expediting the determination process.
- MnDOT's CRU manager calls this an absolute need in MN and nationally. Absolutely needed; will provide needed guidance for Section 106 reviews and improve efficiency of such reviews.
- This could be a valuable tool for project delivery if they can develop a programmatic way to expedite Section 106 clearances of these properties.
- Research is needed for 70's-80's-90's time frame approaching the 50-yr age of places.

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- VTrans has received funding for a preliminary study of post WWII residential properties in Vermont that we hope will lead to the creation of a National Register evaluation and identification model. We need guidance for both residential and commercial properties to assist us when figuring out if there are historic resources in a project's area of potential effect. A national context on Post WWII Commercial Properties would be immensely helpful as we look to create similar documentation in Vermont.
- This ranked second of the top two problem statements submitted to NCHRP by SCOE and I recommend a 5. It addresses one of the most important historic preservation challenges to DOTs across the US, including VDOT: the exponential increase in the quantity of post-WWII properties for historic consideration, in this instance commercial properties. It's the appropriate companion piece to NCHRP Report 723 on residential properties. This research is essential to help DOTs manage a problem of increasing importance in project development.
- This study addresses a significant problem facing DOTs nationwide, and is appropriate for NCHRP. The study has a high likelihood for success, and once done will be extremely valuable across the country.

Item #88: Flash Tracking for Accelerated Project Delivery
A-05

	NR	0	1	2	3	4	5
(17) R&I		2	1	3	3	6	4
(46) RAC	2	2	5	14	8	11	3

Special Committee on Research and Innovation

- [Rating: 0] Problem statement requires substantial revision.
- Many states are looking for ways to accelerate construction and project delivery. This is an appropriate topic for research.
- Currently, IaDOT has engaged in limited Fast Tracking of infrastructure improvement projects. No input would be available for ultra fast tracking (i.e. flash tracking).
- Accelerated bridge construction is emerging
- Not sure how useful this research will be for NH.

Research Advisory Committee

- In Innovative Project Delivery (IPD), we are interested capturing the lessons learned and best practices which may lead to defining and perhaps at some point in the future quantifying the benefits of efficiency and timely delivery. This will enable the DOT to efficiently manage and appropriately allocate risks in Alternative Project Delivery.
- A better way to accelerate projects is in the DOT's best interest. The public frequently desires our projects to be completed faster, with less traffic impacts and less noise.
- Limited applicability in Missouri. We already build our projects much faster than most states. Unsure of useful outcome.
- The concept is interesting but I am not sure that the research statement is clear enough
- The concept of flash tracking for accelerated project delivery may be beneficial. The practices of Accelerated Bridge Construction is emerging and currently being highly developed in the Bridge Construction arena. Value Engineering Study techniques are currently being used with limited successes.

Item #89: Guidelines for Using Sacrificial Coatings to Protect
D-06 Equipment Assets from Corrosion

	NR	0	1	2	3	4	5
(17) R&I			1	8	5		5
(46) RAC	2	1	5	13	12	5	7

Special Committee on Research and Innovation

- While Florida does not have this problem, it is worth noting that coatings for metallic assets has been well evaluated, and the idea of a vehicle-based system to monitor the condition of the coating seems impractical.

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- With increased usage of brine and calcium chloride continuing, the research product would be beneficial.
- [Rating: 2] Project as proposed is too ambitious for a single project.
- The reduction of corrosion with our equipment is a significant issue.
- Start with synthesis prior to full research project.
- Deicing products create significant increases in maintenance equipment and vehicles
- Corrosion is the #1 cause for a unit's preventable failure, but timely replacement is also required allowing for the use of advancements in technology not available in older units (emissions, ABS, airbags, etc.).

Research Advisory Committee

- With corrosion being a national impact to vehicles this research would be beneficial.
- Limiting corrosion on equipment that is used over the years substantially increases the useful life of the equipment. This research is especially useful to organizations that cannot replace their equipment often enough not to have major corrosion issues. Concerned about limited usefulness of sacrificial coatings, especially in moving parts of equipment like under-body where the majority of corrosion occurs.
- Pretty minor issue in the grand scheme in Texas
- This deals with fleet equipment and it appears it would require industry to implement this study's finding for there to be a benefit from this research. Industry should take the lead to ensure findings would be implemented and not the DOTs.
- The exposure to deicing products poses a significant increase in maintenance costs to DOT maintenance equipment and vehicles.

Item #90: Measuring Economic Benefits and Costs for the B-06 Inclusion of Sustainable Elements on Aging Transportation Systems

	NR	0	1	2	3	4	5
(17) R&I			3	6	4	4	2
(46) RAC	1		7	14	11	8	4

Special Committee on Research and Innovation

- This is too broad, and questionable that useful results at this time will be achieved.
- Pertinent to FHWA TAMP requirements.
- [Rating: 3] This problem statement could be restated to reflect a need more focused on a framework for conducting a benefit cost analysis by state DOTs. A framework for calculating the sought-after values, along with other traditional traffic benefits, to support decision making might be more useful and could be synthesized from available resources. There are techniques that are used to value non-market goods and services, which may or may not be applicable to the valuation of sustainable elements. A synthesis study to research the state-of-the art of such techniques regarding sustainable elements could be helpful.
- Economic value should be utilized in determining sustainable element (i.e. increasing community quality of life, carbon emission reductions, multi-modal transportation, etc.) incorporation to secure and program highway corridor funding.
- This looks like just trying to leverage states in doing beautification on existing highways.
- Disagree with proposal need on economics of sustainability.
- A subset of ROI analysis that is nice to have, but not essential. Focus should be on the main areas before sustainability.

Research Advisory Committee

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- This is now a regular part of asset management.
- Web-based program or add on to the INVEST tool (quantifiable ROI metrics) is a need but methodology questionable.
- Cost benefit evaluation for sustainability projects could be helpful, especially if more transportation funds become available. But not practical in current environment.
- The need statement is misleading. There are many sources of information about the economics of sustainability. Economics is one of the main considerations in sustainability, along with environment and community. There is little value in creating a national web-based program because each state DOT will approach sustainability differently. The cost of this is also very high.

