

## INFORMATION TO ASSIST IN CREATING RESEARCH PARTNERSHIPS

This chapter provides a first-hand look at some of the items research units currently use to form and operate successful partnerships. It also contains a listing of concepts about partnerships suggested at the state peer exchange meetings, and then concludes with points to consider before entering into a partnership. Materials were chosen to illustrate unique features that were identified as being important to partnerships.

- California—Terms of MOU with other state and federal governments and the private sector; terms are quite detailed and instructive.
- Kansas—Funding process for the Midwest States Pooled Fund Accelerated Testing Program; other administrative items.
- Maine— Excerpts from its joint funding agreement with the U.S. Geological Survey.
- Minnesota—Language from legislation creating the capability for research partnerships and unique aspects of implementing the partnership legislation.
- Mississippi—Division of responsibilities in a partnership with the private sector.
- Missouri—Intellectual property clauses from the CRADA. Western State—Language from the western state’s partnership agreement; purpose and objectives statements.
- New Mexico—Selected text from its MOU with RSPA, Road LIFE, a 20–25-year partnership.
- Rhode Island (and others)—Summary of the MOU for the New England Transportation Consortium.
- Ontario—Aspects of partnership guidelines.
- Peer Exchange Meetings—Recommendations regarding partnerships.

### CALIFORNIA: TERMS OF A MEMORANDUM OF UNDERSTANDING WITH OTHER STATE AND FEDERAL GOVERNMENTS AND THE PRIVATE SECTOR

Presented here is a synopsis of an MOU for the partnership between the California DOT (Caltrans), industry, a federal agency, a state commission, and a research institution. The partnership also uses a CRADA as the structure to incorporate the federal agency, the U.S. Geological Survey (USGS), and an academic institution to perform administrative functions (University of California at Berkeley). This partnership provides an effective example of the variety of partner organizations that can be used, the research

expertise drawn into the partnership, and the means to provide for administrative support.

The material included in this synthesis shows the thinking behind creating the partnership, which is expressed in a resolution format [e.g., “Whereas conditions” 1, 2, 3, and so on, and “Therefore” action (summarized for this document)]. The MOU continues by describing the scope and operations of the partnership and the role and responsibilities of its individual members. For this synthesis, an outline with content summary is given to provide general direction for others considering what should be included in a partnership agreement. Note in the previous section that the MOU states specifically that it does not commit any resources; it is not an enforceable contract, but a formalized means to coordinate the partnership.

This MOU shows a good example of the operational expectations of the partnership. Many MOUs do not elaborate on the role and responsibilities of the partners and thus suffer for not having clearly defined these aspects before beginning the formal working relationship. Although providing such details is not required for success, mutually determining the roles and responsibilities is necessary whether they are expressed in writing or not.

In the response to the synthesis survey, Caltrans made the following comments:

- The partnership was formed to
  - Leverage funding,
  - Gain technical expertise,
  - Add administrative and project management expertise, and
  - Reduce duplication of research efforts.
- The factors most influential in enabling this partnership were
  - Common goals,
  - Respect of one another’s organizations and project managers, and
  - Scientific integrity.
- The factors most detrimental to forming and sustaining the partnership were
  - Organizational barriers,
  - New funding needs requested to the Governor’s budget, and
  - Time to make things happen.

Perseverance and initiative were the main characteristics that overcame the detrimental factors. The processes of consensus-based project decisions, as well as open, flexible, and creative personnel were the most critical items that facilitated agreements among the partners.

This partnership brought a host of benefits to Caltrans including

- Cost savings,
- Increased productivity,
- Fulfillment in part of agency goals,
- A model for subsequent partnerships,
- Enhanced technical expertise,
- A higher level of results than could have been generated by Caltrans on its own,
- An innovative product,
- A new design or specification,
- A new method, and
- Solidified the relationship with important organizations.

Caltrans considers the addition of more organizations to the partnership, increased invitations to partner in conferences and earthquake reconnaissance field trips, and a more comprehensive attack on the stated problem as measures of the benefits of this partnership. Furthermore, the partnership would be easy to replicate in its administrative framework; however, unless there were the high integrity and open and flexible personalities and mutual respect among partners, the partnership would be difficult to replicate.

#### **General Points of the Memorandum of Understanding**

Partners—Caltrans, Pacific Gas & Electric Company (PG&E), California Energy Commission (CEC), Pacific Earthquake Engineering Research Center (PEER), and the USGS, for Cooperation on Common-Interest Seismic Research under the Program of Earthquake Applied Research for Lifelines (PEARL)

Declarations—“Whereas” statements included for each of the following summary areas:

- Provides the problem definition and a statement that research is needed,
- Establishes that the topic is a mutual problem for all provider partners,
- Describes benefits of collaboration,
- Reinforces past successful collaboration, and
- Establishes expertise of research partners.

Resolution—Formalizes partnership and identifies the name of the partnership.

#### **Outline and Content Summary of the Memorandum of Understanding**

##### *Section I: General Terms*

##### (A) PEARL Research Scope

- Defines scope.

##### (B) PEARL Membership

- Names member organizations.

##### (C) Adding New Member Organizations

- New members are allowed subject to the approval of all current member organizations.

##### (D) Program Direction

- Direction provided by two related Joint Management Committees (JMCs)—one for work executed through PEER and another for work executed through the USGS.
- Definition of JMC responsibilities
  - Identify research topics and guide development of requests for qualifications, and requests for proposals,
  - Review qualifications and select project principal investigators,
  - Negotiate scope and budgets for task orders, and
  - Review research results and approve project deliverables.

##### (E) JMC Membership

- Defines membership and voting privileges.

##### (F) JMC Decisions and Actions

- Establishes consensus basis; provides veto authority for partner organizations.
- Establishes that any partner may undertake research on project rejected by the partnership.

##### (G) Program Funding

- Variety of mechanisms to be used.

##### (H) Task Orders

- A separate task order is written for each project, and
- Task orders may be written to principal investigators from a wide variety of organizations, not restricted to partnership members.

##### (I) Program Administration

- The two research organization members will provide program administration.

##### (J) Review of Data and Interim Findings

- All member organizations to receive data and interim findings at least quarterly.

##### (K) Public Domain Research

- All products of the partnership to be nonproprietary.

##### *Section II: Caltrans-Specific Terms*

##### (A) Caltrans Funding

- Caltrans funding through the PEER Center is provided through a Master Interagency Agreement, with the University of California at Berkeley serving as the administrative center for PEER.

