Launching Enterprise Risk Management in Your Agency

A Record of Workshop Proceedings

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Purpose

This briefing paper summarizes the proceedings of a two-day workshop held as part of National Cooperative Highway Research Program project 20-24 (105) entitled *Launching Enterprise Risk Management in Your Agency*. It summarizes the key activities and recommendations resulting from the workshop for chief executive officers and other senior agency leaders held August 24 – 25, 2015, in Minneapolis, Minn.

Summary of Proceedings and Recommendations

Twenty–six State department of transportation (DOT) officials met for two days in Minneapolis, Minn., over July 24 and 25, 2015, to explore the advantages of enterprise risk management (ERM). Presentations from DOT officials from Washington, California, Minnesota, New Jersey, Vermont, Nevada and elsewhere summarized how risk management prepares agency officials to manage uncertainty, better protect the public and enhance agency performance. The presentations also emphasized how risk management helps satisfy requirements of the Moving Ahead for Progress in the 21st Century Act (MAP-21).

Participants also outlined key steps to support States' risk management evolution that could be pursued by the American Association of State Highway and Transportation Officials (AASHTO), the Transportation Research Board (TRB), and the Federal Highway Administration (FHWA). These steps form an initial risk management roadmap that AASHTO, TRB, and FHWA could pursue. The workshop participants noted the following conclusions and recommendations:

- The workshop was a success that documented the benefits experienced by DOTs that practice risk management. It also exposed DOTs that are not practicing risk management to a summary of the practical applications of risk management.
- The workshop convinced participants that States could benefit from risk management and it is deserving of AASHTO support.
- Specific recommendations included:
  - Report to the AASHTO Board of Directors that the workshop was a success, document its benefits, and recommend their support of risk management, given their earlier position that they needed more information before endorsing risk management;
  - Ask the Board of Directors to pass a resolution supporting risk management as a worthwhile practice for DOTs;
  - Include a summary of risk management in the new Chief Executive Officer (CEO) training AASHTO provides;
  - Introduce AASHTO committees to the many benefits of risk management and explain how it can apply to their disciplines;
  - Assist DOTs with adopting enterprise risk management best practices;
  - Update the National Highway Institute (NHI) risk management training from its current focus on projects and FHWA-defined risks. It may be advisable to develop more than one course. One could focus on project risk management while another focus on program and enterprise risk management.
  - Create a risk management community of interest to support those who practice risk management and to provide a support network for those who want to start;
  - Provide a web portal or other one-stop-shop for those who want information on

risk management;

- Share best practices on the application of risk management;
- Produce a manual for how to manage a DOT including a section on risk management;
- Identify the skill sets needed to practice enterprise risk management and provide training for States to develop those skills;
- Publish best practices from the private sector to inform agencies of the benefits of ERM;
- Develop an executive summary of risk management to introduce it to staff charged with development of strategic plans and other documents;
- Build a suite of training material;
- Gather and share best practices;
- Provide a synopsis of the ERM programs in the DOTs in Washington, California and Minnesota;
- Help States develop a tool to track risks so they can be reported to decision makers;
- Provide a national forum to bring States together and look for risks that cross State boundaries;
- Offer training or a mechanism to frame questions to better understand the identification, assessment, and mitigation of risks.

The Objective of Project 20-24 (105)

This research project had two objectives:

1. Conduct a workshop for senior U.S. transportation agency leaders to help them launch agency ERM programs consistent with MAP-21 requirements
2. Develop a "roadmap" to make available to DOTs the training, tools, and guidance materials agencies need to develop and maintain effective ERM programs.

The roadmap will assist AASHTO, FHWA and TRB to provide ongoing assistance to States to improve their ERM programs.

Approximately 26 State DOT representatives participated as did Stephen Gaj from FHWA, Matthew Hardy from AASHTO, NCHRP program officer Andrew Lemer and a consultant team. Appendix 1 includes the full list of attendees. The session was held at the University of Minnesota Walter Library.

Definitions of Risk Management

Appendix 2 includes a briefing paper prepared for participants. It includes more extensive definitions of risk management and explains its uses and benefits. To summarize for this proceedings,

risk is defined as the positive or negative effects of uncertainty or variability on agency objectives. Risk management is defined as the cultures, processes, and structures that are directed toward the effective management of potential opportunities and threats.

These definitions hold several implications for understanding risk management. First, risks are not always negative. In modern management frameworks, managing risk is about managing uncertainty, variability, threats, hazards, and even opportunities. All of these can affect organizational objectives. A negative risk could be a flood. A positive one a new technology. Secondly, managing risk is about managing performance. Third, managing risk involves looking for opportunities amid the risks.

Enterprise risk management is the formal and systematic effort to control uncertainty and variability on an organization's strategic objectives by managing risks at all levels of the organization. Other levels of risk management could be at the program, project or activity level.

Figure 1 depicts the five step risk process contained in the International Organization for Standardization (ISO) 31000 process. As can be seen, it is a plan, do, check, implement type of process that methodically leads the practitioner through a logical sequence of steps. It begins with establishing the context, or identifying the organization's objectives and environment. It proceeds through identification, analysis, evaluation and managing of risks. Throughout the process, the risk practitioners are monitoring the risks and communicating to appropriate stakeholders. The workshop structure followed the ISO process. After describing ERM, three exercises allowedparticipants to identify, analyze, evaluate and prioritize risks, then suggest treatments. The workshop also included presentations and discussions on how to monitor and review risks, and communicate and consult with stakeholders.
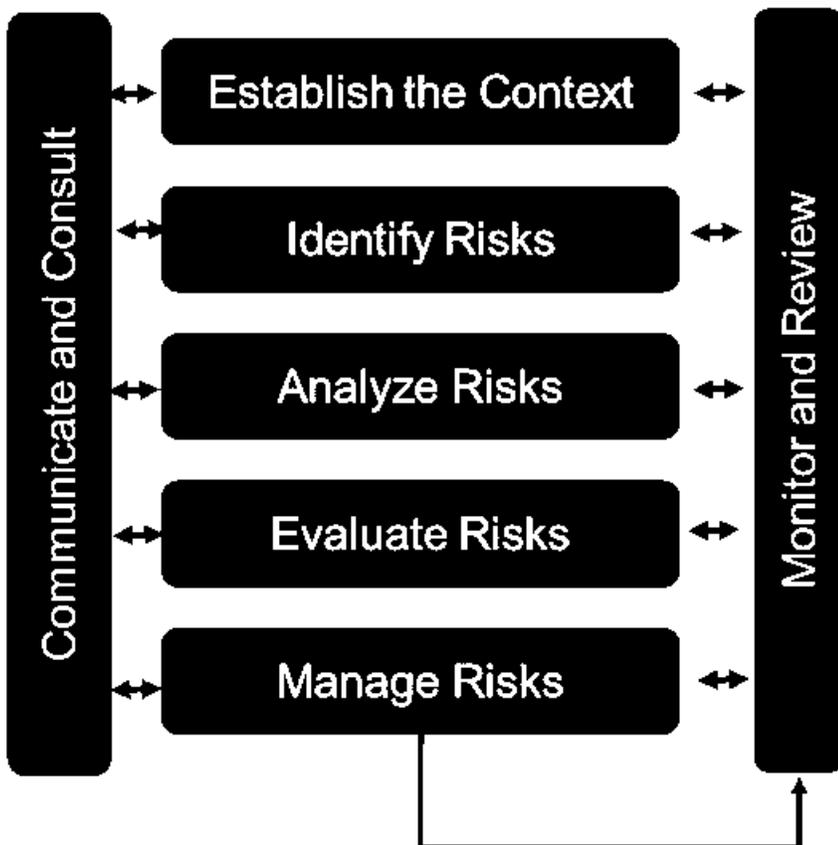
Figure 1-ISO Risk Framework

Recent History of ERM Development

Panel chair Tim Henkel, assistant commissioner of the Minnesota Department of Transportation, explained how the workshop capped several years of effort that originated with the TRB 20-24 committee that produces research for chief executives. The first product was NCHRP 20-24 Executive Strategies for Risk Management by State Departments of Transportation report in 2011.

