

EVALUATION OF THE MONTANA DEPARTMENT OF TRANSPORTATION'S RESEARCH PROJECT SOLICITATION, PRIORITIZATION, AND SELECTION PROCESSES

FHWA/MT-08-005/8117-29

Final Report

prepared for
THE STATE OF MONTANA
DEPARTMENT OF TRANSPORTATION

in cooperation with
THE U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

May 2008

prepared by
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RESEARCH PROGRAMS



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**Evaluation of the
Montana Department of Transportation's
Research Project Solicitation, Prioritization,
and Selection Process**

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Prepared for:

**Montana Department of Transportation
Project number: 8117-29**

May 2008

Technical Report Documentation

1. Report No. FHWA/MT-08-005/8117-29		2. Government Accession No.		3. Recipient's Catalog No.	
4. Title and Subtitle Evaluation of the Montana Department of Transportation's Research Project Solicitation, Prioritization, and Selection Process		5. Report Date May 2008			
		6. Performing Organization Code 5401			
7. Author(s) Daphne Herling		8. Performing Organization Report No.			
9. Performing Organization Name and Address Bureau of Business and Economic Research School of Business Administration University of Montana Missoula, MT 59812		10. Work Unit No.			
		11. Contract or Grant No. Project #8117-29			
12. Sponsoring Agency Name and Address Research Programs Montana Department of Transportation 2701 Prospect Avenue P.O. Box 201001 Helena, MT 59620-1001		13. Type of Report and Period Covered Final Report September 15, 2005 – November 30, 2006			
		14. Sponsoring Agency Code 5401			
15. Supplementary Notes Research conducted in cooperation with the Montana Department of Transportation and the U.S. Department of Transportation, Federal Highway Administration. This report can be found at http://www.mdt.mt.gov/research/docs/research_proj/research_eval/final_report.pdf .					
16. Abstract The Montana Department of Transportation (MDT) contracted the Bureau of Business and Economic Research at the University of Montana – Missoula to conduct research to determine how other states solicit, prioritize, and select research problem statements for the purpose of providing ideas for inclusion in their research programs. MDT is interested in maintaining and improving the quality of its own research process. The purpose of this report is to inform MDT of methods used by the research units in other states' Departments of Transportation to accomplish this stage of their work, to report on the thoughts and ideas of key MDT staff, and to specifically provide recommendations on how MDT can align its problem statement solicitation, prioritization, and selection process with the strategic directions set by the department as a whole.					
17. Key Words Montana, Research, Problem Statement, Solicitation, Prioritization, Selection, Transportation.			18. Distribution Statement Unrestricted. This document is available through the National Technical Information Service, Springfield VA 21161.		
19. Security Classif. (of this report) Unclassified		20. Security Classif. (of this page) Unclassified		21. No. of Pages 105	
				22. Price	

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Section I: Executive Summary

The Montana Department of Transportation (MDT) contracted the Bureau of Business and Economic Research (BBER) to conduct research on the problem statement solicitation, prioritization, and selection process. Obtaining this information was envisioned as an important step in MDT's process of maintaining and improving the quality of its research processes. Of particular interest to MDT is how to strategically focus its problem statement solicitation, prioritization, and selection process.

The research followed a four (4) part structure: 1) reviewing the websites and hard copy publications of MDT's peer research organizations, 2) conducting a web-based survey with key research staff in MDT's peer organizations, 3) conducting in-depth interviews with selected key informants from MDT's peer organizations, and 4) conducting in-depth interviews with selected key informants from within MDT.

Web-Based and/or Research Manual Research

Using the state websites proved to be the least helpful method of inquiry in ascertaining the process used by other Departments of Transportation (DOT's) to solicit, prioritize, and select problem statements. Some websites had links to research units with detailed information available, while others only had one page specific to the research unit. Most findings from this initial stage of the project were gleaned from manuals provided by the different state research units.

The conclusions gathered from this phase are that many states do not use their website, but rather rely on their research manuals for disseminating information about their problem statement solicitation, prioritization, and selection process. Fifteen (15) states had no manual or were in the process of revising them. The recommendation to MDT is to continue to post as much information as practically available on the MDT website to allow other states or interested parties to access information.

Web-Based Survey Responses

A web-based survey was conducted with the questionnaire matrix structured in four sections to gain information about other DOT's strategic plans, problem statement solicitation, problem statement prioritization and selection, and other information to inform the research question. Of the 52 respondents included in this study, 32 participated, marking a 61% response rate.

Several conclusions could be drawn from this phase. The majority of states have departmental strategic plans, whereas most research units do not have strategic plans. Each state has an idiosyncratic process for their problem statement solicitation, prioritization, and selection process; although within those segments there is some consistency. It is interesting to note that a large number of states use some form of brainstorming session or workshop to initiate the solicitation process, determine research emphasis areas, or get input from a broad array of research stakeholders. Eighteen (18) states use some form of an objective ranking or voting method to prioritize and select their problem statements. Ten (10) states use a high-level management committee as the final decision maker in the selection of problem statements.

There is no consistency with how states tie their problem statement solicitation, prioritization, and selection process to departmental strategic direction.

There does not seem to be one particular system that stands out as exceptional for soliciting, prioritizing, and selecting the problem statements. Rather each state has, or is in the process of creating, a system that suits it best.

Key Informant Interviews with MDT Personnel

Four MDT personnel were interviewed. These interviewees were identified by the MDT Research Section. There was overall satisfaction with the Research Section's problem statement process. There was agreement that the rating system for prioritizing and selecting problem statements works well. All four respondents agreed the research problem statement process is not intentionally aligned with MDT strategic direction. They all mentioned that this has been a discussion topic within the department for some time and were enthusiastic about giving their support to developing a way to do so. Recommendations from MDT personnel focused on some type of upper-level management engaging in a risk assessment process or an environmental scan.

MDT might consider approaches used by other states, such as: convening a brainstorming session to discuss research priorities among a broad array of stakeholders, in order to facilitate a cross-subject discussion on where research needs to be focused; or convening a brainstorming session to combine a training component for potential researchers, and to present the research community with the strategic research areas that have been identified by MDT senior leadership.

Key Informant Interviews with Other State Research Units

Seven (7) states were identified and interviews were conducted with the research unit directors. The states were Colorado, Florida, Missouri, North Carolina, Ohio, Oregon, and Washington. These states identified several elements that created a successful problem statement process. The need for continuous and intentional communication within and throughout the department was mentioned by all states. Research units also need to work to develop support and involvement from all DOT personnel - from leadership on down the organizational structure. Collaboration, flexibility, and openness within set guidelines were identified as key elements to a successful problem statement solicitation, prioritization, and selection process. This ensures a creative research environment.

No one process was the primary method used by all states to tie the problem statement process to departmental or research strategic direction. Thus, MDT can explore some type of hybrid to synthesize the most successful elements from any or all of the methods. The elements that were described as the most successful included:

- Build intentional communication channels between the research unit and problem statement submitters within all DOT divisions and ensure both formal and informal communication loops with all stakeholders throughout DOT.
- Develop a mechanism to track communication events with key stakeholders.
- Engage senior management along with the research unit to take leadership of making any change happen.

- Determine overall focus areas for research.
- Use management within the functional areas as the screening mechanisms for problem statements that do not align with their strategic direction.
- Institute some form of brainstorming with stakeholders to get buy-in to the research unit's strategic direction.
- Ensure that complete problem statements are developed prior to submission using a comprehensive problem statement form.

Conversely, it behooves MDT to avoid the mistakes that other states felt they had made - avoid a rigid approach to aligning the problem statement solicitation, prioritization, and selection process to departmental strategic direction. The overall conclusion from this line of questions was: a strategic plan or direction should be used as a guideline, but it shouldn't really drive the program.

Section II: Introduction and Background

The Montana Department of Transportation (MDT) is searching for a line of inquiry about the problem statement solicitation, prioritization, and selection process used by peer Departments of Transportation (DOT) from around the United States. Obtaining this information is an important step in the MDT's process of maintaining and improving the quality of its research process. Research is a key ingredient to any DOT, as stated in the Oregon DOT Research Manual (2003):

Research, one of the principle missions of the first national highway program in the United States, is the oldest continuous federal highway activity. The Federal Highway Act of 1921 authorized the first sustained fiscal support for highway research. Support for highway research was reaffirmed in the Federal-Aid Highway Act of 1962, which mandated funds for planning and research purposes only. The Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991 required a minimum of 25 percent of the State Planning and Research (SPR) funds to be expended on research, development and technology transfer activities. Most recently, Congress passed the Transportation Equity Act for the 21st Century (TEA-21) in 1998, reaffirming support for highway research by continuing mandated funding.

Thus initiating the process for soliciting research ideas is an important, on-going component for all DOT research units. The states are allowed to develop how they will solicit, prioritize, and select projects to be researched. However, in all states, the process begins with the research unit requesting ideas for potential projects. Subsequent to receiving ideas, the research units use their own developed methods for prioritizing and selecting the problem statements to be included in the research program.

The process developed by states for soliciting, prioritizing, and selecting problem statements differs widely, as does the availability of information about how each state accomplishes the tasks. The focus of this research project was but a narrow portion within the overall functions of a research unit. All states are required to have a State Transportation Research Manual which is a useful tool for determining the way a research unit functions.

This research project was designed to use available resources through the websites and research manuals, a questionnaire, and interviews to determine the process used by DOTs to solicit, prioritize, and select problem statements. Four (4) phases were followed: 1) the preliminary web-based and research manual research, 2) a web-based survey of all research units to develop a further understanding of their processes, 3) interviews with a few personnel from within the MDT, and 4) interviews with a selected number of other state research units. Thus, a total picture of differences, similarities, what worked, what did not work, and how the programs are being improved to arrive at an optimum process was developed.

The Solicitation, Prioritization, and Selection Process Used by MDT

As further background to this research report, following is a brief overview of the process MDT uses to solicit, prioritize, and select problem statements. This overview was taken from the MDT research manual entitled *Research, Development, and Technology Transfer Guidelines for the Montana Department of Transportation* (MDT 2006). The entire process is outlined below; for clarity of understanding, portions of the MDT process will be repeated as needed throughout the

report as each step of the problem statement solicitation, prioritization, and selection is discussed.

The process begins with an annual open solicitation for research ideas from the transportation community: a broad array of research partners such as academia, private industry, local governments, tribal authorities, and the public. MDT is committed to involving the widest range of potential research partners.

A Research Problem Statement form is used for submitting ideas for research; it is a two-page document that requires an overview of the proposed research, the need for the proposed research, the benefits that would accrue from that research, and how the research will be implemented. Although Research Problem Statements can be submitted to the MDT Research Section at any time of the year, they may only be reviewed and considered once a year in a formal prioritization and selection process.

Before a problem statement can be prioritized, it must have a champion and a sponsor. A champion is internal to MDT, and is willing to support the problem statement to the Research Review Committee (RRC) and serve as the technical panel chairperson should the problem statement move forward to that stage. In doing this, the champion asserts there is a research need and this need is important to MDT. A sponsor is a district/division administrator or higher who agrees the research is important to MDT and is willing to ensure implementation occurs. Only problem statements with both a champion and sponsor move forward to the project prioritization stage. The champions for each problem statement present their topic to the RRC and district administrators for individual rating. Each member of these two groups rates every problem with respect to their overall worth (50%), timeliness (30%), and attainability (20%).¹

The Research Section will form a technical panel for each selected problem statement, a literature search is conducted, and if current research has not addressed the issue, a scope of work is developed and the process proceeds to the selection phase for research proposals.

¹ After this research was completed, Montana shortened its process by eliminating the prioritization rating stage. In one session, the champions present their topics and the RRC votes as to whether each topic will move forward to the technical panel stage.

Section III: Methods

The Bureau of Business and Economic Research (BBER) at The University of Montana - Missoula proposed reviewing the websites and hard copy publications of Montana Department of Transportation's (MDT) peer research organizations, and conducting a web-based survey with key research staff in MDT's peer organizations, in-depth interviews with selected key informants from MDT's peer organizations, and in-depth interviews with selected key informants from within MDT. The focus of this research project is to compare, contrast, and review the different processes used by state DOT's to solicit, prioritize, and select problem statements. In all states the process begins with the research unit requesting ideas for potential projects; this initial submission is variously called "problem statements", "research ideas", or "research project statements" depending on the state. For the purpose of this report the term "problem statement" will be used to be consistent with terminology used by MDT.

Study Design Implementation

The project was conducted in four (4) phases:

- **Phase 1** consisted of reviewing the World-Wide Web sites of MDT's peer research organizations and requesting electronic or hard copies of research manuals and/or research strategic plans from those organizations.
- **Phase 2** focused on developing and conducting a web-based survey of research units within state DOT agencies around the United States to learn about their process for problem statement solicitation, prioritization, and selection for potential research projects.
- The purpose of **Phase 3** was to conduct key informant interviews with representatives from within MDT and with selected state research managers. The interviews were based on information from the web-based surveys and the state research manuals.
- **Phase 4** involved analyzing the data and producing the final report.

Phase 1: Website Review

This effort consisted of systematically reviewing the problem statement solicitation, prioritization, and selection processes used by MDT's peer DOT's from around the United States by examining their websites. Upon initial review, it was determined that there is little standardization about what is or is not available on state DOT websites concerning this stage of the research process. Many states do not post their research manuals and thus the decision was made by MDT to e-mail all state research units requesting copies of these documents. A spreadsheet was produced to track the outcome of this request with the following results:

- 28 manuals were received.
- 15 manuals were being revised and not available, 8 of these states sent an explanation of their process.
- 11 states did not respond to the request or did not send their manuals.

As a result of this effort, MDT also received a strategic direction document from Missouri. A subsequent request for strategic plans was sent to states that undertook such a process. Thus, an additional seven states sent some form of strategic direction/plan document that was used to inform the understanding of that state's research program.

Several iterations were explored for determining the target characteristics and classification schemes for this phase. The end product was an Excel spreadsheet that asked a series of questions, in four sections, to capture the salient points of each state's problem statement solicitation, prioritization, and selection process. Where possible, this spreadsheet was completed from the research manuals that were received, other documents, and state DOT websites. MDT reviewed the spreadsheet from each state and added or edited responses based on personal knowledge of the state process.

During this phase, BBER also reviewed MDT's research processes from interviews with the research program manager and from MDT's research manual.

Phase 2: Web-Based Surveys

Web Questionnaire Development

The Bureau used the questions developed in the above phase for the web-based survey. MDT provided review and design guidance for each question. The instrument was pre-tested by MDT and by two transportation department employees from states outside Montana. Pre-entered answers were included to reduce respondent burden. The questionnaire matrix was structured in four sections (see Appendix A for the questions in their initial Excel format):

- Strategic plans;
- Problem statement solicitation;
- Problem statement prioritization and selection; and
- Other.

Once the survey questionnaire was complete, testing was conducted with two states, Alaska and Arizona. Once the field test was completed, an e-mail was sent with a link and password for states to complete their survey. Non-respondents were prompted once via e-mail to maximize survey participation.

The list of recipients for the web-based survey was developed using the American Association of State Highway and Transportation Officials (AASHTO) Research Advisory Committee (RAC) list of state contacts which includes 50 states, Washington DC, and Puerto Rico. Of the 52 respondents included in this study, 32 participated (61%). This response rate is typical of higher-quality survey research in the United States today (Groves 2004).

The thirty-two (32) states that responded are: Alaska, Arizona, Colorado, Connecticut, Florida, Hawaii, Idaho, Illinois, Iowa, Kansas, Louisiana, Maryland, Massachusetts, Mississippi, Missouri, Montana, Nevada, New Hampshire, New Jersey, New Mexico, New York, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, Texas, Utah, Virginia, Washington, West Virginia, and Wisconsin.

Web Survey Sampling

No sampling was conducted for this study as there was no random selection of respondents. Rather, respondents were selected from the AASHTO RAC website, which lists the contact information of all AASHTO research units. The problem of non-response existed, as it does with most other data gathering efforts with human respondents.

Web Survey Administration

The web-based questionnaire was administered using the dedicated, secure, WWW computer server at BBER. State transportation professionals were given a unique login and password so there was no chance of unauthorized completions.

Web Data Set Preparation and Reporting

Following data collection, the web survey data was inspected and appropriate data labels were added to facilitate analysis. Responses to yes/no questions were tabulated on a strictly numerical scoring. The coding process for the open-ended responses was completed line-by-line and followed clustering data into categories. These categories were assigned labels. A supplemental “comment” box was included at the end of each of the screens of the web-based survey. These comments were reviewed to ascertain how they informed the questions to which they referred.

Phase 3: Key Informant Interviews

Key Informant Interviews with MDT Personnel

BBER conducted four key informant interviews with identified MDT personnel. The MDT Research Section developed the list of MDT respondents and the topics to be examined by the question guide. BBER staff developed a questionnaire (Appendix B) for approval by MDT. MDT scheduled all interviews, with the following interviews conducted:

- **Sandy Straehl**, Administrator, MDT Rail, Transit and Planning Division (September 12, 2006 at 8:00 a.m.);
- **Loran Frazier**, MDT Chief Engineer (September 12, 2006 at 1:00 p.m.);
- **Jim Currie**, MDT Deputy Director (September 15, 2006 at 1:00 p.m.); and
- **Jim Lynch**, MDT Director (October 4, 2006 at 9:00 a.m.).

Interviews were taped and a transcription was produced. An initial brief overview of the interviews was produced and given to MDT to be used to determine the direction for the interviews with the other state research units.

Key Informant Interviews with Other State Research Units

BBER conducted seven (7) in-depth interviews with key informants from other state research units. BBER delivered the raw electronic data set from the web-based survey to MDT. The responses, along with the results of the key informant interviews with MDT personnel, were then used by MDT to determine which states would be targeted for an in-depth interview. MDT sent

an e-mail to the research unit director requesting their participation in the interview and BBER staff then contacted each state to schedule an interview.

Seven (7) states were identified and interviews were conducted in the following states with the interviewee; dates and times that the interviews were conducted are included:

- *Florida* – Richard Long (October 27, 2006 at 7:00 a.m. MT);
- *North Carolina* – Mrinmay “Moy” Biswas (October 30, 2006 at 1:30 p.m. MT);
- *Washington* – Leni Oman & Kathy Lindquist (October 30, 2006 at 3:00 p.m. MT);
- *Oregon* – Barnie Jones (October 31, 2006 at 3:00 p.m. MT);
- *Ohio* – Monique Evans (November 2, 2006 at 8:30 a.m. MT);
- *Colorado* – Jake Konovov & Rich Griffin (November 2, 2006 at 9:30 a.m. MT); and
- *Missouri* – Mara Campbell (November 3, 2006 11:30 a.m. MT).

Questionnaire

The questionnaire for each interview was based on the responses provided by the research unit to the web-based survey, information gathered from the state research manual (if available), and specific questions requested by MDT. This resulted in very specific individualized interviews with no set questionnaire. However the interviewer developed an overall approach to each interview that followed the following format:

- Introduction and purpose of the MDT project;
- Request for permission to tape interview;
- If a state had not responded to the web-based survey (two had not: Ohio and North Carolina) questions not answered during the research in Phase 1 were completed;
- An overview question on what they perceived made their problem statement solicitation, prioritization, and selection process particularly successful; and what in the process worked well;
- In-depth questions on how they tie the process into the DOT or research unit strategic direction;
- Follow-up, clarification, and expansion to their responses;
- Question on what they might be planning to change or improve with their problem statement solicitation, prioritization, and selection process; and
- Request to follow-up with additional questions if needed.

Interviews

The duration of all interviews was between twenty and forty-five minutes. Two states chose to bring in another research unit staff person. Ohio because they had significantly changed their process over the past year and the staff member invited to join the interview had been particularly instrumental in the changes. Colorado because the research unit director had only

held the position for three months and felt he needed to call on the previous research manager's institutional knowledge.

All interviews were conducted by telephone, taped, and a transcription of each interview was produced. The tape recordings from the interviews were transcribed by a professional transcriber and submitted to BBER staff who edited them for readability. The editing done captured the intent of the speaker and did not in any way change the substance or meaning of the participant's responses. This needed to be done as people rarely talk in crisp statements. In real life, people use incomplete sentences or ramble along with disconnected thoughts strung together with verbal pauses. Also, run-on sentences that are understood when spoken may get confusing when read, thus, periods are often placed during the editing process.

Phase 4: Analysis of Data

Analysis consisted of a two-part process.