- Caltrans may not provide direct funding to the USGS, but may provide funds to PEER to match research activities performed by the USGS that are funded by other partners.
- (B) Caltrans Match Proportion
- Provides match funding limitations and percentages.
  - (C) Eligibility for Caltrans Match Projects must be of interest to Caltrans, and the funding source to which Caltrans will provide match is neither Caltrans nor the state of California Highway Account funds.

*Section III: PG&E-Specific Terms*

- (A) PG&E Funding
- Funding is provided through a master research agreement with the University of California at Berkeley.
  - PG&E funding of activities at the USGS is provided through a CRADA.
- (B) Direction of PG&E-Funded PEARL Research at the USGS
- Provides full authority for other partnership members to participate equally in PG&E-funded research.
- (C) PG&E Management of CEC—Funding
- PG&E provides a contract for a no-cost pass-through of CEC funds.

*Section IV: CEC-Specific Terms*

- (A) CEC Funding
- Funding managed through a separated agreement with PG&E.
- (B) Delegation of JMC Functions to PG&E.

*Section V: PEER-Specific Terms*

- (A) Administrative Center and Costs
- Agree to serve as one of two administrative centers.
  - Annual negotiation to determine direct and indirect costs.
- (B) National Science Foundation Match
- Funding received from PEARL may be considered National Science Foundation matching funds.
- (C) Business and Industry Partnership
- PEARL to be considered part of that partnership, a previously established program.

*Section VI: USGS-Specific Terms*

- (A) Administrative Center and Fee
- USGS agrees to be one of two administrative centers.

- Program administration assessed at USGS-applicable overhead rate; no fee.
- (B) No Contractual Interference
- The MOU must have no impact on existing or future contracts between the USGS and PG&E.

*Section VII: Amendments*

- (A) General
- The MOU may be amended at any time upon consensus agreement of current partnership members.
- (B) New Member Organizations
- New members may be added upon consensus approval of current partnership members.

*Section VIII: Approval*

The MOU will become effective on the last date affixed by the signatories and will remain effective until terminated by any one of the partners. The MOU is not an enforceable contract but is a means of coordinating the partnership process. No funding or resource allocations are committed in the MOU.

*Signature Page*

All partners sign the MOU.

**KANSAS: THE PLACE OF PARTNERSHIPS IN THE STRATEGY OF RESEARCH PERFORMANCE AND A MEMORANDUM OF UNDERSTANDING AMONG STATE RESEARCH UNITS, A UNIVERSITY, AND THE FEDERAL GOVERNMENT**

The Kansas Transportation Research and New-Developments (K-TRAN) Research Program is an ongoing cooperative and comprehensive research program addressing the transportation needs of the state of Kansas, using academic and research resources from the Kansas DOT (KDOT), Kansas State University, and the University of Kansas. Transportation professionals of KDOT and the universities jointly develop the projects included in the research program. Other partners in addition to the universities are the Kansas Turnpike Authority, Wilson and Company (consultant), and the FHWA.

Through the K-TRAN program, Kansas has established a formal process that recognizes partnership activity as an integral part of its annual research effort. The vision of KDOT's research engineer is "The research unit strives to utilize all available resources by pooling academic and

private partners' resources . . . welcom[ing] the input, involvement, and support.”

The K-TRAN partnership is governed by a contract agreement between KDOT and the academic partners, which was originally executed in 1990. The current agreement is for 5 years beginning in 2000. At present, the minimum funding level by KDOT is \$700,000 (\$350,000 per university). For fiscal year 2000, the K-TRAN research expenditures of \$805,550 represented approximately one-quarter of the total KDOT research program funding. The current annual value contributed to the partnership by all participants is \$1 million. A total of \$9 million was committed by all participants over the life of the program, with two-thirds coming from KDOT.

The following K-TRAN program benefits for partners are excerpted for the *Research Annual Report, Fiscal Year 2000* (33):

- Development of a flow of high-quality transportation research targeted to Kansas transportation needs;
- Financial support to engineering students contributing to the pool of transportation professionals in Kansas;
- Continuing education opportunities for KDOT personnel;
- Enhanced quality of faculty, staff, and graduates in the transportation area;
- Attracted federal research resources for use in Kansas; and
- A much expanded but efficiently organized transportation research resource in Kansas.

In response to the survey, KDOT made these comments.

KDOT determines the success of this partnership by quantitative and qualitative measures. The K-TRAN program produces a benefit cost ratio of 13.6:1. Moreover, results are being implemented—two products have been or are in the process of being implemented, four times as many requests are submitted for research than can be funded, and the Program Council management group is satisfied with the program's results.

The three primary reasons why the partnership was formed were to

1. Gain technical expertise,
2. Provide enhanced competitive advantage, and
3. Add administrative and project management expertise.

The three factors most influential in enabling this partnership were

1. Top management support at KDOT and the universities,
2. A decision to allow KDOT to be lead administrative agency, and
3. A broad base of research topics and involvement of many KDOT bureaus and staff.

The factors most detrimental to forming and sustaining the partnership were

- Some universities wanted administrative control, but decentralized project administration causes conflicts and places an extra burden on overworked staff.
- Some faculty members have not performed to the expectations of KDOT staff, and some KDOT project monitors have not been viewed as fair or sufficiently involved.

The situation that helped to overcome the detrimental factors included

- Universities wanting the program more than they wanted administrative control;
- KDOT encouraging more staff to be assigned to spread the workload; and
- Partners giving positive encouragement to the extent possible, with the focus on the *program partnership*, not just the project results.

KDOT believes that this partnership could be easily replicated by another agency. The KDOT research manager reports, “With top management support, the committee structure and department-wide focus could easily be implemented. The agency would have to have an open communications policy as KDOT does and also be able to cut through red tape for approvals to be efficient.” KDOT notes that having more major universities in the partnership might make committee sizes too large, as well as lessen funds available for each institution. Moreover, additional university contractual requirements could add inefficiencies. Keeping the partnership manageable and knowing how much can be appropriately managed is a key to the success of this program.

**IOWA, KANSAS, MISSOURI, AND NEBRASKA: A MEMORANDUM OF UNDERSTANDING AMONG STATE RESEARCH UNITS, KANSAS STATE UNIVERSITY, AND THE FEDERAL HIGHWAY ADMINISTRATION—A REGIONAL POOLED-FUND STUDY**

**Midwest States Pooled Fund Accelerated Testing Program Memorandum of Understanding**

Elements of this MOU are summarized here.