While that was being developed, FHWA, AASHTO and TRB were organizing for 2010 an FHWA International Technology Scanning Program tour. He and other U.S. transportation officials reviewed the risk management programs in England, Scotland, the Netherlands, Germany and Australia. That scan resulted in the usual scanning report but also led to an extensive implementation effort by the scanning team. Those efforts included:

- Producing an executive summary report and other abbreviated materials promoting the benefits of risk management. They were distributed at an AASHTO annual meeting and in other forums;
- The chief risk officer for the VicRoads state transportation agency in the State of Victoria, Australia, was brought to the U.S. to visit with risk management program staff in Washington and Minnesota;
- The VicRoads risk manager also participated in a U.S. webinar and presented at a CEO risk management forum at the 2012 AASHTO annual meeting, and briefed senior FHWA staff;
- The scan team sponsored three NCHRP research efforts:
    - NCHRP 08-36 Task 121 Successful Implementation of Enterprise Risk Management in State Transportation Agencies that examined current U.S. transportation agency ERM published in 2015;
    - NCHRP 08-93 Managing Risk Across the Enterprise, A Guide for State Departments of Transportation and an accompanying Enterprise Risk Management Quick Guide which is about to be published; and
    - The 20-24 CEO workshop.

He reported that the scanning tour confirmed there is applicability of risk management in the U.S. and more work needs to be done. He listed the benefits including that it supports decision making, helps communicate, demonstrates understanding of risks, avoids managing by crisis, and supports objectives. The bottom line is risk management permeates many transportation agencies around the world. The difference in the U.S. versus what was found on the scan is that mature enterprise risk management was formalized abroad. The mature, international agencies did not practice risk management informally, as is the case among U.S. agencies. The mature agencies documented and reported the risks they managed.

Mr. Henkel said all DOT executives are risk managers but how they formally apply it varies dramatically from State to State. Understanding what others are doing will be one of the workshop takeaways. Beyond that, it was an opportunity to share and it is an opportunity to influence the

AASHTO and national risk management agenda.

Lessons from the Private Sector

The keynote speaker was Kristen Rebertus, the chief risk officer for the large agricultural cooperative CHS. It is a diversified agricultural cooperative that generates over $42.7 billion in annual income from 65 countries, It in recent years grew from 5,000 to 11,000 employees. The cooperative serves farmers and other producers. Ms. Rebertus said the board is comprised of 17 farmers who are self-made, successful, common-sense business people. She said the board's recognition of the success of risk management demonstrates its practical application. Key risks facing CHS include fluctuating commodity prices that can hurt farmers' income, critical food-safety concerns related to food production, the operating of a large fleet that hauls ethanol and other sensitive chemicals, and most critically, the safety of employees working in agricultural and industrial settings.

CHS started an enterprise risk management program in 2010 because of a requirement by the U.S. Securities and Exchange Commission for full reporting disclosures. The cooperative had to report to its members the extent to which its board manages its risks, which would be shared by the member owners. Now, the cooperative has comprehensive, iterative risk management process based upon the ISO 31000 framework.

She said the foundation of ERM is risk awareness and understanding. CHS wants all employees to understand the CHS risk framework, to identify their risks and to clarify who owns each risk and how they are to manage them. CHS tries to identify not only threats but also opportunities. Understanding risks and opportunities allows for better decision making and communication. She said through mostly acquisitions, the cooperative now operates 14 different business units that could function as silos. However, by identifying key risks and communicating them across the organization, CHS communicates across its silos and better coordinates both its management of risk and its achievement of objectives.

Ms. Rebertus described risk management as a journey, not a destination. She said she refers to "stealth ERM" by which she means risk management is a not a separate function but deeply embedded into the organization's culture. CHS wants a culture of risk awareness where employees use risk terminology and risk controls in their daily work. She recommended keeping the language of risk management simple so that all members of an organization could understand and participate in the discussion.

She advocated for high-level ERM sponsorship. In the CHS case, there is a board of directors risk management committee. Even with high-level support, an organization cannot flip a switch and expect to have a fully functioning enterprise risk management effort. The process must proceed methodically with training, support and incremental progress. CHS started slowly by training staff and helping them conduct risk-identification and risk-management workshops.

At CHS, risk management serves as a sort of leading indicator of success or concern. The risk management function looks ahead at what could be the risks and opportunities facing its key objectives such as profitability, food safety, and worker safety. At first, the risk management function looked primarily at negative threats but over time developed a stronger focus upon measuring opportunities. She said the point is not about avoiding all risks, but rather to manage threats and to take well-reasoned risks if they lead to greater rewards.

CHS also uses risk-based "stress testing" to plan for contingencies. The stress tests are scenarios of events presented to staff who analyze how the organization could respond. Some of the scenarios may involve falling farm prices, or threats to health or safety. Based upon the scenario planning, the cooperative can identify potential risks and better plan to address them.

One particularly useful exercise was to have the board of directors identify various "risk appetites" or thresholds of risk tolerance. She focused the board upon these risk thresholds by having them review key policies, such as those related to safety and health. From those policies, the organization could better define where it was willing to take risks, and where it was not. When risk thresholds are low, the staff better understand they must exert more active risk controls. Where risk appetites are high, the staff can take more risks in pursuit of an opportunity, such as achieving higher profitability. She said CHS is risk averse is some areas, such as safety. It is risk seeking in others such as trading commodities.

Risks are categorized into eight areas: strategic, financial, human resource, market risk, information technology, health, safety and environment, legal and compliance and operational. Some risks, such as health and safety, are not assigned to one group, but are universally shared.

Examining risks leads to better understanding of root causes. Food adulteration is a key risk in the food-processing industry. By identifying risks to food-safety processes, CHS better appreciated the key role of employee training. Better trained employees understand the consequences of failing to follow practices that prevent contamination and adulteration of foodstuffs. Following the practices diligently, results in less adulteration and lower risks.

She stressed the linkage of risk management with performance. Risks should be viewed through an operational lens. If the risk does not prevent the organization from achieving a key objective, it is not worth addressing. Those risks that create the greatest uncertainty about objectives are the ones deserving of focus.

Despite the agency-wide focus on risk, the large organization only has two people dedicated to enterprise risk management. She and an assistant help support the risk management structure through training, conduct of workshops, production of risk-measurement tools, spreading risk management practices, creation of a risk library, and encouraging staff to incorporate risk management into daily duties. The risk library allows employees to see, report and monitor risks, as well as find risk management resources.

