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INNOVATION & RESEARCH

Virginia and West Virginia's Transportation Research Co–Peer Exchange (June 22–26, 2014)

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DONALD L. WILLIAMS, P.E., Panel Chair
Section Head
Research and Special Studies
Division of Highways
West Virginia Department of Transportation

DAVID M. JARED, P.E.
Chief
Research & Development Branch
Georgia Department of Transportation

WILLIAM "BILL" KING, JR., P.E.
Materials Research Administrator
Louisiana Transportation Research Center

Final Report VCTIR 15-R14

VIRGINIA CENTER FOR TRANSPORTATION INNOVATION AND RESEARCH
530 Edgemont Road, Charlottesville, VA 22903-2454
www.VTRC.net

Standard Title Page - Report on Federally Funded Project

1. Report No.: FHWA/VCTIR 15-R14	2. Government Accession No.:	3. Recipient's Catalog No.:
4. Title and Subtitle: Virginia and West Virginia's Transportation Research Co–Peer Exchange (June 22–26, 2014)		5. Report Date: April 2015 6. Performing Organization Code:
7. Author(s): Donald L. Williams, P.E., David M. Jared, P.E., and William "Bill" King, Jr., P.E.		8. Performing Organization Report No.: VCTIR 15-R14
9. Performing Organization and Address: Virginia Center for Transportation Innovation and Research 530 Edgemont Road Charlottesville, VA 22903		10. Work Unit No. (TRAIS): 11. Contract or Grant No.: 106070
12. Sponsoring Agencies' Name and Address: Virginia Department of Transportation 1401 E. Broad Street Richmond, VA 23219 Federal Highway Administration 400 North 8th Street, Room 750 Richmond, VA 23219-4825		13. Type of Report and Period Covered: Final 14. Sponsoring Agency Code:
15. Supplementary Notes:		

16. Abstract:

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The Federal Highway Administration (FHWA) interpreted the regulation as requiring an exchange of information regarding the various practices a state uses to manage its RD&T2 program. The intent of the regulation was to strengthen weak programs and enhance strong programs with a sharing of ideas.

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Peer exchanges are generally conducted in an informal atmosphere and last from two to four days. Techniques used to gather the information needed by the peer exchange panel include discussion of individual state practices and brainstorming sessions on the focus areas of interest to the host state. Open-ended questions are used during the interview sessions to solicit the strengths and weaknesses of the program from the user's perspective.

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17 Key Words: Virginia and West Virginia co-peer exchange	18. Distribution Statement: No restrictions. This document is available to the public through NTIS, Springfield, VA 22161.		
19. Security Classif. (of this report): Unclassified	20. Security Classif. (of this page): Unclassified	21. No. of Pages: 43	22. Price:

Form DOT F 1700.7 (8-72) Reproduction of completed page authorized

FINAL REPORT

VIRGINIA AND WEST VIRGINIA'S TRANSPORTATION RESEARCH CO–PEER EXCHANGE (JUNE 22–26, 2014)

Donald L. Williams, P.E., Panel Chair
Section Head
Research and Special Studies
Division of Highways
West Virginia Department of Transportation

David M. Jared, P.E.
Chief
Research & Development Branch
Georgia Department of Transportation

William "Bill" King, Jr., P.E.
Materials Research Administrator
Louisiana Transportation Research Center

In Cooperation with the U.S. Department of Transportation
Federal Highway Administration

Virginia Transportation Research Council
(A partnership of the Virginia Department of Transportation
and the University of Virginia since 1948)

Charlottesville, Virginia

April 2015
VTRC 15-R14

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CO–PEER EXCHANGE TEAM

Panel

Donald L. Williams, P.E., Section Head, Research and Special Studies, Division of Highways, West Virginia Department of Transportation (Panel Chair)
David M. Jared, P.E., Chief, Research & Development Branch, Georgia Department of Transportation
William "Bill" King, Jr., P.E., Materials Research Administrator, Louisiana Transportation Research Center

Leadership Team
Virginia Center for Transportation Innovation and Research (VCTIR)

Jose P. Gomez, Ph.D., P.E., Director
Michael C. Brown, Ph.D., P.E., Associate Director for Structures, Pavement, and Geotechnical Engineering
Donna P. Cognata, Business Manager
Maureen L. Hammer, Ph.D., Director, Knowledge Management
Catherine C. McGhee, P.E., Associate Director for Safety, Operations, and Traffic Engineering
Amy A. O'Leary, Ph.D., Associate Director for Environment, Planning, and Economics
Michael M. Sprinkel, P.E., Associate Director for Materials
James W. "Jimmy" White, Jr., Research Implementation Coordinator

Other Participants

Frank A. Betz, Executive Director and CEO, Center for Business and Economic Research, Marshall University
Mary Jane Buckland, Associate Director, Office of Sponsored Programs, West Virginia University
Kevin E. Burgess, P.E., Statewide & Urban Planning Engineer, Federal Highway Administration, West Virginia Division
Jason R. Buys, CGFM, Financial Manager, Federal Highway Administration, Virginia Division
Gene V. Cilento, Ph.D., Glen Hiner Dean of the College of Engineering and Mineral Resources, West Virginia University
Thomas E. "Tommy" Cousins, Ph.D., Professor, Charles E. Via, Jr. Department of Civil and Environmental Engineering, Virginia Tech
Sabrina M. DeVall, Technical Writer/Editor, West Virginia Research Corporation
Michael D. Fontaine, Ph.D., P.E., Associate Principal Research Scientist, Safety, Operations, and Traffic Engineering, VCTIR
Jonathan L. Goodall, Ph.D., Associate Professor, Department of Civil and Environmental Engineering, University of Virginia
Emiliano M. Lopez, Assistant Division Administrator, Federal Highway Administration, West Virginia Division
Kevin K. McGhee, P.E., Associate Principal Research Scientist, Materials, VCTIR

Michael E. Pumphrey, P.E., Research Engineer, Division of Highways, West Virginia Department of Transportation
Radhey S. Sharma, Ph.D., Chair, Department of Civil and Environmental Engineering, West Virginia University
Gene Tey Shin, Ph.D., Senior Program Manager, Knowledge Management, VCTIR
Jonathan T. Storage, Attorney, West Virginia Department of Transportation

Recorders

Justice Appiah, Ph.D., P.E., Research Scientist, Safety, Operations and Traffic Engineering, VCTIR
Soundar Balakumaran, Ph.D., Research Scientist, Structures, Pavement, and Geotechnical Engineering, VCTIR
Mary M. Bennett, Publications Assistant, VCTIR
Benjamin F. Bowers, Ph.D., Research Scientist, Structures, Pavement, and Geotechnical Engineering, VCTIR
Noah J. Goodall, Ph.D., P.E., Research Scientist, Safety, Operations, and Traffic Engineering, VCTIR
Yue Liu, Architect/Engineer, Safety, Operations, and Traffic Engineering, VCTIR
Peter B. Ohlms, AICP, Research Scientist, Environment, Planning, and Economics, VCTIR
Sameer Shetty, Engineering Technician, Structures, Pavement, and Geotechnical Engineering, VCTIR
Gale K. Smith, MLIS, Information and Knowledge Management Program Coordinator, Knowledge Management, VCTIR
Ramkumar Venkatanarayana, Ph.D., Research Scientist, Safety, Operations, and Traffic Engineering, VCTIR