### *Introduction/Background*

- Discusses the advantages of full-scale accelerated testing of pavements and other structural highway components in a controlled environment;
- Summarizes the type of accelerated testing being done at various facilities;
- Describes the Kansas State University Accelerated Testing Facility, its equipment, and capabilities; and
- Establishes a basis for the regional effort; not all testing of mix design parameters and pavements can be included in the national pooled-fund program projects currently under way.

### *Name and Purpose of the Study*

- Identifies the name “Midwest States Pooled Fund Accelerated Testing Program”;
- Gives succinct purpose of study, “To share information and save costs by coordinating accelerated testing of mutual interest among participating states”; and
- Gives the purpose of the MOU
  - To formally describe administrative, financial, and organizational procedures to implement the study and
  - To establish roles and responsibilities for the contracting parties in carrying out the contract requirements.

### *Lead Agency*

The MOU identifies the lead agency and describes its responsibilities, which include

- Administration of the contract study;
- Solicitation of study proposals from participating states;
- Review and submit quarterly vouchers to the states and/or the FHWA for payment, and transmit a copy to the chair of the technical committee;
- Initiate the overall contract and scope of services with Kansas State University; and
- Initiate contracts with each individual state for each specific contract.

### *Participating States*

- The participating states are listed and
- Other states may request to join the pooled-fund study by contacting the technical committee. With concurrence of the technical committee, state(s) will become member(s) upon signing the MOU.

### *Technical Committee*

The MOU describes the technical committee membership and its duties.

- Membership
  - At least one person from each member state with appropriate expertise, one person elected chair by members to serve for 1 year, and each state limited to one vote. The committee chair interacts through KDOT to obtain approvals and ensure coordination with the FHWA for contract-related matters.
  - Representatives from FHWA regional offices (as existed at the time of the execution of the MOU) and division offices, and Kansas State University, as ex officio members.
- Duties
  - Describes committee responsibilities at various stages of the project, including developing criteria for test feature priority, determining the priority list of projects, determining the project budget and contribution for each state, approval of work statements, reviewing final reports and their distribution, and making recommendations for results implementation.

### *Project Manager*

The project manager’s role is defined as that of a first-line contact for technical issues, as the coordinator for committee decision making, and as the lead in information exchange with interested parties.

### *Funding of Study*

- The technical committee prepares an annual budget for the study. Each participating state signs a participation statement (see example following this MOU description). Sources of funds may include federal-aid moneys, state matching funds, and other sources. Each state participates on an annual basis, sharing costs as agreed to by all participants.
- Where federal-aid funds are used, states and the FHWA follow the standard procedures in place for pooled-fund studies. Each state must develop the necessary documentation and approvals in its SP&R Part II Work Program. Where other funds are used, the study should be referenced in the state’s SP&R Part II Work Program.
- Appropriate contracts are executed between the lead agency and Kansas State University for the accounting of financial activities under the MOU. Contracts are executed between the lead agency and each participating state for each specific project.

### *Procedure to Withdraw*

If a participant wishes to terminate its involvement, a 30-day notification is given to the technical committee chair. The participant requesting withdrawal retains responsibility for all existing agreements.

### *Audits*

The performing organization (Kansas State University) must comply with all federal audit requirements.

### *Signatories*

- State highway agency for each participating state,
- FHWA division office, and
- FHWA regional office (as existed at the time of the MOU).

### *MOU Participation Statement*

To the FHWA Division Administrator:

The [state name] will participate with other states in the conduct of the research project identified as the Midwest States Pooled Fund Accelerated Testing Study.

The [state name] promises to contribute \$ [numerical value] for Fiscal Year [year], towards the cost of the research study under FHWA project number [number].

Type of Funds for the Study:

The funding proposed is as follows:

Federal fund type [name type] Amount [how many dollars]  
Other fund type [name type] Amount [how many dollars]

If SP&R funds, are you requesting 100% federal (no state match)? yes or no.

Technical Committee Representative:

We have designated [person's name] as our representative on the technical committee for the study. Our alternative will be [person's name].

The participation statement is signed by the CEO of the participating state.

### **MAINE: A JOINT FUNDING AGREEMENT BETWEEN THE FEDERAL GOVERNMENT (U.S. GEOLOGICAL SURVEY) AND A STATE DEPARTMENT OF TRANSPORTATION**

The USGS, U.S. Department of the Interior, and Maine DOT for Water Resources Investigations) are the parties

listed in this example, as is the date of agreement. The agreement is a standard, one-page joint funding agreement from the USGS.

### **Conditions of the Joint Agreement:**

1. Identifies the effort as a cooperative project and states the project name.
2. States the amounts to be contributed to the project by each party (amounts are equal) and the dates during which the funding will be available. Additional or reduced amounts of funding may be negotiated for the period identified or for succeeding periods, but changes must be by mutual agreement.
3. Costs are to be paid by either party according to laws and regulations governing them.
4. Field and analytical work is to be done under the direction of or with periodic review by the USGS.
5. Areas to be included in the effort are to be agreed upon by both parties. Methods employed are to be according to USGS standards. Modifications are possible by mutual agreement.
6. All field and analytical work of either party is open to the other party. If the work is not being conducted in a satisfactory manner, either party may terminate the agreement upon 60 days written notice.
7. Records will be maintained by the party generating them and are to be available to the other party.
8. Information resulting from the work is to be made available to the public as soon as possible. Documents will be published by the USGS, although the Maine DOT has the right to publish as well. Each publication must state the cooperative relationship between the two organizations.
9. Payments will be made quarterly to the USGS.

Signatories:

USGS District Chief  
Maine DOT, Director, Bureau Planning

### **Comments**

The document is straightforward and regulatory or legal requirements are kept to a minimum. The Maine DOT reports that executing such an instrument would be relatively easy for a state DOT. However, such ease of accomplishment is not due only to a less cumbersome agreement. The reduced complexity of legal arrangements originates from a good match between the partners and clear objectives for the effort. Not all research partnerships have such a forthright early relationship that would prompt this type of MOU. Indeed, most partnerships require considerable effort by the organizations to define project goals and understand one another's motivations and capabilities, often

leading to substantially more guarantees and administrative requirements. Over all the ability to recognize a good match and pursue it is important. The research manager in Maine did so; he called this a “natural partnership,” because the USGS has the data and expertise to analyze them, and the Maine DOT needed the information to improve the efficiency of the state’s waterways and structures.