DOT Risk Management State of the Practice

An opening exercise introduced by consultant team member Hyun-A Park of Spy Pond Partners asked participants to assess their current state of the practice. Participants discussed whether and how the workshop participants' agencies practice risk management. Several themes were reiterated:

- U.S. agencies practice risk management daily, and in many operational areas. However, risk management is practiced informally and the formal identification and management of risk is seldom documented.
- Chief executive officers are the de facto risk officers, whether or not they are officially designated as such. "The buck stops" with them and their decisions made under uncertainty constitutes the agency's risk management process, however, informal it may be.
- There is a broad spectrum of formality in U.S. agency risk management.
- Agencies interested in risk management want more resources to learn how to implement it, train their staff and ingrain it in their organization.
- Risk management practitioners want to understand how to sustain the momentum of risk management particularly during changes of administration.
- Agencies want to better understand how to fund, hire and train employees to support risk management.
- In times of change, it is even more important to manage risks.
- Managing risks improves an agency's reputation, and a strong reputation is important in securing adequate resources.
- Key risks facing the typical agency include an aging workforce, declining revenues, and for many agencies, bridge conditions.
- Transportation agencies often don't consider modal risks, but focus only on highway risks.
- If a "magic wand" existed to create a successful risk management program, leaders would create a risk team with a focus on key partners such as transit providers and contractors.
- While all agencies informally practice risk management, it is important to align risk management practices with formal and recognized frameworks such as the ISO 31000 framework or the European Committee on Sponsoring Organizations (COSO) framework.
- There is value for transportation agencies to conduct risk scenario planning.
- Finances remain a major risk, and the tradeoffs agencies make represent a significant risk-management issue.

How ERM Benefits Executives

Three transportation agency representatives described how enterprise risk management is assisting their decision makers. Michelle Tucker of the California Department of Transportation (Caltrans) said Caltrans has relied on enterprise risk management for several years. As the chief risk

officer, she attempts to demonstrate with concrete examples the benefits of ERM, such as how funding and purchasing decisions can be shaped by risk. Caltrans' audit program also helps to identify the top operational risks, which can be tracked by the agency board and leadership. The agency uses "heat maps" or color-coded matrices to show which risks are the "hottest" or need the greatest attention from decision makers.

Richard Tetreault of the Vermont Agency of Transportation said his agency recently hired its first risk manager. It intends to use risk management to improve its asset management process, and overall agency decision making. Mr. Tetreault said executive support is important to influse risk management in an organization.

The central presentation for the session on how ERM benefits executives was made by Minnesota DOT Chief of Staff Eric Davis, who had been the MnDOT chief risk officer. He said MnDOT started its risk management program shortly after the 2007 collapse of the I-35W bridge in Minneapolis. Then-director Tom Sorel was brought in from FHWA to lead the agency. He brought with him the FHWA experience of enterprise risk management and he instituted it at MnDOT.

The two objectives for MnDOT's risk management program were to restore public trust and to be a world leader in transportation innovation. Mr. Davis spoke candidly of the benefits of risk management but also said that in retrospect MnDOT had a false start that other agencies should avoid. The MnDOT goal was to be a recognized international leader, which was a difficult goal to measure. The agency tried to define without success what it meant to be a global leader. He advised participants to set practical, achievable goals for their risk management programs. Risk management can help address measurable risks but was less effective with such a sweeping goal.

After Tim Henkel participated in the international scan, MnDOT began benchmarking with Australian transportation agency practice and focused risk management more closely on narrow, practical issues. He said he was skeptical, which served to keep the risk management efforts realistic. Risk management is not a solution to all problems but it does help improve decision making and raises the agency's credibility.

From his risk manager tenure he is most proud of a risk assessment matrix that provides agency employees a common framework for measuring risks. It borrowed heavily from Australian documents and built upon their success. It provides seven categories of risk, which are not definitive but serve to prompt thinking about the types of risks the agency faces. Its categories of risk include reputation, business and performance capability, financial, security of assets, management effort, environment, and legal and compliance. For each area, it describes what is meant by a catastrophic risk, a major risk, a moderate risk, a minor risk, and an insignificant risk. It also defines likelihood from being rare events that occur less than once in 10 years to almost certain, that occur several times a year.

Among the types of risks they now focus on are risks such as derailment from the huge oil trains that travel from North Dakota through Minnesota. They pass through many populous areas and a

derailment could be catastrophic.

He advised agency officials who are new to risk management to focus upon practical solutions to everyday risks. Focusing on the risks in operational plans are realistic, as opposed to trying to manage broad, overarching risks in a long range plan. A three to four year horizon is a reasonable timeframe for managing risks because beyond that risk mitigation efforts are less meaningful. He also advised to build a staff to support risk management, although in Minnesota the staff was never more than a couple of people. He suggested interfacing with all levels of the organization and to build internal support for the benefits of assisting work units with managing their risks.

Managing Risks to Extreme Events and Threats to Resilience

Consultant team members Shobna Varma of the StarIsis Corp. introduced the concept of using risk management to prepare for extreme weather and transportation network disruptions. Erratic climate and extreme weather are the new normal but the type and nature of disruptive event can vary widely. She said although it is difficult to predict a specific type of event, there are broad risk management strategies agencies can adopt that better prepare them to address a variety of disasters.

Preparing the transportation network so that it is robust, resilient and redundant is recommended by climate change organizations such as the Intergovernmental Panel on Climate Change (IPCC) and the Federal Emergency Management Agency (FEMA). The "Three Rs" won't prevent extreme weather but they reduce the impacts, which mitigates the risks of disruption. Also recommended are "No Regrets" strategies that have benefits both during extreme weather events and during normal conditions. These are strategies that have independent benefit but also help mitigate extreme weather effects. Examples could include reducing land use development in flood prone areas, or having sound asset inventories that can be used to identify high-risk assets. They are called "no regrets" strategies because they have benefit even if severe events don't occur.

John Milton of the Washington State DOT (WSDOT) described the agency resiliency planning based upon the FHWA Climate Change and Extreme Weather Vulnerability Framework. [1] He compared resilience to buying insurance for future performance. The question is how much does the agency want to spend on insuring future network performance without sacrificing resources that could improve safety or achieve other important objectives?

The Washington governor instructed the agency to examine the transportation system's resilience statewide. Events such as a landslide that killed 43 people and extreme drought that has caused a rain forest to burn increases appreciation for the likelihood of extreme events. The WSDOT effort conducted scenario analysis to analyze what could happen with increased climate extremes including prolonged drought, more intense heat, more severe storm events and rising sea levels. Although the scenarios involved complex meteorological modeling, the analysis of roadway impacts was conducted with field staff and agency subject matter experts. Their methodology was simple and straightforward. Based upon their experience of how their assets and roadway sec-

tions performed in past events, the staff theorized how they may perform in the future based upon different scenarios.

Staff were provided common definitions and rating scales so that the analysis would be comparable between districts and regions of the state. The criticality of assets was rated on a 1-10 scale after they considered basic questions such as, "What keeps you up at night?" "What if it gets worse (given the scenario)?" "How resilient is our existing system?"