ACRONYMS AND ABBREVIATIONS

AASHTO	American Association of State Highway and Transportation Officials
DOT	Department of Transportation
FHWA	Federal Highway Administration
GDOT	Georgia Department of Transportation
GTI	Georgia Transportation Institute
LADOTD	Louisiana Department of Transportation and Development
LSU	Louisiana State University
LTRC	Louisiana Transportation Research Center
NCHRP	National Cooperative Highway Research Program
PI	Principal Investigator
RAC	Research Advisory Committee
RFP	Request for Proposal
RTAG	Research Technical Advisory Group
RD&T2	Research, Development, and Technology Transfer
SHRP	Strategic Highway Research Program
SP&R	State Planning and Research
SWOT	Strengths, Weaknesses, Opportunities, and Threats
TAC	Technical Advisory Committee
UTC	University Transportation Center
UVA	University of Virginia
VCTIR	Virginia Center for Transportation Innovation and Research
VDOT	Virginia Department of Transportation
WVDOT	West Virginia Department of Transportation
WVU	West Virginia University

INTRODUCTION

To be eligible for managing State Planning and Research (SP&R) funds, a state must agree to a peer review of its management process with regard to Research, Development, and Technology Transfer (RD&T2) efforts. Specifically, the federal regulation regarding this requirement states:

> (b) Each State shall conduct peer reviews of its RD&T program and should participate in the review of other States' programs on a periodic basis. To assist peer reviewers in completing a quality and performance effectiveness review, the State shall disclose to them information and documentation required to be collected and maintained under this subpart. Travel and other costs associated with peer reviews of the State's program may be identified as a line item in the State work program and will be eligible for 100 percent Federal funding. At least two members of the peer review team shall be selected from the FHWA list of qualified peer reviewers. The peer review teams shall provide a written report of its findings to the State. The State shall forward a copy of the report to the FHWA Division Administrator with a written response to the peer review findings (23 CFR 420, Subpart B).

The Federal Highway Administration (FHWA) interpreted the regulation as requiring an exchange of information regarding the various practices a state uses to manage its RD&T2 program. The intent of the regulation was to strengthen weak programs and enhance strong programs with a sharing of ideas.

The peer exchange panels are typically composed of state research managers and FHWA, university, or industry personnel, at least two of whom must have received training on peer exchange procedures and guidelines provided by the FHWA and be listed by the FHWA as a qualified peer exchange team member.

Peer exchanges are generally conducted in an informal atmosphere and last from two to four days. Techniques used to gather the information needed by the peer exchange panel include discussion of individual state practices and brainstorming sessions on the focus areas of interest to the host state. Open-ended questions are used during the interview sessions to solicit the strengths and weaknesses of the program from the user's perspective.

From June 22 through 26, 2014, the Virginia Center for Transportation Innovation and Research (VCTIR) hosted Virginia and West Virginia's Transportation Research Co–Peer Exchange (hereinafter co–peer exchange) with state department of transportation (DOT) research managers/directors from Georgia, Louisiana, Virginia, and West Virginia and representatives of the Virginia and West Virginia divisions of the FHWA. The Research and Special Studies Section of the West Virginia Department of Transportation's (WVDOT) Division of Highways is in the planning stages of developing an innovation center and wished to learn from these states. VCTIR was interested in implementation successes and lessons learned.

CONTENT AND FORMAT OF THE CO–PEER EXCHANGE

The co–peer exchange was conducted June 22–26, 2014, at VCTIR in Charlottesville, Virginia. The agenda is provided in Appendix A. To begin the exchange, panel members

provided an overview of their research programs. Discussions were then held to answer the detailed questions listed in the agenda. The co–peer exchange concluded with a SWOT (Strengths, Weaknesses, Opportunities, and Threats) analysis and summary of the exchange.

Co–Peer Exchange Team: Row 1 (left to right): James "Jimmy" White, Jr., Amy O'Leary, Maureen Hammer, Mary Jane Buckland, Radhey Sharma. Row 2: Kevin Burgess, Michael Pumphrey, Sabrina DeVall, Jay Puccio. Row 3: Michael Brown, William "Bill" King, Jr., Donald Williams, Michael Sprinkel, Jason Buys, Gene Cilento. Row 4: Jose Gomez, David Jared.

RESEARCH PROGRAMS IN VIRGINIA, WEST VIRGINIA, GEORGIA, AND LOUISIANA

Presentations by State Representatives

Representatives from Virginia, West Virginia, Georgia, and Louisiana provided overviews of their research programs and answered questions from the panel. They focused on the role of the research program within the state DOT, staffing within the research program, the scope of research, external and internal research processes, and implementation of research results. There were several similarities among the four programs including a strong focus on implementation, use of advisory committees to guide research programs and individual projects, collaboration with university partners, and effective reporting of research results. Major features from these presentations are noted here.

Virginia

VCTIR's responsibilities include development and delivery of an applied research program that supports the Virginia Department of Transportation's (VDOT) mission, expert

consulting for VDOT business units, post-research implementation support, technical oversight of university contract research, and development of future professionals through a graduate assistantship program. VCTIR's successful long-term partnerships with universities have supported an expanded research program, shared laboratories, and effective access to faculty and students. Research advisory committees (RACs) guide VCTIR's research programs, and technical review panels guide the individual research projects. Both groups have field experts within VDOT as members. A champion is identified for each research project. Implementation is considered and stressed from the earliest stages of each research project. Implementation has its own budget, from state funds, and is treated as a separate project from the research itself. Since 2010, 76 implementation projects have been completed.

West Virginia

WVDOT is currently in the planning stages of developing an innovation center and moving research to implementation. The Research and Special Studies Section is housed under the Planning Division of WVDOT's Division of Highways and has four employees. Currently, the Research and Special Studies Section is located at West Virginia University (WVU), Morgantown, and contracts the majority of the research. External collaborators include WVU's College of Engineering and Mineral Resources and Marshall University's University Transportation Center (UTC). Research projects previously followed the traditional materials track but are now divided into nine different areas. Problem statements are solicited from various organizations. Technical advisory committees (TACs) are formed to guide each project, and lessons learned from the field work help in developing specifications and implementation tasks.

Georgia

The strategic goals of the Georgia Department of Transportation's (GDOT) research program align with those of GDOT: policy/workforce, asset management, mobility, and safety. The office of research has seven full-time staff. They explicitly acknowledge the elements of risk in research and work to minimize them. The SP&R funding level is comparable to Virginia's. They have an implementation manager who co-owns the project with the technical manager. Their research technical advisory groups (RTAGs) are comparable to VCTIR's RACs. The recommendations made by RTAGs are vetted by the executive management. The Office of Research produces an annual implementation report.

Louisiana

The Louisiana Transportation Research Center (LTRC) shares several similarities with VCTIR. Their three main focus areas are materials, pavements/geotechnology, and safety/special studies. Their research problem identification committees are similar to VCTIR's RACs. The chairs of the committees form a bigger committee that prioritizes all LTRC projects. In addition to state and SP&R funding, Louisiana established the LTRC Foundation for managing research projects, primarily pavement construction, using funds outside the Louisiana Department of Transportation and Development (LADOTD) funds. LTRC has developed a web-based research project management tool. LTRC develops several reports to manage and market

their research, and their implementation updates are shared with the American Association of State Highway and Transportation Officials' (AASHTO) RAC and the state legislature. Reports include the following:

- the research assessment and implementation report, which includes management and communications objectives, recommendations, and potential impacts
- the biannual research progress report, which includes comments from managers on implementation and performance measurement
- a one-page "capsule," which describes a project at the outset
- a one- or two-page "technical summary," which is produced at the end of a project
- implementation updates
- a one- or two-page "fact sheet," which is produced after completion of each project.

Open Discussion Following Presentations

An open discussion followed the overview presentations and focused on three questions: (1) What do we definitely like about our program and would not change? (2) What would we like but do not currently have? (3) What would we change about our program? The answers from the co–peer exchange panel are categorized here by state. Valuable inputs from FHWA participants are included as part of the state answers.