**Item #91: Organizational and Cultural Factors for Successful
A-07 Transportation Asset Management Integration**

	NR	0	1	2	3	4	5
(17) R&I		1	1	6	6	3	2
(46) RAC	1	1	9	9	14	7	4

Special Committee on Research and Innovation

- [Rating: 3] Worthy of pursuit, but not the highest priority. Consider pursuing as a synthesis project.
- UDOT is fairly well advanced in the cultural and implementation aspects of Asset and Performance Management; however, we could also benefit from understanding best practices from our peers. From a national perspective, this research would benefit many DOTs.
- We've seen at our DOT how important these cultural factors can be to the success of TAM efforts, and we still have a long way to go to get our everyday practices where we want them. This research would be extremely helpful to set up the next generation of TAM leaders and to help us keep moving ahead.
- I think too few states actually are wanting to change their organization
- These are known by now as every agency has worked on this for several years.
- Supported by AASHTO's Committee on Performance-based Mgmt

Research Advisory Committee

- It is easy to underestimate organizational culture, but it absolutely will help or hinder the success of new ways of doing things. Given all state DOTs have to implement TAM, this research would help enable success. The timeline is quick as well given the urgency. MPPM-Supported by AASHTO's Committee on Performance-based Mgmt
- Of limited use for MoDOT, as we have made great strides on Asset Management implementation in the organization.
- Wait for NCHRP 08-112
- Multiple staff think important.
- In my opinion, WSDOT already has organizational and cultural factors needed for TAM Integration, as evidenced by our recent organizational changes. This is synonymous with "change management;" however, this product will arrive too late for practical implementation.

**Item #92: Metropolitan Planning Organizations: Transportation
B-07 Partnerships for the 21st Century**

	NR	0	1	2	3	4	5
(17) R&I		1		10	2	5	1
(46) RAC	2	1	7	13	5	15	2

Special Committee on Research and Innovation

- This proposed study seems to lack focus because of the attempt to simplify the factors affecting the role of individual MPOs.

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- [Rating: 5] This research is timely considering recent legislation implementing performance management and the general transition away from building new infrastructure and continuing movement toward the maintenance and operation of existing facilities and systems.
- There has been a lot of work done in this topic area.
- This would be a valuable project that would benefit MPOs and State DOTs. This is important research at a time when the federal role in transportation is evolving, technology is advancing, and MPOs face increased pressure to be effective regional planning bodies within the shifting framework of federal and state requirements and local political dynamics. Care should be taken that MPOs of all sizes are represented and can find value in the outcomes, including non-TMA MPOs.
- Could be more focusd on relationships between DOTs and MPOs
- Council on Public Transit #1
- Coordination between MPOs and DOTs always important

Research Advisory Committee

- Illinois has a variety of capacities of MPOs. Any research to assist us on building capacity at MPOs will benefit the state DOT and planning as a whole.
- This is likely more useful to large MPOs and the DOTs they work with.
- Not sure this would be useful for Missouri.
- This should be useful but care will need to be taken to not duplicate work in other areas (e.g., FHWA's briefing book for decision makers for example). The case studies need to include small MPOs as well. I assume MPOs will be stratified by TMA and non-TMA as the authority differs (in practice) substantially.
- Potentially useful if the research is focused more on constructive relationships between DOTs and MPOs.

Item #93: Development of High-Quality Databases of Deep Foundations Load Tests **E-05**

	NR	0	1	2	3	4	5
(17) R&I		1	1	9	5	1	2
(46) RAC	2	1	6	11	10	9	6

Special Committee on Research and Innovation

- Greater benefit to the nation as a whole would come from developing a database utilizing the DIGGS schema expanded for load test data for all states to implement. This type of effort would permit all states to interact and effectively create a national database which would be more useful for the future. Does not appear to be a research component to this project.
- [Rating: 3] Development of a national protocol and schema for load test databases is a real need.
- This research will help state DOTs in developing local resistance factors and LRFD implementation.
- This research has been done, though some additional data may be found the benefits may be limited
- Question its value because using non-specific site information for foundation design does not constitute good engineering practice. Also, this seems more like software development than research. (There is no record of NHDOT endorsement at this office.)

Research Advisory Committee

- I concur it is an urgent need to have this work done ASAP. We are working on recalibrating the Reduction Factor for drilled shaft skin friction right now, but suffer short of relative data as stated in the SPR-754 Problem Statement.

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- This is a very important and useful reference tool.
- Enhanced data for deep foundation load test sites can improve the geotechnical designs.
- FHWA already has a database. There would be more benefit if it was up-to-date.
- Various databases have already been developed by the FHWA and other State DOT's on load test data.
- This subject has been done and redone. While the study may propose to add new data to these existing databases, I feel that the benefits will be rather limited. Therefore, this research should have a lower priority.

**Item #94: Deceleration Rates for Design and Arterial Access
C-04 Management**

	NR	0	1	2	3	4	5
(17) R&I		1		6	8	4	
(46) RAC	2	2	5	9	19	8	

Special Committee on Research and Innovation

- There has been a lot of research on this topic. Some of the more recent research has confirmed existing deceleration rates which were developed years ago. This should really be looked at in coordination with intersection, decision and stopping sight distance research. The Operational/signal timing and turn/taper length components of this research may be of value, but it is not likely that Department policy would significantly change based on the findings.
- [Rating: 4] Both driver behavior and vehicle performance have continued to change and the need to update or confirm key performance factors such as deceleration rate, and particularly the differences between drivers, is apparent. This study provides an opportunity to provide foundational data useful to researchers and practitioners.
- Don't see the high value in this project
- More of an issue in urbanized areas

Research Advisory Committee

- MnDOT has not updated its guidance in years. This would be useful to see if the current standards are still relevant to today's vehicles and drivers.
- Not sure if this research would be of great benefit, decel rates our state has been using seems to be resulting in aux lane length that are adequate from an operational and safety standpoint.
- Budget is too high.
- The project raises potential concerns with current recommendations; but these are mainly anecdotal. Perhaps an initial study should be done to more clearly establish the scope of the problem before going ahead with a full-blown study. The budget should probably be revised down.
The deceleration profiles would be useful for designers. Need to provide guidance on the use of research findings for arterial access management.
- Just not sure how much of a problem this is given the wealth of experience through practice and longstanding criteria.