1. Immediately following each interview the interviewer, using a standard post-interview debrief summary form, recorded her initial reactions on how the interview went and if there were any immediate gaps in the responses. This allowed for minor adjustments in questions for subsequent interviews and also recorded such unquantifiable aspects as general atmosphere of the interview and engagement of the participant(s).
2. Once the transcriptions were finished, a close, reflective examination of the data was conducted to find details that addressed MDT's areas of interest. Particular attention was paid to developing constructs, themes, and patterns that explain the research unit's process, what they would recommend, and what should be avoided.

Section IV: Results and Findings

This section of the report details the results and findings of all collected data from the web-based and/or research manual research, web-based surveys, and key informant interviews with Montana Department of Transportation (MDT) personnel and research units in other states.

This section is structured as follows:

- Web-Based and/or Research Manual Research;
- Web-Based Survey Responses;
- Key Informant Interviews with MDT Personnel; and
- Key Informant Interviews with Other State Research Units.

Web-Based and/or Research Manual Research

Using the state websites proved the least helpful method of inquiry to ascertain the process other DOT's use to conduct their problem statement solicitation, prioritization, and selection process. Perhaps it is because of the specific nature and limited audience of this process. The information might be deemed to be used by so select an audience as to not be appropriate or needed by the general public. The general public is evidently the primary target audience of DOT websites. Some websites had links to research units with detailed information available, while others only had one cover page specific to the research unit. Thus, most findings from this initial stage of the project were gleaned from manuals provided by the different state research units.

The information that could be ascertained from the DOT websites or the research manuals was entered into the web-based survey that was then completed by the unit managers around the country. When the surveys were returned, answers that had been pre-filled were changed by very few states, indicating they either skipped them seeing them already filled out or verified them as correct and proceeded. Given the prompt requesting them to verify the information, the depth of engagement of the individuals involved in representing their programs, and their commitment to helping peers, it would be reasonably safe to say the information was correct in most cases.

Results and Findings from Web-Based Survey

Thirty-two (32) states responded to the survey, marking a response rate of sixty-one percent (61%). The questionnaire had two (2) basic types of possible responses: 1) categorical questions (those to which there is a yes/no, or an either/or response); and 2) open-ended questions. Each of the four sections of the questionnaire matrix is reproduced below with the number of responses to each of the categorical questions. If that section had open-ended questions, the open ended or state specific responses have been grouped within identifiable categories of the processes used by the states to accomplish that piece of their problem statement solicitation, prioritization, and selection.

The web-based survey also included a supplementary or comment box at the end of each page. This was included to allow for clarification as the respondent felt necessary. Many of these comments did not add substantially to the understanding of their process, and often the

comments repeated a point made later in the survey or were not directly related to the subject matter of the question. However, where a comment was made that added to the response it is included under the pertinent question and the state that made the comment is identified. If the comment made in a supplemental box is included as part of the report in other sections it is not copied under “Supplemental Comments of Note” sections, rather it is woven into the report. Thus, this part of the report is organized in the following manner:

Web-Based Survey Section 1 – Strategic Plan Questions

Summary of responses and statements of note made in supplementary boxes

Web-Based Survey Section 2 – Problem Statement Solicitation Questions

Summary of responses and statements of note made in comment boxes

Web-Based Survey Section 3 – Problem Statement Prioritization and Selection Questions

Summary of responses and statements of note made in comment boxes

Web-Based Survey Section 4 – Other Questions

Summary of responses and statements of note made in comment boxes

Web-Based Survey Section 1 – Strategic Plan Questions

1A. Does the research unit have a strategic plan?

- 12 research units have a strategic plan.
- 20 research units do not have a strategic plan.

Montana does not have a research unit strategic plan.

1B. Does the Department of Transportation (DOT) have a strategic plan?

- 27 DOTs have a strategic plan.
- 5 DOTs do not have a strategic plan.

Montana has a departmental strategic plan.

Web-Based Survey Section 2 – Problem Statement Solicitation Questions

2A. Does the research unit conduct workshop/brainstorming sessions?

- 21 research units conduct workshop/brainstorming sessions.
- 11 research units do not conduct workshop/brainstorming sessions.

Montana’s research unit does not conduct workshop/brainstorming sessions.

2Ai. States that conduct workshops/brainstorming sessions do so at the following frequencies and times of the year:

- 8 conduct them annually.
- 5 conduct them biennially.

- 4 conduct them as needed.
- 3 conduct them twice a year.
- 1 conducts them three times a year.

Where identified, the reasons for conducting the workshops/brainstorming sessions are:

- **AZ** – To select research subject area and to develop problem statements.
- **NH** – If the number/quality of problem statements received does not reflect the high-priority needs of the state or if a particular discipline is underrepresented in the program or may not be aware of the services the Research Section can provide.
- **OR** – Strategic planning.
- **WA** –To coincide with State Planning and Research (SPR) project selection process (Washington).

2Aii. Are these sessions limited to certain focus areas or open to all areas?

- 10 states limited session to certain focus areas.
- 11 states open session to all.

2Aiii. If limited to focus areas, what are they and how are they determined (DOT and/or research strategic plan)?

The responses to questions 2Aii and 2Aiii overlap. Therefore, they are presented together.

Supplemental Comments of Note:

- **AZ** – A specific project development strategy is employed for each of seven (7) research emphasis areas: 1) environment, 2) intelligent transportation systems, 3) maintenance, 4) materials and construction, 5) planning and administration, 6) structures, and 7) traffic and safety. Workshops are open to all interested parties. However, they usually involve agency groups with an interest in the topic or researchers presenting proposed research topics.
- **CT** – The selected managers and administrators represent all modal areas of the DOT.
- **IA** – Uses the session to gather input on research needs of stakeholders. Brainstorming occurs in focus group meetings on general areas on interest: weather; human factors; pavements; structures; etc.
- **IL** – Specifically uses the session to review and rank the received problem statements. They have focus groups called Technical Advisory Groups for major areas such as pavements, bridges, safety, and so on.
- **MO** – They are limited to the focus areas noted within the strategic research vision.
- **MS** – Determines the content based on the “pulse of the department” or what the leadership has determined are the important issues to discuss. Due to space constraints at the site location, there are five (5) focus areas: 1) materials, 2) construction, 3)

maintenance, 4) traffic & safety, and 5) intermodal planning. Of course, not every topic is covered (structures, training, policy research, etc.). Focus areas may I will look at rotating the focus areas every two years.

- **NH** – New Hampshire Department of Transportation (NHDOT) is in the process of developing an agency strategic plan. It is likely that focus groups will be modified to address key objectives in the plan when it is implemented.
- **OR** – The sessions are limited to transportation related topics. This excludes a lot of general administrative topics that might be of interest to a Department of Transportation (DOT), like workforce development, civil rights, accounting systems, etc. Uses sessions to put their defined topic area categorizations to the test. In other words, they bring a list of defined topic areas or focus areas and get feedback from participants on whether the focus areas are indeed ones that all can agree are the most important.
- **SC** – There are seven (7) breakout sessions: 1) construction/materials, 2) maintenance/bridge maintenance, 3) traffic/safety, 4) road and bridge design, 5) project development/planning, 6) business operations, and 7) hydrology.
- **UT** – We consider problem statements on construction, maintenance, materials, pavements, environmental, planning, asset management, ITS, traffic, safety, geotechnical, structures, hydraulics, and preconstruction.

2Aiv. Are these sessions conducted with internal staff or internal and external participants?

- 6 states conduct the sessions with internal staff only.
- 15 states conduct the sessions with external participants also.

Supplemental Comments of Note:

- **AK** – University faculty, consultants, and vendors are often (but not always) invited.
- **AZ** – It varies, depending on the research emphasis or focus area. Some include external participants, some only agency staff.
- **CT** – Internal executives and managers plus two or three representatives from the CASE (The Connecticut Academy of Science and Engineering).
- **IL** – Industry and universities on Task Advisory Groups.
- **MS** – MDOT, academia, and industry.
- **NJ** – One session is for internal staff with one or two sessions for external participants.
- **OR** – In the past, we included university partners and FHWA. In the future, we may also invite local government and some private sector input, from organizations like asphalt and concrete paving associations.
- **SC** – Industry representatives (asphalt, concrete, etc.), other government representatives (FHWA, USGS, etc.) and representatives from in-state universities are included.

- **TX** – We have a formal brainstorming session for both internal and external participants but we also have informal brainstorming sessions that happen as needed for internal staff.
- **UT** – FHWA, universities, private sector, and UDOT.
- **VA** – FHWA, VA division representatives, some university representation, but primarily VDOT staff.

2Av. If external, who?

Many states did not specifically identify who they consider to be stakeholders. The other categories of external participants most frequently mentioned were Federal Highway Administration (FHWA), university representatives, industry representatives, and contractors. Washington and South Carolina invite stakeholders from other state agencies. South Carolina also invites personnel from city and county departments. Also, see 2Aiv responses.

2B. How often are problem statements solicited?

- 22 states solicit problem statements annually.
- 3 states solicit problem statements every other year.
- 1 state solicits problem statements twice a year (Illinois).
- 1 state solicits problem statements three times a year (New Mexico).

Montana solicits problem statements annually.

Several states had individualized processes worth noting. Virginia does not solicit problem statements in the formal sense; they internally discuss and prioritize potential research topics. Iowa reports that they do not solicit problem statements at all without elaborating how they choose research projects. Florida and New Hampshire report they solicit problem statements throughout the year with New Hampshire adding that “reminders (to submit problem statements) are more frequent in the months leading up to the annual Research Advisory Council meeting”.

2Bi. When?

Timing for the solicitation of problem statements has no particular discernable pattern, but rather the months identified are throughout the year.

Montana solicits for problem statements in November.

2Bii. Can problem statements be submitted outside of the solicitation cycle?

- 30 states accept problem statements outside the solicitation cycle.
- 2 states do not accept problem statements outside the solicitation cycle.

Montana accepts problem statements any time; however, they may only be considered during the annual solicitation process.

Supplemental Comments of Note:

- **IA** – In February and March, we poll our customers (internal) about their needs in order to formulate the next year's SPR program.
- **MD** – We do on occasion consider pooled fund studies out of cycle since they tend to come in year round. The Research Advisory Board makes the decision on whether or not the study should be funded out of cycle.
- **OR** – We're in the process of adjusting our schedule to be in step with a parallel selection process with our University Transportation Center (UTC) Partner.

2Biii. If yes, are they considered at that time or during the next solicitation cycle?

- 16 states consider them at that time.
- 12 states considered them during next cycle.

Montana has processes in place to initiate research projects outside the solicitation cycle. These include: Pooled-Fund studies, Montana Partnership for the Advancement of Research in Transportation (MPART Small Projects), MDT-WTI partnering projects, and Administration High Priority topics. MPART small projects are projects that cost less than \$25,000 and are less than one year in duration. For all of these categories, research projects can be initiated outside of the solicitation cycle as often as required. The process includes: notifying the Research Programs manager of the research need; forming a technical panel, or in the case of pooled-fund studies, identifying a technical champion; and a proposal(s) or problem statement, in the case of pooled-fund studies, is obtained and approved by the RRC.

Supplemental Comments of Note:

- **AK** – We have a "Rapid Research Response Program" where time-critical research needs can be funded. We select projects under this program in consultation with our chief engineer.
- **AZ** – Small budget projects (\$15,000 or less) are considered at any time during the year and evaluated with e-mail votes. Ideas for large budget projects can be developed at any time during the year with the understanding that new projects are approved only once a year.
- **CT** – Research need statements are considered as soon as received.
- **IL** – Statements are taken anytime. Formal deadline announced for next round followed by selection for funding in October and March.
- **MO** – If it was elevated through a different avenue than the solicitation cycle, then it is more likely an urgent issue and/or director driven.
- **MS** – Typically I have two cycles, the formal one I detailed earlier and then one six (6) months later in the spring for any unsolicited proposals. We program the bulk of our research to coincide with the federal fiscal cycle, but I always leave a balance just in case we receive something that is needed outside of the formal solicitation cycle.

- **NH** – Depending on the urgency of the problem, submittals might be inventoried until the next NHDOT RAC meeting or NCHRP/NETC solicitation cycle, or may move forward immediately. Our procedures allow us to add high-priority projects to the program outside the normal cycle, provided certain approvals are obtained (NHDOT RAC chair, director/commissioner, and FHWA).
- **NM** – Problem statements may be submitted at any time; however the Oversight Committee only reviews and approves at scheduled times.
- **SC** – In special cases, projects can also be approved for funding between workshops by a vote of the Department's Research and Development Executive Committee.
- **TX** – Depending on the issue, we may decide to consider it immediately and issue an RFP outside the solicitation cycle.
- **VA** – We consider our program to be dynamic to meet our customer's needs. If a research need is identified after the annual work program is adopted, we will modify the work program if the new topics are considered to be of higher priority.
- **WA** – With some exceptions. We have Quick Response and Student Studies programs that can start at any time. If the requestor can bring funds, we'll help them start anytime. Pooled Fund projects can be started at anytime if there is available funding.

2C. Are the potential problem submitters only from within the DOT?

- 6 states permit potential problem submitters only from within the DOT.
- 25 states permit potential problem submitters from the DOT and others.

Montana welcomes problem statements from anyone.

Supplemental Comments of Note:

The comments were mostly used to describe the need for an internal champion, a requirement that ensures a problem statement has at least one individual who will focus on it and shepherd it through the process. Occasionally a state will only accept a problem statement from a certain branch within the DOT even though the idea might be generated and developed with external partners.

- **MA** – Submitters often work with university principal investigators to draft problem statements. However, problem statements must come from within the EOT (Executive Office of Transportation).

2Ci. If yes – who can submit problem statements?

Thirteen (13) states reported that they accept problem statements from anyone, sometimes further identified as “interested parties”, “appropriate organizations” or “stakeholders”. In Montana, the research programs manager solicits research ideas from as wide a variety of individuals as possible; anyone can submit problem statements. Virginia, which does not have a formal solicitation, will accept research ideas from anyone. Other states limit their solicitation efforts to a combination of universities, transportation industry representatives, state or local public agencies, or FHWA. Several states have unique methods for selecting problem statements. Colorado has the Research Implementation Committee (RIC) and

oversight teams determine who will be potential submitters. Connecticut occasionally will solicit from the state legislature. In Oklahoma, the task force groups, convened to develop problem statements have external members from the industry and university who can submit problem statements.

Many states require that all problem statements have a champion who is internal to the DOT. The champion is expected to be the leading advocate for the idea and often to be the person who presents it to the initial screening committee.

Kansas described the most unique system which originates with a solicitation for research ideas sent to all Kansas DOT staff, FHWA Kansas Division staff, universities within the state with civil engineering and transportation graduate programs (Kansas University & Kansas State University), local government officials, and major associations/organizations representing contractors and suppliers associated with transportation. All research ideas received are reviewed initially for appropriateness by the Research Program Council. Approved research ideas are assigned to area panel leaders who work with their area panel members to clarify the intent of each idea, to generate interest among faculty at the university, and to expand the ideas into potential research project statements. Only after this process, does the Research Technical Committee then solicit research project statements from the two universities.

2D. Is problem statement solicitation related to DOT strategic plan and/or research strategic plan?

- 14 states relate problem statements to the DOT and/or the research strategic plans.
- 14 states do not relate problem statements to the DOT and/or the research strategic plans.

Montana does not relate the problem statement solicitation to the MDT strategic plan.

Supplemental Comments of Note:

The comments under this question related to the next question, 2Di, and are included there.

2Di. The states that do relate problem statement solicitation to the DOT and/or the research strategic plans were asked how they do this.

Their responses are all idiosyncratic, thus for clarity, each state's answer has been included below under an overall grouping of how the link is made between the problem statement and the strategic plan or direction.

Although the strategic plan is important, problem statements are not limited to priorities in the strategic plan.

- **AZ** – The Research Center has begun to identify how each research proposal relates to the Department's strategic plan. However, the key strategic plan issues are so broad that all research proposals have easily fit within one or more of the strategic plan critical areas.

- **HI** – They usually address specific needs/problems that relate to the DOT strategic plan.
- **SC** – The Department's strategic plan is discussed in each breakout session at the Research Workshop, but problem statements are not limited to the strategic plan.
- **TX** – Because the strategic plan is relatively broad, it is fairly easy to make the link.
- **WA** – The RAC sets the strategic direction for the solicitation of project proposals and identifies strategic research goals.
- **WV** – Only problem statements with direct implementation potential are considered.

The actual solicitation of problem statements is based on previously determined research direction (Other problem statements not relating to a previously determined research direction also may be funded).

- **CO** – Solicitations for research problem statements are based on strategic research direction.
- **FL** – The Research Center meets with management to solicit guidance on upcoming emphasis areas and strategic direction. The research selection process begins with direction provided by upper management. Functional areas should only include projects for which the need has been internally established as supporting set strategic direction.
- **IA** – Annually develops and publishes a list of prioritized research needs.
- **MO** – It has to tie and/or link to one of the ten (10) strategic research focus areas and let us know what the benefit would be. The ten (10) strategic focus areas are: highway safety, traffic management, transportation management systems, road and bridge design, advanced materials for roads & bridges, transportation security, modal access and mobility, economic issues related to transportation, customer communications and expectations, and funding and finance issues.
- **NV** – One of the NDOT statement evaluation criteria being used is whether a statement is in line with the department strategic goals or divisional objectives.
- **NY** – It is tied to the DOT's five (5) priority result areas: 1) mobility and reliability, 2) safety, 3) environmental, 4) economics and sustainability, and 5) security.

The problem statement must relate DOT's strategic plan, goals, or objectives.

- **PA** – Submitters must define how the projects relate to our Department's strategic plan. We use a form for all idea submissions and one section of the form asks how the project relates to our strategic objectives.
- **RI** – When prioritizing problem statements, the Research Advisory Board looks for a link to State Highway Administration's business/strategic plan. Problem statements that address a goal or objective are prioritized above those that do not.
- **UT** – The problem statement must identify with one of the strategic goals.
- **WI** – Submitters are asked to explain the relationship to the strategic plan in the problem statement.

No formal way to determine the relationship.

- **MA** – It is not directly linked, but we may consider linking problem statements to strategic plan goals and objectives in the future.
- **MS** – Not formally, but there is some relationship.
- **OR** – There is no formal link, and there is no systematic effort to link them. However, the people making these decisions understand the organization's mission and priorities, so it's not hard to see correspondence. I discourage using the Agency's strategic plan as a template for ours, because we want to concentrate our efforts where research is needed. Just because an issue is important to the Agency doesn't mean there is necessarily a role for research.

Supplemental Comments of Note:

- **AK** – We feel that having a DOT strategic plan would be helpful.
- **NH** – When the NHDOT strategic plan is implemented, it is likely we will add a space to the submittal form outlining how the problem statement addresses a component in the strategic plan.
- **NJ** – No, but progressing in the direction of matching the capital investment strategy to the research program.

2E. Does the research unit help the problem statement submitter write/develop problem statements?

- 25 states help the submitter develop the problem statements.
- 6 states do not help the submitter develop the problem statements.

In Montana, the Research Program Manager and Project Manager help the problem statement submitter write/develop problem statements as requested.

Supplemental Comments of Note:

Several states use different methods to help a potential problem statement submitter. These methods were often described in the comments. To avoid time consuming work, some states try to ensure maximum knowledge on the part of submitter so they know up front what is required. Others link research staff with focus areas so help is part of the process. Frequently, the research unit will initially screen the problem statements to determine the need for a rewrite or clarification. This happens prior to the statements going to the first committee for review. Other states stand ready to assist, but there is no formal process to ensure interaction with a submitter. Many states also perform literature searches to ensure the research has not already been done prior to problem statement submittal.

2Ei. If so, what position does this?

Twenty one (21) states use someone from within the research unit to help problem statement submitters. If the actual position was identified it is usually the research

manager, research project manager, or the research engineer. Louisiana and Colorado use a committee or team to do this, and Florida hosts formal training sessions for potential submitters as well as assisting one-on-one if needed.

Web-Based Survey Section 3 – Problem Statement Prioritization and Selection Questions

3A. Are the problems prioritized by a numerical system or voting system?

Respondents were asked to highlight one option below, or if a combination of both, to please describe:

- 1 state has a numerical system;
- 8 states have a voting system;
- 18 states have a combination of both; and
- 6 states identified as having an “other” process.

Montana has a combination of a numerical and voting system; prioritization is numerical and selection is voting. However, before a problem statement can be prioritized, it must have a champion and a sponsor from within MDT. A champion is internal to MDT, and is willing to support the problem statement to the Research Review Committee (RRC) and serve as the technical panel chairperson should the problem statement move forward to that stage. In doing this, the champion asserts there is a research need and this need is important to MDT. A sponsor is a district/division administrator or higher who agrees the research is important to MDT and is willing to ensure implementation occurs. Only problem statements with both a champion and sponsor move forward to the project prioritization stage.