Virginia

1. What We Definitely Like and Would Not Change

- *RACs.* They provide a grassroots foundation, with a strong implementation focus and support.
- *Project champions.* They are critical for follow through and implementation.
- *Implementation coordinator.* A dedicated person with an agency-wide network is vital to implementation success. Relationship management and an understanding of the VDOT culture are more important for implementation success than a deep understanding of the technical details.
- *Dedicated implementation funding.* Research study funds and time do not stretch far enough to support implementation.

2. What We Would Like But Do Not Currently Have

- *More marketing/publication staff.* We need to put even more emphasis on implementation and telling our stories succinctly.

- *Robust research management system.* A system similar to that of LTRC is desired.

- *Project capsules*. Products similar to those of West Virginia are desired. Interested people need to know when a project is launched.

3. What We Would Change

- *Contract language with universities.* Universities' intellectual property provisions have changed significantly in recent years.

- *University technical editors.* University project reports sometimes need much review. If they employ professional editors to review reports before submitting them, VCTIR staff can be more efficient.

Louisiana

1. What We Definitely Like and Would Not Change

- project champions

- marketing/communications group, which is robust

- implementation coordinator

- research management system, which is robust

- publication group, which is a robust mix of university and LADOTD employees with a main LADOTD staff overseeing the process.

2. What We Would Like But Do Not Currently Have

- *Increased skills in relationships management and agency networking for the implementation coordinator.* The current focus is on budget separation between research projects and implementation projects.

- *Increased use of visual/video communications.* Some people are more visual learners, and videos and short summaries are effective communication methods for a non-technical audience.

- *Project capsules similar to West Virginia's,* in which project synopses are provided in short, non-technical briefs.

3. What We Would Change

- Increased SP&R funding would allow us to separate the Materials Division and the Research Division, which would give us more visibility within LADOTD.

Georgia

1. What We Definitely Like and Would Not Change

- RTAGs
- ensuring that there is a technical implementation manager accountable for each project
- implementation coordinator
- master contracts with universities, which allow easy allocation of individual projects.

2. What We Would Like But Do Not Currently Have

- *Technical review panels with FHWA staff, etc.* A system similar to VCTIR's is desired.
- *Robust research management system.* A system similar to LTRC's is desired. A database is needed to archive ongoing projects.
- *Marketing/communications resources.* More publications staff is needed.
- *Implementation process.* More implementation staff is needed.
- *Implementation summary reports.* Currently implementation results are reported by technical assistance managers but are not documented.

3. What We Would Change

- We would have university technical editors.

West Virginia

1. What We Definitely Like and Would Not Change

- *Implementation.* Implementation should be led by someone who has a strong network within the organization and experience working with field staff, as that encourages respect.

- *Marketing.* We get great ideas from people regardless of their background and education, and we learn to communicate with them.

2. *What We Would Like But Do Not Currently Have*

    - *More resources/staff.* We need a project manager, another engineer, and a marketing team. We have to prioritize who and how we add staff.

    - *Telling the story to the executives.* We use the analogy of "Tylenol bottle synopsis" to get the point across clearly and succinctly.

3. *What We Would Change*

    - *Organization.* We would like to pull all research activities in the DOT under the Research Division, including the Local Technical Assistance Program.

    - *Recognition within WVDOT.* Make the research division independent from other divisions.

    - *Contract language with universities.*

Three Major Points Taken From Presentations and Discussion

1. It is important to have an implementation lead, preferably an individual with in-depth knowledge of the agency.

2. It is important to let agency staff know what the researchers are doing through communications and outreach efforts.

3. It is important not to stop at communication and to engage the district level staff by visiting and meeting with them directly, e.g., Georgia's "Research Road Show," in which they visit the districts to discuss research.

DISCUSSIONS ON OTHER TOPICS

Research Topic Solicitation

- It was generally agreed that the solicitation for research projects should be grassroots in nature.

- A DOT champion should be encouraged for all projects.

- It can sometimes be beneficial to have a contract with a university for facilitating the process in other universities.

- It is important to expand the notice of solicitation for research topics and attend meetings (such as maintenance meetings) to identify the issues that may benefit from research activity.

- It is important to have a champion on board from the beginning; in fact, identifying the champion should be a part of the solicitation process.

Open-ended Agreements

- In several states, master agreements are established and kept between the DOT and university contractors.

- A quick start vehicle (such as West Virginia's "pick-up-the-phone" start) can be established if there is an urgent matter that needs to be researched quickly; however, there needs to be an awareness of a potential perception of inequality with these types of agreements if the agreement is with just one university.

- On-call relationships can be established with contractors; however, there in an inherent risk that those dollars will not be spent and thus will be lost at the end of the fiscal year if state funds are used.

Principal Investigator (PI) Agreements

- Virginia spoke about the establishment of close relationships with each individual university researcher. The researchers are encouraged to attend RAC meetings to get to know VDOT employees and to hear and understand the problems VDOT is facing. There is a good relationship with the contract researchers.

Researchers Within the DOT

- The inherent advantage of researchers within the DOT conducting research is their familiarity with the agency.

- The problem with this approach is that there can be a conflict with researchers outside the DOT (e.g., universities) that would like to complete work with DOT funding. This issue may be mitigated if awards are based on skill set and project need.

Hiring and Retaining Ph.D.–Level Employees at the DOT

Virginia

- Most members of the VCTIR staff have a Ph.D.

- There are three research scientist levels: 1, 2, and 3. A P.E. is required for many research scientist positions but not for all. The scientist positions are not limited to the civil engineering discipline.

- In response to a question about hiring level, VCTIR explained that they hire in different pay bands and that there is an established career ladder that allows scientists to advance.

- Ph.D.–level employees are not always the answer. There are a number of positions at VCTIR where the most qualified candidates had a master's degree when other members of the applicant pool had a Ph.D. degree.

- The VCTIR model and relationship with the University of Virginia (UVA) allow for VCTIR employees to teach; however, the time spent and compensation are not part of the VDOT position.

Louisiana

- LTRC has a host of employees with a Ph.D. that are technically part of Louisiana State University (LSU). However, they have hired Ph.D.s under LADOTD. Some of the professors from LSU that are a part of LTRC hire Ph.D. associates, whereas LADOTD employees typically hire graduate assistants.

- There is an established agreement with LSU that they can have two tenured professors that work 100% for LTRC. However, they must teach a class at LSU each year. If the professor is tenured, LSU continues to hold the position; however, if he or she is not tenured or if the contract ends, so does the position.

- The relationship between LTRC and LSU is not a part of the master agreement but rather a separate contract between the two entities.

Funding of State DOT's Research Programs

Presentations

Use of SP&R and State Funds

- For Virginia, SP&R funding is the primary source of research funds, but there is some state funding for salaries and administration.

- Louisiana relies on SP&R funds as the main funding for research.

- Georgia's research program is funded by SP&R funds, although they previously used state funds.

- West Virginia uses SP&R funds for research—about $2 million (25% of 2%), based on an 80/20 match. They have some purely state-funded projects for urgent issues.

Costs Incorporated Into Operating a Research Center or Program and Application of an Overhead Rate

- Virginia does not have an internal overhead rate—as noted previously, state funding is applied to salaries and administration costs.

- Louisiana does charge overhead—a "fringe benefit rate," which is actually multiple rates.

- The overhead rate for Georgia is built into administrative costs.

- West Virginia is considering application of an overhead rate. They do rent space from a university and use an additive rate in the mid-80% range.