Staff discussed possible impacts such as higher temperatures affecting bridge expansion joints, pavements, rail tracks, construction periods, habitat projects and electrical equipment. Increased precipitation was considered from its effect on flooding roads and tunnels, road washouts, pump capacity and drainage.

Hydrologic shifts were considered as possibly affecting soil stability, water supplies, and bridge and road support structures.

Sea level rise and storm surges were reviewed for impacts on coastal erosion, flooding, bridge footings, drainage, roadside stability and salt corrosion.

Definitions and scales for how to measure different impacts, from minor impacts to complete catastrophic failure, were provided to the staff. The product of the analysis was a list of assets most likely to be affected and strategies for improving network resilience. Affected assets were ranked and mapped. The risk analysis identified how known threats will be intensified by more severe weather, and it reinforced the value of current maintenance and retrofit programs. The process of using field and office staff to identify and rate hazards provided a means to capture the insights of staff in a practical way.

The WSDOT analysis demonstrated how relatively simple risk management tools can be combined with staff experience to produce a meaningful analysis of assets most at risk. A measure of success will be if in 50 years, people say, "I'm so glad they thought of this."

David Kuhn of the New Jersey DOT also described his agency's use of the FHWA climate change impact framework to identify the State's climatic risks to its transportation system. It had three goals which were to identify key transportation assets, develop climatic scenarios for 2050 and 2100, and overlay the findings to assess potential future impacts. It modeled two regions, a coastal study area and an inland corridor. Based upon expected sea level rise and increased storm severity, the modeling indicated that in 2100 in the "medium" climate change scenario there would be a 1 meter sea level rise with storm surge, that 48.5 miles of roadway would be impacted potentially, 2.9 miles of transit lines affected and 31 miles of total rail lines inundated. In the inland study area, the "medium" 2100 impacts were 81 miles of roadway potentially impacted, including major routes such as Interstate 295, Interstate 276 and U.S. 130. As well, 138 miles of rail including 11.7 miles of AMTRK would be affected.

Risk-mitigating adaptation strategies identified included:

- Site future infrastructure out of or above estimated flood impact zones;
- Identify or create redundant routes;
- Abandon or relocate infrastructure in chronically flooded areas;
- Assist with land use policies that discourage development in high-risk areas;
- Enhance shoreline infrastructure such as with sea walls;
- Elevate infrastructure;
- Enhance drainage;
- Prepare for closures when necessary;
- Establish and update detours and evacuation routes;
- Improve traveler notification of closures;
- Increase inspections and maintenance;
- Maintain wetlands;
- "Nourish" or augment beaches.

Recommendations included assessing decision makers' acceptance of the validity of the forecasts. A question is how much are they willing to make decisions based upon the climate and impact models? The analysis also identified data gaps on elevations for bridges and culverts. It also identified gaps in understanding the impacts of incidents, such as infrequent, localized flood closures. Finally, the study recommended a high-level vulnerability assessment for the entire state.

Following the presentation, the participants broke into groups for exercises on extreme weather event risks. They chose from different scenarios and then identified the risks that could be generated. The risks identified from the scenarios included:

Extreme Heat Events – Would generate health risks to the workforce and increase equipment failures. Mitigation strategies could include night-time work and avoiding outside work during the hottest periods.

Increased Storm Intensity – The highest risks were increased flooding and the impact on alternative routes not designed to accommodate the traffic volumes. Other risks included harm to economic activity and goods movement. Treatments included preparing to sandbag routes, planning for detours and more outreach to understand the impacts. High-risk areas such as the North Carolina Outer Banks were singled out. Resiliency and redundancy could be improved through emergency planning, and incrementally improving evacuation routes to withstand more severe storm events.

Increased Snowfall – Risks from increased snowfall would be infrastructure deterioration caused by increased chemical use and plowing. Also less money would be available for investment because of higher treatment costs.

Increased Precipitation – This scenario led to the identification of many risks but only one high probability/high impact risk which was moisture impacts in the pavements affecting performance.

Ms. Varma noted the lessons of the exercise which are that risk identification can be done quickly, and detailed data are not needed to identify the highest risks. Veteran staff experience can be the most valuable tool for identifying which assets can be affected by severe events.

Managing Financial Risks

Risk management supports long-term financial planning by enabling decision makers to evaluate the uncertainty that surrounds key financial issues, such as revenue forecasts, inflation estimates or legislative budgeting decision. The workshop participants discussed financial risks and how risk management can help to identify and prepare for them.

Scott Richrath of Spy Pond Partners introduced the concept of financial risks. He noted that agencies try to manage the risks of future income variability and fluctuating prices. An example could be considering hedging future fuel prices by locking in prices with long-term contracts, which can save money if prices rise but lose money if prices fall.

Ms. Varma introduced the concept of risk treatment by explaining the five "Ts". When financial and other risks are identified, decision makers can decide to treat, tolerate, terminate, transfer or take advantage of them.

The participants broke into groups and discussed risks posed by financial issues including: The risks and rewards of the one-time revenue influx from the American Recovery and Re-Investment Act, the risk of Congressional funding action or inaction, risks surrounding revenue projections, the risk of inflation projections and risks in agencies' ability to manage expenses and address financial needs.

Among the threats and opportunities they identified were:

- ARRA presented opportunity but also a threat by giving a false impression of the resources agencies had;
- The continued lack of Federal funding creates an opportunity to emphasize the need for additional State investment;
- Increasing State investment would be a form of risk treatment while agencies will likely have to tolerate a lack of additional Federal investment;
- One group suggested some funding risks could be transferred to public, private partnerships, or PPPs.

Communicating Risks to Legislators and Key Stakeholders

Risk management improves communication. It allows an organization to communicate to its internal and external stakeholders the uncertainties surrounding its objectives. It also communicates that the organization was responsible by anticipating what could go wrong, what could threaten its objectives, and what could threaten the safety of its stakeholders. Finally, it also al-

lows organizations to document they have considered the risks before attempting to capitalize on a new opportunity.

Tim Henkel presented on how MnDOT integrates risk into its performance, planning and asset management functions. The agency's long-range, 50 year vision drives its investment plans. The investment plans integrate performance planning and risk assessment to establish funding priorities. The consideration of funding levels considers the impact of different investment levels upon the agency's performance targets. Then, the agency's performance-reporting and monitoring processes evaluate progress and report performance to the public.

The agency's 20-year investment plan is called the Minnesota State Highway Investment Plan, or MnSHIP. It includes objectives in major program areas such as safety, asset condition, and mobility. Within the MnSHIP plan, different performance-level options were described, each with a different cost and a different outcome on system condition and performance. The risks for each investment scenario were described. The risk for investing more into infrastructure condition was that congestion could increase. Investing more in mobility leads to declining asset conditions. The plan illustrates the current investment program that balances both asset condition levels with funding only the most important mobility projects. MnSHIP communicates that the agency has considered risks both to asset conditions and to mobility. It attempts to keep the risks of poor asset condition and poor asset performance reduced to acceptable levels.

Mr. Henkel showed a graphic with three performance levels. The less the State spends on infrastructure maintenance the more risk to asset condition and performance it experiences. It can reduce the risk of crashes, congestion and poor conditions but only by spending more. MnSHIP illustrates how the agency attempts to integrate risk, performance, asset management and prudent spending to achieve the best overall return and the lowest risks with the resources it has.