Note: After this research was completed, Montana shortened its process by eliminating the prioritization rating stage. In one session, the champions present their topics and the RRC votes as to whether each topic will move forward to the technical panel stage.

3Ai. If a state has a combination process they were asked to describe it.

Again their responses to this question were all idiosyncratic, thus for clarity, each state’s answer has been included below under an overall grouping of how the process for prioritizing the problem statement is achieved.

Prioritization is within committees who develop their own method.

- **AZ** – Where formal workshops are conducted there are two stages for proposal evaluation. The first occurs during the workshop. The second occurs when the final set of proposals is evaluated by the Research Council. For workshop evaluations, each project manager must develop a weighted voting scheme prior to the workshop. The voting scheme typically allocates votes to all key workshop participants with the weights being announced prior to the workshop. Workshop participants rate each proposal on a 0–3 scale. The evaluations are tabulated, based on the weighted votes, and the top five proposals are presented to the Arizona Transportation Research Center (ATRC) manager for review. If the proposals meet the approval of the ATRC manager

they are included in the package of proposals submitted to the Department Research Council for evaluation.

- **CT** – Need statements are subjected to the prioritization systems of the programs they are considered under. Most have numerical and voting elements.
- **FL** – Each functional office prioritizes projects.
- **OR** – Each committee uses a slightly different system, but all involve some form of voting or assignment of points.
- **TX** – Different research management technical assistance panels do it differently.
- **VA** – Processes vary within the advisory committees.
- **WA** – Each of the RAC can determine their selection method at the time we kick off the solicitation process.

Prioritization is determined by consensus of management.

- **IA** – Consensus of management.
- **PA** – Prioritized by top management based on the most pressing needs.

The combined process in Montana is described as: The champions for each problem statement present their topic to the Research Review Committee (RRC) and District Administrators (DA) for individual rating. Each member of these two groups rates every problem based on overall worth, timeliness, and attainability. The scale is 0–3, with 0 = no value and 3 = high value. Research staff compiles the comments and average ratings for each problem, with the overall worth equaling 50%, timeliness equaling 30%, and attainability equaling 20% of the total score. Topics are chosen because they address actual concerns of the Department rather than topics of specific interest to individual researchers. The RRC reviews the compiled ratings and determines which projects will move forward to the technical panel stage.

Note: After this research was completed, Montana shortened its process by eliminating the prioritization rating stage. In one session, the champions present their topics and the RRC votes as to whether each topic will move forward to the technical panel stage.

Supplemental Comments of Note:

- **NH** – NHDOT RAC members first provide a rating from 0 to 5 using the National Cooperative Highway Research Program (NCHRP) rating system. Then all problem statements are ranked by voting members.
- **OR** – We have a two-stage process. In the first stage we evaluate it by ensuring it meets a list of criteria: Does it address a critical need of Oregon Department of Transportation (ODOT)? Is there a high probability of success? (Consideration is given to a project where the potential benefits warrant a high-risk effort.) Is there ongoing or planned research on this specific problem? Is the estimated budget and schedule acceptable, as verified in a review with the problem submitter? Do the ODOT units that may be affected by the research support the suggested research? At the second stage, I ask each committee member to allocate a defined number of points

to research problem statements, there is a maximum number of points any one problem statement can receive.

3B. If voting system – who votes and what is the voting process?

The most frequently described process follows the following format: a committee of experts and/or technical personnel representing different emphasis areas convenes and is presented with the problem statements to be reviewed. They then vote on whether the problem statement should/should not be included in the research program. There is often a list of criteria that are to be considered when voting. Pennsylvania is the only state where research staff prioritizes the problem statements. Typically, after this initial committee, the lists of prioritized problem statements then go to another committee for selection.

For a comprehensive listing of the actual responses by state to this question, please refer to Appendix C.

3C. If committees are used, what is the committee make-up?

Responses to this question were mostly gleaned from state research manuals which listed the committees used in the prioritization and selection process by position within DOT, universities, or other entities. Rather than list all these positions that sit on committees in this section, the responses have been included as Appendix D. Only Virginia, West Virginia, and Iowa do not use committees to prioritize problem statements.

Montana uses a Research Review Committee (RRC). The RRC's membership is broad and includes most of the MDT divisions, as follows: director; deputy director; administration division administrator; aeronautics division administrator; business process solutions operations manager; district representative; highways and engineering division administrator; information services division administrator; maintenance division administrator; motor carrier services division administrator; rail, transit, and planning division administrator; research programs manager; and planning and research engineer, Montana Division, Federal Highway Administration.

3D. How are prioritized problem statements selected for research?

Once the problem statements have been prioritized, most states use a higher-level committee or decision-making body to accomplish the selection process. Sometimes there is an interim step whereby the research unit juxtaposes the prioritized list against the funding availability to assist the decision makers in their final selection. Some of the states that use functional areas or topic areas during the solicitation and prioritization phases allocate percentages of the total funding to each area; thus for those states, selection is made within the funding level of each topic or functional area. In some states the final prioritized list has already been matched to available funding and the list is presented to a higher-level committee or group for endorsement rather than a further selection process.

In Montana, the RRC reviews the ratings and comments from the prioritization phase and selects the high priority topics for that solicitation cycle.

Note: After this research was completed, Montana shortened its process by eliminating the prioritization rating stage. In one session, the champions present their topics and the RRC votes as to whether each topic will move forward to the technical panel stage.

Thus the different methods used fall into the following categories, with the number of states that use that specific method in parenthesis. Some states report a combination of methods and thus the total number is greater than the number of states that responded to this question.

- Higher-level body selects and reduces the prioritized list (16). Montana falls into this method.
- Higher-level body ratifies or endorses the prioritized list (4).
- Consensus among several different groups (4).
- Selection is made within each functional area, often with consideration of functional area funding allocations (3).
- Selection is made on funding availability (3).
- Research unit matches total funding availability with the prioritized list (2).
- Other – did not directly answer the question referring to a ranking/rating system, but did not identify who did this (2).

For a comprehensive listing of the actual responses by state to this question, please refer to Appendix E. The responses have been grouped under the above categories.

3E. Are problem statement prioritization and selection related to the DOT's strategic plan and/or research strategic plan?

- 18 states related this process to the strategic plan(s).
- 13 states did not relate this process to their strategic plan(s).

Montana does not relate the problem statement prioritization and selection to MDT's strategic plan.

3Ei. If a state tied the process to the strategic plan(s) they were asked how they do it.

Again there are several different methods used by states during the prioritization and selection phase to establish the connection between the problem statement and DOT strategic plans. Twenty (20) states responded to this question, despite only eighteen (18) reporting they relate the two. The most widely used is that the relationship to the strategic plan is one of several selection criteria. Thus the different methods used fall into the following categories, with the number of states that use that specific method in parenthesis.

- One of several criteria used to select problem statements (9). This means that the state has made tying the problem statement to the DOT strategic plan one of criteria by which the problem statement is prioritized and selected.
- A list of issues and topic areas based on the state's strategic direction is developed and used to solicit problem statements (6).

- High-level management determines if the problem statements compliment the departmental strategic direction; there is no formal process to do this (2).
- The DOT strategic plan is used as the initial screening mechanism by the research unit (2).
- Other (1). In Hawaii, the research unit determines if the proposed problem statements are research and development projects or technical assistance projects.

For a comprehensive listing of the actual responses by state to this question, please refer to Appendix F. The responses have been grouped under the above categories.

3F. Is there a special process for selecting emergency problems or problems outside of the solicitation cycle?

- 18 states have a special process.
- 12 states do not have a special process.

Montana has a special process for selecting emergency problems or problems outside of the solicitation cycle. If MDT Administration identifies a research need that requires immediate attention, the research programs manager is informed, a technical panel is formed, and a proposal(s) is obtained and approved by the RRC. Problem statements outside the solicitation cycle can also be considered through the following other methods (refer to Section 2Biii, page 16).

Supplemental Comments of Note:

Many of the comments were a reiteration of answers to Question 3Fi listed below, thus the comments from this box have been included in that question. Mostly, the comments expanded on their process.

3Fi. If there is a special process, they were asked to explain it.

The responses to this question were hard to categorize as many states repeated their answers from the above prioritization and selection process. It might be thus assumed that they follow the same process for problem statements received outside the solicitation cycle as they do for those received within the solicitation cycle. Montana's process is explained in Section 2Biii (page 16).

Supplemental Comments of Note:

- **AK** – Rapid Research Response Program. We are also starting an "Innovative Features Program" to fund ad-hoc evaluations of new or novel concepts/approaches/procedures/materials. Participation in Pooled Fund Studies may be considered in this manner.
- **AZ** – The Research Council decreed that emergency projects (i.e., projects outside the normal selection cycle) should be put forth with their own budget. In other words, if someone needs the project bad enough they should come in with the money to fund it.
- **CO** – E-mail approval from the RIC is sometimes secured in special cases.
- **ID** – Small projects only.

- **IL** – Small projects limited to \$15K per project can get funded without going to full committee. Total funding is approximately \$90K/year, with a limit of \$15K per project area.
- **MD** – If a high priority need comes up outside of the solicitation cycle, the Research Division can go to the Research Advisory Board to present the project. Should the board determine that it should be funded, the Research Division would seek concurrence from the FHWA Division office.
- **NV** – NDOT has an "off-cycle" process for approving the projects that have some urgency to be initiated right away and for approving some pooled fund studies that have a deadline for participation.
- **OR** – Within SPR we set aside a discretionary fund, but I limit that to fairly small projects (\$15,000). For a really important project out of cycle, I go to management and ask for state funds. If it's really important there's usually not an issue getting state funds. That keeps our SPR process consistent and honest.
- **PA** – In the event of an Emergency Declaration by the Governor, say for a bridge problem, we can suspend general contracting procedures and avoid normal solicitation processes.
- **SC** – If an emergency problem arises, projects can be approved for funding by a vote of the Department's Research and Development Executive Committee.
- **UT** – Special requests are funded as needed.
- **WA** – The first question is will we be able to find funding? After that, the director of research & library services will request the opinion of the RAC member responsible for the topic and then the Research Executive Committee chair and the research executive member that supervises the relevant RAC member. If we all agree it's a good idea and timely, we move forward with the project.

Web-Based Survey Section 4 – Other Questions

4A. How many research staff are there in the research unit?

Thirty-two (32) states responded to this question with the average number of research unit staff being 13. Four (4) states reported that some of these are part-time. The largest research unit is Virginia, reporting approximately 100 staff, and the smallest being Maine, with only 2 part-time personnel. The median number of staff is 8 and Montana has 4.

The following is the number of states that fall within four numerical categories:

<i>Range of Staff</i>	<i>Number of States</i>
4 or less	9
Between 5 and 10	8
Between 11 and 20	11
Between 21 and 100	3

Montana, with four employees in the research unit, falls within the smallest number cohort although this is not the minority of states.

4B. What is the total amount of research funding from all sources (FFY 2006)?

Twenty-nine (29) states responded to this question, and the average research funding from all sources was \$4.95 million. The highest funded state is Texas with approximately \$20 million, and the lowest amount of funding was reported by Rhode Island with \$870,000.

Funding levels of all states that responded are listed below from highest amount to lowest amount. The number of staff is included in parenthesis beside the funding amount.

- **TX** – \$20 million about, (18)
- **FL** – \$14 million, (5)
- **VA** – \$14 million about, (100)
- **IA** – \$10 plus million, (15)
- **PA** – \$9 million, (12)
- **NY** – \$7.1 million, (18)
- **LA** – \$6.5 million, (38)
- **NJ** – \$6 million, (12)
- **IL** – \$5.5 million, (19)
- **WA** – \$4.75 million approximately, (7.5)
- **MO** – \$4 million, (20)
- **MD** – \$3.9 million, (3)
- **MA** – \$3.6 million, (2)
- **WI** – \$3.5 million, (2.5)
- **OK** – \$3.5 million, (5)
- **AZ** – \$3.5 million approximately, (8)
- **OR** – \$2.9 million, (16)
- **HI** – \$2.8 million, (5)
- **SC** – \$2,436,467, (4)
- **WV** – \$2.5 million approximately, (2)
- **CO** – \$2,309,000, (6)
- **MS** – \$2 million, (13)
- **NV** – \$1.9 million, (5)
- **NM** – \$1.8 million, (7)
- **MT** – \$1.8 million, (4)
- **ID** – \$1.4 million, (1.5)
- **AK** – \$1 million, (3)

- **NH** – \$0.9 million, (4)
- **RI** – \$0.87 million. (8)

Three (3) states (KS, UT, and CT) did not respond to question 4B, but did respond to question 4A which asked for the number of staff; Kansas has 26 staff, Utah has 12, and Connecticut has 13.5.

4C. Does the research unit include other functional areas (such as ITS, approved products, library etc.)?

- 29 states include other functional areas.
- 3 states do not include other functional areas.

4Ci. States that include other functional areas were asked which areas.

The most frequently listed functional area included in a research unit is a library (11). Others were: technology transfer (3), intelligent transportation systems (ITS) (2), Local Technical Assistance Program (LTAP) (3), training (2), new product or experimental features or evaluation (10), responsibility for process improvement (2), data collection and photo-logging (2), and geotechnical engineering (1). All other states listed specific areas such as: statewide noise, erosion control, material certification and materials quality assurance program, pavement friction, materials, bridge, maintenance, and construction.

Montana considers the library, technology transfer, and experimental features as main research functions, and also oversees the LTAP Program.

4Cii. States that include other functional areas were asked how many staff are assigned to each area.

4Ciii. States that include other functional areas were asked what amount of the total research funding is attached to each area (FFY 2006).

These two questions are linked and every state has a different response. Thus the most practical way to report on this is by comparing side-by-side the number of staff assigned to each functional area and the amount of total research dollars attached to each area. This is done in Appendix G.

4D. When during the research project solicitation, prioritization, and selection process is a literature search conducted?

The following five (5) periods were identified as to when the literature search is conducted; the number of states that conduct them during the specified timing is in parenthesis:

- The problem statement submitter is expected to document a literature search (7).
- During solicitation phase or when research problem statement/proposal is written (4);
- Immediately upon receipt of problem statement by research unit (6);
- As part of prioritization (6); and

- After prioritization (4).

Montana conducts a literature search after the prioritization and selection phases.

4E. Are local universities partnered with research units?

- 22 states are partnered with local universities.
- 8 states are not partnered with local universities.

MDT's Research Section contracts work to public and private organizations both inside and outside of the state. The Research Section also partners with the Western Transportation Institute (WTI) at Montana State University (MSU). WTI is a University Transportation Center (UTC).

Supplemental Comments of Note:

Some states used this comment box to elaborate on the process their state uses to interact with UTC's:

- **AK** – The University of Alaska is a National UTC. We are working to establish a more robust collaborative relationship.
- **MA** – Universities are under agreement (contract) with Research Section. This is not exactly partnering.
- **NY** – Each project must have a DOT champion or we will not even begin the evaluation process. We have so many universities to utilize that we do not give special treatment to any one over another. We encourage university research to work with DOT staff to better understand our needs and develop projects that are of benefit to our priority result areas.
- **OR** – There is often a parallel UTC proposal; in those cases the UTC proposal will include a more thorough and substantial literature review.
- **VA** – VTRC is a joint venture of VDOT and the University of Virginia, although we have cooperative relationships with other Virginia universities.

4Ei. If yes, is all research conducted by the universities?

- 5 states that partner have all research conducted by the universities.
- 18 states that partner do not have all research conducted by the universities.

4Eii. States that partner were asked which universities.

All states use in-state, public universities. Several have regulatory constraints on how to categorize private universities. Only a few states use out-of-state universities to conduct any research.

4F. Does the research unit have staff dedicated to conducting in-house research?

- 10 states have staff dedicated to conducting in-house research.

- 14 states do not have staff dedicated to conducting in-house research.

MDT does not have any research staff dedicated to conducting in-house research, although the research unit is responsible for evaluating experimental projects. This function is performed in-house by the experimental projects manager (EPM).

Supplemental Comments of Note:

As evident from the comments, respondents did not feel this was a categorical question to be answered by a simple yes/no. Thus the elaboration within the comments showed a variety of approaches to in-house research. Utah, Oklahoma, and Idaho use research personnel to only conduct small projects or limit their time on in-house studies. In Oregon, all research staff are expected to conduct research and spend about fifty percent (50%) of their time doing so.

- **AK** – We will conduct in-house research as staff capacity allows – especially for our Rapid Research Response Program. Generally, we’ve found that our two research engineers are too busy with marketing, research problem solicitation, and project management to conduct in-house research.
- **IA** – Some maintenance and materials research is conducted in-house. That is not reflected in the \$10 million figure under the research funding amount question.
- **ID** – In our Administrative Division there is an Economics and Research Section.
- **MD** – In-house research is conducted by the appropriate technical office.
- **OK** – Only small projects.
- **OR** – All of them do some in-house research, and staff usually collaborates with university investigators in substantial ways. Research coordinator workloads are structured to allow about fifty (50%) of time conducting research, as opposed to managing research.
- **UT** – Each staff member may spend about ten (10%) percent of their time on in-house studies. No person is fully dedicated to in-house studies.

4Fi. If a state has staff dedicated to conducting in-house research, they were asked how many staff do in-house research.

4Fii. What amount is dedicated to these staff?

Again these two questions are best combined to give a picture of the dedicated research staff and the dollar amount allocated to them. Of the ten (10) states that have staff dedicated to in-house research, the number of staff dedicated to in-house research varied considerably depending on the structure of the individual research unit and where it is placed in the overall DOT. The different answers are listed in *Table 1*.

Table 1: Number of staff and amount dedicated to staff in ten (10) states that have staff dedicated to in-house research. Iowa responded yes to having in-house research but replied to both 4Fi and 4Fii as zero.

State	Number of Dedicated Staff	Funding Amount
CT	13.5 FTE	not answered
IA	0	0
ID	5	not answered
IL	16 FTE	\$0 Federal \$'s \$1.2 million +/- State \$'s
LA	38	\$4 million
MO	4	not answered
NM	1	not answered
OK	1 to 2	5% of total budget
UT	Not answered	About 10% of our internal budget dedicated to salaries
VA	100	Approximately \$8 million

A complete compilation of all supplemental comments for all questions is included in Appendix H.

Key Informant Interviews with MDT Personnel

Concurrently with the dissemination of the web-based survey, four interviews were conducted with MDT personnel. The interviewees were identified by the MDT Research Section. The questions asked encouraged open-ended responses and each interviewee was encouraged to expand on topics of importance to them within the research project's line of inquiry. In some cases the person might stray from the scope of the research topic and these detours have not been included in this report. The MDT research programs manager has been apprised of these responses. This section covers the responses to the interviews as they inform the research project. Individuals are not identified.

Questions 1 and 2 were designed as "ice breaker questions". Each person interviewed was asked for their current position at MDT and the role that they play during the problem statement solicitation, selection, and prioritization process.

The positions interviewed were:

- Administrator, Rail, Transit and Planning Division;
- Administrator, Engineering Division;
- Deputy Director; and
- Director.

The roles they play are appropriate to their positions, with all being involved from a higher-level strategic focus. The director and deputy director were not as familiar with the minutiae of the

research solicitation, prioritization, and selection process, as were the Engineering and Rail, Transit, and Planning administrators.

Although a question was asked pertaining to each of the three (3) steps of the problem statement solicitation, prioritization, and selection process, this report will integrate the answers as the respondents tended to answer for the process as a whole. No-one broke it down in their minds and stating the question as a step by step process did not resonate. Thus, the summary is the overall inquiry on what during the problem statement solicitation, prioritization, and selection process works well/does not work well.

According to two (2) people, the current process for problem statement solicitation, prioritization, and selection works well, and the Director did not feel qualified to answer in detail, but had not heard of problems. The fourth person stated that the process followed the one used by Transportation Research Board's National Cooperative Highway Research Program (NCHRP) and works best for states with larger research divisions; these comments are included below. When asked for specific examples of what works well or not so well, the answers were as follows with the number of responses on each in parenthesis.

What works well in MDT's process of problem statement solicitation, prioritization, and selection?

- Inclusion of partners (2)

The two higher-level personnel interviewed referred to the inclusiveness of the problem statement solicitation process as being an aspect that works well.