Supplemental Funding Sources, Including Innovative Funding, Funding From Industry, or Money From Other Sources

- Virginia has had access to some innovative funding, via FHWA, the National Science Foundation, the National Cooperative Highway Research Program (NCHRP), and university partnerships. Although there are active industry associations in Virginia, they do not provide funds for research.

- Louisiana works with funds through the DOT or universities and receives no external funding from outside sources. They do perform some non-DOT research funded through the LTRC Foundation and on occasion have done supplier or industry testing.

- Georgia receives some industry support, usually in-kind, such as use of the National Center for Asphalt Technology's test track facility. Since they have three UTCs, innovative funding is available. Other sources of funding include construction funds made available for safety research, e.g., a fog detection system.

- West Virginia receives some funding from the Industry and University Cooperative Research Program. Some safety funds are available, and they do work with other transportation agencies in the state. Also mentioned were the Center for Integration of Composites Into Infrastructure and Dr. John Zaniewski, a tenured faculty member at WVU whose endowment is supported by asphalt industry contributions.

Research Work Performed in Conjunction With Other State Agencies

- Virginia has performed research for other agencies under the umbrella of the Commonwealth's Secretary of Transportation, such as the Department of Aviation, Department of Motor Vehicles, and Department of Rail and Public Transportation. Virginia has also been involved in work for the Virginia Department of Historic Resources and has engaged in geotechnical research in conjunction with Virginia Tech.

- Georgia has worked with non-DOT agencies, such as the Department of Natural Resources (co-funding a study of bears), has done research with historic preservation, and has cost-shared with the U.S. Geological Survey.

- West Virginia works with other agencies in the state on research activities.

Discussion

An open discussion followed the presentations and focused on three questions: (1) What do we definitely like about our program and would not change? (2) What would we like but do not currently have? (3) What would we change about our program?

What participants like and would not change:

- use of safety funds to supplement research
- collaborative organizations—i.e., center and pooled funds.

What participants would like but do not currently have:

- additional SP&R funding

- simplified federal system

- more SP&R dollars from planning

- more control or flexibility over contributions to programs such as the Transportation Research Board, NCHRP, and the Strategic Highway Research Program (SHRP)

- internal service funding to help support center (charge state entities)

- more industry funding.

What participants would change:

- consideration of additional funding sources
- additional outreach to other states, as well as within the DOT, on research value
- state input up front on a potential future SHRP3
- funding for travel as part of quality assurance for research.

An additional point raised was that industry funding through universities is viewed differently from DOT's receiving money directly from private companies. Pooled fund studies are another option to avoid the appearance of DOT research being influenced by a private source of funding.

Use of Students

The incorporation of student employees into various functions in research aids in filling positions while offering students real-life work experience and the opportunity to work on a team with DOT employees. Student employment can also function as a recruiting tool, as students who find the agency a good fit may want to return as full-time employees after graduation.

Presentations

Virginia uses students as employees in various ways:

- temporary employment during the school year
- graduate research assistantships (mostly master's level), funded for 2 years
- a scholar program with paid summer work, stipends for educational expenses, and lead-in to the core development program.

West Virginia's perspective on the use of students is as follows:

- We have had successful experiences using students on part-time, temporary basis.
- Scholarships are offered, but in some cases students leave as soon as their obligation has been fulfilled.
- The need to obtain quick answers when needed may require a standing pool of graduate students or on-call contracts with university researchers.

Louisiana's use of students includes the following:

- summer employment for high school juniors and seniors
- internships for undergraduates—juniors and seniors
- co-op program, but no scholarships
- post-graduation employment offers.

Georgia's use of students includes the following:

- Formal internships are offered (co-ops were used in the past but have been replaced by interns).
- Scholarships are offered for employees.
- The student chapter of the Institute of Transportation Engineers is engaged.

One concern about using students is that their schedules may not mesh with research schedules, leaving work unfinished:

- Virginia noted that that timing of research needs and the academic timeframe do not always fit well.

- For Louisiana, the faculty usually ensures that the work is completed as necessary.

- Georgia does not have significant issues with student work left unfinished.

- West Virginia has observed problems with the timing of the research—the consumer may need the result in 18 months, but the research may end up taking 36 months.

Discussion

An open discussion followed the presentations and focused on three questions: (1) What do we definitely like and would not change? (2) What would we like but do not currently have? (3) What would we change?

What participants like and would not change:

- use of high school students during summers to attract them to the transportation field

- university pays tuition and DOT pays stipend for graduate students (as done by WVU/WVDOT)

- matching of thesis form to DOT report

- requiring a draft report 3 months before project end

- hold-back (20%) on projects until the final report is submitted

- deliverable-based contract, as used in Texas, Arizona, and Minnesota.

What participants would like but do not currently have:

- split funding between university and DOT for Ph.D. students to ensure that DOT gets practice-based research and the university successfully prepares doctoral students

- marketing of total compensation at DOT vs. salary dollars in private industry to attract and retain employees

- review of student reports by university editorial staff

- more input into student selection that matches DOT needs—Virginia has input into admissions via the center's staff members' roles as visiting faculty.

What participants would change:

- coordination of DOT project schedules with university schedules (as currently done by Georgia).

BREAKOUT SESSIONS

Attendees separated into three breakout sessions to discuss three separate topics: finance, universities and UTCs, and FHWA. Attendees regrouped after the breakouts to compare their findings.

Finance

What options are there to negotiate overhead rates? What options are there with regard to payment issues; deliverable systems; and how to track benefits/cost of research?

- Universities are treated as either grantees or vendors in terms of overhead rates. Under the vendor model, universities are treated no differently than any other vendor from the outside; therefore, the overhead rate can be negotiated. VCTIR operates under this model with its university partners. VCTIR needs to revisit this to ensure that the rate is correct for each university and each entity. Currently the rate varies (8.5%, 12%, and 26%), so VCTIR will try to negotiate one rate for all. The grantee model, unlike the vendor model, is not open to negotiation. It is governed by federal regulations for flow-through grants with no match.

- Payment issues, understood as paying for something (up to 95%) and not getting a deliverable, were discussed. The consensus was that withholding 5% is not a significant incentive to deliver. VCTIR withholds 20%, which can be a more significant incentive to deliver. West Virginia uses a task-based approach whereby payments are tied to specific deliverable elements (e.g., 5% for literature search or 5% for final report). This may require standard specifications for the distribution of payments with both parties signing off on the amount per task. Writing this into a contract helps, comparable to a bid/build contract. Getting a detailed invoice can be a problem, depending on the university, but it can work. This approach keeps both parties accountable and provides structure. It is supported by regulation 2 CFR, Part 225 (in Appendix A, Section C, 1, j.): Federal Cost Principles for State and Local Governments and Indian Tribes.

- Invoicing for deliverables can vary, requiring careful attention on the part of the project monitor. VCTIR requires monthly invoices from universities. VCTIR also requires quarterly progress reports if the project duration is less than 1 year and a progress report every 6 months for longer term projects. Progress reports follow a standardized form. Others require progress reports with every invoice, produced by the vendor, and do not follow a specific format.

- At VCTIR, the business manager and associate directors monitor costs, and research teams, with the help of staff economists, monitor benefits. Research benefits / return on investment are commonly reported to VDOT executive staff. This is typically presented as a monetized comparison of the "old way" of doing things vs. the "new way" of doing things.

Universities and UTCs

What is the best approach for selecting a researcher once the problem is known?

- University affiliation should be a secondary consideration behind facilities, expertise, and ability to deliver on schedule. It is important to distribute projects to both experienced faculty and junior faculty. One way is to have a program that invites young professors to submit short proposals for projects on a fixed 1-year schedule at $30,000, similar to Louisiana's Transportation Innovation for Research Exploration program. Georgia uses a consortium of universities, the Georgia Transportation Institute (GTI), which maintains a database of researchers and their areas of expertise. GTI can collect proposals, from which GDOT selects.