As in the ISO framework seen in Figure 1, the Minnesota DOT's continuous review of its performance serves to monitor not only its performance but also its management of its risks. If it delivers the balanced program identified by the MnSHIP analysis it will continue to reduce the risks to its asset conditions and to the State's mobility. MnSHIP sets 20-year investment priorities. Districts' 10-year programs manifest the MnSHIP objectives through specific projects. Annual performance review ensures the projects are delivered, and the MnSHIP objectives are advancing as planned.

John Milton described how risk and performance reporting allow an agency to better tell its story on conditions and needs. It can help to inform the media, elected officials, decision makers, managers, and employees. It also supports increased productivity, the understanding of the effectiveness of different strategies and investments, and it reduces liability and risk.

He illustrated how WSDOT used risk analysis to communicate investment needs in its ferry terminals and fleet. The sinking of a ferry obviously would be a catastrophe, and therefore, the safety of the fleet is paramount. Because the mobility of a significant portion of the State's population

depends on the reliability of the ferry system, its performance also is critical. The department's performance report, known as the Grey Notebook, describes the ferry conditions and investment needs in terms of both performance and risk. Low preservation investments in vessels resulted in 33.4 percent of the value of the vessels requiring preservation, compared to a target of 24.7 percent. In 2007, four vessels had to be pulled from service and emergency replacement funds were required.

A risk-prioritization matrix helps to prioritize ferry vessel preservation. Based on the likelihood of the system failing and the consequences of the failure, vessel conditions were rated as a 1, 2 or 3. Condition 3 indicated the higher possibility of catastrophic failure or the long-term disruption of service. A level 1 assessment indicated that the asset or system does not currently need replacement. The documentation of the fleet condition by risk level helped communicate both the investment need and the agency's logic for identifying the needed investments. The risk-based analysis also allows WSDOT to report, that by value, 8.3 percent of the ferry system assets are in the Condition Rating 3 and require replacement.

He also demonstrated an internal risk reporting system that allows employees to access department-wide-risk information. The reporting system keeps internal stakeholders informed while the performance reporting communicates to external stakeholders.

Risk Management to Support Key Agency Priorities

Shobna Varma described how risk management helps executives achieve their strategic goals and manage risk to high priority objectives. She noted that the "buck stops" with the CEO who will be held accountable if objectives are not achieved or major processes break down. She cited several areas where risk management can aid executives in managing risks to key performance.

Ms. Varma noted the biennial report to Congress from the U.S. Department of Transportation inspector general. Although agency executives may not be aware of the risk caused by fraud or malfeasance, the inspector general's report documents monthly indictments and convictions among State employees and contractors for abusing Federal-aid funds. A robust risk management program would evaluate risks to major programs, and risks caused by fraud and malfeasance should be among the risks considered.

Project risks are another common area for focusing a risk management program. Risks to the cost, scope, schedule and quality of construction projects are among the most mature areas of risk management. She said that executives who consider creating an ERM program should consider including the regular management of project risks.

Critical risks to privacy are demonstrated every time there is another news report on a corporation or government agency being hacked. Because DOT personnel and insurance files may include sensitive privacy data, the agency faces significant information and hacking risks if it does not include proper firewalls and controls. Again, a robust risk management program would include

evaluation of the agency's data and privacy risks.

Managing risks to employee health and safety is one of the oldest forms of risk management. If an agency institutes an ERM program, it will want to include a robust risk-management program to identify and mitigate risks to employees' safety.

Workshop participants contributed their observations on how risk management helps their agencies achieve its most critical objectives. CEO Rudy Malfabon said the Nevada DOT (NDOT) is developing an enterprise risk management program. Among the factors contributing to the effort were the risks identified for a $500 million major public-private-partnership project. Among the risks the agency recognized were risks to the right-of-way acquisition and relocation schedule and budget, the cash flow risks, how the risks may change if the project were pursued as a design/build versus a P3, and what delivery method most reduced NDOT risks. Other risks were whether bonding for the project would affect the total project cost and the agency's cash flow.

The agency analyzed the project's risks, including risk that expensive rights-of-way would increase further in cost. The risk faced by the higher project costs caused the agency to become more cognizant of project cost risk. It is now evaluating right-of-way parcels based on their risk of cost escalation and using the information to redesign, or reconsider, projects. He said the risk effort began small when one project manager who was knowledgeable with one risk management software stepped up and took the lead on managing risks. Now, that project manager is serving as a temporary risk manager.

The agency plans to pursue risk management across the enterprise. It has identified risk levels at the corporate level, at the functional/department level, and at the project/operations level. It will be evaluating risks to its capital plan, will conduct a global risk assessment and will review risks to its financial plans. He said the agency plans to provide training on risk policies, roles and responsibilities, and available reference materials.

Michelle Tucker of Caltrans said officials try to make the risk process approachable so it calls its standard presentation, "Risky Business." It was important to the new Caltrans board to have a risk management process and so her office was created in 2013. Caltrans adopted the ISO 31000 model. At the time, there wasn't a lot of information available on how to start an ERM program. Because Minnesota and Washington DOTs relied on the ISO framework, California followed suit.

An important consideration for Caltrans is that ERM should not be narrowly focused but should look at as many risks as possible, and understand how different risks interact.

Their top risks are summarized in a 50 page report, and the risks break down to the Central Office and to the 12 districts. Her office produces a primary enterprise risk management profile and two divisional risk profiles. She is part of a two-person staff who traveled to each district over three months. They met with senior district leadership and spent a half day identifying their risks. They used a post it note technique similar to that used in the workshop. They have staff identify risks, write them on notes and post the notes on large, map-size risk matrices. The employees view the

risks identified by their colleagues and develop consensus on the top ones. More than 1,000 risks were identified and then prioritized to the top 15 risk categories. Those 15 categories were presented to the Caltrans executive board for high-level focus.

The 15 highest corporate risk categories were:

- Develop Our Workforce
- Develop Shelf Ready Projects & Project Initiation Documents
- Enhance Communication to Improve Reputation
- Engage and Support Employees
- Ethical Employees & Strong Performance Management
- Financial Risks from External Mandates
- Flexibility in Environmental Stewardship
- Foster Partnerships
- Increase Equipment &Vehicle Availability
- Innovative Information Technology
- Reinvent Caltrans Culture
- Strategic Cell Phone Deployment
- Streamline the Delivery Process
- Strengthen Contract & Procurement Process
- Support Skilled and Ethical Supervisors

Ms. Tucker said because the agency's top five goals run the gamut it's not surprising that the identified risks also are diverse.

The top risks formed the agency's Enterprise Risk Profile. Treatment plans were identified for most of the top risks, and performance measures were established for the 2015-2020 Strategic Management Plan. Additional audit plans were developed to evaluate the controls associated with the risks identified in the department's discipline process, financial systems, and project identification process.

Ms. Tucker said the risk workshops kept employees focused on the agency's key objectives. During the workshops, they posted the agency's objectives on the wall. Ms. Tucker said her staff developed useful forms allowing workshop participants to stay focused on key agency objectives, and to quickly identify risks to them. The forms list the agency's top objectives and lead participants to consider risks to those objectives from the areas of:

- safety and health
- stewardship, efficiency, sustainability
- livability and the economy
- system performance
- organizational excellence.