- Ranking system (3)

The system MDT uses to rank the problem statements was held up by three (3) individuals as being noteworthy. One mentioned that although the process is a little cumbersome, there does not appear to be a better way to create an objective system. Keeping the process objective was discussed by another respondent who has a historic perspective; he said:

We go through the rankings and everybody understands where their pet project stands. Before, when we didn't have enough money to go around, there would be some quite interesting arguments over why are we picking that one and not this one, and the current system is a pretty good one for keeping things clean.

- All divisions compete for one pot of money (1)

I think leaving it in one pot allows some of the smaller divisions to be able to get some of their priorities funded, depending on the importance of it or the impact to the Department's mission as a whole.

What doesn't work well in MDT's process of problem statement solicitation, prioritization, and selection?

- Process too bureaucratic (2)

One (1) individual felt the research process from start to finish, including the problem statement solicitation, prioritization, and selection, is too bureaucratic. This person understood the process reflected the NCHRP model, which as a process at the national level “is essential when you are working with fifty (50) state departments of transportation and you are looking for funding that will come through the states to the NCHRP program”. However given the size of the Montana program, it could be streamlined and made less bureaucratic. The actual solicitation process of problem statements works fine; it is the prioritization and selection that has become burdensome according to this individual.

It's not the solicitation side of the process, that is okay. There are probably eight (8) or ten (10) different proposals on an annual basis and they are batted around. People present to the administrative staff, the administrative staff chews on them a little bit and then everybody votes. Normally there aren't an awful lot of the research proposals that aren't funded. I think it is a little bit too bureaucratic for the size of agency we have.

Note: After this research was completed, Montana shortened its process by eliminating the prioritization rating stage. In one session, the champions present their topics and the RRC votes as to whether each topic will move forward to the technical panel stage.

Other Observations of Note:

- The degree of competitiveness of the process was not agreed upon.
- One (1) individual, as noted above, felt that because most problem statements are selected for possible research projects, the process could be streamlined or the research dollars could be allocated within the different divisions. However, the lack of competitiveness was not an issue to two (2) other respondents. One (1) person pointed to the historic changes in the levels of research dollars and that there may be plenty now, but this could change and thus competition would increase. The comments below reflect the lack of consensus on this issue:

With most projects being funded there is no competition for dollars.

I think it is pretty competitive now. There are some of them that have to wait a little while before they got funded.

Normally, there aren't an awful lot of the research proposals that aren't funded.

One major theme came up in all interviews: create a strategic way to tie the problem statement development/research project selection into MDT long-term transportation needs.

Expanded responses on this theme:

1. Create a strategic way to tie the problem statement development/research project selection into MDT long-term transportation needs.

In the current process, all four (4) respondents agree that there is no tie between research project solicitation, prioritization, and selection and MDT strategic direction. They all mentioned that this has been a discussion topic within the department for some time and were enthusiastic about giving their support to developing a way to do so. One (1) of the

respondents stated that within the engineering division those problem statements that reflect the division's priorities are ranked higher and more likely to be selected. But that is only at the engineering division level. The fact that the discussion about strategic direction only happens at the divisional level and not at higher levels within MDT was reiterated by another individual interviewed. Thus, it was felt that a higher-level process needed to happen to determine how the problem statements could be more driven by departmental strategic priorities. All of the following direct quotes speak to the issue.

In the current process, people have an opportunity to have a conversation about what strategic issues are facing their divisions during the normal Research Review Committee meetings. But that's not what people are talking about. If you are familiar with strategic planning, there is something called an environmental scan. There really should be a look at what the issues are that are facing the Department as a whole. There needs to be a conversation amongst all those divisions and administrators. You have to start saying, what are the issues that we are facing that are really problematic and how do we respond to them? And the research program is a tool to do so.

An environmental scan as a part of a strategic vision is something that is a formal process where you take a look at your baseline information and you take a look at things that are changing, you take a look at the threats, you take a look at the opportunities, and then you try to figure out a way to address those things with research in a timely fashion to make the most of them or to mitigate the worst of it. And that's not happening.

I worry sometimes that we are not strategically focused when we select and award research projects. And one thing that I have talked to her (the research unit director) about that I think may be helpful, would be if we could get the management team within the Agency together annually and talk from a strategic prospective of where we see a need for research and why we need it in that area. That might help us in doing a better job of focusing or getting the most benefit out of the limited research dollars we have.

Not a full strategic planning process, but what I would term, a risk analysis or at least a brainstorming session internally on where we think the greatest needs are for focusing the research dollars, whether it be with the hyperinflation we are seeing right now in steel and cement and asphalt, maybe we need to focus our research dollars on alternative methods of paving.

If it's more targeted in areas that we as a management team feel we ought to be targeting. Right now I don't know that we have that. There are lots of people and lots of ideas, who put their problem statements in and we do rank them, but I don't think we do anything at this point to really try and bring focus on areas that we want to concentrate on.

We do need to consider how to get a more strategic program, we could start with a risk analysis to determine need, start within MDT and then go into the districts. Find out what are the problems going to be in the future, what are the things in the state that hold us back. We need a set of priorities and what are the outside influences that would affect these priorities.

Key Informant Interviews with Other State Research Units

Seven (7) states were identified and interviews were conducted with the research unit directors in the following states:

- *Colorado;*
- *Florida;*
- *Missouri;*
- *North Carolina;*
- *Ohio;*
- *Oregon; and*
- *Washington.*

The results from the interviews are reported by state according to responses that are pertinent to Montana's line of inquiry. The responses are based on the loosely designed questionnaire guide. All individuals interviewed were familiar with the research project and were enthusiastic about participating. They were evidently proud of the work done by their own program and several had been directly responsible for establishing the system of problem statement solicitation, prioritization, and selection used by their program. The Colorado Research Unit manager was new to the position, having held it for only three (3) months, but had invited the past director to participate in the interview. Thus all states were represented by people with longitudinal familiarity of their process and had worked over the years to improve it. The shortest time someone had held the position was Colorado and the longest was Florida with twenty (20) years tenure. The average is just over eight (8) years in the position.

Two (2) states, Ohio and North Carolina, had not completed the web-based survey so responses were requested of those two states to fill in answers that could not be ascertained from the state website or from the research manual, if available.

COLORADO

What in the research unit director's opinion makes the problem statement solicitation, prioritization, and selection process particularly successful; what in the process worked well?

The opportunity for all stakeholders to be involved was identified as one of the strengths in the Colorado process. They are able to identify their needs and then see that there is a way to sort through all the needs that everyone can understand. They use a brainstorming process to fill in potential gaps after problem statements are initially solicited. This brainstorming is done by technical research oversight teams in specific subject areas.

How is the process tied into the DOT's strategic direction?

Colorado's experience with tying the problem statement process to the DOT's strategic direction has evolved and there is no longer any guarantee that the problem statements have to align with the DOT strategic plan. However there is an intentional effort to keep strategic goals in mind:

We want to leave it open enough that if there are some problems out there that are urgent that we didn't really think about in terms of our strategic direction, that we could include those. But we do track how many projects are addressing the strategic direction and how many don't. Also when we do the solicitation, we incorporate the strategic directions and we ask people to refer to that and try to focus in those areas.

To ensure that senior management is involved with setting the research unit's strategic direction, the chief engineer and the director of the division of transportation development participate in the meeting where the Research Unit sets the strategic direction. The Research Council is also involved and it is composed of high-level managers from across the state. This meeting is held once a year and although the direction does not change very much each year, it is reviewed and, if needed, adjustments are made.

In order to narrow the number of problem statements, the oversight teams review them to make the decision as to which will be forwarded to the Research Council for final selection. Although the Research Council is supposed to consider alignment with departmental strategic direction there is no scoring to ensure it.

When asked about recommending ways to tie the problem statement process into the strategic direction, the response was that they do not recommend it. The notion of making a rigid link between the two is felt not to be good for the research process as a whole and would stifle the creativity needed to come up with innovative research ideas.

In our efforts to try to link those in a more solid fashion, we got a lot of resistance, especially from the engineering side. They wanted to make sure that we had the flexibility to address the needs out there. They felt that maybe looking only to the strategic direction and locking things in to that wasn't all that good an idea. So, efforts to make it very rigid have been resisted by management. You know, things are going to come up, a problem or issue is going to come up that does not necessarily hit the strategic plan, but we still need to do the research on them and we need to have that flexibility.

The bottom line was: a strategic plan or direction should be used as a guideline but it shouldn't really drive the program.

Are there plans to improve how the problem statement solicitation, prioritization, and selection process works?

The idea for improving the process used in Colorado was identified as:

I think we need to identify questions that have the best chance of practical application after research is completed. I think closer cooperation with our field engineers, designers, constructors, and environmental staff would be helpful and, in fact, we are contemplating housing our subject matter experts, physically, not administratively, but physically in the areas of expertise.

FLORIDA

What in the research unit director's opinion makes the problem statement solicitation, prioritization, and selection process particularly successful; what in the process worked well?

Full engagement of the entire Department was the primary success identified.

How is the process tied into the DOT's strategic direction?

In Florida, a separate process is used to ensure that each functional area's strategic plan is in sync with the overall Florida DOT strategic direction. It is important to the research unit that the functional areas submit problem statements which reflect the overall Department's research needs, not "simply because the issue is intriguing to them, or it's something that they are curious about". In order to ensure that the research need ties with departmental strategic direction, the research unit meets with each of the offices and asks that question directly.

Communication within and throughout the department at all management levels was highlighted as being an important means to infuse the system with strategic thinking. There was frequent interfacing between senior management and managers. All conversations, even informal or private ones, are discussed and made available throughout the Department.

He (chief engineer) will meet with his managers on a monthly basis and during those meetings we go through and discuss the executive board meeting; we go through some of the private meetings that we have had with Secretaries. This Department is made up of a Secretary and three Assistant Secretaries and the chief engineer is down the next level, but he doesn't hold anything back. He talks about private conversations he's had with the three Assistant Secretaries. He talks about the district production directors' meetings and all of the things that he is involved with on a daily basis with his managers and he requires those managers to have, in turn, staff meetings with their folks and to transmit those comments. We have a series of note-taking software here in the Department, so any employee can log on and read the minutes of the meetings, at any level that they are held within the Department, so someone in our mailroom could read the executive board meeting minutes, someone in maintenance could go ahead and look at the chief engineer's meeting minutes.

The Research Unit has contact points, called research coordinators, within each of the functional areas and all research projects from start to finish are managed by these coordinators. There is almost daily communication with each of the coordinators, monthly meetings held by the research unit, and periodic training sessions. This, in Mr. Long's opinion is what really contributes to in-depth knowledge about what the research needs are within the functional areas and where the problem statements should be coming from. He feels that this process builds on itself and that the solicitation of problem statements does not start anew each year.

Mr. Long feels that the tone of infusing the Research Unit with strategic thinking comes from leadership within the Research Unit.

I have had the honor of doing a lot of peer exchanges, and during those peer exchanges you run across a lot of different research managers in different states, and you could see the differences, you could see the fact that some are good, some are bad, some of the research program is ancillary to their primary duty which maybe planning or something else. I'm dedicated to nothing but research.

Mr. Long was instrumental in changing the direction to make sure that research problem statements did not just reflect as he termed it “asphalt and concrete”, but included all modes and aspects of transportation. When asked if he had plans to improve or change how the problem statement solicitation, prioritization, and selection process works, the response was “no”.

MISSOURI

Missouri has a unique research unit structure. In 2004, a new DOT director restructured the whole department. He combined quality, process improvement, and re-engineering business processes with research. As part of the restructuring, the research division merged with the strategic planning quality group and was renamed Organizational Results Division and the director became the Organizational Performance Administrator.

What in the research unit director's opinion makes the problem statement solicitation, prioritization, and selection process particularly successful; what in the process worked well?

The new structure has intentionally aligned the research program with what the DOT calls their tangible results. These are eighteen (18) desired outcomes that the Department wants to achieve. The eighteen (18) desired outcomes or tangible results are:

1. Uninterrupted traffic flow;
2. Smooth and unrestricted roads and bridges;
3. Safe transportation system;
4. Roadway visibility;
5. Personal, fast, courteous and understandable response to customer requests (inbound);
6. Partner with others to deliver transportation services;
7. Leverage transportation to advance economic development;
8. Innovative transportation solutions;
9. Fast projects that are of great value;
10. Environmentally responsible;
11. Efficient movement of goods;
12. Easily accessible modal choices;
13. Customer involvement in transportation decision-making;
14. Convenient, clean and safe roadside accommodations;
15. Best value for every dollar spent;

16. Attractive roadsides;
17. Advocate for transportation issues; and
18. Accurate, timely, understandable, and proactive transportation information (outbound).

The process for aligning the new structure with the tangible results was facilitated by the Organizational Results Division and was described as:

We invited industry, universities, consultants, MODOT, federal highway, just a gamut of people and there was around 80 in attendance, and we invited them to a day-long strategic breakthrough thinking event where we talked to them about what MODOT's results were, what our desired outcomes were for the organization holistically. Then we put them into breakout sessions, where they could identify what the key research focus areas needed to be over the course of the next three to five years for us to be able to create or deliver innovation for the Department, to close organizational gaps, and help the Department achieve success in each one of those results.

To ensure that all the eighteen (18) desired outcomes are reviewed, the Organizational Results Division oversees a tracker system, which is based on 120 performance measures used to gauge performance and how well tangible results are being met.

The Organizational Results Division opted to have a strategic research vision that dovetailed and aligned with the tangible results and our performance indicators.

Missouri's previous process for determining which problem statements to pursue was left to an informal, unsystematic approach based on who was best at getting an idea funded. With the approach used now, the division can be sure that they have answered the question:

How can any DOT decide what research they really need if they don't understand where the gaps are in the organization and what practical information that can be implemented is going to help them do their job better, faster, cheaper?

Once the departmental tangible results were determined, the Organizational Results Division developed ten (10) focus areas that correlate or support the tangible results. The ten (10) focus areas are: 1) highway safety, 2) traffic management, 3) transportation management systems, 4) road and bridge design, 5) advanced materials for roads and bridges, 6) transportation security, 7) modal access and mobility, 8) economic issues related to transportation, 9) customer communication and expectations, and 10) funding and finance issues. However, it is important to Missouri's program that they avoid being too proscriptive.

We don't get so specific in the focus area that it backs us into a corner to do very specific research projects, but it gives us enough focus and direction that we at least know it has to help solve one of those issues.

Likewise to ensure that problem statements are driven by strategic thinking, all submissions must have the support of someone in a senior-level position.

We'll take ideas and problem statements and concepts from anybody, but we won't move forward with a problem statement unless it has two things: 1) a champion at the high level that agrees that this is something that we need to put some energy and focus into, and is willing to implement the results of the research and 2) the problem statement must identify a specific deliverable that is practically able to be implemented.

When asked if there have been any unforeseen consequences from restructuring of the unit, the response was there has been a broader array of problem statements and, thus, research projects have shifted away from the typical asphalt-concrete type of research.

We are looking at larger, more diverse, multi-modal research projects versus just your typical, pavement type related, or bridge related.

The actual process for developing problem statements is initiated by the Organizational Results Division by looking at the tracker system to identify gaps and/or problems, then by interacting with the senior management person who oversees the area in question. This process leads to an agreement on where the biggest gaps exist and what focus areas need the most assistance. The senior manager then becomes the champion of the developed problem statement and pitches the idea to the annually convened senior management team members, which includes the district engineers.

Are there plans to improve how the problem statement solicitation, prioritization, and selection process works?

In order to improve their current process, the Organizational Results Division will be hosting events to be called "Transportation Research Forums". Each event will be specific to each of the ten (10) focus areas, and will be designed to inform the division's strategic research vision. The planned process is:

We are going to tell them where MODOT is on that focus area, where the federal government is on that focus area, what research has been done, and then give them an opportunity to elevate ideas, suggestions, ask questions, so they better understand where our needs are, where our voids are, and perhaps maybe where they can focus their energies and efforts to obtain some of our research dollars.

When asked if she would recommend more states looking at the way Missouri has changed, the response was:

I would recommend any state to look at thinking about broadening their vision of what research really is and instead of having research be a division that focuses on engineering asphalt and concrete and testing, to broaden that vision to be basically innovative solution finders.... Because I think the old school, or the old mind frame of doing research is not going to be in motion or in play in ten years.

It was emphasized that any change has to be top down and that DOT leadership has to drive the process, "because you can't expect your day-to-day worker bees to effect massive change within an organization, it has to be driven from the top down".

NORTH CAROLINA

What in the research unit director's opinion makes the problem statement solicitation, prioritization, and selection process particularly successful; what in the process worked well?

That the research unit is customer-centered was identified as the main strength of the process. These customers were identified as being at the technical management and administrative management levels; in North Carolina, called the unit head, section head, and branch manager. The Research Unit uses its four key staff members by assigning them to each of four (4) identified research areas, which are grouped from a management point of view: 1) planning and environment; 2) pavement, maintenance, and operations; 3) structures to technical hydraulics; and 4) traffic and safety.

One other strength of the program was identified as:

In our Department we have a research culture from top to bottom; beginning from the Secretary's office, they are all engaged in research at a local level as well as at a national level.

How is the process tied into the DOT's strategic direction?

North Carolina approaches this issue in a different manner than all other states interviewed and clearly the process is quite idiosyncratic. Although Mr. Biswas stated that the Research Unit follows the departmental strategic plan, they really do not dwell on it. In his opinion, a strategic plan is too broad and can be too diffuse to be a useful guide to research. In North Carolina, it is the State Transportation Improvement Plan (STIP) that drives their research needs.

So our research strategic plan is to support the STIP, which is really managed by our technical managers, so what we support is our technical managers to do their job. And that way, indirectly, we are supporting the strategic plan.

North Carolina calls problem statements "research ideas", which they solicit from their customers through a very interactive, one-on-one process. The Research Unit staff asks all customers for ideas, though these ideas are not prioritized until the submitter develops a preliminary proposal. Unlike some other states, North Carolina does not use the amount of available research dollars to help in the prioritization and selection process.

Research ideas are given to the Research Unit, who then groups them into one of the four research areas, once the 5-page preliminary proposal is submitted, another review by the division is made to reduce the number of proposals. The executive committee then decides which will be converted into full proposals. So there is no reduction in the number of research ideas received until after the review of the preliminary proposals. The Research Unit relies on the initial screening being made by the submitter's immediate supervisor.

For example, in our traffic branch, the various traffic people might generate twenty research ideas, but the head of the traffic branch and his assistant, they will go through those ideas and they will give us maybe ten. And so the research ideas come pre-screened

from the unit, internally pre-screened. So whatever research ideas that we get, all ideas are good ideas.

North Carolina uses brainstorming sessions, focus groups, and seminars on an as needed basis with these taking place formally or informally. Sometimes the communication might be driven by an emphasis area not submitting research ideas and to re-invigorate that division's interest in research. However, to avoid being a "bottleneck" in this interactive work, the Research Unit encourages their customers to communicate directly with the researchers. Conversely, if they feel that some communication is not going on, then they will intervene and make sure the communication is managed.

Mr. Biswas was instrumental in instituting North Carolina's more organic process for research idea solicitation, prioritization, and selection. The previous system of selection was a ranking system using 10 to 11 criteria. He felt this leads to apathy amongst DOT personnel who lose interest submitting research ideas. By creating a more customer focused research process through constant communication and interfacing he feels that North Carolina has a robust and dynamic program.

People can see that things are happening, that they are getting their needs served and we (the Research Unit) are available to them whenever they want us.

OHIO

What in the research unit director's opinion makes the problem statement solicitation, prioritization, and selection process particularly successful; what in the process worked well?

The flexibility of the process was identified as one of the best aspects of Ohio's program. Because they are a small, maneuverable unit, they have developed what was termed "a living process. We'll try something, if it doesn't work, we don't have to be married to it for five years before we decide to try something different." However, a supportive group outside of the Research Unit was identified as making this flexibility possible; "In most cases, I don't have to get a bunch of approvals to change something with our program".

On a more detailed level, the format of the problem statement submission form is thought to be particularly successful as it is comprehensive enough to give the Research Unit a thorough opportunity to look at the idea without having to waste staff time by lengthy discussions with the submitter to clarify intent. Their document's length and level of detail is similar to that used by MDT.

How is the process tied into the DOT's strategic direction?

Ohio periodically conducts cooperative research seminars. They got the idea from Michigan's process to talk with stakeholders, get ideas about the research direction and process, and how to refine it and make it better. The seminars combine a training component for potential researchers and for presenting the research community with the strategic research plan to:

go over the focus areas that have been identified by our senior leadership. These focus areas are supposed to represent broad topics that senior leadership within the

organization feels will require research over the next ten years in order to position us where we want to be in the future.