**Item #95: Recycled Asphalt Shingles in Asphalt Mixtures with
09-55 Warm Mix Asphalt Technologies**

	NR	0	1	2	3	4	5
(17) R&I		3	1	5	4	4	2
(46) RAC	2	4	4	10	10	11	4

Special Committee on Research and Innovation

- Florida does not currently allow the use of RAS in asphalt mixtures. However, should the need arise to use RAS, this project would provide good information on how to appropriately incorporate RAS into asphalt mixtures.
- [Rating: 5] This topic is very important and timely to FHWA and State agencies. Increased pavement distress and

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increased incidents of premature pavement failure have been linked to increasing use of recycled asphalt shingles (RAS) across the U.S. This additional funding request is needed to fill some gaps in the project and validate recommendations. The resulting guidance will have a significant impact on the industry and current practice.

- There are concerns about the impact of RAS in the mix. The money would be better spent on evaluating long term effects of RAS in general in HMA.
- Shingles do not melt at full HMA temps. How could they possibly melt at cooler temps?

Research Advisory Committee

- N/C
- Idaho does not use RAS in asphalt mixtures and does not anticipate using RAS in the future.
- Continued monitoring of in place test sections. MnDOT allows RAS in our specifications, but with questions on performance.
- It seems like many studies have been done with bad results.
- Use of WMA has declined recently, but may rebound as energy costs increase.
- Many studies at the State level
- Recommended continuation of existing research by project panel and NCHRP program officer.
- This would be a good opportunity to take advantage of our new SCB/IFIT test equipment
- Results have been interesting to date but to address long term performance, it is necessary to continue to monitor the test sections and validate laboratory findings against field data. Without this step, it is not possible to provide implementable recommendations.
- This project allows the continuation of monitoring of the field sections constructed on the previous 09-55. The long term monitoring of the Recycle Asphalt Shingles (RAS) field sections is critical to determining the impacts of using RAS and Reclaimed Asphalt Pavement (RAP) in HMA which can increase the hardness of the asphalt binder which could lead to premature cracking and fatigue problems over the life cycle of the HMA. Actual field performance data is needed to determine the viability of RAS/Warm Mix Asphalt applications.

**Item #96: Best Practices Guide for State Department of
B-14 Transportation and Economic Development
 Collaboration on Site Selection**

	NR	0	1	2	3	4	5
(17) R&I		1	3	5	6	2	2
(46) RAC	1	1	7	12	14	6	4

Special Committee on Research and Innovation

- [Rating: 4] FHWA has current research regarding private sector site selection that could support this proposal. This research has the potential to strengthen the integration of economic development considerations into the transportation planning and programming process not only for State DOTs, but MPOs, RTPOs, and local governments.
- While improving private sector site location is always good, this appears to have little applicability for UDOT. These decisions are made by local governments and industry clusters, and mega sites are located by the governor's office and trade center partners.
- This guide would be very helpful to transportation and economic development officials at the state and local levels to understand how site selection decisions are made and how transportation assets can be improved to make a region more competitive.

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- Similar to recent research
- Will be an up and coming discussion in the future in NH as our freight plan is completed and implemented

Research Advisory Committee

- N/C
- focused on site selection economic development recruitment which is not DDOT's focus
- This is a topic that is relevant to all state DOTs and regional planning partners, as well as project proponents, who cite economic vitality regularly when advocating for project programming and implementation. While efforts are underway to better understand economic impacts by public entities - MassDOT has a consultant on board for these efforts - further research that taps into what other agencies are doing would be beneficial.
- Mississippi falls short in clear collaboration among those responsible for transportation and economic development. This could be a useful resource for practitioners in both industries to help fill some of the gaps.
- Agree with NCHRP reviewer comments.
- Potentially duplicative of other recent research.

Item #97: Sources of Zinc in Highway Runoff

B-09

	NR	0	1	2	3	4	5
(17) R&I			3	7	4	3	2
(46) RAC	1	1	9	12	14	5	3

Special Committee on Research and Innovation

- Although we (FDOT) are aware of the pollutants typically identified within stormwater runoff, Zinc has not been a primary concern in Florida. This study would be beneficial in helping to better identify natural versus man-made sources typically associated with stormwater runoff from State-owned roadways.
- Recommend approval at \$500k.
- [Rating: 3] Zinc is a pollutant of concern that utilizes the roadways as a viaduct to enter nearby waterways, but it is no different than other contaminants such as calcium, potassium, iron, magnesium, aluminum, lead, phosphorus, manganese, copper, nickel, chromium, and cadmium. However, studies have shown that namely the metals of copper and zinc may cause harm to aquatic organism, namely salmonids who ingest it since zinc mostly settles in the bottom and does not dissolve in water. This research would only be ideal if sources of zinc that is inclusive of the DOTs ROW be considered, however, difficult that may be.
- Zinc in highway runoff and its impact to Iowa waterways is expected to become a notable issue at some point in the future. The determination of the major contributors to the zinc runoff will be the first step in addressing the issue.
- Zinc is a common constituent in highway runoff, and a contaminant of concern in many regions of the country, and for regulatory agencies. There are several potential sources of zinc in the typical highway right of way (vehicle wear, appurtenances, fences, guardrails, sign posts, pavement, storm drain conduits). This research would quantify zinc inputs from specific sources to lead to BMP selection and effective reduction of the concentration of zinc in highway runoff.
- No Zinc issues have impacted NHDOT

Research Advisory Committee

- Not a pollutant listed in the top concerns in our State for our specific NPDES permitting.
- This is a good study, but not as urgent in DC because we have so many impairments, not just zinc.
- As more TMDLs are developed (naming both DOTs and including WLA for zinc) it will be important for DOTs to have

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tools to effectively deal with zinc. Source control is the best way for DOTs to address pollutants in our runoff and the results of this project will enable DOTs to work collaboratively with resource agencies and comply with current and future regulations.

- Not more than a moderate concern or need in MN thus far.
- Zinc runoff is not an issue that DNR has recognized MoDOT should monitor.
- We agree with FHWA comments

We have developed a white paper on the topic but this would be a much deeper dive. Zn TMDLs are expected in the future in NC.

- Problem statement claims zinc is source related. Adjacent off-ROW sources should be studied. This research is not needed.
- Roadway project considerations; potentially valuable to get an understanding of this topic before it is raised as an issue within Vermont; WQ is so front and center these days
- Preparation of TMDL's is certainly a priority for many state DOTs. While zinc is a pollutant of concern in highway runoff, the potential that a TMDL will be required for this is quite low compared to other pollutants. Also, as noted in the research problem statement, because there are numerous emission sources for zinc, it is unclear how characterizing the contributions related to each of these sources for a small number of locations will serve as an accurate estimate for the sources of zinc for a specific location in the event a TMDL for zinc is required.
- Zinc is a common constituent in highway runoff, and a contaminant of concern in many regions of the country, and for regulatory agencies. There are several potential sources of zinc in the typical highway right of way (vehicle wear, appurtenances, fences, guardrails, sign posts, pavement, storm drain conduits). This research would quantify zinc inputs from specific sources to lead to BMP selection and effective reduction of the concentration of zinc in highway runoff. Submitted by the TRB Stormwater Committee (AFB65), which Ken Stone is a member.