Joint program relationships: how do two universities work together on a project?

- One university may subcontract to the other so that there is a sole PI and therefore one person who is ultimately responsible. From the university perspective, however, there is an advantage to co-PIs as it gives the faculty member more credit for promotions and tenure. One solution is to list the PIs as co-PIs but have one sub to the other based on the order in which they are listed.

What are the opportunities to co-finance facilities?

- A DOT may purchase equipment and make an initial investment to staff it for a few years until the university has enough research projects to make it self-sustaining.

What can DOTs do to support university researchers and their labs?

- DOTs can use SP&R funds for equipment, which can also be used in later projects.

- Virginia's Smart Travel Laboratory, which focuses on operations data and performance monitoring, is jointly supported by UVA and VCTIR and is used to answer quick-turnaround research questions.

- GDOT also contributes to university labs. They often retain ownership of the equipment but allow universities to house and use it. GDOT retains primary access to the equipment via an informal agreement.

What is included in a good request for proposal (RFP)?

- The best RFPs are largely specific, which allows universities to respond appropriately. They should remain at least somewhat open-ended, so that universities can propose a technique that the DOT may not have considered. Other RFPs are intentionally vague in order to let researchers demonstrate their expertise and understanding of the problem.

- RACs can be leveraged to write successful RFPs.

- Most include a suggested project cost in the RFP, but a university is allowed to propose a higher amount. Universities generally prefer an estimated cost so that they know how to budget time and how much effort to put into writing the proposal. DOTs often have trouble getting universities to bid on low-budget projects and may avoid advertising a budget so as to encourage proposals. If the cost is uncertain, university researchers can often provide an estimated budget based on the project description in informal discussions.

How can DOTs encourage universities to complete research projects on schedule?

- Earlier discussions mentioned using a 20% holdback of project funds contingent on delivery of the final report or requiring a draft final report 3 months before the project's end date.

- Holding monthly conference calls with the TAC and the PI to report on project status is an option. Specifically, the conference call is more effective than written status reports alone. The TAC membership can range from 4 to 12 people representing different areas of expertise as well as representatives from the DOT, other agencies, and industry.

- Project management software such as Microsoft Project can be helpful in encouraging realistic scheduling and on-time delivery. GDOT requires it for projects funded at $500,000 per year or more. It is important for a DOT to read and respond to the reports and to respect the additional time universities must spend to produce them.

- Projects should coordinate with graduate student schedules and graduation targets. It is also important for university faculty to communicate timing constraints early in the project.

- Master's degree students are often in school for 2 years, yet projects are often 18 months in duration. Generally the project schedule should be based on the project needs, realizing that it is a minimum of 18 months for a student. If a project extends beyond one graduate student's time, it should be the responsibility of the faculty to handle the transition. Universities with large programs can absorb these scheduling differences easily, but small programs may have to leverage alternative funding mechanisms, such as teaching assistant assignments. Ph.D. projects are somewhat

more complicated. With a 2-year project, these students will spend the first year as a teaching assistant doing background research and will work on the project during the final 2 years.

What is the role of the university in implementing the research findings?

- Virginia has had success with the Innovative Bridge Research and Deployment Program (IBRD). Virginia Tech has found many students who are interested in working on projects with implementation prospects. Students will use the implementation component as part of their dissertation or thesis.

- Good projects will consider implementation early, and RFPs may require an implementation plan as part of the proposal. Other projects have an opportunity to implement components of the projects concurrently with the research. Some DOTs have separate budgets solely for implementation projects. The technical advisory panel should help guide the project toward implementation.

- Some DOTs have had success with a quad chart, which is a presentation technique that specifies a single slide with four quadrants to summarize a single project. The final slide would include findings and next steps. This can be helpful in getting university faculty to summarize their research succinctly for presentation to a lay or leadership audience.

- DOTs should focus on long-term relationships with university researchers rather than project-to-project funding. The issue of project timeline and Ph.D. student scheduling can be overcome by supporting research projects with useful follow-on work and long-term objectives.

Participants Visit the Concrete Lab at VCTIR

Participants Visit the Soils Research Lab at VCTIR

FHWA

What are strengths of centers? What are weaknesses? Are there any concerns for use of federal funds? Are there federal funding sources outside SP&R funds?

- One important strength of internal research centers when compared to the universities is that as DOT staff, researchers of the center would be committed to the DOT's need for applied/implementable research. It also allows for control of the research program/projects. Other advantages include access to facilities and laboratories as well as the opportunity to recruit and train future staff.

- VCTIR has developed a defined research implementation structure and process with an identified champion, who is closely tied to project initiation and implementation. A key part of the process is to go to the field and work with the people there to develop specific ways to put research recommendations into practice. The process combines research methodology with the embedded commitment of resources to implement research-based solutions. Research neutrality is critical.

- Some weaknesses of research centers are that the capital needs can be steep and the center may have high administrative overhead once it becomes operational. Further, universities have flexibilities that research centers do not. To stay relevant, it is important for the center to be aligned with and supportive of the DOT's interests. The center has to remain connected not only to the executive level but also to the general field and the people doing the work on the ground. It is especially important to re-establish relationships with every change of administration; the story has to be fresh and refreshed regularly.

- Federal funds may not be used to pay for center operations. Administration cost is the responsibility of the state. However, federal funds can help pay for equipment, but the procedure must be followed. In general this is best to do when the intent is to keep the equipment for its useful life because reselling can be very complicated.

- Other federal funding sources are available, depending on what is being done. Examples include the Surface Transportation Program (STP) Flex, Congestion Mitigation and Air Quality Improvement Program (CMAQ), and Technology Transfer (T2).

SWOT ANALYSIS FOR WEST VIRGINIA

This exercise focused on West Virginia and its desire to set up a research center that would work closely with universities.

Summary of Outcomes

At the end of the exercise, the top three items from each category regarding research centers had been identified.

Strengths:

1. being woven into agency culture and developing relationships with agency staff

2. joint partnerships between DOT and universities to pursue grants

3. (tie): (a) Implementation focus, and (b) Knowledge by universities of research needs so they can gear up and provide a wider circle of skill sets.

Weaknesses:

1. lack of knowledge within the organization about the research skills available

2. protracted delivery of research results

3. (tie): (a) Defining purpose to build a foundation, and (b) Small and decreasing pot of federal dollars available (along with constrained state and special dollars).

Opportunities:

1. establishing a solid purpose for existence and adding value to the organization

2. articulating value through each project and program

3. taking advantage of universities' growing programs and seeking outside funding (such as NCHRP) in partnership with state research agency.

Threats:

1. administrative changes

2. sustainable financial funding; federal regulations require a minimum expenditure of SP&R funds on research, but it may not be enough to fund a research program

3. restricted travel for research participation and professional conferences.

Participants Engage in the SWOT Analysis Discussion

Discussion

To begin the discussion, examples of threats were clarified; threats might include funding, high staff turnover, and poaching of staff positions. Participants also reviewed notes from the previous days' discussions. Details of the morning's discussion are presented here, followed by four tables listing all items identified through the SWOT analysis.

- Although VCTIR is under VDOT control, it has agreements with universities. Louisiana has a similar center, but all its researchers are affiliated with universities. WVDOT is likely to structure its center similar to Louisiana's, with researchers affiliated with external organizations/universities in West Virginia.

- VCTIR's memorandum of agreement is strong and could be a model for others—not necessarily in specifics, but in its very existence. A memorandum of agreement can define the purpose and importance of a research center within WVDOT. It could be

formalized through legislation to protect the research center from political changes such as turnover in the state administration and to ensure sustainable financial funding.