It is these broad focus areas that each departmental division or office will look to when developing specific problem statements that they feel will be needed over the next five years. The offices develop their problem statements and then present them in breakout sessions based on subject matter. The researchers then have the opportunity to identify where gaps might exist.

So it (the cooperative research seminar) is really an open forum to talk about those things and I noticed that the first time we did it, there was a little hesitancy on the part of the researchers to be real forthcoming with some of their ideas and questions and concerns because they kind of viewed any suggestions they might make as proprietary or intellectual property. But once they saw how we used the information, the next one we did was much more open and useful for both parties.

The DOT upper-level management develops the focus areas in collaboration with the Research Unit. The Department does have its separate strategic plan and what they call strategic initiatives, which are long-term projects they want to focus on for a two-to-three year period.

In many respects the research that we do is looking at ways to support those initiatives, but all of the research isn't directly tied into those and neither are all of the focus areas. The focus areas are looking a little bit longer than the Department's strategic initiatives.

The focus areas are converted into problem statements through senior leadership's development of a bulleted list of certain sub-topics under each focus. Then it is up to the individual sponsoring offices to align their actual list of problem statements in support of that list of sub-topics. The division deputy directors are responsible for making sure that any needs identified within the offices under their division and then across divisions, truly represent the Department's needs and priorities, and that no focus area has been neglected.

So they are kind of the glue that ties it all together in terms of the review process.

Whenever any office develops problem statements, they are supposed to get approval from their division deputy director before it is ever sent to the Research Unit for further processing.

Are there plans to improve how the problem statement solicitation, prioritization, and selection process works?

Several areas have been identified for improvement in the problem statement solicitation, prioritization, and selection process. The Research Unit has been trying to expand the problem statement process to include the district offices. Although they have seen more participation by the districts, it is still not as much as the Research Unit would like.

Another area that has been challenging is coordinating and convening senior management for the Research Selection Committee. The change to include senior management in the process was intentional to make sure that the Department's priorities were being met.

OREGON

What in the research unit director's opinion makes the problem statement solicitation, prioritization, and selection process particularly successful; what in the process worked well?

As with several other states, Oregon identified being open and democratic as the factor that makes for a successful process. The problem statement solicitation is sent out to a broad array of stakeholders, from there "it takes on a life of its own".

Another success is the brainstorming session, done every five or so years, to discuss research priorities. This is achieved by convening a broader array of stakeholders with whom the Research Unit generally interacts to have a cross-subject discussion on where research needs to be focused. It is very intentional that the breakout sessions are made up of diversely represented subject areas and interests.

How is the process tied into the DOT's strategic direction?

Oregon does not deliberately tie their research process to the DOT strategic plan or direction. It is felt there is not necessarily a correspondence between research needs and departmental innovation needs, and that the Department's strategic plan is not forward looking enough.

By the time we can get a project selected, launched and finished, the Department is on to something else. That sort of flies in the face of the concept of strategic planning, but when you realize that our average tenure of one of our directors is three years, you can understand why we don't want to follow the director's lead.

However,

I won't say that we are completely disengaged from the Department's needs. I think that gets brought into the deliberations of the Research Advisory Committee, but there is nothing explicit about it.

It is left to the technical committees to determine the research priorities and to plan ahead for future needs. These expert task groups are organized by subject area and they make the decisions on the prioritization and selection of the problem statements. They are in the constant, on-going process of revising their own list of strategic priorities and will make revisions based on input from the brainstorming meetings. The eight (8) task forces which correspond to the eight (8) functional areas are responsible for development of their own priority list of research areas. The eight (8) functional areas are: 1) construction and maintenance; 2) pavements and materials; 3) hydraulics; 4) geotechnical and environmental; 5) traffic safety and ITS; 6) planning and economic analysis; 7) structures, roadway design, human factors and driver safety; and 8) multi modal. The Research Advisory Committee is made up of senior management, and one of the members is on each of the expert task groups. This way senior management direction is brought to the expert task groups, thereby ensuring senior-level input to setting research strategic direction and priorities.

Are there plans to improve how the problem statement solicitation, prioritization, and selection process works?

A chronic problem with dissatisfied customers and “chronic bickering” over project selection were the things mentioned when asked what he would like to improve.

When we solicit the 120 problem statements and fund 10, there are a lot of people who don't succeed and that means we end up with a lot of sore losers and a lot of grouching about the process. I don't know if there is a good solution for that, but it is one that we are constantly fighting. We have done a lot of fine tuning to the process over the years. Almost all has been in response to complaints about people's research needs not being addressed by the program. I am not sure what we can do about that, but it is something that we are constantly struggling with.

WASHINGTON

What in the research unit director's opinion makes the problem statement solicitation, prioritization, and selection process particularly successful; what in the process worked well?

The research problem statement solicitation, prioritization, and selection process has recently been significantly revised at the Washington DOT (WSDOT). The primary area of change was the creation of four standing research advisory committees (RAC's) which are tasked with coming up with a set of problem statements that they feel address the Department's strategic direction. The four (4) RAC's that provide input to the WSDOT Research Program are: 1) Project Delivery, 2) Operations, 3) Multimodal Transportation, and 4) Information and Finance. The Research Advisory Committees are also the entities that come up with the strategic direction within their own functional area. Also, they now insist on submitters developing only complete, comprehensive problem statements. This has ensured that the problem statements are a) complete and b) directly tied to the Agency's strategic direction. The Research Unit identified a good strategy for further ensuring the research reflects departmental goals by having the Research Advisory Committees chaired by a member of the Research Executive Committee.

In addition, the Research Advisory Committees were encouraged to tie their problem statements to the governor's strategic agenda and her list of priorities of government, which is a term to identify the focus of state government and the way state government wants to do business.

The impetus for changing the problem statement process came four years ago when DOT leadership called for research to be more strategic. However, no direction was given about what was not strategic about the existing process.

So we took that (charge) and went to the Research Executive Committee and said okay, we need to be more strategic, let's try to tie it to what makes sense for the Department. We do not have a current strategic plan for the Department. We have a draft business directions document that was at the time considered our strategic plan. We took that business plan and looked through it; the Agency was trying a variety of ways to explain itself in various tables and formats to the legislature. We took that and used it, created questions out of it and said to the Research Advisory Committees, use this to rate your projects, because it is directly tied to the business directions.

Another impetus for making changes was the frustration in the length of time for completion of research projects. In trying to respond to that complaint, the solution cut out the time to create a robust problem statement. So the Research Advisory Committees were trying to use a comprehensive and rigorous rating process to prioritize problem statements that were not very well fleshed out. The Washington Research Unit used this as the focus of their 2005 peer exchange.

In attempts to avoid a prescriptive process, the Research Unit charged the Research Advisory Committees to develop their own way to rate projects. The result has been diverse rating and ranking systems. Two (2) of the committees opted to bring forward their functional area ideas and have a discussion of each, and from those discussions, come to a consensus as to a priority list that fits within their allocated budget. Three (3) of the committees have rating criteria that approximately mirrors the NCHRP process of rating.

The Research Unit staffs each research advisory committee and this enables them to stay closely in touch. This has been a positive interaction; however:

the downside is there isn't one point person; we have to just decide who is going to be point on this committee for this upcoming meeting, but the good side is that we all stay in the know, where we need to be and we know what is competing against our issues. And I (the Research Unit director) try to sit in on all the meetings that I can, just because I am curious. It's good to know what people want.

Another identified success of the new process is that the Research Unit was asked to be more tactical in how information was sent to the different DOT personnel involved with the problem statement process:

Because everybody is so busy, they are always really too busy to deal with research, which isn't today's issues, and so we're trying to be careful and making one document so they can open one document and print that rather than have multiple documents that they have to print individually. We've got our mailing list tightened up, we've got their assistants on the list, so hopefully those folks aren't being tasked with doing a lot of printing.

There is also a point at which the list of problem statements is reviewed to identify gaps. When asked how gaps in strategic directions were identified, the response was that:

It's probably more of a gut feel for the strategic direction. The Research Advisory Committees are saying don't be overly prescriptive; our leadership currently is not one to go through a lot of process to get to an outcome. It's really more about, be the best professional that you can be and use your gut. You've read the strategic plan that we've put together, you are aware of the governor's management and accountability program, you're aware of the priorities of government – make it so.

Are there plans to improve how the problem statement solicitation, prioritization, and selection process works?

As a result of the changes made to the process, it is felt that a lot of good information was gathered on what was important to the Department, but missing was good information on

what constituted a solid research approach. To deal with this, the Research Unit has encouraged each of the research advisory committee functional areas to hold a workshop if they felt it was important and to include faculty from the two research institutions. Thus, after identifying a problem, the Research Unit turned it into a success by bringing the research advisory committees together with the university faculty who are looking at cutting edge research and familiar with projecting into the future.

One aspect of the change identified as not necessarily needing improvement, but one that needed to be managed was that in the old process of ad hoc research committees, the members were primarily technical staff. This made for in-depth technical knowledge, but it made it difficult for non-technical problem statements to be selected.

I would say the technical staff was frustrated when we first created the Research Advisory Committee because they felt left out.

A question was asked about resistance to change internal to the DOT with the response being that the Research Unit undertook a very inclusive process to develop the changes.

The Research Advisory Committees, as well as the Executive Committee, have been a sounding board; we've run things by them and then they make suggestions, so actually a lot of the process has come with their suggestion and their blessing, so it wasn't generally always our ideas, it was feedback we got from them about what was working and what wasn't working. So they have some buy-in.

Once the new process was put in place, the Research Unit conducted a comprehensive and inclusive marketing campaign internally.

We send a monthly report to the chief of staff that gets copied to all of the executives. They don't all read it, but they do cruise through it and it gives them an update on various projects and they definitely know what's been selected. We send out notices on completed reports and we got posters and we've had a research open house and we've got flyers. I think before it was easy to say we weren't strategic because there wasn't a lot of marketing material laying around and a lot of knowledge. It is a lot harder to say that now.

Section V: Conclusions and Recommendations

Conclusions to be drawn from this research project are summarized under each phase of the project. Also in each section there are some recommendations based on the conclusions to address how the research unit within MDT might use this information as a step in its efforts to maintain and improve the quality of its research processes. Thus this section is structured as follows:

- Conclusions and Recommendations Based on Web-Based and/or Research Manual Research;
- Conclusions and Recommendations Based on Web-Based Survey Responses;
- Conclusions and Recommendations Based on Key Informant Interviews with MDT Personnel; and
- Conclusions and Recommendations Based on Key Informant Interviews with Other State Research Units.

Conclusions and Recommendations Based on Web-Based and/or Research Manual Research

Conclusions

The information from this phase of the project was used to inform the next phases rather than to draw any substantive conclusions or recommendations. However some overall conclusions can be drawn:

- Many states do not use their website for disseminating information about their problem statement solicitation, prioritization, and selection process.
- Only 28 states had manuals or made manuals available to this project.
- 15 states had no manual or were in the process of revising them.
- Details of the problem statement solicitation, prioritization, and selection process were not laid out in the available manuals.

Recommendations

- Continue to make as much information as practically available on the MDT website to allow other states to access information.

Conclusions and Recommendations Based on Web-Based Survey Responses

Conclusions

The majority of states have departmental strategic plans, whereas most research units do not have strategic plans.

Each state has an idiosyncratic process for their problem statement solicitation, prioritization, and selection process; although within those segments there is some consistency. The large number of states that use some form of brainstorming session or workshop is interesting to note.

- 21 states use some form of a brainstorming session or workshop to establish research priorities or solicit problem statements.
- Annual solicitation of problem statements is the norm.
- 18 states use some form of an objective ranking or voting method to prioritize and select their problem statements.
- 10 states use a high-level management committee as the final decision maker in the selection of problem statements.

There is no consistency with how states tie their problem statement solicitation, prioritization, and selection process to departmental strategic direction. The methods used are:

- 9 states make this aspect a criterion during the prioritization and selection process;
- 2 states use their research advisory committees, which have senior management representation, as the check and balance to ensure alignment with departmental strategic direction; and
- 6 states develop a list of issues and topic areas based on the state's strategic direction and use the list to determine where to solicit problem statements.

Similarities and differences to Montana:

- Of 32 states, 9 had four or fewer staff (Montana has four staff) and 18 states have total research budgets within a similar range of up to \$4 million (MDT's budget is \$1.8 million).
- 10 research units conduct in-house research (Montana does not specifically conduct in-house research for research projects but does the evaluation component for experimental projects).
- 29 states have staff dedicated to other functional areas (Montana has one staff member dedicated to the library functional area).
- Montana was the only state to report a strictly numerical system for prioritizing the problem statements. 8 states have a voting system and 18 states use a combination numerical/voting system (Montanan prioritizes by ranking and selects by voting).

Note: After this research was completed, Montana shortened its process by eliminating the prioritization rating stage. In one session, the champions present their topics and the RRC votes as to whether each topic will move forward to the technical panel stage. Therefore, Montana no longer has a numerical system for prioritizing the problem statements.

Recommendations

There does not seem to be one particular system for soliciting, prioritizing, and selecting the problem statements that stands out as exceptional; rather each state has, or is in the process of creating, a system that suits it best. As noted in the Results and Findings Section of this report, there are overall types of methods used by states to do this. MDT might look at these different methods and determine what might work best to meet its needs given available resources and the internal environment within MDT as a whole. For instances in strategically focusing MDT's

solicitation, prioritization, and selection process to MDT's strategic plan, the Research Unit might consider using one of the models used by other states. The different methods used to do this are:

- Problem statement prioritization includes an evaluation component on how it links to the DOT and/or research strategic plan.
- No formal way to determine the relationship between the statements and the strategic plan.
- The actual solicitation of problem statements is based on previously determined research direction.
- Although the strategic plan is important, problem statements are not limited to priorities in the strategic plan.

Conclusions and Recommendations Based on Key Informant Interviews with MDT Personnel

Conclusions

- Overall, personnel were satisfied with the Research Unit's problem statement process.
- Developing a mechanism to tie the problem statement process to departmental strategic direction has been under discussion.
- Problem statement process competitiveness is dependent on availability of research dollars.

Recommendations

Given that the interviewed MDT personnel all felt that the process was working in Montana, it does not behoove the Research Unit to change its system for prioritizing and selecting problem statements. However, there is evidently some focus and desire of a more intentional effort to strategically focus the problem statement process. Recommendations from MDT personnel focused on some type of upper-level management engaging in a risk assessment process or an environmental scan. Both processes are designed to look down the road at what MDT must plan for and be prepared for which can be informed by specific research projects.

MDT might consider a couple of approaches used by other states: 1) similar to Oregon, convene a brainstorming session to discuss research priorities with a broad array of stakeholders to have a cross-subject discussion on where research needs to be focused. It is very intentional that the breakout sessions are made up of diversely represented subject areas and interests and 2) similar to Ohio, convene a brainstorming session to combine a training component for potential researchers and a presentation to the research community of the strategic research areas that have been identified by senior leadership.

The major difference between these two approaches is that one gets stakeholders to identify strategic research priorities, and the other gets those priorities developed by internal senior-level management and then presents the list for critique.

Conclusions and Recommendations Based on Key Informant Interviews with Other State Research Units

This phase of the project was very useful in developing conclusions and recommendations on areas in which MDT research staff is most interested.

Conclusions

Below are the overall themes that developed upon examination of the data. Many of these points will be familiar to MDT, or to any organization, as they are based on requirements in any functioning unit – the fact that communication is so important will not be a revelation to anyone, but it always requires focus and intentionality.

- Research units need to work to develop support and involvement from all DOT personnel.
- Supportive leadership is key in making any changes.
- Having a flexible problem statement solicitation, prioritization, and selection process within set guidelines maintains a creative research environment.
- Keeping research in the consciousness of other DOT personnel is an important factor to maintain the quality of a research program.
- Communication with stakeholders both internal and external to DOT is a major contributor to a healthy process.
- Many of the processes in place were instituted to revise older, less systematic, less transparent methods of problem statement solicitation, prioritization, and selection.
- An open and democratic process considered the most successful part of problem statement solicitation, prioritization, and selection.
- Using a collaborative process with stakeholders to determine research direction and needs has been successful for those states who initiated it.
- Initiating a rigid system to tie problem statement solicitation, prioritization, and selection to the departmental strategic direction can constrain the research program in potentially harmful ways.
- Do not limit research ideas to the traditional definition of “asphalt and concrete” but build into the problem statement solicitation process a wider notion of what constitutes a research idea.
- Ensure that complete problem statements are developed prior to submission using a comprehensive problem statement form.

Recommendations

Exploring ways to strategically focus the problem statement solicitation, prioritization, and selection process has been under discussion at MDT. Now, with the information gleaned through this research project, MDT might look at ways to move forward on this issue. MDT may already be considering integrating some of the methods used by other states into its own process. No one process was the primary method used by all states; thus, MDT can explore

some type of hybrid to synthesize the most successful elements from any or all of the methods. The elements that were described as the most successful were:

1. Build intentional communication channels between research unit and problem statement submitters within all DOT divisions and develop mechanisms to track communication to ensure both formal and informal communication loops with all stakeholders throughout DOT.

- **FL** – Uses note-taking software so any employee can log on and read the minutes of the meetings, at any level. The Research Unit has contact points, called research coordinators, within each of the functional areas.
- **NC** – Four key staff members are assigned to each of the four identified research areas. If they feel that some communication is not going on, they will intervene and make sure the communication is managed.
- **WA** – The Research Unit conducts an on-going comprehensive and inclusive internal marketing campaign.

2. Engage senior management along with the research unit to take leadership of making any change happen.

- **MO** – Emphasized that any change has to be top down and that DOT leadership has to drive the process.
- **NC** – A research culture exists from top to bottom, beginning from the Secretary's office; they are all engaged in research at a local level as well as at a national level.
- **OH** – A supportive group outside of the research unit is needed to create a flexible research unit.
- **WA** – The Research Unit undertook a very inclusive process to develop the changes.

3. Determine overall focus areas for research.

- **MO** – Once the departmental tangible results were determined, the Organizational Results Division developed ten focus areas that correlate or support the tangible results.
- **NC** – Focus areas have been identified from a management point of view: planning and environment; pavement, maintenance, and operations; structures to technical hydraulics; and traffic and safety.
- **OH** – Each departmental division will look to identified broad focus areas when developing problem statements. These focus areas represent broad topics that senior leadership within the organization feels will require research over the next ten years.
- **OR** – Organizes expert task groups by subject area and allows them to make the decisions on the prioritization and selection of problem statements. They are in the constant, on-going process of revising their own list of strategic priorities and will make revisions based on input from the brainstorming meetings.

4. Use management within the functional areas as the screening mechanisms for problem statements that do not align with their strategic direction.

- **CO** – To ensure that senior management is involved with setting the Research Unit’s strategic direction, the chief engineer and the director of the division of transportation development participate in the meeting where the Research Unit sets the strategic direction. The Research Council is also involved and it is composed of high-level managers from across the state.
- **MO** – All submissions must have the support of someone in a senior-level position to ensure that problem statements are driven by strategic thinking.
- **NC** – The Research Unit relies on the initial screening being made by the submitter’s immediate supervisor.
- **OH** – The division deputy directors are responsible for making sure that problem statements truly represent the Department’s needs and priorities, and that no focus area has been neglected.
- **OR** – The Research Advisory Committee is made up of senior management and one of the members is on each of the expert task groups. This way senior management direction is bought to the expert task groups, thereby ensuring senior-level input to setting research strategic direction and priorities.

These expert task groups are organized by subject area and they make the decisions on the prioritization and selection of the problem statements. They are in the constant, on-going process of revising their own list of strategic priorities and will make revisions based on input from the brainstorming meetings. The eight task forces are responsible for development of their own priority list of research areas.

- **WA** – A good strategy for further ensuring the research reflects departmental goals is by having the research advisory committees chaired by a member of the Research Executive Committee.

5. Institute some form of brainstorming with stakeholders to get buy-in to the research unit’s strategic direction.

- **CO** – Uses a brainstorming process to fill in potential gaps after problem statements are initially solicited. This brainstorming is done by technical research oversight teams in specific subject areas.
- **MO** – The new structure has intentionally aligned the research program with what the DOT calls their tangible results. These are eighteen (18) desired outcomes for what the DOT wants to achieve. To ensure that all the parts are reviewed and followed, the Organization Results Division oversees a tracker system, which is based on 120 performance measures that are used to gauge performance and how well tangible results are being met.
- **NC** – Conducts brainstorming sessions, focus groups, and seminars on an as needed basis with these taking place both formally and informally.
- **OH** – Their seminars combine a training component for potential researchers and a presentation of the strategic research plan to the research community to go over the focus areas that have been identified by senior leadership.