**Item #98: Assessing Pedestrian Crashes on the Freeway System:
G-02 Analysis and Prevention**

	NR	0	1	2	3	4	5
(17) R&I			3	5	7	3	1
(46) RAC	1		10	13	12	7	2

Special Committee on Research and Innovation

- The study done by Hudson et. al. in 2015 seems like it will answer most questions and is fairly recent. It might make more sense to wait a couple years and revisit this research topic in 2020 when Automated Vehicles are more prevalent.
- [Rating: 2] This problem statement is recommended for referral to the 20-05 synthesis panel. The target of this proposal is desirable, and necessary for development of the data for assessing pedestrian crashes on the freeway system. However, for the results of this effort to be applicable nationwide, data should be collected from a cross section of communities in the United States.
- An in-depth report that highlights causes of pedestrian crashes on freeways and methods to prevent them would be a valuable resource for state DOTs.
- This crash type is rare in NH.

Research Advisory Committee

- Pedestrian crashes on freeway are fewer but higher severity. Additional detail nationwide would be helpful due to limited occurrence in each state.
- Potential for nationwide interest, as pedestrian crashes are a rising trend. Appropriate for NCHRP research. Recent research performed includes assessment of countermeasures (2017) and state agency surveys (2015) for best practices.

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Proposed research sounds like it will be duplicating the efforts of recently published research. Currently, what percent of all pedestrian crashes occur on interstates/freeways? Is this type of pedestrian crash experiencing an increase in frequency?

- Low priority in DC.
- Illinois is a "high" non-motorized fatality state. Pedestrian fatalities on interstate highways contribute to the overall non-motorized fatalities, and identifying countermeasures to reduce these pedestrian fatalities could be of value to Illinois.
- The research motivations and needs are valid. However, it appears to be a broad/preliminary survey study. With the proposed budget and timeline, We have a doubt in the following claim: "As well, this research should develop a general framework for a comprehensive program aimed at reducing pedestrian fatalities on the freeway system. This framework should include countermeasures using the four "e's," (engineering, education, enforcement, and emergency medical services), and be adaptable for different states."
- I wonder how this research will take place since FARS data cannot be used. Most of the fatalities are due to suicide and those working (whether workers on the roadway, persons fixing vehicles, enforcement and the like). Since many fatalities on freeways involve suicide and these cases are not in FARS, a large number of the perceived fatalities will not be included. The workers on the roadway could involve some infrastructure modifications but most likely involve awareness and education. For the awareness and education changes to be recommended, the effectiveness would have to be measured or included in this research. Is there already research based guidance for the enforcement community to minimize injury/fatalities. Likewise for roadway construction workers and tow truck operators. Or is that the intention of this research? There are still a lot of unknowns and clear direction of the research statement.
- Statewide pedestrian crashes have been up, and there is a notable increase in unintentional pedestrian. MnDOT staff have reached out to other states regarding how they are communicating and messaging for pedestrian safety where people may not have started out as pedestrians. If this is selected, this could identify messaging and prevention strategies for unintentional pedestrians. Pedestrian crashes on freeways are often unintended. Some start their trip in a motor vehicle, then become a pedestrian due to a breakdown or crash. MnDOT is interested in educational opportunities to raise awareness of this issue.
- The Freeway-pedestrian fatality numbers are probably too small for any one state to study, so a national study is useful. Given the solution is limited to education & enforcement, and people involved in these crashes may not have other choices than to walk, suggest limiting the study scope, budget (around \$125K) and time (1 year). The problem is relatively small and the solutions are limited because peds on freeways are prohibited. Possible synthesis?
- An in-depth report that highlights causes of pedestrian crashes on freeways and methods to prevent them would be a valuable resource for state DOTs.

**Item #99: Development of Programmatic Agreements for Project-
B-15 level Particulate Matter "Hot-Spot" Air Quality
 Analyses**

	NR	0	1	2	3	4	5
(17) R&I		1		9	5	2	2
(46) RAC	1	4	4	18	11	5	2

Special Committee on Research and Innovation

- [Rating: 0] Many of the projects that are unlikely to produce an exceedance of the NAAQS are already filtered out based on current CAA-related requirements and procedures, some of which can be utilized in the NEPA context if desired. In the NEPA context, the emphasis is on a comparison of alternatives, not a threshold-based evaluation comparison to the NAAQS.
- Seems to add only minimal personal knowledge to a States tool box.
- Good project on which conditions warrant PM hot spot analysis. It would be beneficial to have additional information on project types and thresholds

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- This proposal involves the development of a template for states to use in the development of a PM Categorical Finding to demonstrate project level transportation conformity for basic efforts located in areas of PM non-attainment. It is possible this template could also be used to demonstrate compliance with NEPA. The development of this template would be particularly helpful to NH as it is struggling to maintain PM attainment in the southwestern part of the state. In the event this area of the state falls out of PM attainment, this template would assist in streamlining the air quality and review process for projects located within this part of the state as well as throughout the state for the purposes of demonstrating NEPA compliance. Streamlining project level air quality reviews through the implementation of a Categorical Finding would translate to substantial project development cost savings.

Research Advisory Committee

- CT. has a Programmatic Agreement with FHWA regarding Categorical Exclusions.
- PA approach seems good but not a high need in MN and FHWA questions the value.
- In the last 10 years at MoDOT, we have not had to complete hot spot air quality analysis.
- Might be of benefit to other states, but not to NC
- No programmatic agreement exists for Hot Spot particulate matter analysis. PM is not critical in Texas.
- Not on Vtrans' radar from what I am aware of
- I would rate a 2, mainly because Virginia no longer has any PM nonattainment or maintenance areas. It could have long term usefulness though if one comes back, or if FHWA someday changes course and requires the evaluation of PM for NEPA purposes. This was the fifth lowest of the six problem statements submitted by SCOE.
- This research project is much needed. We need more information about what conditions warrant and do not warrant a particulate matter (PM) hot-spot analysis. Currently, WSDOT must conduct interagency consultation to demonstrate that a project does not need a hot-spot analysis. Having materials to support a programmatic agreement would simplify this task and reduce the work needed for air quality on projects in PM maintenance areas. Even if a programmatic agreement is not available, having additional information about project types and thresholds that warrant a hot-spot analysis would be very helpful to state DOTs.