Ms. Tucker said they emphasize that risks are threats and opportunities. Based on the participants' perspective, they were predisposed to identify either risks or opportunities. She said the audit office identified only threats while the public affairs office identified only opportunities.

She said while the first rounds of risk-identification workshops took three months, it may take less time in subsequent rounds. She found that visiting all districts was important to generate commitment to ERM. They started in May and by October they had identified their risks, and spent another month developing reports.

To become a more risk-conscious organization, she said Caltrans wants to compare itself against a maturity model. The agency has a five year strategic plan to reach the optimized risk level. Among the maturity objectives are to deploy risk management down to the front lines. She said they learned it takes between three and five years to deploy risk across the organization.

John Milton illustrated the concept of using risk management to support agency objectives by focusing upon how WSDOT uses risk management to achieve its project and program objectives. The agency's risk for on-time, on-budget project delivery increased over the years as the Washington Legislature moved to identify more major projects through line items in the agency budget. Years in advance of the project being ready for bid, the Legislature identifies the project and its construction budget. Mr. Milton used a chart to illustrate the many interconnected activities that all must be coordinated in order for a project to be delivered on time, on budget and within scope. Each component of the complex chart represents a function that could create risk for the project. When all the risks to all projects are considered, they represent many risks to the overall construction program the Legislature wants the agency to deliver.

The agency began emphasizing risk management when between 2001 and 2011 it experienced a 48 percent erosion in purchasing power, which disrupted plans to deliver a set of projects to be funded with a 5 cent fuel tax increase. At the same time, the State's ferry system struggled to pay for fuel increases. The agency was achieving its bridge and pavement condition targets but asking the Legislature for more money to sustain them.

With the Legislature unwilling to lower targets and objectives, the agency had to use risk-based decisions to achieve the same objectives for less cost. It shifted the focus of its pavement program from hot mix overlays to more reliance on chip seals. The agency balanced the risk of lower pavement performance with the opportunity of the cost savings. He said the agency still faces risks, such as hundreds of miles of aging concrete pavements that eventually must be replaced. However, to date its focus on managing risk has allowed it to achieve higher pavement conditions with less cost. It also can more accurately predict the risks to achieving its major construction program within the Legislative limits.

How Risk Management Supports Performance

Early in the workshop the connection between risk management and performance management

was emphasized. As the ambition and complexity of an organization's performance objectives increase, so do the risks to them. An organization can't achieve its goals if it can't manage the risks that surround them. As objectives become more complex, so do their risks.

John Milton discussed how risk management supports performance management at WSDOT, emphasizing the safety program as an example. Washington is a litigious state and the agency has no sovereign immunity, and the State has joint and several liability. That means the DOT is more likely to be found liable for crashes, even if roadway conditions were a minor factor in the crash.

Using risk-based analysis, the agency is pursuing small, less-expensive projects but ones that are more effective. Designing to the Green Book standards can lead to "over design." Designing for optimal roadway conditions is expensive and it addresses crashes that can be possible, but not necessarily probable. WSDOT shifted its safety program focus to isolate factors that are probable contributing factors. Instead of designing for a 20 year horizon, it focuses safety funds on addressing the narrow, immediate factors. Money saved can be used on other locations, rather than designing to a standard that may not produce safety results.

He illustrated how the agency used statistical, risk-based analysis of the contribution of highway lighting to safety. The traditional assumption is that lighting reduces crashes. However, analysis of crash data showed that lighting made little difference in twilight conditions of dawn and dusk. In heavily urbanized areas, the density of traffic created adequate lighting from the many vehicle headlights. In the early morning hours, traffic was thin and lighting seemed to have little effect on crashes. The agency was able to reduce the hours of lighting without noticeable safety effect but with substantial cost savings. It has received no complaints, and received some praise from the "dark sky" advocates.

The "risk threshold" the agency sets will be determined by the resources it has. Although WSDOT is a "target zero" State (aligning with the FHWA vision "Toward Zero Deaths"), it lacks the resources to eliminate all risk factors. Also executives know that crashes often are caused by driver behavior independent of the roadway conditions. How much crash risk an agency must accept will be driven by the resources it can direct. If it has substantial resources, it can have a low threshold and mitigate more roadway conditions. If like most agencies, it has limited resources, it has to tolerate a higher threshold of crash risk and focus its resources on the highest contributing factors. For WSDOT, its top priority safety risks were identified as impaired drivers, run-off-the-road crashes, intersection related, speeding, young drivers, distracted drivers and traffic safety data systems.

WSDOT like many states found it increasingly difficult to find traditional, high-crash locations. Instead, it moved to a more sustainable, systematic highway safety policy. WSDOT views safety not as an absolute black and white line but rather from a risk perspective. From a risk management basis they think they can strengthen their legal position by changing the debate to more fact-based analysis on the causative factors.

Launching an ERM Program

Gordon Proctor described the sections from the upcoming risk management guide on how to launch a risk program. The guide says that three components are necessary for a successful ERM launch: a risk policy, risk tools, and processes to integrate risk consideration into normal business operations. Presentations from Michelle Tucker and John Milton provided case studies of how risk management was launched in the two agencies.

In Caltrans, the interest in risk management was spurred by several issues. Episodes of employee misconduct led both the agency and the legislature to recognize the need to control such risks. Employee surveys of managers and supervisors recognized the need to help manage risk with employees throughout the organization. Finally, the MAP-21 emphasis on risk management convinced the organization's board to implement an enterprise risk management program in 2013.

Initially, executives may think it is another "business speak", "flavor of the month" fad. However, Caltrans executives better understood the need for it after benchmarking against corporate risk management programs, which are essential in the corporate world. Also, legislation such as the Sarbanes-Oxley Act that requires risk management for corporations further convinced Caltrans officials that risk management is a best practice.

After reviewing the ISO framework and examining practices in the corporate world, Caltrans adopted enterprise risk management with the following attributes:

- Enterprise risk management should encompass the entire agency.
- It should identify risks from various sources and recognize how they relate.
- Risk management should be embedded in the agency's culture.

She said everyone already practiced risk management from the mailroom to the boardroom but it was an informal process until Caltrans adopted the ISO 31000 framework. Caltrans had long been a leader on project risk management. With the adoption of ERM it expanded its practice at the agency level, the program level and at the project/activity level for a full enterprise risk management program.

The development of the biennial risk assessments across all districts and divisions, and the active management of the identified risks, help to cascade risk management throughout the agency. The effort required strong executive report, which came from the Executive Board. In 2013, it created the Office of Enterprise Risk Management. Since then, the scope and formality of risk management expanded significantly.

She compared the traditional risk management approach to a sailing trip by ancient mariners. Sailors could survive storms in uncharted waters by being adventurous, through heroic efforts, and through continually reacting to panic and uncertainty. An agency that practices enterprise risk management resembles a modern super-cargo shipping corporation. Its cargo is insured, courses

are charted and contingency plans in place. By adopting the ISO framework and by identifying its top corporate risks, an organization can act more like the cargo ship captain who has mitigated uncertainties and identified contingencies.