- **OR** – Conducts brainstorming sessions every five or so years to discuss research priorities. This is achieved by convening a broader array of stakeholders than they generally interact with to have a cross-subject discussion on where research needs to be focused. It is very intentional that the breakout sessions are made up of diversely represented subject areas and interests.

6. Ensure that complete problem statements are developed prior to submission using a comprehensive problem statement form.

- **OH** – the format of the problem statement submission form is thought to be particularly successful as it is comprehensive enough to give the Research Unit a thorough opportunity to look at the idea without having to waste staff time by lengthy discussions with the submitter to clarify intent.
- **WA** – Detailed problem statements are an important component in streamlining the solicitation and prioritization process.

Conversely, it behooves MDT to avoid the mistakes that other states felt they had made. The most important element identified was: avoid a rigid approach to aligning the problem statement solicitation, prioritization, and selection process to departmental strategic direction.

- **CO** – Colorado’s experience with tying the problem statement process to the DOT’s strategic direction has evolved and there is no guarantee that the problem statements have to align with the DOT strategic plan. However, there is an intentional effort to keep strategic goals in mind, although they do not recommend a rigid link between the two.
- **MO** – It is important to Missouri’s program that they avoid being too proscriptive.
- **OH** – The research unit is a small, maneuverable unit; they have developed what was termed “a living process” and can move quickly to change things that are not working.
- **OR** – It is felt there is not necessarily a correspondence between research needs and departmental innovation needs, and that the Department’s strategic plan is not forward looking enough.

The bottom line was that: a strategic plan or direction should be used as a guideline but it shouldn’t really drive the program.

References

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APPENDIX A

State Transportation Research Procedure Questionnaire

APPENDIX A

State Transportation Research Procedure Questionnaire

Start
Here:



Please provide your answers in the columns below to the right of the arrow or by highlighting an appropriate item or writing a response:

<i>1. Strategic Plan</i>	1A. Does the research unit have a strategic plan?→	Highlight one option below: Yes No	
	1B. Does the DOT have a strategic plan?→	Highlight one option below: Yes No	
<i>2. Research Problem Solicitation</i>	2A. Does the research unit conduct workshop/brainstorming sessions?→	Highlight one option below: Yes – go to i below No – skip to 2B below	
		i. How often/when?→	
		ii. Are these sessions limited to certain focus areas or open to all areas? →	Highlight one option below: Sessions limited – go to iii below Open to all areas – skip to iv below
		iii. If limited to focus areas, what are they and how are they determined (DOT and/or research strategic plan)?→	
		iv. Are these sessions conducted with internal staff, or internal and external participants?→	Highlight one option below: Internal staff only – go to 2B below External participants too - skip to v below
		v. If external, who?→	

	2B. How often are problem statements solicited? →	→	Please write the frequency below:
		i. When? →	Please enter approximate time of year:
		ii. Can problem statements be submitted outside of the solicitation cycle?→	Highlight one option below: Yes – go to iii below No – skip to 2C below
		iii. If so, are they considered at that time or during the next solicitation cycle? →	Highlight one option below: Considered at that time Considered during next cycle
	2C. Are the potential problem submitters only from within the DOT?→	Highlight one option below: Yes – skip to 2D below No – go to i below	
		i. Who can submit problem statements?→	
	2D. Is problem statement solicitation related to DOT strategic plan, and/or research strategic plan? →	Highlight one option below: Yes – go to i below No – skip to 2E below	
		i. If so how? →	
	2E. Does research unit help the problem statement submitter write/develop problem statements? →	Highlight one option below: Yes – go to i below No – skip to 3A below	
		i. If so what position does this? →	

3. Problem Statement Prioritization and Selection	3A. Are the problems prioritized by a numerical system or voting system? →	Highlight one option below or if a combination of both, please describe: → Numerical – go to i below Voting – skip to 3B below	
		i. What are the criteria, scale, etc?→	Now go to 3C below
	3B. If voting system – who votes and what is the voting process? →		
	3C. If use committees, what is the committee make-up?→		
	3D. How are prioritized problem statements selected for research?→		
	3E. Are problem statement prioritization and selection related to DOT strategic plan, and/or research strategic plan? →	Highlight one option below: Yes – go to i below No – skip to 3F below	
		i. If so, how?	
	3F. Is there a special process for selecting emergency problems or problems outside of the solicitation cycle? →	Highlight one option below: Yes – go to i below No – skip to 4A below i. if so, what? →	

4. Other	4A. Number of research staff		Please enter number here:
		→	
	4B. What is the total amount of research funding from all sources (FFY 2006)?		Please enter dollar amount here:
		→	
	4C. Does research unit include other functional areas (such as ITS, approved products, library etc)?→	Highlight one option below: Yes – go to i below No – skip to 4D below	
		i. If so what are the areas?→	
		ii. How many staff are assigned to each area?	Please enter number of staff by area below:
		→	
		iii. What amount of the total research funding is attached to each area (FFY 2006)?	Please enter dollar amount by area below:
		→	
	4D. When during the research project solicitation, prioritization, and selection process is a literature search conducted?→		
	4E. Are local universities partnered with research units?→	Highlight one option below: Yes – go to i below No – skip to end	
		i. If yes, is all research conducted by the universities?	Highlight one option below: Yes No
		→	
		ii. Which universities?→	
	4F. Does research unit have staff dedicated to conducting in-house research?	Highlight one option below: Yes – go to i below No – skip to end	
		i. If so how many staff? →	Please enter number here:
		→	
		ii. What amount is dedicated to these staff?	Please enter dollar amount here:
		→	

APPENDIX B

Key Informant Interview Questionnaire of MDT Staff

APPENDIX B

Key Informant Interview Questionnaire of MDT Staff

Purpose: to garner suggestions and ideas to improve the problem statement solicitation, prioritization, and selection process used by MDT.

Who: people within MDT with in-depth knowledge of the MDT research program.

Questionnaire: the following questions are deliberately open-ended and are designed to lead the interviewee to talk freely about his or her thoughts, ideas, feelings, and experiences with the program. Topic areas listed below are intended to guide the interviewer – if any of the topic areas are not raised during the conversation, the interviewer will bring them up.

1. What is your current position and (briefly) what are the responsibilities attached to that position?
2. What role do you play during the problem statement solicitation, prioritization, and selection process?
3. What during the solicitation phase of problem statements works well?
4. What during the solicitation phase of problem statements does not work well?
5. What are some ways it could be done better? (Interviewer will ensure that ideas are fleshed out as well as how they could be made operational.)
6. What during the problem statement prioritization process works well?
7. What during the problem statement prioritization process does not work well?
8. What are some ways it could be done better? (Interviewer will ensure that ideas are fleshed out as well as how they could be made operational.)
9. What during the problem statement selection process works well?
10. What during the problem statement selection process does not work well?
10. What are some ways it could be done better? (Interviewer will ensure that ideas are fleshed out as well as how they could be made operational.)
11. Any last thoughts or ideas?

Topics to be raised if they do not come up in conversation:

Tie into strategic goals/plans etc.

Attached to focus areas

APPENDIX C

Responses to Web Survey Questionnaire: Question 3B

APPENDIX C

Responses to Web-Based Survey – Question 3B

Question 3B: If the problem statement is prioritized by a voting system, who votes and what is the voting process?

- **AZ** – At the Research Council’s option, a preliminary e-mail vote may be conducted to reduce the number of proposals. Typically, a maximum of five proposals are put forth by the Arizona Transportation Research Center (ATRC) in each of the following seven (7) research emphasis areas: 1) environment, 2) intelligent transportation systems, 3) maintenance, 4) materials and construction, 5) planning and administration, 6) structures, and 7) traffic and safety. The Research Council typically chooses to reduce this number to a maximum of three proposals for final consideration. Thus, the number of proposals brought forward is determined by the Research Council.
- **FL** – Prior to requesting prioritized lists of projects, the Research Center meets with the Executive Board to solicit guidance on upcoming emphasis areas and strategic direction. The Research Policy Committee (RPC) will accept or amend the prioritization of proposed projects for inclusion in the annual work program. The RPC may also recommend modifications to scopes of work, schedules, and proposed budgets in order to make the research effort more beneficial to the Department. The committee also approves the suggested principal investigators, where identified.
- **HI** –HDOT’s Research Advisory Committee (HRAC) votes to prioritize the projects for funding. The HDOT Research Unit must receive at least six voting member’s vote to implement.
- **IA** – The submitter of the problem statement will attend the Iowa Highway Research Board (IHRB) meeting and provide a short oral presentation. The board will ask questions and offer suggested changes, then will vote to accept, reject, or table the problem statement. Considerations for sponsorship are: availability of funds, project budget needs, balance in the types of work to be supported, expected benefits, and urgency of need.
- **KS** – At the Research Technical Committee meeting, each area panel leader makes a presentation on the assigned problem statements. Universities present approved problem statements in priority order. The Technical Committee votes to prioritize the recommended pre-proposals from each university. The chairman tabulates the ballot results for presentation to the Program Council. Voting is based on: relevance to critical research needs of KDOT; relevance of proposed research idea to the theme of K-TRAN; amount of overlap of the proposed research idea with other programs or completed research; duration of proposed research project; and extent to which minorities and handicapped persons are involved in the research, either as participants, recipients, or beneficiaries.
- **LA** – Problem statements received by Louisiana Transportation Research Center (LTRC) are assigned to Research Problem Identification Committees (RPIC) for rating according to need and implementation potential.

- **MA** – The Transportation Research Needs Committee is comprised of division heads from the Highway Department, EOT, and representatives from the modal agencies such as Transit, Registry of Motor Vehicles, MA Port Authority, MA Turnpike Authority, and the MA Aeronautics Commission. The committee recommends problem statements for inclusion into the work program.
- **MO** – District engineers, leadership within the MoDOT.
- **NH** – Research advisory committees.
- **NJ** – They are ranked by each Research User Committee member and the ranks are averaged and tallied.
- **NV** – RAC members; the individual RAC members receive prioritization ballots and other pertinent information prior to the annual RAC meeting. Prior to the meeting, the Research Division tallies the ballots then submits an ordered list of project titles to the RAC at the meeting.
- **OR** – Each expert task group (ETG) member ranks the proposals and the results are compiled for consideration during the spring ETG meeting. Two to three projects are selected by the ETG for Stage 2 development and RAC consideration. At a RAC meeting, a brief presentation of the Stage 2 project proposals will be made. Following, committee members are asked to rank each Stage 2 proposal.
- **PA** – Research Division staff rank and prioritize problem statements.
- **RI** – The RRAC will be asked, as part of the rating procedure, to categorize as “not to be considered further”. A simple majority vote will remove such problem statements from the ranking.
- **UT** – Each discipline group at workshop.

APPENDIX D

Responses to Web Survey Questionnaire: Question 3C

APPENDIX D

Responses to Web Survey Questionnaire: Question 3C

Question 3C: If the state uses committees to prioritize problem statements, what is the committee make-up?

- **AK** – RAC: chief engineer, deputy commissioner of highways and public facilities, deputy commissioner/director of marine operations, deputy commissioner of aviation, director of program development, central regional director, northern regional director, southeastern regional director, FHWA representative, and subject matter experts (for problem statements in their area of expertise).
- **AZ** – The Research Council currently includes eighteen department staff, ranging from division heads to senior managers, plus one Federal Highway Administration staff.
- **CO** – The Research Implementation Committee (RIC) is composed of 8–10 high-level CDOT department managers who are appointed to the council by the executive director and a representative from the FHWA. Each research subject area will have an appropriate RIC member who has the authority in a subject area within CDOT and will serve as champion for research in that subject area. Oversight teams: a team established to provide technical guidance and oversight for the RD&T program in specific subject areas.
- **CT** – Evaluation committees and councils vary with the program. For example, one is jointly governed by four appointees of the commissioner and four appointees of the president of the university.
- **FL** – Top management.
- **IL** – Two committees are comprised of key staff mostly lower-middle managers to upper-middle managers, plus industry and university types. The Executive Committee is comprised of department directors.
- **HI** – HDOT’s Research Advisory Committee (HRAC) shall be comprised of 11 voting members from the following HDOT offices: the engineering program manager of the Materials Testing and Research Branch (MTRB); Airports Division administrator; Harbors Division administrator; Central Planning office administrator; Research and Technology Transfer section head (HWY-LR); and representatives from the following Highways Division offices: Construction and Maintenance Branch (HWY-C); Traffic Branch (HWY-T); Design Branch (HWY-D); Right-of-Way Branch (HWY-R); Staff Services Branch (HWY-S); and Oahu District (HWY-O), who represents all the neighbor island districts.
- **IA** – There is no committee.
- **ID** – Enterprise-wide.
- **KS** – The Research Program Council sets policy and approves the K-TRAN research program developed by the Technical Committee. Make up: Secretary of Transportation,

Assistant Secretary, state transportation engineer, deans of engineering schools, and representatives from the private sector. The Research Technical Committee oversees all of the problem statement process. It is made up of at-large members (engineer of research, chairman of Technical Committee, technology transfer engineer, and chief of Bureau of Construction and Maintenance). Area panel leaders are from: Planning, Pavements and Materials, Traffic Operations and Geometric Design, Bureau of Traffic Engineering, Structural, Computing, Drainage, Rail, Aviation, Public Transit, local governments, four university designees; and FHWA representative K-TRAN. Area Panels represent different specialty areas within the K-TRAN and the universities.

- **LA** – LTRC Policy Committee is appointed to advise and assist the director in coordination of the research, education, and training programs; it has eleven members. The Project Review Committee (PRC) is appointed by the director and has a major responsibility for assisting the LTRC engineer administrator or manager in the development of acceptable research problem statements and overseeing the rest of the research process. The Research Advisory Committee (RAC) is appointed by the director to review, prioritize, and rate research problem statements selected by RPICs. It is composed of RPIC chair, LTRC staff, DOTD technical staff, field personnel, and a FHWA representative. The Research Problem Identification Committee (RPIC) was formed to assist the LTRC staff in the formulation and refinement of problem statements. Members are appointed by the director from LTRC personnel, DOTD, universities, and private industry; FHWA is an invited observer of the committee. Selection is based upon the expertise and interest of each individual relative to the technical subject matter.
- **MD** – The Research Advisory Board (RAB) guides the research program. Membership is broad and includes MDOT and modal staff as well as local government, FHWA, and university and industry representatives.
- **MO** – Variety of state engineers (design, construction, bridge, materials, etc., as well as division leaders on the business side such as human resources, controller, etc.). Also includes several district engineers.
- **MS** – Varies, it depends on the proposal. I send it to the departmental staff that are involved in the area that the research is proposed for their numerical rating.
- **MT** – The Research Review Committee's (RRC) prioritizes and selects problem statements. Membership is broad and includes most of the MDT divisions, as follows: Director; Deputy Director; Administration Division Administrator; Aeronautics Division Administrator; Business Process Solutions Operations Manager; District representative; Highways and Engineering Division Administrator; Information Services Division Administrator; Maintenance Division Administrator; Motor Carrier Services Division Administrator; Rail, Transit and Planning Division Administrator; Research Programs Manager; and Planning and Research Engineer, Montana Division-Federal Highway Administration. The district administrators (DA) also prioritize problem statements.
- **NH** – Research Advisory Council: chair is administrator, Bureau of Materials and Research. Secretary is chief of research, Bureau of Materials and Research. Members are Bureau administrators from Bridge Design, Bridge Maintenance, Construction, Environment,

Highway Design, Highway Maintenance, Rail & Transit, Right-of-Way, Traffic, Planning & Community Assistance, Turnpikes and Aeronautics, along with the assistant director of project development. In addition, associate (non-voting) membership is extended to the following: bridge engineer; FHWA; chief; CE Research Division at CRREL; and the VP for Research & Public Service at UNH; director, T2 Center at UNH; and State of NH Office of Information Technology.

- **NJ** – Directors and a few managers.
- **NM** – Representatives from DOT and FHWA.
- **NV** – The RAC is composed of the following members: 1) planning and research engineer from the FHWA Nevada Division office, 2) NDOT chief construction engineer, 3) NDOT Research Division chief, 4) NDOT chief materials engineer, 5) NDOT chief maintenance engineer, 6) NDOT chief bridge engineer, 7) NDOT chief road design engineer, 8) NDOT operations analysis engineer, 9) NDOT chief safety/traffic engineer, and 10) a district engineer representative. The Research Division chief coordinates and presides over the RAC meetings. The FHWA representative serves as a non-voting member of the RAC. Members serve for as long as they hold their respective positions. The district engineer representative serves on a rotational basis for three years. The Research Management Committee (RMC) is comprised of the following members: 1) deputy director, 2) assistant director of planning, 3) assistant director of operations, 4) assistant director of engineering, and 5) assistant director of administration.
- **NY** – Our RAC is made up of representatives of each of our five (5) divisions and representatives of the NYS Thruway and Bridge Authority; FHWA participates as a non-voting member.
- **OK** – Division subject experts.
- **OR** – Research Advisory Committee (RAC) membership is drawn from high-level ODOT technical and managerial staff. Voting members also include the research unit manager and two university representatives. FHWA Division office has a designated non-voting member. An expert task group (ETG) provides technical oversight for the eight (8) functional areas: 1) construction and maintenance; 2) pavements and materials; 3) hydraulics; 4) geotechnical and environmental; 5) traffic, safety, and ITS; 6) planning and economic analysis; 7) structures, roadway design, human factors, and driver safety; and 8) multi modal. ETG's consist of a RAC representative, research unit representative, FHWA representative, and two to four technical experts.
- **PA** – Program Management Committee.
- **RI** – RRAC membership is drawn from high-level technical and managerial staff in the RD&T Research Unit, the operating unit of the RIDOT, and FHWA Division office.
- **SC** – Each breakout session at the research workshop prioritizes the list of topics from their group. A "champion" is then selected to prepare a problem statement for the high priority topics.

- **TX** – Research Management Committees (RMC) consist of a chair (district engineers), vice chair (district engineers), and individual members (division, office, district staff). Technical Assistance Panels (TAP) finalize and prioritize project statements for presentation to the RMC. The chair of the TAP will be a TxDOT employee. The size of the panel is determined by the RMC chair. Panel members may be from TxDOT, academia, and FHWA. The RMC chair may approve members from local governments, private industry, trade groups, etc. Representation from any interested Texas state-supported university.
- **UT** – UDOT, universities, FHWA, and private sector.
- **VA** – There is no overall evaluation committee.
- **WA** – The Research Executive Committee (REC) defines research goals that are the basis for project selection and establishes the selection committees. Members include: Assistant Secretary, Engineering and Regional Operations Division; director, Strategic Planning and Programming; director, Environmental and Engineering Programs; director, Maintenance and Operations Programs; chief of staff; regional administrator, eastern Washington; regional administrator, western Washington; and four (4) Research Advisory Committees (RACs), 1) Project Delivery, 2) Operations, 3) Multimodal Transportation, and 4) Information and Financial Operations. Each has 9 to 12 members. The RACs are chaired by members of the Research Executive Committee and supported by the staff of the research office. The role of the RACs includes: providing input into the creation of research problem statements, prioritizing research needs in a manner that addresses critical agency issues and aligns with the strategic direction of the Agency, and recommending to the Research Executive Committee research projects to be funded.
- **WI** – It varies according to the research type (materials/construction, policy, pooled fund). Members typically have technical expertise in the research area.
- **WV** – Upper management and FHWA members make the final decisions on selection. A committee does not exist.

APPENDIX E

Responses to Web Survey Questionnaire: Question 3D

APPENDIX E

Responses to Web Survey Questionnaire: Question 3D

Question 3D: How are prioritized problem statements selected for research?

Different methods used by states to prioritize problem statements fell into a total of seven (7) categories as listed below, with the number of states that use that specific method in parenthesis. Some states reported a combination of methods and thus the total number is greater than the number of states that responded to this question.

1. Higher-level body selects and reduces the prioritized list (16).
2. Higher-level body ratifies or endorses the prioritized list (4).
3. Consensus among several different groups (4).
4. Selection is made within each functional area often with consideration of functional area funding allocations (3).
5. Selection is made on funding availability (3).
6. Research unit matches total funding availability with the prioritized list (2).
7. Other – did not directly answer the question referring to a ranking/rating system but did not identify who did this (2).