Item #100: Mitigation of Pressure Flow Scour by Improving the Hydrodynamic Conditions at the Upstream of The Bridge Superstructure

	NR	0	1	2	3	4	5
(17) R&I		1	1	9	7	1	
(46) RAC	1	2	3	14	16	8	1

Special Committee on Research and Innovation

- Although it would be interesting to see research performed to assess the actual bridge shape and how it impacts the hydraulics within the waterway, it is not a critical need for FDOT.
- [Rating: 0] Duplicative of past FHWA research (Research report FHWA-HRT-09-028 "Hydrodynamic Forces on Inundated Bridge Decks")
- This research could be useful for bridge overtopping due to extreme events.
- Applicability of special beam design to mitigate scour would be limited.
- Good topic area known to effect scour.
- While this is interesting research, the streamlining of bridges to accelerate flow is not likely to be welcomed by environmentally minded people who wish to minimize velocities to minimize scour.

Research Advisory Committee

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- It is unclear how successful the study will be but I am optimistic. This does seem like a good way to get ahead of an upcoming problem.
- Improving hydrodynamic conditions could reduce debris accumulation and other harmful effects to the structure.
- Agree with FHWA comments
- The pressure flow scour equations currently being utilized seem excessively conservative.
- Additional detail regarding the scope of proposed work would be helpful.
- WSDOT BPO has 771 bridges that would see pressure flow during the 100-year flood. Some of those may be under pressure flow at higher probability floods. Pressure flow has not been overly studied but it is known that it will increase scour at a bridge. Any method that reduces the vertical contraction will minimize the scour during these events. The climate is showing a warming trend which will result in wetter years in Washington. Low probability floods will be realized.

**Item #101: Tool and Guidebook to Identify Commercial Delivery
B-01 Parking Needs for Loading and Unloading in
 Metropolitan Areas**

	NR	0	1	2	3	4	5
(17) R&I		1	5	4	5	3	1
(46) RAC	1	2	8	13	11	5	5

Special Committee on Research and Innovation

- This is a big issue in urban areas and is needed.
- [Rating: 3] Focus on "investigating available methods of data collection and analysis and to integrate analytics, regulations and coordination to provide more efficient solutions than work that has not considered these three aspects together" and make proper recommendations on how to supplement existing data for MPOs' freight planning purpose. It is also important that most of the efforts is on understanding the existing data and their strength and weakness.
- This is a current issue in areas like the NW Quadrant of Salt Lake City, Utah. W&D developments are built with insufficient truck parking. This will also become an increasingly sensitive issue as intra-regional freight distribution increases with online shopping.
- This topic is important and the issues is becoming of greater importance with more and more e-commerce
- Not a large perceived issue in NH

Research Advisory Committee

- With the estimated increase in freight movement expected over the next couple of decades the impact on mobility in urban areas will require local agencies and state transportation agencies working together to mitigate the impacts.
- This is an interesting topic but entirely driven by the private sector, both on the supply side-and destination (market) side. I see limited value to this from a SDOT freight perspective.
- DDOT has a research project on freight trip generation underway to answer some of the same questions posed in this study
- This should more of a local ordinance need than NCHRP.
- MPPM-Committee on Planning's 3rd highest ranking
- This is a high priority project.
- Similar study is currently underway in Seattle. Worked performed by UW Urban Freight Lab, which also presented at

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TRB in Jan. and hosted a webinar on 1/17. Sizeable level of interest from across the country. Rise of e-commerce and densification is driving much of the issue. Audience includes DOTs, planning, manufacturers, retail, developers, shippers/carriers, law enforcement among others. Less dense areas across the state and the country may not have similar conflicts/needs, but could learn valuable lessons from the Seattle and NCHRP study.

Item #102: Developing Endurance Characterization Curves for C-07 GFRP Reinforcing Bars

	NR	0	1	2	3	4	5
(17) R&I		2	5	4	3	1	4
(46) RAC	1	2	7	16	11	5	3

Special Committee on Research and Innovation

- Current design methodology is limited in regards to creep and fatigue, which criteria can in many cases control the design. These limits are established based on dated information and it is known that these limits are overly conservative. This research will allow for a more defined allowable limit and allow specifications to be developed for properly assessing the creep and fatigue thresholds. Research outcomes could allow for GFRP, a non-corrosive material, to be more palatable to the owners for usage in aggressive environments.
- [Rating: 3] This study could begin to address the issue; however, it is not clear that the all GFRP bars would perform the same and thus is it not clear that a study assessing a suite of proprietary bars would actually provide a fully useful solution.
- There is not a significant demand for this GFRP research.
- This research is needed to advance the use of corrosion resistant reinforcing bars in bridges and structures. The payoff is much longer life of bridges and lower maintenance cost.
- SCOBs priority??
- I believe this should be a high priority for NH. It furthers the development of the Guide Spec for GFRP. GFRP has a lot of potential due to its lack of corrosion potential.

Research Advisory Committee

- Studies being conducted by ACI.
- Developing endurance curves would allow manufacturers to ensure product stability.
- Although Missouri likes GFRP rebar, it is probably not necessary to research if it will last 125 years. Current LRFD Standards are calibrated for 75 years, which should be sufficient.
- This is a topic that needs to be researched.
- VDOT's S&B Division is interested in GFRP as an alternative to stainless or corrosion-resistant rebar as a means to drive down the cost of the other materials. However, why does the proposal seek 125-year durability limits when current design standards aim for 75 to 100-year service lives? Also, developing durability curves that fit all of the available GFRP products may be difficult to do because material properties of different product vary widely, unlike more conventional steel.
- WSDOT is not using glass-fiber reinforced polymer (GFRP) reinforcing bars for bridges. AASHTO GFRP Specifications has sufficient design information if needed. We are using epoxy coated bars and other corrosion protection measures for our bridges.