This assessment of the partner member fit has proven to be accurate. The synthesis survey revealed that the Maine DOT technical panel members and USGS principal investigators have developed professional relationships that lead to successful projects and generate high-priority research results. Research results are being implemented and new projects are being selected by Maine’s Research Advisory Council. The Maine DOT acknowledges that developing the professional relationships is the most difficult element of the partnership to replicate. However, these relationships will be created as the partners work together and will be solidified through contact and trust building. With each success, the partnership relationships become stronger—An experience that leads to further success. A good match of partners and a well-defined project of value to all is just the beginning. Over time, partnerships then develop in quality.

**MINNESOTA: PARTNERSHIP LEGISLATION CREATING THE CAPABILITY FOR RESEARCH PARTNERSHIPS FOR A STATE DEPARTMENT OF TRANSPORTATION, FORMAT FOR INITIATING A PARTNERSHIP PROPOSAL, APPROVAL PROCESS FOR PROPOSAL ACCEPTANCE, AND A SAMPLE AGREEMENT**

**Minnesota Partnership Legislation**

The partnership legislation provides the Minnesota DOT (Mn/DOT) with unique opportunities to more effectively manage transportation issues and technology in the future, through partnerships. District engineers and office directors are accountable for the development of proposals for agreements using the statute. Proposals must meet Mn/DOT’s mission, vision, and strategic plan, and be in the best interest of Minnesota citizens. All agreements using the legislation must be in writing. Expenditures are made from a special revenue account established for such purposes. Agreements must be approved by authorized Mn/DOT officials, the attorney general, and the Departments of Finance and Administration. The sample agreement outlined in this section is less than two pages.

The process is clear and easy to implement. The material for this summary is taken from brief implementation documentation that includes people to contact for guidance, the offices requiring approval, and a

flowchart of the process, all of which facilitate entering into the partnership.

*Minnesota Statutes, 1992, Section 174.02, Subdivision 6*

Subdivision 6: AGREEMENTS. To facilitate the implementation of intergovernmental efficiencies, effectiveness, and cooperation and to promote and encourage economic and technological development in transportation matters within and between governmental and non-governmental entities:

- (a) The commissioner may enter into agreements with other governmental or nongovernmental entities for research and experimentation; for sharing facilities, equipment, staff, data, or other means of providing transportation-related services; or for other cooperative programs that promote efficiencies in providing governmental services or that further development of innovation in transportation for the benefit of the citizens of Minnesota.
- (b) In addition to funds otherwise appropriated by the legislature, the commissioner may accept and spend funds received under any agreement authorized in paragraph (a) for the purposes set forth in that paragraph, subject to a report of receipts to the Commissioner of Finance at the end of each fiscal year and, if receipts from the agreements exceed \$100,000 in a fiscal year, the commissioner shall also notify the governor and the Committee on Finance of the Senate and the Committee on Ways and Means of the House of Representatives.
- (c) Funds received under this subdivision must be deposited in the special revenue funds and are appropriated to the commissioner for the purposes set forth in this subdivision.

*Partnership Proposal Format*

1. Approximate cost participation or dollar value to Mn/DOT.
2. What parties are interested in this partnership?
  - a. Mn/DOT contact person [provide name, address, phone, fax].
  - b. Other party [entity name] contact person [provide name, address, phone, fax].
3. Describe the proposed responsibilities of each party.
  - c. Mn/DOT would agree to: [provide description].
  - d. Other party [entity name] would agree to: [provide description].
4. How will the partnership benefit each party?
  - a. Benefits to Mn/DOT: [describe].
  - b. Benefits to [entity name]: [describe].
  - c. What other benefits including cost savings would result? [describe].

5. Approximate duration of proposed partnership: [from date, to date].
6. Identify any other justification for pursuing this partnership. What will happen if it does not materialize?

Signed by

District Engineer/Office Director  
Assistant Commissioner  
Director, Financial Management

#### *Proposal Approval Process*

- Partnership proposal is developed at the district or office level.
- The District Engineer or Office Director discusses the concept with the Division Director.
- Subject to Division Director approval, the written proposal is forwarded to the Director of the Office of Financial Management.
- If the concept is determined “sensitive,” the concept is forwarded to Deputy Staff for review.
- Subject to Deputy Staff agreement, a complete agreement package is prepared, and the package is processed through the normal budget and contract procedure.
- After the agreement is approved, encumbrances are processed.

#### *Example Partnership Agreement*

- Identifies the partners. An example is between the Mn/DOT and a Minnesota county government.
- Declarations (Whereas . . . ) succinctly describe the needs or resources considered critical for the project. An example is where the Mn/DOT owns a communication tower and the county wants to use the tower for installing a remote receiver.
- Resolution (Be it resolved . . . ) to enter into agreement. An example is
  - Mn/DOT permits county to install and maintain receiver, specifications detailed;
  - County agrees that work will be performed by qualified technical personnel;
  - Agreement requires Mn/DOT approval of all work on tower;
  - County agrees that work is being done at its own risk and cost and accepts full responsibility for liability;
  - Agreement establishes an effective date and length of agreement;
  - Agreement establishes a fee that the county will pay for power usage; and
  - Agreement provides 30-day written cancellation option for either party.

- Signatures
  - County
  - Minnesota Assistant Attorney General
  - Mn/DOT, Commissioners of Administration and Finance

#### **Comments**

Of all the organizations surveyed for this project, Minnesota was the only state that reported its specific legislated language that promoted research partnerships. The importance of the language is twofold. First, it encourages formation of research partnerships legitimizes them at the highest level of the state. Second, it provides a mechanism for the Mn/DOT to accept financial resources from a partnership organization, enabling the department to cooperatively fund projects with its partners. This mechanism substantially broadens the type of research partnership in which a state DOT would normally participate. Data from the survey and literature indicate that the state DOT is the primary funding body, and other partners bring technical expertise, facilities, in-kind services, and other resources to the relationship. With this legislation, Minnesota can attract partners with funding resources, thus potentially attracting private-sector organizations with funds for research. The legislation also provides the means to accept other states’ funds for pooled-fund research. Accepting such funds has been an administrative barrier for many state DOTs.

Enacting the legislation was the result of many small steps. Most important was that Mn/DOT research activities built substantial credibility through solid performance, focus on strategic goals of the organization, and implementation of results. These accomplishments occurred over time, by talented researchers and research managers, and with the guidance of supportive executives. Today, research activities are seen as an investment in transportation, and research is viewed as an essential stewardship of resources—whether the work is accomplished through the traditional federal-aid SP&R program, maintenance program research, local road research, intelligent transportation system research, or other initiatives. When such of conditions exist, legislation specifically promoting research partnerships is not as far out of reach as some state research units may suppose. The lesson from Minnesota is that performance yields trust and enables unprecedented opportunity.