The agency continues to develop new tools to assist with its ERM program. It has developed heat maps and consequence tables so its employees can have a common understanding of how to measure the likelihood and impact of risks. It also developed an innovative heat map that allows the mapping of both threats and opportunities. The two are mapped in mirror image with promising opportunities shown on one side of the heat map and threats shown on the other.

It is drafting training to develop district and division ERM champions. Also, training for all employees is being developed to explain the role and uses of risk management in Caltrans.

John Milton described the evolution of ERM at the Washington DOT. WSDOT first started with risk-based asset management, then focused on project cost and schedule risk estimation, and more recently is increasing the maturity of the entire enterprise risk management program.

Getting staff to consistently measure risk has been a focus for WSDOT. Its success in achieving strategic goals and objectives requires that performance, asset, and risk management programs work across boundaries. This team effort increases efficiency and effectiveness.

A first step in ERM is to understand what constitutes a risk; how probable that risk is; and how severe the impact might be if the risk were to occur. WSDOT has created a matrix that contains the definition and categories of risks so that employees have a tool for common measurement

The next step at WSDOT was the development of a usable tool for defining, linking to strategic objectives, measuring, mapping and mitigating risks. With risk management for projects, programs, assets and the enterprise, the Department has developed a strong culture of risk management and inter-office dialogue. As a result, understanding has increased for all areas and perspectives.

The question of "why enterprise risk management?" can be answered in several ways, based on the Washington experience. ERM helps to optimize decision making. The "risk portfolio" needs to balance risks and opportunities across the enterprise. He said the key is to look across the enterprise so that the strategies to deal with risks occur across functional boundaries.

A number of risk management tools can be purchased but WSDOT developed its own in-house tools. Some of its tools were adapted from the New South Wales, Australia, transportation agency's risk management process. Its Cost Estimation Valuation/Cost Risk Assessment and ERM tools can be found on its website. It also has on-line a number of tools such as a likelihood and impact description matrix that staff can use to ensure a common measurement of risks across the department. One tool uses slider bars for the probability, exposure and consequence of a risk. The user sets the slider bars on a scale for each of the three measures and the tool generates a risk rating. Maps of high-risk assets are used to communicate risks such as unstable slopes and flood-

ing hazards. Maps also are useful for identifying high-risk crash locations. The climate change risk analysis results that were mentioned earlier are kept available to assist with planning for repair of slopes, culverts and other assets that may be at risk from climatic events. The use of risk management to expand the application of chip seals provides communication tools for how the agency is dealing with its funding crisis.

The expanded use of risk management coincides with its tightening fiscal situation. As it looks for efficiencies, it can use risk management to fine tune expenditures. It can accept more risk in some areas in order to free resources for others. The reduction in highway lighting is just one example. Another is a risk-based analysis of "hard shoulder running" where traffic is allowed on shoulders during peak hours. This alternative can create savings and improved mobility but it also creates risks if shoulders can't accommodate the loads, or vehicles crash into adjacent barriers and rails.

A legal risk summit was held with the attorney's general office and WSDOT officials to view key legal risks and to discuss key agency programs to mitigate them. Traditional risk mitigation strategies are in place such as self-insuring the agency for tort liability, and requiring contractors and vendors to have liability insurance. WSDOT also insures some of its bridges and ferry boats. The assets are insured for property and business interruptions including earthquakes, flooding and terrorism.

Risk-Based Asset Management as a Catalyst for ERM

The final set of presentations occurred on the afternoon of the second day. These presentations were part of an intentional overlap between the NCHRP CEO risk management workshop and an FHWA asset management peer exchange. Because of the interest generated by MAP-21's requirements for risk-based asset management plans, the topic of risk-based asset management was held at the end of the CEO workshop and the beginning of the asset management peer exchange. Members of the FHWA peer exchange joined the last sessions of the CEO workshop to jointly discuss the use of risk management in asset management programs.

Shobna Varma and Gordon Proctor prepared a presentation that explained how risk management is the complement to and enabler for asset and performance management. Risk management helps agencies manage the uncertainties surrounding their asset and performance programs. Uncertainty surrounds asset management plans because of their long horizons, and their need to achieve specific condition targets. Uncertainty accompanies estimates of long-term revenue, asset performance, traffic loadings and asset investment levels.

MAP-21 requires asset management plans to include long-term financial plans. Such plans are influenced by many outside factors such as inflation, stakeholder needs, policy makers, legislators, the climate, the economy, and by the projects selected by agencies and MPOs. The many stakeholders and issues influencing asset management financial plans create risks that must be addressed in the asset management plan.

Additional risks include appropriation uncertainty. A 10-year financial plan will span 2.5 State Transportation Improvement Program (STIP) cycles and 5 biennial state budgets. Decisions in the budgets and STIPs can create uncertainty about delivering the asset management plan as intended.

Rich Tetreault of VTrans presented a case study of how asset management is reinforcing risk management in his agency. VTrans' commitment to asset management is changing the way the agency conducts business. It has formed an asset management unit, hired an asset manager and recently hired its first risk manager. The intent is to maximize the value of the agency's investments while meeting the expected levels of service. Doing so will result in fiscal accountability, customer satisfaction and transparency.

The risk management training the agency sought to assist with its asset management generated agency-wide interest in risk management. Some personnel who attended the training already are applying risk management to projects and initiatives. The new risk manager will work with each business unit to help identify and manage the risks to each unit's strategic objectives. The approach should lead to a focus on risk from the customer's perspective.

Kirby Becker of the Minnesota DOT discussed how risk management considerations were integrated into the agency's asset management process. The agency's draft asset management plan includes risk analysis as a key component along with lifecycle cost analysis, performance measures, investment strategies and assessment of performance gaps.

MnDOT's enterprise risk management framework encompasses its asset management efforts. Risk is integrated into the agency's 20-year investment strategy, known as MnSHIP. Risk also is considered in the 4-year Highway Systems Operations Plan, and into the bridge and pavement management processes. The agency also identifies and manages its larger global risks. It identified through the asset management plan analysis what it called "undermanaged risks." Those are risks that to date had not be thoroughly recognized or managed.

Undermanaged risks identified through the asset management planning process are considered ones presenting opportunities to better manage assets and to reduce global risks. Among the undermanaged risks that now will receive increased attention are deep storm water tunnels for I-35W south, many miles of access roads, ramps, frontage roads and auxiliary lanes that are not currently being monitored. MnDOT uncovered risks associated with undermanaged assets by focusing on risks to achieving the performance outcomes that had not previously been in the forefront.

The 20-year MnSHIP investment plan used risk as a lens that builds upon a 2010 assessment of the agency's risk profiles within 10 investment categories. Risk profiles were developed for each district and for many programs. The pavement and bridge management systems were used to identify, evaluate and plan for risks, and those risks are recorded in the agency's risk register. The asset management plan process further elaborated on the risks identified in the MnSHIP plan and

further identified risks that would impact the assets, the public or the agency. The process began with a focus on global risks and transitioned to an emphasis upon the undermanaged risks to assets. Risks were prioritized and mitigation strategies identified. A focus was upon risks to the agency achieving its asset performance targets.

Several lessons resulted from the development of a risk-based asset management plan. One was to justify the already-underway improvements to the bridge management system to improve condition forecasting. Another was to formalize the inspection of overhead sign structures and high-mast light towers to reduce failure risk.