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Item #103: Methodology for Analyzing Noise and Vibration B-16 Impacts on Different Terrestrial Species

	NR	0	1	2	3	4	5
(17) R&I		1	3	6	4	3	2
(46) RAC	1	5	9	14	6	6	4

Special Committee on Research and Innovation

- [Rating: 5] States have raised concerns about the effects of highway operations and construction activities on terrestrial species for many years. Specific issues relate to how they need to address comments from resource agencies in biological opinions and in NEPA documentation.
- This issue is of importance to a number of states, and understanding how others are dealing with regulatory issues would be beneficial
- This proposal involves developing a consistent methodology for analyzing noise and vibration impacts to wildlife species. To date NH has mainly dealt with aquatic wildlife noise and vibration impacts within the coastal areas of the state. However, with the addition of the Northern Long Eared Bat and other terrestrial wildlife species to the endangered species list, there is potential for terrestrial species noise and vibration related impact concerns. It is clear that there is very little guidance at both the federal and state level as to how these impact assessments should be conducted. The results of this study would give broad guidelines and parameters which could be used to guide assessments should they be requested by the resource agencies in the future.

Research Advisory Committee

- This is a hot topic for CT right now, especially for noise and vibration impacts to sturgeon. We also have issues with birds of prey.
- This research would be helpful to ITD in that reliable methodologies for analyzing noise impacts on terrestrial species would likely result in more consistent biological assessments/opinions. Often, there are significant differences in the way effects are analyzed in biological studies. This leads to inconsistent expectations and commitments, in which ITD needs to comply. This can sometimes impact projects' schedules. Sound methodologies could ultimately result in a better outcomes for the species and transportation goals.
- -This has not been an area of concern here in Minnesota but understand others could have issues. MnDOT's wildlife ecologist states this is not a high need in MN.
- This is a hot topic for U.S. Fish & Wildlife Service. We have been asked several times to provide information, particularly on vibration impacts to endangered species, under Section 7 consultation. After looking for information ourselves, it is evident there's not much out there. Taking the time to research this ourselves can delay project delivery.
- This is an issue coming to forefront for State DOTs, and we currently have NO consistent metrics, procedures, or expertise for analyzing impacts to wildlife.
- No limits of effect exist. Revised scope to limit number of species studied. Number of species proposed too broad.
- Important considerations for Natural Resource reviews; could assist design considerations.
- While a very interesting topic, I would rate this a 1, as the noise regulation currently does not apply to terrestrial species, and I'd be hesitant to research this further in the absence of concrete federal requirements. US Fish and Wildlife has issued guidance on noise impacts, specifically regarding eagles and bats, although I fear this research could prompt additional federal requirements. This was this lowest ranked of the six problem statements submitted by SCOE.
- WSDOT has worked with US Fish & Wildlife to develop certain metrics for marbled murrelets and spotted owls. However, it may not be consistent with other states and there may be a better approach than what we have now. It would be good to find out what the current research is on this topic, what other states are doing and what the regulatory agencies are looking for with regards to mitigation and avoidance. Construction at night is becoming more of an issue in Washington disturbing birds specifically. This is of wide interest nationally.

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Item #104: **Defining Geotechnical Test and Performance Data for Asset Management and Accelerated Design Benefits**

	NR	0	1	2	3	4	5
(17) R&I		2	3	7	5	2	
(46) RAC	2	2	5	12	16	3	5

Special Committee on Research and Innovation

- This is a data dictionary project that has nothing to do with determining the soil properties needed to implement the Geotechnical Asset Management (GAM) Guidelines to be released by NCHRP next year. Once the GAM Guidelines are complete, GAM requirements will be pushed by an FHWA initiative. The results of this project need to facilitate our compliance with that initiative rather than focusing on expanding the DIGGS data dictionary. Also, there is not any research component to the proposed scope.
- [Rating: 4] The development of DIGGS has been widely supported by FHWA, industry, and a DOT pooled fund study. The management and communication of data as an asset is a necessary step for more cost effective and safer engineering solutions.
- UDOT would benefit from consistency in the informational format of geotechnical data. We agree with the arguments presented on the benefits of being able to easily utilize existing and historical data found in a consistent format for current needs.
- Not clear on the topic. Not sure of the value of online data dictionaries
- The problem statement is vague on how they will accomplish the objectives, and it doesn't make a compelling argument as to why individual state DOTs should place a high priority on adopting DIGGS.

Research Advisory Committee

- Not recommended. There is a need for a clearly defined standard to include subsurface and geo-structural data into an usable database. Unfortunately, this effort is another odd piece of the transportation asset management system that differs from state to state. With some degree of standardization of each State's asset management database, result of this research will have a very limited impact.
- This topic is already addressed by FHWA.
- Unclear as to what the proposal is trying to do or accomplish. It is almost like they have two different topics mixed together. One is standardization, storage, and accessibility of geotechnical data; primarily boring log data and lab data. The second topic seems to be a quest to define metrics or evaluation standards for various geotechnical assets. This research is proposed to develop an on-line data dictionary for soil properties, structure installation, and performance. By having a standardized data structure, access to data across companies, agencies, etc. could be more efficient. However, the necessity of having a standardized data format for our data is probably not that important to us. We already have much of this data in a format that is already beneficial to us. As stated, I don't see this being very useful. I think that this proposal is overly broad and will have difficulty producing a tangible, defined result. It also seems somewhat peripheral to geotechnical asset management.

Item #105: **Rubberized Hot Mix Asphalt v. Hot Mix Asphalt Lifespan study - A mechanistic empirical study**

	NR	0	1	2	3	4	5
(17) R&I		1	5	7	3	2	1
(46) RAC	1	1	7	16	12	6	2

Special Committee on Research and Innovation

- Florida has already done significant work with respect to rubber modified asphalt binders and mixes. We have appropriate specifications and market driven specifications that allow contractors to use polymer or rubber modified binders at their option.
- Good concept. Lean on details. Needs to encompass more than CA.
- [Rating: 0] Achievement of the research objective will require a much more extensive investigation that can be

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accomplished with the time and level of funding proposed.

- UDOT has used crumb rubber mixes in the past with some issues. Our current specification allows the use if blended in the binder at the terminal. This would be good research, but there are other issues more pertinent at this time.
- Agree with FHWA and NCHRP reviewer comments. Maybe this would be better as a pooled fund project.
- Beneficial to a limited number of states
- NHDOT has used ARGG in varying climates/traffic levels. Would be beneficial to have more performance data even though this seems targeted for CalTrans.