- The agreement between VDOT and UVA, a copy of which was provided to attendees, does not necessarily protect VCTIR from political changes or ensure stable finances. There is a continuing need in Virginia to communicate the basic nature of a research program. One strategy to do so is to maintain a direct connection between the core business of the state DOT and a research center's work. This includes the need to make sure the research center leverages the strengths of the DOT and complements its weaker aspects. Since the original agreement, VCTIR has expanded to work with many other Virginia colleges and universities.

- VCTIR guards against changes in administration by weaving VDOT's culture into its work and decisions. Technical assistance—essentially on-call consulting for VDOT—helps strengthen relationships with many different levels of VDOT personnel.

- VCTIR is known for meeting the needs of its customers. Its RACs help ensure that VDOT staff stay involved in identifying relevant research needs and expose rising agency leaders to the value of research. Currently, both the VDOT Commissioner and Deputy Commissioner advanced through the ranks of VDOT and have seen the benefits of VCTIR research at other levels of VDOT.

- LTRC was created by the Louisiana legislature in 1986, and this provides some security from LADOTD administration changes.

- Legislation in West Virginia could help its research center become part of its state DOT culture. The research center would need to define a solid purpose, which would lead to branding, slogan(s), and a positive reputation.

- A weakness of a research program could be protracted delivery time for results. This problem may relate to staffing limitations.

- There was discussion of working with universities and keeping research contract distribution equitable among universities and within universities.

- Rather than VCTIR competing with universities, the universities have expanded VCTIR's abilities to handle various topics in partnership. Universities often consult VCTIR when hiring faculty to see if they can provide people with capabilities VCTIR could use. University centers related to transportation research (such as the Virginia Tech Transportation Institute—VTTI) could have been seen as competition, but by working together, Virginia produced a structure wherein VTTI and VCTIR are mutually beneficial.

- Universities are good at finding funding for research issues. VCTIR does not have grant writers but does have some administrative support that can help. If the funding program requires a state DOT to lead the grant, VCTIR can do so but is happy to let others lead and be a participating subcontractor on a grant. For programs with an advantage or a requirement to leverage state matching funds, VCTIR has the ability to provide those funds or some in-kind support such as staff time.

- The Louisiana state legislature designated LSU as the flagship state university for the state's research program, facilitating that state's partnership. Other universities in the state can also be used.

- Georgia has a system for distributing work among its many state universities. GTI, which administers university research contracts for GDOT, can distribute research topics among universities; thus far, Georgia Tech has dominated the program, but other schools are now entering the mix.

- There was discussion about how universities working with a transportation research center could benefit from partnerships with other state agencies. For example, a West Virginia project on deer/vehicle collisions involved partnering with the West Virginia Department of Natural Resources.

- There was discussion about competition with private consultants and others. In West Virginia, consultants seemed to have the perception that the development of a research center would cut into their business.

- At VCTIR, although consulting firms can do some of the same work, it is typical for VDOT to ask VCTIR first. In Virginia, the division of work between consulting firms and VCTIR is reasonably well defined. Production work goes to consultants; publishable research goes to universities and VCTIR. VDOT may call on VCTIR to participate in reviewing the consultant proposals. VCTIR avoids doing production work such as quality assurance testing in its labs; that is for the consultants.

- A strength at VCTIR has been anticipating VDOT's needs and staying ahead of the curve.

- In some cases, agency staff may reach out to favorite consultants, preventing the research division from being involved.

- Growing the West Virginia research program beyond existing expertise in civil infrastructure could include staffing or collaboration to provide expertise in economics and environmental issues. There is a plan to grow the research center from 4 to 14 people over time, and assistance with facilities will be needed from universities. A library is desired in Charleston, along with offices in Morgantown (WVU) and Huntington (Marshall University), to be near university researchers. Geographic distance may not be much of a problem for the generation in their 30s who will soon be running things and are comfortable with virtual connections.

WVDOT's Division of Highways is decentralizing, but good central meeting spaces remain in Charleston. Although additional locations may be desirable, there could be negative effects from spreading out too much. For example, will three locations spread the staff too thin and result in fewer face-to-face interactions?

Tables 1 through 4 list all items identified through the SWOT analysis along with the number of votes by participants for each item during the prioritization process. Although the items in each table are sorted from most to least votes, an item with zero votes is not necessarily unimportant; each attendee was asked to vote for only the top two items in each category.

Table 1. Potential Strengths of a Center-Based Approach Based on Experience at Other DOT Research Centers

Strength	Votes
Being woven into agency culture and developing relationships with agency staff (VCTIR)	12
Joint partnership between DOT and universities to pursue grants	8
Knowledge by universities of research needs so they can gear up and provide a wider circle of skill sets	5
Implementation focus	4
Aligned with the core business of the organization	3
Different strengths/focus among universities—more skills and knowledge for agency to tap	2
Documentation of research	2
Advisory committees to ensure that research is targeted to agency needs	2
Problem-solving skills/technical assistance (essentially on-call internal consultants)	2
Diversity of toolbox: knowledge and skill sets available internally and at universities (such as outside civil engineering)	2
Partnering/relationships	1
Rating process to select research and partnership with university groups	1
SPR funding	0
Focusing on primary issues	0
Access to economists at VCTIR	0
Knowledgeable, informed DOT employees	0
Support of executives	0
VCTIR provides assistance at no internal cost to VDOT to help understand who can assist with problems (university, consultant, or internal research)	0
Offering quality assurance on other work, such as that done by consultants	0

Table 2. Potential Weaknesses of a Center-Based Approach Based on Experience at Other DOT Research Centers

Weakness	Votes
Lack of knowledge within the organization about the research skills available	9
Protracted delivery of research results	9
Defining purpose to build a foundation	7
Small and decreasing pot of federal dollars available (along with constrained state and special dollars)	6
Discontinuity due to staffing changes (lack of succession planning)	5
State funding sustainability	4
Staffing limitations	4
Not recognizing that the changing work world is less dependent on a physical presence in one space; limiting possibilities based on the "old" model of doing things	2
Equity among universities for project funding: competition for funds	1
Sometimes the agency asks for research funding when what is really needed is additional funding for a non-research project (so it gets submitted as a research proposal)	0
Missing capabilities, particularly missing an economist in WV	0

Table 3. Potential Opportunities of a Center-Based Approach Based on Experience at Other DOT Research Centers

Opportunity	Votes
Establishing a solid purpose for existence and value to organization	9
Articulating value by each project and program	6
Universities growing programs and seeking outside funding (such as NCHRP) in partnership with state research agency	5
Increase WV staff from 5 to 14 to increase capabilities and broaden areas of expertise, including PhD affiliates through the university	4
Identify and understand stakeholders and communicate effectively (different stakeholders have different roles)	4
Weave into state legislation	2
Partner with industry, consultants, etc. (those who could be potential competitors)	2
Maintain a presence in different areas of WV by increasing offices and labs through university partnerships	2
Training facility in partnership with a university	1
Potential WV transportation library location in Charleston, to be centrally located in the state	1
Differentiate what DOT staff, university partners, and consultants each do: clearly define roles and relationships	1
Research opportunities for universities to work with other agencies with DOT assistance	1
Direct outreach to potential groups in agency	1
Involve university and industry partners in determining research needs	0
Marketing to various groups	0
Branding	0
Bring back innovative bridge program and similar federal programs	0
Smaller states' input into federal programs (through AASHTO), particularly which topics will be studied	0
Working with other state agencies (such as state Department of Natural Resources) to address research questions	0
Marketing to various groups	0

Table 4. Potential Threats to a Center-Based Approach Based on Experience at Other DOT Research Centers

Threat	Votes
Administration changes	15
Sustainable financial backing: federal regulations require a minimum expenditure of SPR funds on research, but it may not be enough to fund a research program	11
Restricted travel for research participation and professional conferences	8
Being perceived as threat by consulting groups (that the center is now doing what consultants formerly did)	3
Potential equity issues between partners	3
Agency not going to research division with questions first	2
Negative public perception of state employees	0
Off-the-top contributions of federal funds to national organizations and research programs (such as SHRP): need to fit the needs of smaller states	0

FINAL TAKE-AWAYS

In wrapping up the co–peer exchange at the end of the Wednesday session, participants thanked VCTIR for hosting the exchange. They expressed appreciation for the opportunity to establish relationships with other states' research programs and FHWA. They found it helpful to hear the similarities and differences of the research programs in DOTs in West Virginia, Georgia, Louisiana, and Virginia.