Another lesson was that the reliance on existing data to develop the TAMP provided insight into the completeness and reliability of data, and the risks associated with undermanaged assets. The identification of data gaps and undermanaged assets led to the identification of the need to better manage the storm water tunnels, ramps, and auxiliary lanes.

Also presenting was Stephen Gaj of the FHWA Office of Asset Management, Pavements and Construction. He summarized the MAP-21 requirements for States to develop risk-based asset management plans. Those will answer the basic questions such as what assets do States own, what is their condition, which are critical, what are the best investment strategies, and what is my best long-term funding? Each of those questions raise the further question of what are the risks to the assets, and to their preservation?

The types of risks agencies could expect to identify include:

- Funding
- Reputation
- Data accessibility and quality
- Political changes
- Global conditions
- Leadership changes
- Extreme weather and storm events
- Climatic change, and
- Many others.

FHWA provides many resources for States to better manage risks to assets. These include a series of reports on risk-based asset management, webinars on risk management, NHI training, and the AASHTO asset management guide. The AASHTO Asset Management Subcommittee and the TRB Asset Management Committee also provide resources and expertise.

Research Needs and Risk Roadmap

A product of the workshop was a preliminary list of research and support activities to make available to DOTs the training, tools, and guidance materials agencies need to develop and maintain

effective ERM programs.

A facilitated group discussion resulted in the following suggestions:

- Assistance with geographical information system (GIS) applications that use asset data that could be like "encyclopedias" of risk. The presentation by the Nevada DOT on right-of-way parcels that present high cost risks prompted the suggestion that GIS tools may be able to assist with risk management efforts.
- Tim Henkel reminded the participants that there will be a risk management guide, as well as a risk register tool which also is under development. In addition, the existing NCHRP report and the international scan report are available to assist states.
- A one-stop web portal for risk management resources was suggested.
- Another suggestion was updating the National Highway Institute risk management course to reflect MAP-21 issues. Multiple versions of the course may be needed, such as one on project risk management as well as versions on enterprise and program risk management.
- An AASHTO board resolution in support of risk management was suggested. The exact nature of the resolution was discussed without clear consensus.
- Another suggestion was to report to the board of directors that the workshop was a success and that the five CEOs in attendance believe risk management holds potential to help executives. The board also could be told there is support for providing additional risk management resources to the States.
- Further AASHTO action could be to introduce the concept of risk management to the AASHTO committees. Committees could be requested to consider how risk management could be integrated into the transportation agency processes they address.
- Another suggestion was to provide a manual for new CEOs on how to manage a complex transportation agency, and include information on risk management.
- The AASHTO "new CEO 101" sessions could include explanations of risk management and how to use it. The session could explain that risk management is a best practice.
- Follow up work could emphasize that risk management is essential to agencies' strategic plans. The workshop illustrated how risk management is not tangential but essential to agencies' performance.
- Another suggestion was to illustrate and emphasize the need for enterprise risk management, and not just risk management at a project or program level. There needs to be a modular linkage shown between the management of risks at all levels of an organization. Now, risk management is rather disjointed, and it needs to be linked across all organizational levels.
- The successes of risk management could be documented and shared.
- It would be helpful to other States to have a summary of how the three advanced agencies in Minnesota, Washington and California conduct risk management.
- Model tracking tools would be useful to States. These could track program levels risks by identifying the analysis of the risks and tracking the management of them. These tools

could document the risk issues raised by staff. Those risk issues could influence tradeoffs later. An example could be two otherwise equal candidate projects could be prioritized if one of them reduces an agency risk.

- Explanations for how risk helps communicate across silos would be useful. The CHS risk manager showed how risk discussions fostered communication across 14 business units. Similarly, state agencies have difficulty communicating across multiple silos. Providing common definitions and measures could improve communication.
- Helpful to State personnel would be a risk management community of interest. Agency personnel can tap into a large, national network of asset management practitioners. A similar community of interest for risk management also would be useful.
- Similar to the community of interest is the need for a national risk management forum to bring States together. There is a need for a national network of State practitioners to advance the state of the practice. FHWA practices risk management but only from a compliance standpoint. The States may find major opportunities if they collaborate on risk management, and seek opportunities as well as threats.
- Another suggestion was assistance with how to frame risk questions. The answers received often depend upon how questions are framed. Assistance would be useful on how to frame risk questions to best identify a full range of risks.
- Advice would be useful on how to identify the proper skill sets for a risk manager. The right candidate needs to not only understand risk management but also be a good communicator and advocate.

The workshop participants next discussed what elements should be in a roadmap for States that want to develop enterprise risk management programs. Among the suggestions were:

- Some of the goals in long range plans are aspirational, and not realistic. The goals and objectives for State agencies need to be grounded in what is achievable. From those achievable and realistic goals, the enterprise risk management process should evolve. In addition to just setting targets for asset conditions, the agency needs to understand it must identify a realistic set of objectives for the next decade, then manage the risks to them.
- Agencies that are setting objectives should document the assumptions and risks surrounding them. They should document what they expect and are planning for important factors such as inflation rates, Federal-aid amounts, and other key assumptions. Those assumptions include risks that are important to agency objectives.
- States are at different levels of risk management maturity. A key question will be how to get more States involved.
- States face difficult tradeoffs, such as whether they should let some roads return to gravel. It would be helpful to understand how to use risk to make such decisions.
- States that pursue risk management need help understanding how to look across assets when considering risks. Risks to one asset could be reduced only to increase the risk to another. A roadmap needs to help States understand the interconnections between risks,

and understand how to compare risks to dissimilar objectives. Opportunity costs should be considered.

- There is a significant need for States to understand how to set a target. Some targets are "pulled from the air" such as no more than 10 percent of assets should be deficient. That may or not be a good target depending upon what other priorities are critical, such as retrofitting bridges for seismic events. It would be helpful to States to have more meaningful ways to set targets. Then, risks to those targets could be measured.
- Participants offered help in documenting how they set targets. Methods included basing targets on risk, basing them upon return-on-investment, and setting targets that indicate the long-term sustainability of the asset.
- State guidance is needed for how to reduce to a meaningful few a lengthy lists of risks. Risk management workshops identify many risks but it is difficult to prioritize them down to the top agency risks. Guidance is needed on how to do this effectively.
- A template for how to start and sustain a risk management program is needed.

Closing Comments

Tim Henkel wrapped up the session with closing comments. He prefaced his highlights with the history of how AASHTO, FHWA and TRB got to this point in the risk management evolution. The earlier NCHRP reports, the international scan and the advocacy of practitioners led to what is now a crossroads. The efforts to date have exposed states to the concept of risk management. Now, the decision before AASHTO, FHWA and TRB is whether to, or how to, advance its practice further.

Mr. Henkel said the participants agree the workshop achieved its goal of explaining to executives how to launch an enterprise risk management program. The remaining objective is to develop a roadmap for how States, AASHTO, FHWA and TRB can assist agencies that want to implement or improve ERM practices in their agency.

Appendix 1

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DRAFT

Appendix 2

(insert latest background paper)

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http://www.fhwa.dot.gov/environment/climate_change/adaptation/publications_and_tools/vulnerability_assessment_framework/