Research Advisory Committee

- Research statement as written is too CalTrans specific.
- N/C
- ITD does not use rubberized asphalt and we do not anticipate using it in the foreseeable future.
- Does different rubber % impact results? I think so!
- Only a few select states use rubber in their asphalt mixes (and not MN).
- Feedback has been positive and if it could improve the mix then millions of dollars could be saved.
- MDT doesn't use the ME Design process or utilize rubberized Hot Mix Asphalt.
- Potential to learn more about the benefits of rubber in asphalt mixes to mitigate reflective cracking & other deterioration. The scope of this work, as proposed, would include a specification that could be used by DOT's - which is a very useful deliverable of research like this.
As written, the problem statement appears to address a mixture used specifically by a single state. If modified to provide greater applicability, work to address the benefits of using rubberized asphalt mixtures may be more appealing, especially as a number of states are interested in alternatives to provide longer lifespan and address challenging pavement conditions. However, as the statement stands now, I do not see it as beneficial to enough agencies to be pursued. It is important to quantify the benefits for rubberized hot mix asphalt . This problem statement needs some modification to cover benefits in terms of material and structural perceptive.
- WSDOT has not experienced great gains when rubberized hot mix asphalt(HMA) has been used. WSDOT has little interest.

Item #106: Lane-Keeping Practices Characterizations G-01

	NR	0	1	2	3	4	5
(17) R&I		2	2	4	8	2	1
(46) RAC	2	5	11	12	10	3	2

Special Committee on Research and Innovation

- [Rating: 5] This proposal has the potential to greatly improve CV and AV systems that have great potential that is under-utilized in crash reductions.
- This problem statement may belong better to the automakers, not DOTs. Automakers would build these algorithms.
- Somewhat interesting.
- This research has value and the \$300k would seem to be less than sufficient to identify NDS data, develop the data set, and then perform the research as outlined. Is this research intended to be internal or external to FHWA.

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- Should be left to OEMs
- This research is more appropriate for vehicle manufacturers.
- MnDOT & FHWA are promoting flexible design which includes narrower lanes. At same time, truck traffic & our older driver population is increasing. Important to understand lane keeping in these groups as we look to reduce the space they have to navigate. Good topic, but this project needs to be delivered in 6 month timeframe.
- The auto industry will drive this effort.
- Research objective is not well defined.
- This problem statement would add more value to the research if the human-driver interaction in the CAV environment could be examined holistically.
- Some value, but proposed tasks are very vague. Not sure objectives can be accomplished.
- This research has value and the \$300k would seem to be less than sufficient to identify NDS data, develop the data set, and then perform the research as outlined. Is this research intended to be internal or external to FHWA.

**Item #107: Development of a Practitioners Handbook for Noise
D-17 Wall Inspection Procedures During and Post
 Construction**

	NR	0	1	2	3	4	5
(17) R&I		1	2	10	4	2	
(46) RAC	3	1	10	16	10	2	3

Special Committee on Research and Innovation

- Might be helpful to collaborate with SCOBS on development of this one.
- [Rating: 2] States may be able to address this need by coordinating with states that already have acceptance and inspection methodologies. This could be an issue for states that do not build many noise barriers.
- Many of the inspection procedures during construction are already covered in other structural guidelines such as: concrete drilled shaft, precast concrete and reinforced structural concrete. Post construction evaluation may be helpful for determining the condition of our assets over time.
- Noise wall designs tend to be designed with relatively high safety factors and tend to be robust. The risk of catastrophic failure is most likely low. Current inspection techniques tend to be consistent with other types of structures. Specific techniques could be investigated and incorporated into current inspection guidance documents.
- I see the merits of long term evaluation of soundwall performance but in NH we only construct one type of wall, so I'm not sure how beneficial this research will really be.

Research Advisory Committee

- CT is not typically installing large amounts of new noise walls
- This might be good for construction and maintenance practitioners.
- MnDOT does have inspection criteria for existing walls but to have this handbook for new walls might be helpful. Our issues with noise wall performance has been mostly the stain/paint. Moderate need, but methodology and level of effort not well described? Are scope and cost understood? We struggle with non-bridge asset inspection.
- Many miles of Noise Walls have been constructed in the US ; however, national guidance for inspecting Noise Walls is not available.

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- As Montana builds more barriers, procedures for inspection of barriers will be very helpful.
- Noise wall designs tend to be designed with relatively high safety factors and tend to be robust. The risk of catastrophic failure is most likely low. Current inspection techniques tend to be consistent with other types of structures. Specific techniques could be investigated and incorporated into current inspection guidance documents.

Item #108: Surface Property Data Requirements for AASHTO’s C-16 Highway Safety Manual

	NR	0	1	2	3	4	5
(17) R&I		1	3	7	5	3	
(46) RAC	1	2	8	19	12	3	

Special Committee on Research and Innovation

- [Rating: 3] Premature because of lack of standards for collection of surface properties. Not the highest priority for safety at this time.
- Currently being addressed through other research projects/programs.
- This could be worked a bit more but seems to have benefit
- Research could make safety analysis more complex and data dependent, which would be an undesirable outcome.

Research Advisory Committee

- N/C
- Considerations should be given to not just those needs in the 1st edition HSM but also those that are being included in the HSM2 which will be out before this research is completed.
- Help improve the HSM
- Benefit is limited at this point. Other factors within the HSM are probably more important.
- This research may provide improved models for more accurate analysis.
- his issue is worthy of research, but there are already established projects and pooled fund studies (low the Low-Cost Safety Improvements Pooled Fund) that are better avenues for considering this problem. Based on NCHRP staff review, other efforts addressing the major concerns are underway.
- I was looking for support for this from somebody affiliated with the AASHTO or TRB HSM committees. The approach seems reasonable but the proposal is sketchy. The budget is stated as "more than \$250K" which is unusual and does not provide confidence about what needs to be done or what the B/C might be.

Item #109: RSAP Update D-19

	NR	0	1	2	3	4	5
(17) R&I		1	6	6	2	2	2
(46) RAC	2	4	11	13	7	5	3

Special Committee on Research and Innovation

- This software is very frequently used for safety analysis by FDOT staff and consultants. The software can be cumbersome and needs the proposed updates. The proposal includes the capability for the user to check the input data visually through the creation of a plan view generated from the user inputs--this should have been done a long time ago.
- [Rating: 2] We would rate this high next year, after NCHRP Project 17-88 to update encroachment rates is further along and can be incorporated. If this project is funded, we recommend the RSAP on-line training be added to the project to promote usage by more agencies. FHWA may be able to provide some funding for the training component.
- I know this project has merit, but I can't understand why they didn't put a budget to it. That fact doesn't garner support from our State, as we shy away from undefined open ended projects. Please define dollar amount.