1. Higher-level body selects and reduces the prioritized list.

- **AK** – 1) The research engineer reviews, 2) subject matter experts review and prioritize/some are rejected, 3) subject matter experts present to RAC, 4) RAC may reject for any number of reasons, 5) surviving needs statements are scored using criteria in 3Ai, 6) projects approved based upon score, and 7) available budget constrains number of approved projects. In addition to ranking the research needs statements, the board may: 1) add or remove research need statements from board consideration; 2) alter research need statements; and 3) make recommendations to Statewide Research regarding scope, investigators, schedules, budgets, or other matters pertinent to the proposed research.
- **AZ** – The final group of proposals is presented and discussed at a Research Council meeting. The Research Council then scores each proposal, again from 0–3. The scores are totaled and all proposals are ranked together, from highest to lowest.
- **CO** – Oversight teams will complete an analysis of each problem statement (previous research, TRIS search results, feasibility, and application). Only problem statements that are not currently being studied, either by CDOT or another agency, will be considered. The oversight team will then develop a prioritized list of the accepted problem statements for presentation to the RIC. With the approval of the appropriate RIC member, oversight teams will submit recommendations to the RIC. The RIC will meet and prioritize the recommended problem statements. Recommended problem statements will be finalized by the chief engineer, director of the division of transportation development, and research coordination engineer.

- **HI** – The Research Unit determines if the proposed problem statements are research and developmental projects, or technical assistance projects. They determine if proposed problem statements qualify for SPR funding. The HDOT’s Research Advisory Committee (HRAC) votes to prioritize the projects for funding.
- **IA** – Engineering and Statewide Operations bureau chiefs note the priorities in their own bureaus. Research director and Highway Division director establish overall priorities.
- **KS** – The chairman of the Technical Committee provides a prioritized list of the pre-proposals for consideration by the Program Council at a meeting scheduled during late February or early March. The Program Council is updated on the process used to develop the list, as well as any special situations. It reviews the budget, discusses the recommendations of the Technical Committee, approves a final categorized list of projects, allocates funding, and discusses the policy implications of the recommendations. Any policy changes or emphasis areas for the next solicitation are also discussed. The actions of the Program Council are documented in the official minutes of the meeting and a spreadsheet is drafted detailing of the approved projects in the annual K-TRAN research program.
- **LA** – The top problem statements from each RPIC are submitted to the Research Advisory Committee, who evaluates the problem statements according to need and implementation, resulting in a priority list used by LTRC to determine funding.
- **MS** – The highest numerical ratings are presented to my RAC for their vote.
- **MT** – The RRC reviews the ratings and comments from the prioritization phase and selects the high priority topics for that solicitation cycle.
- **NM** – The Oversight Committee evaluates projects according to the Agency's goals and objectives.
- **NV** – The RMC makes the final decision as to which research activities are included in the annual research plan.
- **OR** – Expert task groups each nominate 2–4 top projects from their subject area. The Research Advisory Committee (RAC) ranks these 16–32 finalist problem statements.
- **RI** – Individual ratings are averaged to create a ranking of remaining projects. Only a short list of projects submitted by URI is then sent to the Joint Research Advisory Committee (JRAC). The final RRAC and JRAC rankings are then sent to the RIDOT chief engineer and RIDOT director for review and final selection.
- **SC** – A ballot is prepared listing all selected topics from each breakout group from the Research Workshop in the prioritized order as determined by the group. The ballot is then forwarded to RDEC members along with the problem statement forms. The RDEC members rank the topics on a scale of 0–5 (0 no need, 5 great need). Ballots are returned to the materials and research engineer. The research staff then tallies the ballots and prepares a spreadsheet listing the rank of the topics. A meeting of the RDEC is then

scheduled to finalize project selection. Topics approved for funding are then initiated in a prioritized order as determined by the RDEC over the next two years.

- **UT** – The available research funds are applied to the list of priority statements developed at the workshop. The priority list and funding scenario is presented to the Research Division staff for their input and to senior leaders in the Department for their feedback. Minor changes can be made to the priority list based on feedback received and further evaluation of the problem statement scopes. Senior leaders may request that several projects be moved up or down in the funding list. Next Research Division staff members are assigned as project managers for each of the projects and they discuss possible principal investigators for each. The final research priority funding list is submitted for approval to the Department and FHWA.
- **WA** – The director of research and library services compiles the priority problem statements and presents the recommendations of the RAC's to the Research Executive Committee.

2. Higher level body ratifies or endorses the prioritized list.

- **MD** – This information is reviewed with the state highway administrator for his endorsement in preparing the final research work program.
- **NJ** – The Bureau of Research manager will assign the submitted problem statements to the Research Unit for review and evaluation. Assigned research staff will evaluate the submission through discussion with the submitter, other key NJDOT staff, and literature searches. Problem statements that have sufficient merit will be prepared for submission to the Research Users Committee (RUC). The proposed research final disposition report (summarizing each problem to be addressed, suggested approach, recommended disposition, resource category, and an estimate of the persons and months) is then presented to the RUC for review and approval.
- **PA** – The draft PennDOT research program is presented to the PennDOT Program Management Committee for their endorsement in preparing the final research program.
- **WA** – The Research Executive Committee retains final approval of the research program.

3. Consensus among several different groups.

- **CT** – The 8-member council has a screening process for pre-proposals, followed by peer reviews, and a prioritization/voting process.
- **MO** – They are generated from partners and internal staff that determines the research would benefit the DOT.
- **NY** – Each person gets to rank the proposals that have been scored by research staff. We tally all the rankings into one combined rank order list and present to the group for discussion. Votes can be changed at this time if needed.

- **VA** – Synthesis of advisory committee suggestions, researcher input, management input, and external demands (a directive from General Assembly to do a study, for example).
4. Selection is within each functional area often with consideration of functional area funding allocations.
- **AZ** – A maximum of five research proposals are selected from each of the seven research emphasis areas.
 - **FL** – The Research Center (RC) provides management with a comprehensive analysis of proposed research (e.g.; distribution of work amongst universities, results from TRIS/RIP searches, workload of project managers and principal investigators, past performance of principal investigators, perceived need based upon strategic plans, and relationship/impact of proposed research on other functional areas). The RC also answers questions posed by management that is specific to each proposal. If cause is not found to eliminate/defer/modify the request, then the proposals are initially accepted in priority order until a predetermined level of funding for that functional area has been obtained.
 - **IL** – Prioritized by each TAG/subject area. The Executive Committee usually tries to fund the top topic in each area with some judgment on benefits to the Department and cost. This group tends to want to fund lower cost projects to cover needs in a wide area.
5. Selection is made on funding availability.
- **ID** – Limited by available funding.
 - **WI** – Decisions are based on need and available funds.
 - **WV** – Based on the overall ratings, availability of funds, and provision of a project monitor.
6. Research Unit compares funding.
- **MD** – The cumulative research problem statement rankings, in priority order, are used to prepare recommendations for the draft research work program. In developing the draft work program, the Research Division compares the ranked research needs against the available funding for new projects for the upcoming fiscal year.
 - **PA** – In developing the draft work program, the Research Division staff compares the ranked research needs against the available funding for new projects for the upcoming fiscal year.
7. Other.
- **NH** – Problem statements are first rated using the 0 to 5 NCHRP criteria. Then each problem statement is ranked in order of priority.

- **OK** – Based on the level of interest and research to see whether similar work is being done elsewhere.

APPENDIX F

Responses to Web Survey Questionnaire: Question 3Ei

APPENDIX F

Responses to Web Survey Questionnaire: Question 3Ei

Question 3Ei: If problem statement prioritization and selection is related to DOT strategic plan and/or research strategic plan, how is this done?

There are several different methods used by states during the prioritization and selection phase to establish the connection between the problem statement and DOT strategic plans. The different methods used fall into the following five (5) categories, with the number of states that use that specific method in parenthesis:

1. One of several criteria used to select problem statements (9);
 2. A developed list of issues and topic areas based on the state strategic direction are developed and used to solicit problem statements (6);
 3. High-level management determines if the problem statements compliment the departmental strategic direction, there is no formal process to do this (2);
 4. The DOT strategic plan is used as the initial screening mechanism by the research unit (2); and
 5. Other (1).
1. One of several criteria used to select problem statements.
 - **CO** – It is a function of the RIC to consider oversight team recommendations and the strategic needs and priorities of CDOT in developing a prioritized list of research projects.
 - **CT** – In the council-run program, ConnDOT members reflect on Department priorities in their voting.
 - **MD** – The Research Advisory Board looks for a link between the problem statements that are submitted and SHA's business/strategic plan.
 - **MO** – They have to tie or be aligned with the research strategic visions; the problem statement has to tie in with or be aligned with one of the focus areas. It also has to tell us what we will "get" from the research.
 - **NJ** – The capital investment strategy linked to each research project topic and percentage allotted to each category is calculated.
 - **NM** – The Oversight Committee evaluates projects in light of the Agency's strategic plan.
 - **NV** – The RAC rates each problem statement based on whether the statement is aligned with the Department's strategic research plan.

- **OR** – It is one of several key variables that committee members consider.
 - **WI** – It's a key consideration by the evaluation committee.
2. A developed list of issues and topic areas based on the state strategic direction are developed and used to solicit problem statements.
- **FL** – The functional office must provide discussion on how the research "fits" within their strategic plan. The Research Center's deployment plan is the center of its strategic plan, so the deployment plan is the main consideration when considering what projects to fund.
 - **IA** – Research need is identified through the strategic program process. A list of needed research is established prior to selection to assist in the selection process.
 - **NY** – Each voting member gets to rank the proposals in how each project meets our five (5) priority areas, which are: 1) mobility and reliability, 2) safety, 3) environmental, 4) economics and sustainability, and 5) security.
 - **OK** – They are grouped into subject areas.
 - **PA** – Research needs are determined by IDEA submissions received through the department-wide annual business plan process.
 - **UT** – The workshop's emphasis is to isolate issues and topics that are inherent to UDOT's strategic goals.
3. High-level management determines if the problem statements compliment the departmental strategic direction, there is no formal process to do this.
- **TX** – Because the strategic plan is so broad, it is easy to make the link. However, there is not a formal check with the plan for each problem statement.
 - **WA** – In the past we tried to take elements of our Agency's strategic (business) plan for rating research projects. This proved to be more difficult than helpful – because problem statements and strategic goals weren't detailed enough to provide discreet answers. The REC feels the RAC members, because of their managerial levels and because accountability is important, can and do ensure research they put forth is of high priority need within the context of the Agency's mission and current goals.
4. The DOT strategic plan is used as the initial screening mechanism by the research unit.
- **KS** – Area Panels do initial evaluation of appropriateness to research needs to determine further consideration.
 - **NH** – Problem statements submitted by non-NHDOT personnel must identify an NHDOT sponsor prior to acceptance. Although not required, it is recommended that problem statements submitted by department personnel also include this endorsement.

Research staff conducts a preliminary literature review (use of TRIS and RIP database) for each problem statement to help determine need.

5. Other.

- **HI** – Determine if proposed problem statements are research and developmental projects, or technical assistance projects.

APPENDIX G

Responses to Web Survey Questionnaire: Question 4Cii and 4Ciii

APPENDIX G

Responses to Web Survey Questionnaire: Questions 4Cii and 4Ciii

Questions 4Cii and 4Ciii: If the research unit includes other functional areas (such as ITS, approved products, library etc.), they were asked how many (4Cii) and then how much was allocated to each (4Ciii).

AK – 4Cii. – 2 staff to research, 2 staff to training/LTAP/library, 1 staff to section manager, and 1 staff is clerical support.

4Ciii. – \$1.0 million budget for research, \$300,000 for NHI, and \$300,000 for LTAP.

AZ – 4Cii. – The Arizona Transportation Research Center provides \$68,000 to the Agency's Local Technical Assistance Program each year.

CO – 4Cii. – 1 to each functional area (LTAP/technology transfer, CDOT library).

4Ciii. – LTAP/TT = 55+80/2309 or 6%, CDOT Library = 80/2309 or 3%.

CT – 4Cii. – Numbers are approximate: traffic signal repair 10 staff; materials testing 65 staff; pavement management 7 staff; radio repair 5 staff; and research, photolog/friction, testing/product evaluation 20 staff.

4Ciii. – None is 'attached' to other areas.

FL – 4Cii. – Part-time administrative assistant handles the library functions.

4Ciii. – 100% of research unit's budget goes to research.

HI – 4Cii. – The same 4 engineers assigned to oversee the research program also oversee the other functional areas.

4Ciii. – Approx. \$700,000.

IA – 4Cii. – 2 staff to library; 2 staff to ITS.

4Ciii. – SPR \$2.5 million, Iowa Hwy Research Board \$2.5 million, primary road research \$750,000, ITS \$3 million, innovative bridge research \$1.1 million, traffic & safety \$700,000, and Living Roadway Trust Fund \$100,000.

IL – 4Cii. – Bridge 1, pavement 5, field planning data collection 7, and new products 1.

4Ciii. – Bridge \$80,000, pavement \$275,000, field planning data collection \$300,000, and new products \$75,000. This does not include contract research, only staff and support staff.

MA – 4Cii. – 2 Part-time.

4Ciii. – SPR Planning Funds are used for ITS. SPR Research Funds are used for Research.

- MO** – 4Cii. – Process improvement/facilitation 8 staff; New Product Review 1 staff; Library 1 staff; research management and general research 8 staff.
- 4Ciii. – No response.
- MS** – 4Cii. – No one is formally assigned; assignments are made based on need and there is a tremendous amount of cross-over among the three (3) areas (research, pavement management & non-destructive testing programs). For example our operational FWD is used to generate overlay recommendations, but it is also used for research projects.
- 4Ciii. – Non-destructive testing for operational tasks is charged to the construction or maintenance project and no research funding is used. \$300,000 annually is used for pavement management, and the other \$1.7 million is used for research.
- MT** – 4Cii. – 1 staff to library.
- 4Ciii. – The library budget is not distinct from the research programs budget, but it is minimal, probably less than \$100,000. Research also provides \$68,000 to LTAP.
- NJ** – 4Cii. – 2 people work in library.
- 4Ciii. – Library gets \$160,000, the remaining goes to research.
- NY** – 4Cii. – 1 staff to the library, 6 staff to structural/bridges, 5 staff to pavement/materials, 3 staff to statistical evaluation, and miscellaneous 3 staff to tech transfer. Coordination of research funding is allocated for staff time only (on an annual basis). Funding for individual projects must compete against outsourcing the research.
- OK** – 4Cii. – One staff has oversight of two to three areas.
- 4Ciii. – Special research 5%, materials 22%, special planning 2%, bridge 15%, experimental product evaluation 3%, general research 25%, maintenance 24%, and construction 4%.
- OR** – 4Cii. – 11 staff to research, 5 staff to LTAP.
- 4Ciii. – \$280,000 to LTAP and \$2,320,000 for research; we share an indirect budget of \$300,000 which is difficult to split out.
- PA** – 4Cii. – 1 to library.
- 4Ciii. – \$60,000 for library materials and contracts.
- SC** – 4Cii. – 1 staff to new products, and 1 staff to LTAP Center.
- 4Ciii. – New products \$10,000, and LTAP \$220,994.
- UT** – 4Cii. – Administration 2, research projects 3, technical transfer 2, new products 1, experiential features 1, library 1, archive 1, and office 1.
- 4Ciii. – No response.

VA – 4Cii. – 2 FT librarians plus three hourly library support staff.

4Ciii. – Approximately \$120,000.

WA – 4Cii. – 2.6 library, experimental features is managed by one of the research managers, but most work is conducted by project offices or other support offices.

4Ciii. – This is the biennial breakdown of SPR funded project only: environmental \$702,000; design & safety \$405,000; bridges & structures \$247,000; operations \$718,000; construction/maintenance/materials \$481,000; and mobility & intermobile planning \$410,000. Our way of tracking project dollar distribution is changing to fit the RACs, so this is some of the data from a transitional time.

APPENDIX H

Supplemental Boxes

APPENDIX H

Supplemental Boxes from Web-Based Survey

Questions 1A, 1B, 2A

1A. Does the research unit have a strategic plan?

1B. Does the Department of Transportation (DOT) have a strategic plan?

2A. Does the research unit conduct workshop/brainstorming sessions?

- **AK** – Currently, we do this informally at ad-hoc meetings or at annual focus group meetings (i.e. Traffic Engineer's meeting).
- **AZ** – The Research Center uses a combination of formal workshops and informal meetings with user groups to develop problem statements.
- **CT** – An annual brainstorming session is conducted with selected managers and representatives from the Connecticut Academy of Science and Engineering to prompt ideas for technology-scan and published-literature-based studies.
- **IA** – Brainstorming occurs in focus group meetings on general areas on interest: weather, human factors, pavements, structures, etc.
- **IL** – We have focus groups called Technical Advisory Groups for major areas such as pavements, bridges, safety, and so on.
- **MS** – We will be doing our first "Research Needs" workshop in December 2006.
- **NJ** – Annual Research Showcase has traditionally held a brainstorming session in four categories.
- **NY** – We work throughout the year with other program areas to flesh out their research needs.
- **OR** – We don't have a strategic plan per se, but a list of strategic research priorities. Our brainstorming sessions occur on approximately a 5-year cycle to develop strategic priorities. During intervening years we refine existing priorities.
- **UT** – We host an annual UTRAC Workshop involving about 125 experts from UDOT, University of Utah, Utah State University, Brigham Young University, FHWA, and the private sector.
- **VA** – We have nine (9) research advisory committees. Each is focused on a different subject area and they don't all operate the exact same way, but most do some type of problem identification and prioritization process. The results are not binding on VTRC, but they are used to guide the development of the research program in that area.

- **WA** – Agency strategic plan is on our website. Brainstorming sessions are at the discretion of each Research Advisory Committee functional area.

Questions 2Ai, 2Aii

2Ai. States that conduct workshops/brainstorming sessions do so at the following frequencies and times of the year.

2Aii. Are these sessions limited to certain focus areas or open to all areas?

- **AK** – At focus group meetings, the proposed research needs often focus on the focus areas even though we do not limit the subject matter.
- **AZ** – A specific project development strategy is employed for each of seven (7) research emphasis areas: 1) environment, 2) intelligent transportation system, 3) maintenance, 4) materials and construction, 5) planning and administration, 6) structures, and 7) traffic and safety. Workshops are open to all interested parties. However, they usually involve agency groups with an interest in the topic or researchers presenting proposed research topics.
- **CO** – We have research oversight team meetings for each specific subject area, where suggestions from employees and universities are considered as part of the brainstorming process.
- **CT** – The selected managers and administrators represent all modal areas of the DOT.
- **IL** – Limited to the identified Task Advisory Group areas.
- **MO** – They are limited to the focus areas noted within the strategic research vision.
- **MS** – Due to space constraints at the site location, I am forced to have five (5) focus areas: 1) materials; 2) construction; 3) maintenance; 4) traffic & safety; and 5) intermodal planning. Of course I can't cover everything (structures, training, policy research, etc.). I will look at rotating the focus areas every two years.
- **NJ** – Initially it is limited, later it is not.
- **OR** – The sessions are limited to transportation related topics. This excludes a lot of general administrative topics that might be of interest to a DOT, like workforce development, civil rights, accounting systems, etc.
- **SC** – There are seven (7) breakout sessions: 1) construction/materials; 2) maintenance/bridge maintenance; 3) traffic/safety; 4) road/bridge design; 5) project development/planning; 6) business operations; and 7) hydrology.
- **UT** – We consider problem statements on construction, maintenance, materials, pavements, environmental, planning, asset management, ITS, traffic, safety, geotechnical,

structures, hydraulics, and preconstruction.

- **WA** – We direct that when a workshop is held, it must include representatives from both state research institutions (at least).

Question 2Aiii

2Aiii. If limited to focus areas, what are they and how are they determined (DOT and/or research strategic plan)?

- **NH** – NHDOT is in the process of developing an agency strategic plan. It is likely that focus groups will be modified to address key objectives in the plan when it is implemented.
- **WA** – We invite university professors to these discussions (at the discretion of the RAC member). They must invite reps from both research institutions. They can invite other governmental agencies, but we would discourage inclusion of private companies (it would get into bias issues).

Question 2Aiv

2Aiv. Are these sessions conducted with internal staff or internal and external participants?