#### **MISSISSIPPI: EXAMPLE LANGUAGE OF THE DIVISION OF RESPONSIBILITIES IN A PARTNERSHIP BETWEEN A STATE RESEARCH UNIT AND A PRIVATE-SECTOR COMPANY**

The objective of the partnership of Mississippi DOT’s research unit and its materials unit with that of a private-



sector testing organization was to determine why distress was appearing in polymer-modified test sections. This work is a cooperative venture that emerged from previous research efforts. The cooperative effort was easily put together because there was a specific need recognized by all partners. It exemplifies the foundation of a good partnership, an identified goal that all participants see as important. The common goal provides the opportunity to work toward the same result from all sides of this partnership. The Mississippi DOT research manager also observed that the organizations needed each other to meet the goal. Each partner was interested in the other's welfare because it was clear to both that if either one failed, the goal would not be met. Another factor for success was Mississippi's good relationship with the materials supplier. That relationship allowed the work to be performed well without unnecessary complexity.

This example also shows the benefits of well-defined roles, wherein each partner knows its responsibility and is well qualified to perform what is required. All partnerships, whether with many partners or just two, or whether with many tasks or just a few, must strive for unambiguous language describing the expectations of the partners' involvement. Although this project is relatively small and has few partners, the explicit description is a good example for any size of partnership.

The following language is excerpted from the project agreement. The Mississippi DOT (research unit and materials unit) is providing SP&R funds and overseeing and conducting fieldwork. The private-sector company, Ergon, Inc., is conducting material testing and evaluation. The agreement has clear language, and it is concise and informative.

#### *Long-Term Evaluation of Polymer-Modified Asphalts*

**Problem Statement and Partnerships:** Recent observations have revealed modes of distress other than rutting, which present a need for further materials evaluation and continued field monitoring. This proposal is submitted in order to address those distresses as well as investigate the probability of distresses, which may not yet be visible. Both Mississippi Department of Transportation (MDOT) Research and Ergon, Inc., have recognized these problems and have approached each other concerning a joint venture to extend the previous two state studies by another three years. The intent is for MDOT to use SP&R funding for its source of revenue and Ergon to perform testing at no cost to the MDOT. MDOT will oversee and conduct all fieldwork including sand-patch testing, rut measurements, friction testing, pavement distress surveys, and coring. Ergon Technical Development will conduct material testing and evaluation while reporting its findings to the MDOT.

#### **MISSOURI: INTELLECTUAL PROPERTY CLAUSES FROM HONEYWELL INTERNATIONAL—COOPERATIVE RESEARCH AND DEVELOPMENT AGREEMENT**

The following articles are excerpted from a CRADA between Honeywell International, Inc., and the Missouri

Highway and Transportation Commission. Honeywell is operating through its U.S. Department of Energy (DOE) contract. The articles included show the extent of the intellectual property stipulations for the project, "Develop an Automated System of Air Void Detection in Hardened Portland Cement Concrete."

#### **Definitions**

Intellectual property means patents, trademarks, copyrights, mask works, protected CRADA information, and other forms of comparable property rights protected by federal law and foreign counterparts.

Background intellectual property means the intellectual property rights in the items identified in the agreement, which were in existence prior to or produced outside of the CRADA, including inventions that were applied to practice prior to the CRADA. Licensing of background intellectual property, if agreed to by the partners, requires a separate licensing agreement.

#### **Articles Dealing with Intellectual Property**

##### *Copyrights*

- Partners may assert copyright in any of their general information.
- Each partner has first option to retain ownership of copyrights in works created by its employees.
- Copyrights in jointly developed works are jointly owned.
- If one partner does not retain ownership of a work created by its employees, the copyright can be assigned to the other partner. DOE is assigned copyrights not retained by either party.
- The federal government has for itself and for others acting on its behalf, a royalty-free, nontransferable, nonexclusive, irrevocable worldwide copyright license to reproduce, prepare derivative works, distribute copies to the public, and perform publicly and display publicly, all copyrightable works produced by the CRADA.
- A copy of all copyrighted software source and executable code and documentation is provided to DOE.
- After 3 years under which information from the CRADA is protected and not to be disclosed at periodic intervals, DOE can request the copyrighted software for purposes of commercialization provided such request does not cause a termination of a licensee's right to use the software.
- Copyright notices are to be placed on all media, including digital forms.

### *Inventions*

- Partners are to disclose to each other and the DOE inventions, which may be protected under the patent act. Disclosures must contain sufficient technical detail for clear understanding of the nature of the invention.
- Each partner retains the rights to the inventions made by its employees.
- Title to jointly made inventions are jointly owned.
- If one partner does not retain title to an invention of its employees, the title can be retained by the other partner. DOE retains title to inventions not retained by either party. DOE may retain title to inventions for which a patent application is not filed.
- The federal government retains a nonexclusive, non-transferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the United States any invention made under the CRADA throughout the world.

### *Licenses*

- During the CRADA and for 6 months thereafter the Missouri DOT can obtain an exclusive license to Honeywell's inventions made under the CRADA.

### *Filing Patent Applications*

- The inventing partner has first opportunity to file a U.S. and foreign patent application. The other partner may file after 1 year if the inventing partner does not. The inventing partner is to provide support.
- Partners agree between themselves which organization files patent applications on joint inventions.

### *Trademarks*

- Partners may seek trademark/service mark protection on products or services generated by the CRADA in the United States and foreign countries.
- The federal government has the right to use such trademarks/service marks.

### *Cost of Intellectual Property Protection*

- Each partner is responsible for payment of all costs relating to intellectual property protection.

According to the survey responses from Missouri, getting the CRADA established was not an easy task. Missouri rated it "difficult" when asked if such a partnership

could be replicated in another agency. They also reported that there were difficulties getting the legal requirements of both partners incorporated into the CRADA. Each organization initially presented "unyielding points" until both organizations' legal departments had the opportunity for discussion and negotiation. Patent rights and residual interests in the inventions made under the CRADA were items that needed specific attention. Despite these difficulties and the complexity of the agreement, as indicated in part by the detailed treatment of intellectual property, both partners overcame these obstacles by being persistent and ready to compromise.

The goals of the project for the partners were of sufficient value that they spurred the partners on to resolve problems. Honeywell desired to reduce its reliance on federal defense spending and to develop the air void detection system as a product for its own use. Missouri needed a system that would reduce its current labor-intensive method as well as the technical expertise to develop such a system. The project results became more important than their administrative or legal differences. Additionally, Missouri DOT had a good working relationship with its then FHWA regional office that initiated the contract. Trust and persistence enabled the partners to rise above the potential deal breakers and ultimately forge a beneficial partnership for both organizations.