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- Improvements and extensions to the Roadside Safety Analysis Program (RSAP) are consistent with updates that are expected for the roadside design guide and HSM. Unfortunately it looks like the proposal was never finished (there are missing parts) so this is unlikely to go forward. I will work with Scott this year to improve the proposal so we might make a better shot next time.
- To my knowledge, NHDOT does not use RSAP program.

Research Advisory Committee

- State uses TTI and other real world testing not software. Of little value to ADOT's current processes.
- As we continue to move towards projects that are performance based (i.e. it not about bringing the road to standard, it is about addressing a performance need) we will need tools to justify the decisions. The Road Safety Analysis Program (RSAP) is one of those tools.
- RSAP is functional but it could use some improvements/upgrades. Improvement to an existing knowledge base could be of value.
- Incomplete problem statement.
- Cost?
- Limited use at MoDOT as this time.
- No funding amount specified.
- State not using RSAP.
- The types of updates being proposed are important. However, the main concern that has been raised by field staff is the appropriateness of the encroachment data that RSAP currently uses.
- Improvements and extensions to the Roadside Safety Analysis Program (RSAP) are consistent with updates that are expected for the roadside design guide and HSM. Unfortunately it looks like the proposal was never finished (there are missing parts) so this is unlikely to go forward. I will work with Scott this year to improve the proposal so we might make a better shot next time.

Item #110: Environmental Impacts of Access Management B-02

	NR	0	1	2	3	4	5
(17) R&I		1	3	10	5		
(46) RAC	1	2	9	17	13	1	2

Special Committee on Research and Innovation

- AV/CV is at our doorstep. Too late in the game to consider this now.
- [Rating: 1] This research does not benefit stormwater or water quality practitioners.
- This research directly aligns with UDOT and State of Utah's interests in being able to quantify or measure air quality and emissions-related externalities associated with various access management treatments. The current lack of quantitative data in this area constitutes a clear programmatic deficiency for all access management administrators and practitioners.
- This physical research project is not worth the time and expense planned. The information that would result from this research could easily be produced through modelling and simulations. It seems they are using buzz words (sustainability and green house gases) to promote an experiment that could be better served with by good simulation research project. Modelling/simulation programs out there, already developed, would make the desired results available for a fraction of the cost.
- The issue here seems to be more about changing travel than emissions. Focus is on GHG effects of access management

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and not overall environmental impacts

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- CT is already very developed, I don't foresee this having a large impact on air quality for us.
- A need but not high for measuring air quality emission correlations to develop corridor/areawide predictive models.
- We already know access management projects benefit the environment. Quantifying this has limited benefits.
- Reasonable idea, not as high priority as some others
- This work is very important to a huge geographic portion of the country.
- This research is not needed.
- NEPA Considerations but potentially out of touch for VTrans at this point in time
- understand the concerns of the reviewers, and suggest that as a mitigation the project may incorporate sketch planning methods to estimate air and water impacts. As an example: it's probably unrealistic to run MOVES for every corridor plan, but some simple rules of thumb that could be used for air quality (as is done in the Access Management Manual for speeds and crash impacts) could be helpful. Please remember that the work done for NCHRP 420, which gave simple ways for estimating crash impacts, is still the basis for much of the access management documentation that exists at present including the 2nd edition of the Access Management Manual, so although that analysis was relatively "simple" it has been extremely useful. The change in scope suggested by NCHRP's third paragraph--to focus on air quality and water quality benefits--seems to be a promising way to accomplish the project within the allotted budget. Regarding the comments: the expected stormwater impact of access management may be as straightforward as a comparison between a highway that has robust access management and a widened highway (with impermeable surface) with poor access management. Thus simple ways to demonstrate how runoff is increased may be appropriate. Also, adding an environmental component to access management impacts could find its way into TIAs which many states require when submitting exception requests. The air quality benefits associated with access management projects would be useful to have documented, and as noted in the problem statement, available for use in conformity determinations (if appropriately documented).
- This project is looking at sustainability, air quality impacts and greenhouse gas (GHG) for access management projects. As the problem statement says, DOTs need more information on how access management activities affect emissions, primarily GHG emissions. However, it seems that the challenge is not in understanding the emissions, but understanding the resulting changes in travel - both how travelers make different choices and how travel speeds and conditions change. I'm not clear about how a field study would help this understanding. This study is about the GHG or air quality effects of access management, not the overall environmental impacts.

Item #111: Field Guidance for Developing Expedient Spatial E-01 Infiltration Test

	NR	0	1	2	3	4	5
(17) R&I		3	7	2	5	2	
(46) RAC	1	5	12	13	8	5	1

Special Committee on Research and Innovation

- Acknowledging the challenges of the current testing methods, this area is not a priority for FDOT.
- [Rating: 0] Efficiency of an ASTM standard does not warrant having an NCHRP problem statement. While a more efficient means for conducting infiltration tests might be nice for DOTs, this research effort does not warrant to be one for NCHRP.
- This research is not a priority at this time.
- The research approach proposed is poor. The research appears to focus on the double ring infiltrometer as the "gold standard".

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- CT utilizes very few infiltration systems along our corridors due to parent soil types and high costs of maintenance
- Having a less cumbersome and labor intensive method as an alternative to ASTM-D3385 would reduce cost and would hopefully increase the chances of it being used prior to the installation of an infiltration practice. This research project has a direct tie-in with NCHRP 25-51.
- MnDOT OES considers this a high need.
- Agree with FHWA comments, also, NCDOT doing our own research
- J Armstrong panel member interest
- The measurement of surface infiltration rate is indeed a customary and required practice associated with the selection and placement of newer, infiltration-based stormwater management controls. The currently accepted test method (ASTM-D-3385) can be cumbersome and time consuming, so identifying a faster, more efficient method would theoretically allow more measurements to be taken during a given time period. The recommended funding level of \$200,000 is too low and should be increased by at least 50 percent.
- While the research would be of great interest to us, the research approach proposed is poor. The research appears to focus on the double ring infiltrometer as the "gold standard". I believe that would be a mistake. Furthermore, we (WSDOT) have already done a much more thorough investigation of this issue using full scale infiltration facility measurements as the gold standard in previous research. I see little benefit for this research as proposed.