They were especially thankful for the attendance and participation of academic partners, particularly those who traveled from WVU and Marshall University. They were thankful for the detailed program agenda that kept the meeting on track and focused on providing guidance for WVDOT's Department of Highways to start a research center. An FHWA participant noted that the process of developing research manuals and holding peer exchanges has streamlined FHWA oversight so that they do not have to approve and coordinate every research project. Everyone was thankful for that.

Listed here are highlights of what participants from the states and FHWA particularly took away from the co–peer exchange.

West Virginia:

- The co–peer exchange removed several fears regarding putting together a research center, from the use of Ph.D.–level employees to how to set up contracts. It provided a high degree of comfort for moving forward.

- WVDOT has the opportunity to do something unique and beneficial for the state.

- A first need in West Virginia is to establish appropriate staffing levels, likely with the addition of an implementation manager/coordinator.

- WVU looks forward to working with WVDOT's Division of Highways on establishing a research center.

- It is critical to focus on where needs and abilities align rather than on where they differ.

- Communication is a key to strategically forming a research center.

Georgia:

- We will look at strengthening the solicitation process.

- We will look at targeting specific groups who may have research needs.

- We will be going to more meetings within the agency to discuss research and to hear about needs.

- We will look at establishing a set-aside for bringing young people into the program.

- We will be telling universities to be strong in what they do well and not try to do it all.

Louisiana:

- Research is underutilized in the state DOT.
- They will work on "selling" some of the state's research results.
- They will explore to see if state maintenance funds could be used specifically to address maintenance research requests.
- It is a valuable practice to limit publications to 75 pages. It is unreasonable to expect most operations staff to review 300-page reports.

Virginia:

- VCTIR is interested in pursuing research road shows to district offices.
- There is interest in producing an annual implementation report.

FHWA:

- FHWA will research assisting VCTIR with a research management system.
- Each agency should continue to focus on its purpose and trying to do the right thing.
- Restrictions on travel at the DOTs are disappointing because it is important to find out what other states are doing.

Participants concluded the visit with a tour of UVA's Center for Transportation Studies before traveling to Blacksburg for a tour of the Virginia Smart Road managed by the Virginia Tech Transportation Institute.

APPENDIX A

AGENDA

VIRGINIA AND WEST VIRGINIA'S TRANSPORTATION RESEARCH CO–PEER EXCHANGE

June 22-26, 2014

Virginia Center for Transportation Innovation and Research, Charlottesville, and Virginia Smart Road with Virginia Tech Transportation Institute, Blacksburg

Sunday, June 22, 2014: Travel day

4:30–6:00 PM Meet with Facilitators (Facilitators: Jose Gomez and Donald Williams)

6:00–8:00 PM Greet and Meet Dinner (Location: Vivace)

Monday, June 23, 2014 (Attendance: DOT and FHWA Personnel)

8:00–8:30 AM Welcome and Overview (Jose Gomez)

- Mandate of peer exchange (Jose Gomez)
- Goals of this peer exchange (Donald Williams)
- Introduction of and use of facilitator (Jose Gomez)
- Format for discussion (Facilitator: Maureen Hammer)

8:30–9:45 AM Overview of Existing Facilities in Virginia, Georgia, and Louisiana

- Role within state DOT
- Staffing and roles within research program
- How is DOT's research governed within DOT?
- Scope of research
- External university dependence
- Process for conducting internal research
- Implementation of research results

9:45–10:30 AM Take-Away From Overview

- What we definitely like and would not change?
- What we would like but do not currently have?
- What we would change?

10:30–10:45 AM Break

10:45–11:45 AM Selection of and Completion of Required Research

- Process to solicit research topic
- Do you use any open-ended agreements with universities, contractors, or consultants that can be used at any time?
- Role of DOT management requesting quick research of issue that is not solicited
- How are contractors (researchers) chosen to complete research?
- Are consultants used and to what extent?
- How much research is conducted by DOT personnel?
  - — Advantages
  - — Disadvantages
  - — Conflict with researchers outside DOT desiring to complete work

11:45–1:00 PM Lunch at VCTIR

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1:00–2:00 PM Take-Away From Selection Process

- What we definitely like and would not change?
- What we would like but do not currently have?
- What we would change?

2:00–3:00 PM Organization of Center to Work With Contractors (Universities)

- RFP/proposal
- Memorandum of understanding overview
  - — Details
  - — Rights extended to DOT as result
  - — Advantages/disadvantages
  - — Legal procedure
- Hiring and retention of Ph.D.–level employees at DOT
  - — Hiring within civil service system
  - — Benefits received from university/DOT?
  - — Possibility of co-funded positions between DOT and university
  - — At-will employees
  - — Teaching/training
  - — Does university have a non-profit that oversees research?
  - — Any hirings through non-profit (501-(c)3)?
  - — Ability to go after non-DOT research and how that is handled

3:00–3:15 PM Break

3:15–4:15 PM Take-Away From Organization Process

- What we definitely like and would not change?
- What we would like but do not currently have?
- What we would change?

4:15–5:15 PM General Wrap-Up of Day's Activity

- Review summaries of take-aways
- Review agenda and determine if any topics should be added

Dinner on Your Own

Tuesday, June 24, 2014 (Attendance: DOTs and FHWA Joined by Universities and UTCs)

8:00–9:00 AM Summary of Monday's Discussion

- Welcome (Jose Gomez)
- Introductions
- Summary of take-aways thus far (David Jared)
- Format for the day's activity (Donald Williams)
- Questions/discussion

9:00–10:00 AM Funding of State DOTs' Research Programs

- Use of federal State Planning and Research (SP&R) funds
- State
- What costs are incorporated into operating center or program?
- Do the centers apply an overhead rate to internal research that is used to fund itself?
- Does DOT research receive any funding for positions, labs, etc., from other sources such as industry, etc.?
- Innovative funding?
- Other funding sources
- Do centers conduct research for other non-DOT agencies? If so, is an overhead rate applied?

10:00–10:15 AM Break

10:15–11:15 AM Take-Away From Selection Process

- What we definitely like and would not change?
- What we would like but do not currently have?
- What we would change?

11:15–12:15 AM Use of Students

- Employment opportunities
  - — Temporary employment
  - — Internships
  - — Co-op program
  - — Scholarships
- How can students work for the center on research and obtain master's and Ph.D. degrees?
- Does DOT offer a scholarship directly tied to the center?

- Ways to support students post-graduation to employment at DOT
- Issues with research not being completed because of students' schedules

12:15–1:15 PM Lunch

1:15–2:15 PM Take-Away From Use of Students
- What we definitely like and would not change?
- What we would like but do not currently have?
- What we would change?