### **WESTERN STATE: EXAMPLE PURPOSE AND OBJECTIVE STATEMENTS FROM A STATE RESEARCH PARTNERSHIP AGREEMENT WITH A UNIVERSITY**

The following excerpt from a western state DOT and its state university system agreement is a good example, expressed in writing, of a state DOT's awareness of the needs and unique capabilities of its state university system. In addition to the state's goals of more cost-effective research, this partnership recognizes the broader outcomes of the relationship, those beyond producing a specific product. The partnership documentation readily embraces the basic motivations of the university system and capitalizes on the role it can provide for the citizens of the state.

A key to the relationship between this state DOT and the university system is its operating with the knowledge that the relationship is based on mutual advantage. If a state DOT operates with the assumptions that the funds it spends have, for example, no business increasing the expertise of the academic staff, nor for providing educational experiences for students, then there will be little mutual advantage. The relationship, therefore, will be difficult at best. Furthermore, if the cultures of both organizations are at odds, and little effort is made to find points of shared value, partnership is elusive. In the past, parochial attitudes and inflexibility in cultures created conflict between state

DOTs and academic institutions. However, the more each partner strives to operate by taking into consideration the basic motivations and cultures of the other partners, the more productive will be the relationship.

This western state had a good start with the setting described in the introduction, purpose, and objectives of its partnership. However, words in an agreement or MOU do not ensure a successful relationship. The real issue is how the agreement worked in day-to-day operations. In this situation, key people in forming the partnership retired. The state found that two of the most influential factors for forming the partnership, communication and compromise, were difficult to sustain considering the retirements. The state research manager specifically reported in the survey response that personnel had to make a concerted effort to put those two factors in place. Overall, the state considered this partnership a less than successful venture. The motivations of the partners and the differing cultures tended to be disabling. A clear agreement and the ability to operate as a well-stated agreement stipulates, is essential. However, this example shows that when there are staff changes, partnership relationships also change. Nurturing the personal relationships during change is as important or even more important than crafting an acceptable formal plan.

### **Introduction**

Employing the highest ideals of cooperation and partnership, the state university and the western DOT propose to establish a partnership for transportation research. Initial funding for the partnership are federal-aid highway funds.

Through this partnership, the state DOT, the FHWA, the university system, and at a later time, the private sector, will provide a means to seek out and expedite solutions to transportation problems facing the DOT and, ultimately, the citizens of the state. It is further anticipated that the research partnership will strengthen the educational programs of both the university and the state university system.

### **Purpose**

The main purpose of the research partnership is to provide the state with a center for cooperative, jointly funded transportation research. This center, once in operation, will allow the state to better use limited research resources, such as specialized expertise and research facilities.

### **Objectives**

The overall goal of the research partnership is to provide an institutional setting within the state whereby the state

DOT, the university, and other interested parties are given the opportunity to investigate a wide variety of transportation technologies. The goal will be accomplished through the following objectives:

- Establish an ongoing, funded mechanism, providing continuity to research projects and personnel;
- Expand research and educational opportunities for transportation students at both the undergraduate and graduate level;
- Expand on-campus employment opportunities for students of transportation and other disciplines;
- Upgrade the depth of the professional instructional staff;
- Establish a mechanism to ensure interaction with the Local Technical Assistance Program and its mission of technology transfer;
- Encourage the use of advanced technologies in transportation applications through feasibility studies and/or demonstration projects;
- Collect research problem statements and forward them to the state's research unit for inclusion in its research prioritization process.

### **NEW MEXICO: MEMORANDUM OF UNDERSTANDING BETWEEN A STATE DEPARTMENT OF TRANSPORTATION AND THE RESEARCH AND SPECIAL PROGRAMS ADMINISTRATION FOR A 20–25-YEAR RESEARCH INITIATIVE**

The MOU discussed in this example has a unique term among the partnership examples received from the study survey: the relationship is planned for 20 to 25 years. The term for the partnership is based on the length of the project, which includes a 20-year warranty period for a highway's performance. The partnership between New Mexico State Highway and Transportation Department (SHTD) and the U.S.DOT Research and Special Programs Administration (RSPA) is an example of how a long-term effort can set some precedents for partnership relationships. The literature confirms that partnerships mature through long-term relationships. The relationship can become more productive as the partner organizations' staffs gain experience in working together. The New Mexico SHTD seeks to capitalize on such positive results in its long-term commitment for RSPA's evaluation of innovative design methods and performance warranties.

Most research partnerships are formed because there is a specific need for a research product and there are common goals among the partners, much like that of the Mississippi example provided earlier in this section. Partnerships then continue because products resulting from the relationship and goals were met. A number of partnerships endure for many years, encouraged by the continuing

mutual advantage produced by the relationship. This partnership has a unique length of relationship specified; however, the partnership itself is still based on a clear need associated with a defined project.

The specified term length may provide some motivation to keep the partnership together. However, the true test of whether the relationship will last comes from the ability of the partnership to produce the expected results, as well as the trust that the partners' staffs build over time. Trust and the adeptness of the partners to sustain it when personnel changes occur will be essential to overcoming major problems that arise during the conduct of the work. At the writing of this synthesis, the partnership is less than 3 years old.

The partnership MOU is concise and direct. It was signed by the chief executive officers (CEOs) of both organizations. The following is the full agreement.

#### MOU between the New Mexico SHTD and the U.S.DOT RSPA

The New Mexico State Highway and Transportation Department (NMSHTD) has negotiated and signed a contract with a subdivision of Koch Industries of Wichita, Kansas, to design, manage, construct, and (at the option of the state), partially finance the expansion of a 121-mile section of NM Highway 44 that is to service four lanes of traffic no later than November 2001. For a one-time cost of \$62 million, Koch will guarantee the overall performance of the highway pavement for twenty years from the date of completion, and also will warrant the bridges, drainage, and erosion control features of the highway for ten years. The NMSHTD anticipates that it will save \$89 million in maintenance costs over the twenty-year period.

The Research and Special Programs Administration (RSPA) Volpe National Transportation Systems Center (Volpe Center) is a recognized national technical resource that has the necessary capability and expertise to assist the NMSHTD (in conjunction with the Federal Highway Administration) to establish an independent and objective economic analysis framework and conduct analyses to determine the efficacy of the NM44 approach to providing public roads using innovative design methods and performance warranties. Further, the RSPA Volpe Center has the institutional stability to provide the desired continuity of research and analysis over the life span of the twenty-year warranty period.