- **AK**– University faculty, consultants, and vendors are often (but not always) invited.
- **AZ** – It varies, depending on the research emphasis area. Some include external participants, some only agency staff.
- **CT** – Internal executives and managers plus two or three representatives from the CASE.
- **IL** – Industry and universities on Task Advisory Groups.
- **NH** – To date, focus group sessions have included only internal staff.
- **NM** – External agencies may propose research, however all proposals must have an internal sponsor and be reviewed by an oversight committee.
- **MO** – We invite external partners as well as key internal staff.
- **MS** – MDOT, academia, and industry.
- **OR** – In the past we included university partners and FHWA. In the future we may also invite local government and some private sector input, from organizations like asphalt and concrete paving associations.
- **SC** – Industry representatives (asphalt, concrete, etc.), other government representatives (FHWA, USGS, etc.), and representatives from in-state universities are included.

- **TX** – We have informal brainstorming sessions internally also.
- **UT** – FHWA, universities, private sector, and UDOT.
- **VA** – FHWA, VA Division representatives, some university representation, but primarily VDOT staff.

Question 2Av

2Av. If external, who?

- **AK** – Participants may vary depending upon meeting venue. (Formal annual focus group meeting or informal ad-hoc meeting).
- **AZ** – For topics with external participants the representation will include agency staff, Federal Highway Administration staff, university researchers, consultants, other state agency staff, county and city staff.

Questions 2B, 2Bi, 2Bii

2B. How often are problem statements solicited?

2Bi. When?

2Bii. Can problem statements be submitted outside of the solicitation cycle?

- **AZ** – Small budget projects (\$15,000 or less) are considered at any time during the year and evaluated with email votes. Ideas for large budget projects can be developed at any time during the year with the understanding that new projects are approved only once a year.
- **CT** – We sometimes use 'last call' communication just prior to submission deadlines for various regional and national research programs, including the various synthesis programs.
- **IA** – In February and March, we poll our customers (internal) about their needs in order to formulate the next year's SPR program.
- **MD** – We do on occasion consider pooled fund studies out of cycle since they tend to come in year round. The Research Advisory Board makes the decision on whether or not the study should be funded out of cycle.
- **MS** – We program the bulk of our research to coincide with the federal fiscal cycle, but I always leave a balance just in case we receive something that is needed outside of the formal solicitation cycle.
- **NH** – Depending on the urgency of the problem, submittals might be inventoried until the next NHDOT RAC meeting or NCHRP/NETC solicitation cycle, or may move forward immediately. Our procedures allow us to add high-priority projects to the program

outside the normal cycle, provided certain approvals are obtained (NHDOT RAC chair, director/commissioner, and FHWA).

- **NM** – Problem statements may be submitted at any time, however the Oversight Committee only reviews and approves at scheduled times.
- **NY** – We are working to develop a yearly schedule, but with our new process we have some issues to resolve before that can happen.
- **OR** – We're in the process of adjusting our schedule to be in step with a parallel selection process with our UTC Partner.
- **SC** – In special cases, projects can also be approved for funding between workshops by a vote of the Department's Research and Development Executive Committee.
- **VA** – We consider our program to be dynamic to meet our customer's needs. If a research need is identified after the annual work program is adopted, we will modify the work program if the new topics are considered to be of higher priority.
- **WA** – We'll accept problem statements at anytime and provide these to the RAC member responsible for the functional area of the topic.
- **WI** – Pooled Funds solicitation is sometimes twice/year (June and January).
- **WV** – This is discouraged, but unfortunately some researchers try to obtain special consideration by talking to upper management.

Question 2Biii

2Biii. If yes, are they considered at that time or during the next solicitation cycle?

- **AK** – We have a "Rapid Research Response Program" where time-critical research needs can be funded. We select projects under this program in consultation with our chief engineer.
- **AZ** – Small budget projects (\$15,000 or less) are considered when they are presented. Large budget projects must successfully pass through a research center screen before being put forth for final evaluation by the Research Council.
- **CT** – Research need statements are considered as soon as received.
- **IL** – Statements are taken anytime. Formal deadline announced for next round followed by selection for funding in October and March.
- **MO** – If it was elevated through a different avenue than the solicitation cycle, then it is more likely an urgent issue and/or director driven.

- **MS** – Typically I have two cycles, the formal one I detailed earlier and then one six months later in the spring for any unsolicited proposals.
- **MT** – There are a number of ways that research ideas can move forward before the next solicitation cycle: 1) small projects (contracts are in place at MSU and UM for projects less than \$25,000 and 1 year; 2) Administration high priority; 3) wildlife and fisheries topics; and 4) MDT/WTI collaboration topics. All of these projects move forward as soon as the RRC approves the proposal.
- **NH** – Problem statements are considered immediately. They may be appropriate for programs such as NCHRP or NETC (regional program), so depending on the time of year, they could be submitted to those programs immediately. Also, as stated above, our program has provisions for addressing high-priority needs outside the normal process.
- **NJ** – Depending on funding availability.
- **NM** – Projects are reviewed and approved during the year and scheduled for inclusion in the following year's work plan.
- **NY** – Unless they come in very close to the start of the next cycle.
- **OR** – We accept but rarely receive problem statements outside the annual solicitation cycle. When we do, we hold them until the next round.
- **TX** – Depending on the issue, we may decide to consider it immediately and issue an RFP outside the solicitation cycle.
- **WA** – With some exceptions. We have Quick Response and Student Studies programs that can start at any time. If the requestor can bring funds, we'll help them start anytime. Pooled Fund projects can be started at anytime if there is available funding.
- **WI** – There are some exceptions.
- **WV** – If problem statements are submitted before the fall solicitation process begins, they are held until then. Problem statements must be resubmitted each year if not selected the previous year – they do not "carry over."

Question 2C

2C. Are the potential problem submitters only from within the DOT?

- **MA** – Submitters oftentimes work with university principal investigators to draft problem statements. However, problem statements must come from within EOT (Executive Office of Transportation).
- **MD** – The solicitation is also sent to the University of Maryland and Morgan State University providing an opportunity for researchers to submit problem statements for

consideration. They are however, encouraged to work with SHA staff to determine priorities before submitting an idea.

- **MT** – Research ideas are welcome from anyone.
- **NJ** – NJ Transit Organization and Motor Vehicle Commission, as well/occasionally NJ State Police.
- **NV** – Both from Nevada universities, RTCs, MPOs, and within the department.
- **NY** – We require a champion within the DOT for the proposal to be given serious consideration, but they can be submitted by anyone.
- **OR** – We accept problem statements from any source, but we advise submitters that they usually need an in-house advocate.
- **PA** – A research champion must be identified within the DOT (field or Central Office).
- **SC** – Input can be received from anyone for developing a problem statement; they can only be submitted by SCDOT personnel.
- **VA** – The vast majority are from within the DOT.
- **WA** – While anyone can submit an idea through our website, it is the Agency that determines the priorities.

Question 2Ci

2Ci. If yes, who can submit problem statements?

- **AZ** – Problem submitters can be anyone. The most common are agency staff, university researchers, consultants, and other state agencies.
- **IL** – Most are internal, followed by university, then industry.
- **NM** – Problem statements from outside the agency are submitted to the Research Bureau, which coordinates with the appropriate organizational unit.
- **NY** – We require a champion within the DOT for the proposal to given serious consideration, but they can be submitted by anyone.
- **WA** – We actively encourage problem statements from agency employees.

Question 2D

2D. Is problem statement solicitation related to DOT strategic plan and/or research strategic plan?

- **AK** – We feel that having a DOT strategic plan would be helpful.
- **AZ** – The Research Center has begun to identify how each research proposal relates to the Department’s strategic plan. However, the key strategic plan issues are so broad that all research proposals have easily fit within one or more of the strategic plan critical areas.
- **CT** – Past solicitations have focused on typical subject areas (very broad and multimodal) and the different ways the Department routes and handles research needs statements.
- **IL** – Open solicitation.
- **MA** – Not necessarily. We may consider linking problem statements to strategic plan goals and objectives in the future.
- **MS** – Not formally, but there is some relationship.
- **NH** – Not at this time. When the NHDOT strategic plan is implemented, it is likely we will add a space to the submittal form outlining how the problem statement addresses a component in the strategic plan.
- **NJ** – No, but progressing in the direction of matching the capital investment strategy to the research program.
- **NM** – We do not yet have a strategic plan, although this is a goal.
- **OR** – Strategic priorities are attached to the solicitation as a guide for submitters and the strategic priorities are considered, along with other variables, by selection committees.
- **PA** – We use a form for all idea submissions and one section of the form asks how the project relates to our strategic objectives.
- **TX** – Yes, for the most part and in theory. Some research management committees place a little more emphasis on this than others.
- **VA** – Not necessarily. But presumably a research topic that relates to the VDOT strategic plan would be considered a higher priority than one that is not. In the end it's our call.
- **WA** – Yes, but we aren't proscriptive in the process. We have information to help RAC members select strategic ideas but we leave it to them to align research needs to the strategic goals of their functional area.

Question 2Di

2Di. The states that do relate problem statement solicitation to the DOT and/or the research strategic plans were asked how they do this.

- **WA** – There is discussion of this before the kick off of the solicitation process and the RAC can decide how proscriptive to be.

Question 2E

2E. Does the research unit help the problem statement submitter write/develop problem statements?

- **AK** – Research staff performs literature searches and helps author problem statements in consultation with the submitter.
- **AZ** – A research project manager is assigned to work with everyone submitting a research proposal. It is the project manager's responsibility to insure that the proposal is complete and presented in the most effective manner.
- **CT** – Yes, our assistance usually helps the submitter sharpen up their ideas on research needs and we check for publications that might address their need.
- **FL** – Mostly administrative, we leave the technical stuff to the experts within each office. We provide instructions via our website, one-on-one, and through training sessions for project managers and research coordinators held throughout the year.
- **IL** – In some cases. Once each TAG group has top picks, the statements go to an executive committee for funding. Research Unit advises on need to rewrite before sending to Executive Committee.
- **KS** – Examples and feedback on questions are provided, but no specific help is normally given.
- **MD** – Typically the submitter works with the researcher who will conduct the study on the development of the problem statement. The Research Division is available to assist in the development of a problem statement should the submitter request it.
- **MS** – I have a sheet that I attach to the solicitation that details the information I need in the proposal.
- **MT** – The Research Program Manager and Project Manager help the problem statement submitter write/develop problem statements as requested.
- **NH** – If asked we will assist the submitter in developing his/her problem statement.
- **NY** – Yes if asked or invited to do so.
- **OR** – Submitters are encouraged to contact research staff. Research staff follows up with submitters when they find problem statements that are unclear or poorly written.

- **SC** – If assistance is needed, we will help. However, the problem statement form comes with specific instructions.
- **UT** – A research staff member is assigned to each of the focus areas and aids in problem statement submittals.
- **VA** – Generally no, but sometimes have helped clients frame research questions when they need help.
- **WA** – We'll help with the concept development and connect staff to professors to discuss a concept. We make no commitment to a researcher outside of the department that participates in developing a problem statement.
- **WV** – Only the forms are provided by our Research Section. The form itself is fairly straight-forward. Help is provided if needed, however.

Question 2Ei

2Ei. If so what position does this?

- **MA** – Our research section consists of two people.
- **WA** – I have 4.5 research managers helping with this.

Questions 3A, 3Ai

3A. Are the problems prioritized by a numerical system or voting system? Respondents were asked to highlight one option below or if a combination of both, to please describe.

3Ai. If a state has a combination process they were asked to describe it.

- **AZ** – Where formal workshops are conducted there are two stages for proposal evaluation. The first occurs during the workshop. The second occurs when the final set of proposals is evaluated by the Research Council. For workshop evaluations, each project manager must develop a weighted voting scheme prior to the workshop. The voting scheme typically allocates votes to all key workshop participants with the weights being announced prior to the workshop. Workshop participants rate each proposal on a 0–3 scale. The evaluations are tabulated, based on the weighted votes, and the top five proposals are presented to the Arizona Transportation Research Center (ATRC) manager for review. If the proposals meet the approval of the ATRC manager they are included in the package of proposals submitted to the Department Research Council for evaluation.
- **MT** – Prioritization is numerical, selection is voting.
- **NH** – NHDOT RAC members first provide a rating from 0 to 5 using the NCHRP rating system. Then, all problem statements are ranked by voting members.

- **OR** – We have a two-stage process. At the second stage, I ask each committee member to allocate a defined number of points to research problem statements on a list, with a maximum number of points to any one problem statement.

No answers in supplemental box 15

Question 3B

3B. If voting system – who votes and what is the voting process?

- **RI** – The RIDOT Research Advisory Committee (RRAC) rates each problem statement on a scale of 0 to 5.

Questions 3C, 3D & 3E

3C. If committees are used, what is the committee make-up?

3D. How are prioritized problem statements selected for research?

3E. Are problem statement prioritization and selection related to DOT strategic plan and/or research strategic plan?

- **AK** – We have neither a DOT nor research strategic plan.
- **AZ** – They are related to the Agency’s strategic plan in that each Research Council member can consider the strategic plan objectives when scoring the proposals.
- **CT** – Yes, as well as the mission and priorities of the university, for the council-run program cited above.
- **FL** – More importantly, for a project to be funded it must meet criteria established within the Department’s deployment plan process.
- **IL** – Those in line with strategic needs tend to get funded.
- **MS** – Not formally.
- **NH** – Not yet (see above).
- **OR** – The connection is a flexible one; committees consider priorities along with other variables, like the ability to research the problem, cost, likelihood of success, and high payoff.
- **TX** – In theory.
- **WA** – Selection is discussed in terms of strategic plans but so much is needed that it is generally difficult to find something to research that doesn't fit a strategic need.

No answers in supplemental box 18

Question 3F

3F. Is there a special process for selecting emergency problems or problems outside of the solicitation cycle?

- **AK** – Rapid Research Response Program. We are also starting an "Innovative Features Program" to fund ad-hoc evaluations of new or novel concepts/approaches/procedures/materials.
- **AZ** – The Research Council decreed that emergency projects (i.e., projects outside the normal selection cycle) should be put forth with their own budget. In other words, if someone needs the project bad enough, they should come in with the money to fund it.
- **CO** – E-mail approval from the RIC is sometimes secured in special cases.
- **FL** – Nothing "special", our process allows for projects to be funded as the need occurs regardless of timeframe or classification.
- **IA** – Same as the typical process.
- **ID** – Small projects only.
- **IL** – There is a small projects fund that the research engineer can use without going to full committee; it is limited to \$15,000 per project.
- **MD** – If a high priority needs comes up outside of the solicitation cycle, the Research Division can go to the Research Advisory Board to present the project. Should the board determine that it should be funded, the Research Division would seek concurrence from the FHWA Division office.
- **MT** – See comments under 2Biii.
- **NV** – NDOT has an "off-cycle" process for approving the projects that have some urgency to be initiated right away and for approving some pooled fund studies that have a deadline for participation.
- **OR** – Within SPR we set aside a discretionary fund, but I limit that to fairly small projects (\$15,000). For a really important project out of cycle, I go to management and ask for state funds. If it's really important there's usually not an issue getting state funds. That keeps our SPR process consistent and honest.
- **PA** – In the event of an Emergency Declaration by the Governor, say for a bridge problem, we can suspend general contracting procedures and avoid normal solicitation processes.

- **SC** – If an emergency problem arises, projects can be approved for funding by a vote of the Department's Research and Development Executive Committee.
- **UT** – Special requests are funded as needed.
- **VA** – VTRC is always willing to adjust the program to meet changing customer needs.
- **WA** – The first question is, will we be able to find funding? After that, the director of research & library services will request the opinion of the RAC member responsible for the topic and then the Research Executive Committee chair and the research executive member that supervises the relevant RAC member. If we all agree it's a good idea and timely, we move forward with the project.

Question 3Fi

3Fi. If there is a special process, they were asked to explain it.

- **AK**– Participation in Pooled Fund Studies may be considered in this manner.
- **IL** – Fund total ~ \$90K/year, limit \$15K per project area.

Questions 4A, 4B & 4C

4A. Number of research staff.

4B. What is the total amount of research funding from all sources (FFY 2006)?

4C. Does research unit include other functional areas (such as ITS, approved products, library, etc.)?

- **AK** – The Research & Technology Transfer Section has a total of 6 positions: 2 positions (research engineers) are dedicated to research functions; an additional 2 positions (training specialists) are dedicated to training and LTAP functions (and assist with communication/training to support research implementation; 1 position (research & T2 manager) manages the Section; and 1 position for clerical/administrative. The Section also oversees our DOT library and training, LTAP, NHI, and BTEP programs.
- **AZ** – The Arizona Transportation Research Center staffs and houses the department library and directs the product evaluation program.
- **CT** – I'll have to look up the answer to the money question.
- **IL** – Library (just starting) and new products planning field work (skid, deflection, pavement video/IRI data collection).
- **MA** – ITS Planning Program.

- **MS** – MDOT Research oversees the research, pavement management, and non-destructive testing programs for the Department.
- **NH** – Qualified products list and bridge deck condition surveys (contract administration and recommendations only).
- **NM** – Library.
- **OR** – LTAP with 2 full-time and 3 part-time employees.
- **TX** – Approved products. We also provide the funding and associated contract management for the research library which is outsourced to the Center for Transportation Research at the University of Texas.
- **UT** – We do have a separate ITS unit at our TOC, but the Research Division is also involved. We have a research library, new products and the archive staff is in Research.
- **VA** – Library, although technically it is a part of the Knowledge Management office but it is housed at VTRC. We also sponsor an ITS Lab at the University of Virginia.
- **WA** – The director, fiscal analyst, and secretary also support library functions in the department.
- **WV** – Our reports are available through our website. Our research library was unfortunately eliminated to build more cubicles for our division.

Question 4Ci, 4Cii & 4Ciii

- 4Ci. States that include other functional areas were asked which the areas are.
- 4Cii. States that include other functional areas were asked how many staff are assigned to each area.
- 4Ciii. States that include other functional areas were asked what amount of the total research funding is attached to each area (FFY 2006).
- **WA** – We currently allocate our funding to the RACs in the following way: project delivery 50%; operations 25%; multimodal transportation 15%; and information & finance 10%.

Questions 4D & 4E

- 4D. When during the research project solicitation, prioritization, and selection process is a literature search conducted?
- 4E. Are local universities partnered with research units?
- **AK** – The University of Alaska is a National UTC. We are working to establish a more robust collaborative relationship.

- **MA** – Universities are under agreement (contract) with Research Section. This is not exactly partnering.
- **NH** – Not officially, although they have non-voting membership on NHDOT RAC.
- **NY** – Each project must have a DOT champion or we will not even begin the evaluation process. We have so many universities to utilize that we do not give special treatment to any one over another. We encourage university research to work with DOT staff to better understand our needs and develop projects that are of benefit to our priority result areas.
- **OR** – There is often a parallel UTC proposal; in those cases the UTC proposal will include a more thorough and substantial literature review.
- **VA** – VTRC is a joint venture of VDOT and the University of Virginia, although we have cooperative relationships with other Virginia universities.

Questions 4Ei & 4Eii

4Ei. If yes, is all research conducted by the universities?

4Eii. States that partner were asked which universities?

- **AK** – Generally our research is awarded on a competitive basis and not limited to a particular university. For example, we have active projects with the University of Alaska, Utah State University, and the University of North Carolina.
- **FL** – We do some research with places like Oak Ridge National Labs and with private consultants. 95% of our research is done through the university system.
- **TX** – There are very rare "in-house" research projects.

Questions 4F

4F. Does the research unit have staff dedicated to conducting in-house research?

- **AK** – We will conduct in-house research as staff capacity allows especially for our Rapid Research Response Program. Generally, we've found that our two research engineers are too busy with marketing, research problem solicitation, and project management to conduct in-house research.
- **HI** – Due to the other functions assigned to the research unit, the research personnel do not have the time to conduct in-house research projects.
- **IA** – Some maintenance and materials research is conducted in-house. That is not reflected in the \$10 million budget figure.

- **ID** – In our Administrative Division there is an Economics and Research Section.
- **MD** – In-house research is conducted by the appropriate technical office.
- **OK** – Only small projects.
- **OR** – All of them do some in-house research and several staff usually collaborate with university investigators in substantial ways. Research coordinator workloads are structured to allow about 50% of time conducting research, as opposed to managing research.
- **UT** – Each staff member may spend about 10% of his or her time on in-house studies. No person is fully dedicated to in-house studies.
- **WV** – We used to conduct in-house research on a regular basis before we lost our staff engineers.

Question 4Fi & 4Fii

4Fi. If a state has staff dedicated to conducting in-house research, they were asked how many staff do in-house research?

4Fii. What amount is dedicated to these staff?

- **IA** – This funding would be part of the operating budget. Staff is not dedicated for research; it is just a part of their work.
- **IL** – We currently are not seeking reimbursement for research work conducted in-house. This increased our ability to do more contract research and pooled fund studies with SPR funds.

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