2:15–3:45 PM Breakout Sessions
- Group 1: Finance (Facilitator: Kevin McGhee)
  - What options are there to negotiate overhead rates?
  - Payment issues
  - Deliverable systems
  - How to track B/C of research
  - Innovativeness
  - Miscellaneous
- Group 2: Universities and UTCs (Co-Facilitator 1: Maureen Hammer)
  - What is the best approach for selecting a researcher once the problem is known?
  - Joint working relationships between two locations (universities) working on same project and using strengths of each
    - What are concerns?
    - What are benefits?
  - Are avenues within center willing to co-finance (e.g., teaching positions, labs, office space, etc.)?
  - Can DOT's research programs help assist in development of needed educators, labs, etc., at university or UTC?
  - How do you view research implementation and university's/UTC's role in assisting in the process?
  - How can RFPs be better written?
  - How can universities/UTCs assist in getting research completed on schedule?
  - Miscellaneous
- Group 3: FHWA (Co-Facilitator 2: Gene Shin)
  - What are strengths of centers?
  - Any concerns for use of federal funds?
  - Are there any other federal funding sources outside SP&R?
  - Flexibility of center
    - What are strengths?
    - What are weaknesses?
  - Concerns that need to be addressed?
  - Miscellaneous

3:45–4:15 PM Group 1 Summary (Facilitator Presents)
- Points discussed
- Questions that need clarification
- Response to questions

4:15–4:45 PM Group 2 Summary (Facilitator Presents)
- Points discussed
- Questions that need clarification
- Response to questions

4:45–5:15 PM Group 3 Summary (Facilitator Presents)
- Points discussed
- Questions that need clarification
- Response to questions

5:15–5:30 PM Conclude

6:30–9:00 PM Meet for Dinner As Group (Proposed Location: The Shebeen Pub and Braai—To Be Confirmed)

Wednesday, June 25, 2014

8:00–11:30 AM SWOT Analysis (Approximately 30 Minutes Each Subject) (Facilitator: Maureen Hammer)
- Strengths
- Weaknesses
- Opportunities
- Threats

Noon Conclude Meeting at VCTIR

Travel to Blacksburg, Virginia, for tour of Virginia Smart Road

Thursday, June 26, 2014

10:00–2:00 PM Visit to the Virginia Smart Road Managed by the Virginia Tech Transportation Institute in Blacksburg

APPENDIX B

PARTICIPANT CONTACT LIST

West Virginia

Donald L. Williams, P.E.
Section Head
Research and Special Studies
WVDOT-DOH
Chestnut Ridge Research Building
886 Chestnut Ridge Road
P.O. Box 6884
Morgantown, WV 26506
(304) 677-4000
Donald.l.williams@wv.gov

Frank A. Betz
Executive Director
Center for Business and Economic Research
Marshall University
One John Marshall Drive
Huntington, WV 25755
(304) 528-7262
betzf@marshall.edu

Mary Jane Buckland
Associate Director
Office of Sponsored Programs
West Virginia University
P.O. Box 6845
Morgantown, WV 26506-6845
(304) 293-6736
mjbuckland@mail.wvu.edu

Gene V. Cilento, Ph.D.
Glen Hiner Dean
Statler College of Engineering and Mineral Resources
West Virginia University
367 Mineral Resources
Morgantown WV 26506.
(304) 293-4157
gene.cilento@mail.wvu.edu

Sabrina M. DeVall
Technical Writer/Editor
WVU Research Corporation
P.O. Box 6103
Morgantown WV 26505
(304) 293-9930
Sabrina.DeVall@mail.wvu.edu

Michael E. Pumphrey, P.E.
Research Engineer
Research & Special Studies
WVDOT-DOH
84 Terrace View Drive
Morgantown, WV 26508
(304) 206-8625
Michael.E.Pumphrey@wv.gov

Radhey S. Sharma, Ph.D.
Professor and Chair
Civil and Environmental Engineering
West Virginia University
625 Engineering Science Building
Morgantown WV 26506
(304) 293 9920
radhey.sharma@mail.wvu.edu

Jonathan T. Storage
Attorney
WVDOT
1900 Kanawha Boulevard, East
Building Five, Room 517
State Capitol Complex
Charleston, WV 25305
(304) 558-2823
jonathan.t.storage@wv.gov

Federal Highway Administration

Kevin E. Burgess, P.E.
Statewide & Urban Planning Engineer
Federal Highway Administration, West Virginia Division
700 Washington Street East, Suite 200
Charleston, WV 25301
(304) 347-5266
kevin.burgess@dot.gov

Jason R. Buys, CGFM
Financial Manager–Virginia Division
U.S. Department of Transportation
Federal Highway Administration
400 North 8th Street, Room 750
Richmond, VA 23219-4825
(804) 775-3360 (direct)
jason.buys@dot.gov

Emiliano M. Lopez
Assistant Division Administrator
West Virginia Division
Federal Highway Administration
700 Washington Street East
Suite 200
Charleston, WV 25301
(304) 347-5929
emiliano.lopez@dot.gov

Georgia

David M. Jared, P.E.
Chief, Research & Development Branch
Georgia Department of Transportation
Office of Research
15 Kennedy Drive
Forest Park, GA 30297-2534
(404) 608-4799
djared@dot.ga.gov

Louisiana

William “Bill” King, Jr., P.E.
Materials Research Administrator
Louisiana Transportation Research Center
4101 Gourrier Avenue
Baton Rouge, LA 70808
(225) 767-9129
Bill.King@LA.GOV

Virginia

Jose P. Gomez, Ph.D., P.E.
Director
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1936
Jose.gomez@vdot.virginia.gov

Michael C. Brown, Ph.D., P.E.
Associate Director, Structures, Pavements, and Geotechnical Engineering
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1936
Michael.brown@vdot.virginia.gov

Donna P. Cognata
Business Manager
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1957
Donna.Cognata@VDOT.Virginia.gov

Thomas E. "Tommy" Cousins, Ph.D.
Professor
Charles E. Via, Jr. Department of Civil and Environmental Engineering
Patton Hall
Virginia Tech
Blacksburg, VA 24061
(540) 231-6753
tcousins@vt.edu

Michael D. Fontaine, Ph.D., P.E.
Associate Principal Research Scientist
Safety, Operations, and Traffic Engineering Team
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1980
Michael.Fontaine@VDOT.Virginia.gov

Jonathan L. Goodall, Ph.D.
Associate Professor
Department of Civil and Environmental Engineering
University of Virginia
Thornton Hall, 351 McCormick Road, Office B218
P.O. Box 400742
Charlottesville, VA 22904
(434) 243-5019
goodall@virginia.edu

Maureen L. Hammer, Ph.D.
Director
Knowledge Management
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1987
maureen.hammer@VDOT.virginia.gov

Catherine C. McGhee, P.E.
Associate Director for Safety, Operations, and Traffic Engineering
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
434-293-1973
Cathy.Mcghee@vdot.virginia.gov

Kevin K. McGhee, P.E.
Associate Principal Research Scientist
Materials Team
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1956
Kevin.McGhee@vdot.virginia.gov

Amy O'Leary, Ph.D.
Associate Director for Environment, Planning, and Economics
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
434-293-1995
Amy.Oleary@vdot.virginia.gov

Gene Tey Shin, Ph.D.
Senior Program Manager
Knowledge Management
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1966
Gene.Shin@vdot.virginia.gov

Michael M. Sprinkel, P.E.
Associate Director for Materials
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1941
Michael.Sprinkel@vdot.virginia.gov

James W. "Jimmy" White, Jr.
Research Implementation Coordinator
Virginia Center for Transportation Innovation and Research
530 Edgemont Road
Charlottesville, VA 22903
(434) 293-1931
Jimmy.White@vdot.virginia.gov