This Memorandum of Understanding (MOU) sets forth a mutual intent on the part of the NMSHTD and the U.S.DOT RSPA to work cooperatively in the New Mexico Road LIFE (Road Lifecycle Innovative Financing Evaluation Initiative). The MOU recognizes the importance of having a sustained R&D relationship between the RSPA Volpe Center and the NMSHTD throughout the Road LIFE initiative over the next 20 to 25 years. Further, the MOU also establishes the intent and basis for the RSPA Volpe Center to negotiate and accept specific tasks along with terms and conditions under annual reimbursable agreements with the NMSHTD for work to be performed on a best-effort basis in support of the Road LIFE initiative.

#### THE NEW ENGLAND STATES AS REPORTED BY RHODE ISLAND: MEMORANDUM OF UNDERSTANDING AND POLICIES AND PROCEDURES FOR A MULTISTATE AND FEDERAL HIGHWAY ADMINISTRATION CONSORTIUM (NEW ENGLAND TRANSPORTATION CONSORTIUM)

The New England Transportation Consortium (NETC) has existed since 1983 and operating by means of an MOU similar to the current one since 1988. The NETC is a multistate and FHWA consortium that is financed through the FHWA pooled-fund process. The MOU and the policies and procedures for the NETC are examples of a well-developed partnership agreement. The consortium has overcome typical barriers and problems experienced by partnerships, it has produced results that are beneficial to all members, and it continues to mature over time to be an increasingly more valuable research tool for its partners. Currently, the designated lead state is Connecticut, and the NETC administrative coordinating organization is the University of Connecticut.

The MOU establishes the collaborative activity and formally describes the organizational, financial, and administrative activities of the partnership. The NETC policies and procedures then describe the operational characteristics and activities established by the MOU.

This consortium could be used as an example for other states desiring to form a partnership. The partnership provides a structure that takes advantage of the FHWA's Pooled Fund Program, having started as a regional pooled-fund project. The partnership gains technical expertise for the states, adds administrative and project management experience by having an administrative coordinator, and substantially leverages funding through the pooling of financial resources.

The MOU contains the following:

- *Purpose*—The transportation agencies of the six New England states join together to pool their professional, academic, and financial resources for transportation research. The cooperation will focus not only on research, but also on development and implementation of substantially improved methods for dealing with common problems. Such problems will be associated with the administration, planning, design, construction, rehabilitation, reconstruction, operation, and maintenance of the transportation system in the region.
- *List of Members*—Six New England states and the FHWA, ex officio.
- *Organization and Management Description*
  - Policy Committee (CEOs from the DOT members and the FHWA, ex officio) governs and defines

the overall research, development, and implementation needs of the consortium.

- Advisory Committee [representatives from each state, FHWA ex officio, and a representative from a university in each state selected by the respective state representative (universities have no voting rights)]. It oversees the selection and content of an annual work program and monitors the progress of research and the implementation of results.
- Technical Committee (one representative from each state and others as needed) oversees the technical aspects of each research project.
- Administrative Management (coordinator) is an organization selected by NETC members through a request—for proposals to provide administrative coordination services for the consortium.
- *Funding*—The consortium is funded through the FHWA pooled-fund process.
- *Program Development*—The Policy Committee annually approves a program. Requests for proposals are issued to the universities designated by NETC and others as needed.
- *Project Selection*—The Advisory Committee recommends projects to be funded to the Policy Committee. Administrative management is performed by the Coordinator.
- *Amendments*—The MOU may be amended at any time by the Policy Committee.
- *Signatories*—The CEOs of each member state.

The policy and procedures detail the process by which the consortium operates. The document describes the elements in the process; provides a suggested time frame for the annual program development; details the consortium's organizational chart; describes the order of business for various meetings; and provides guidance on research proposals, reporting, and other deliverables of research, as well as intellectual property rights.

For more information on NETC, see the consortium's website: <http://www.cti.uconn.edu/ti/Research/about.htm>.

## **ONTARIO GUIDELINES FOR SELECTING RESEARCH PARTNERS**

In its guidelines, Ontario includes all types of researcher organizations as partners; only the section on collaborative arrangement is listed.

### **Types of Research Assignments**

**Pooled research funds**—A number of road jurisdictions contribute funds to a pooled research fund managed by a

nonprofit research institution or road association to which they belong.

**Cost sharing research projects with others**—Research partners contribute cost, staff time, testing services, or other equity and share in the rights to the products and risks. Participants May include road jurisdictions, research institutions, and private-sector partners.

### **Process**

With regards to pooled research funds, approvals are required for contributions to general research funds for road organizations that the ministry belongs to, provided that

- Ministry obtains special membership rights to the research products,
- Ministry has a vote in selecting the projects, and
- The research is focused on the ministry's core businesses.

For cost sharing research projects the process provides that

- The ministry project manager contacts potential partners with the requisite resources and interest;
- The project manager recommends short-listed partners and prepares a draft legal agreement, with internal approvals required;
- The project manager negotiates legal agreement, with internal approvals required;
- If the ministry has the lead, the delivery mechanism for the project follows the standard agency procedures; and
- If another research partner has the lead, it follows its own procurement guidelines.

## **PEER EXCHANGE METHODS—CONCEPTS, METHODS, AND RECOMMENDATIONS REGARDING RESEARCH PARTNERSHIPS**

During the past 5 years, state DOTs have been conducting research peer exchanges. Each state DOT research unit has held a meeting in which five to eight peers have met to discuss the management of the host state program, as well as issues of importance to the participating state DOT research units. Partnerships were a topic of interest to many state DOTs during these meetings. This section is a collection of the concepts, methods, and recommendations on research partnerships, as detailed by participants at the peer exchanges. The material is taken from the findings and conclusions documented in the peer exchange reports and from interviews with state DOT research managers. These items are all based on lessons learned, expressed during the exchanges. They could be the beginning of a best practices

portfolio for research partnerships; however, refinements and comparisons for degrees of effectiveness would be required to determine best practices.

Although all state DOT R&T programs have similar goals, each program has unique characteristics that set it apart from every other program. The differences are not so significant that a good idea for one state R&T program is not still a good idea for another state. However, that good idea is most probably not beneficial for every state R&T program. There will be, owing to the differences in the various state programs, concepts included that provide different and sometimes opposing recommendations for the same item. Achieving the balance for incorporating partnerships into the operation of the research units depends on the individual program and its individual context.

### Partnership Activities

- States are successfully engaging the private sector (e.g., asphalt and concrete paving associations, Associated General Contractors, and mineral and aggregate associations) in their research needs identification process and in their research project review processes.
- Develop a “quick response team” at the partnership university or research organization to provide assistance to the DOT on problems that require an immediate solution.
- Expand the relationship with the university(ies) to include other disciplines outside of civil engineering.
- The relationship with the FHWA and the partner university(ies) provides remarkable support and expertise to assist in building or rebuilding the research program. Use these resources to provide credibility for the RD&T program.
- A strong, supportive relationship with the FHWA Division Office has been highly influential in establishing the research program. Take care in developing and maintaining this relationship.
- The R&T units sponsor a number of full-time faculty appointments at the major partnership university. A close working relationship with members of the RD&T unit and operational staff is established with the faculty members. Benefits accrue to the agency through the conduct of practical and applicable research. In such situations, it is possible to work with top graduate students who may be attracted to employment opportunities at the agency. Such arrangements are profitable for the agency and university alike, provided that the appointments are in force for at least two- to three-year periods.
- To maintain long-term quality, objectivity, and competitiveness of research performed by university partners, review by external industry and academic peers is advisable.
- Create an incentive program that, for example, takes a small percentage of the documented savings from implementation of research results and puts it in an “investment account” for the partnership university. The account can then be used for “unfettered” or blue-sky research by the university, with the only requirement being that it be directed at the strategic goals of the DOT. The university would be required to evaluate and document the cost savings to the department. Resources

required to do this would be paid from the “investment account.”

- Create an incentive program that, for example, takes a small percentage of the documented savings from implementation of research results and puts it in an investment account at the DOT. The account could then be used for unsolicited proposals by the private sector, professional capacity building, such as technical seminars, implementation assignments, and more.

### Facilitating Partnerships

- Develop a working group between the DOT and university transportation centers to shape future strategic and tactical plans for research.
- DOT district/region offices can derive more benefit from research through developing relationships with researchers at universities located near the respective offices. Building such relationships will provide a greater capability in the academic community in the state and foster more practical solutions to DOT problems.
- Increase the communication among neighboring states regarding their experiences and research outcomes. Develop the network by scheduling regular interchange with the RD&T managers—telephone discussions, conference calls, meetings, or whatever mechanism that works for the managers. Fostering such relationships may be the initial steps of cooperatively funded research.
- Commit more resources to regional pooled-fund efforts. Consider a university as a project administrator.
- Develop a memorandum of understanding with various organizations to expedite the agency’s ability to use these resources.

### Setting Up Processes to Handle Partnerships

- Develop a standard language and processes for issuing request for proposals for partnerships so that the department is prepared to use it when the opportunity arises for partnership projects.
- A trend for which research functions within agencies must prepare is the requirement for public–private partnerships to become more like those now seen in the private sector. Such partnerships must foster a commercial value for the private-sector partner, must deal with intellectual property rights, must incorporate the means to handle hard money (not just soft money), and must handle other similar items. A strategic investment for an agency is to begin to develop policies and processes to facilitate these new partnerships.
- Put substantial effort into planning and building an academic partnership relationship so that the university faculty will know how to be responsive to the agency’s needs and so the agency will know what it can reasonably expect from the university. In particular, work closely with university research partners to help them more effectively understand the department’s strategic directions, so research problems are more directly aligned with agency goals.

### Points to Consider Before Entering a Partnership

The following points are provided to assist with thinking through the process of forming a partnership. The items are not intended to be a checklist for successful partnerships.

- Do you have any examples of successful partnerships from which you could apply successful strategies for this partnership?
- Do you have a means to capture practices that work well, so others can use them in future partnership activities?
- Have you consulted any policies and procedures within your organization that provide guidance for forming partnerships?
- Is there a formal structure that will be used for the partnership, including some type of agreement or MOU?
- Understanding that partnerships internal to the agency on the average produce more implementable results, have considerations been given to using internal resources and partners as well as external partners? If external partners are being used, what extra effort is being planned to ensure implementable results?
- Will there be mutually defined goals for the partnership, written and agreed to by all parties? This is a basic element of the agreement, the MOU, or the work plan for the internal informal agreement.
- Is there common interest in the topic so that all partners will be particularly committed to the work of the partnership?
- Is there interest and support from management for this partnership?
- Is there sufficient mutual advantage to all partners to initiate and sustain the partnership?
- Does the partnership build on the partners' qualities rather than trying to fill gaps?
- Most successful partnerships commit to a project that will bring mutual advantage to all parties. Does the partnership have such a project defined?
- Are all resources for the partnership able to be supplied by the partners? Is your organization committed to providing resources identified as its contribution?
- Knowledge outcomes of the partnership should be the primary goal of the partnership. If leveraging funds or financial concerns are the only reason, reconsider the necessity of forming the partnership.
- Is this partnership the start of a potential long-term relationship? Is there a defined project with anticipated implementable results to show the success of the partnership and to spur it on to more activity?
- Do you trust your potential partners, and as a priority, have you considered how trust will be built at all levels of the partnership relationship?
- Has consideration been given, as a priority activity, to building the relationship at all levels within the partnership organizations?
- Do the organizational cultures of the various partners support partnership activities? Has a concerted effort been made to accommodate and understand the differing cultures among the partners? This will take extra effort.
- Do you have an alliance manager for the partnership? This is an individual who will care for and nurture the partnership and be able to expedite the conduct of the work technically and administratively.
- Is the work being done by the partnership designed to produce tangible results periodically? Is the structure of the work such that progress can be shown regularly?
- Are successes (research results and implementation) well communicated, so that sponsors and all participants know the positive outcome of the partnership?

## FINDINGS AND RECOMMENDATIONS

Partnerships are many faceted and the findings regarding them are equally as diverse. The following section summarizes the findings of this synthesis and presents recommendations for implementation and future research.

The findings of this synthesis show that transportation research partnerships are working well for many public-sector organizations. Research units can improve the opportunity for success in their current partnerships by using these findings as a benchmark against which existing activities can be compared. Additionally, these findings can provide some guidance about characteristics that could be incorporated into future partnerships.

- Research Units Form Partnerships
  - With other units within their own agency—On average, research units indicated a preference to form partnerships with other units within their own agency. The most frequently cited divisions or bureaus within the agency were materials, maintenance, traffic engineering and operations, structures, design, and planning. Most of the descriptions of these internal partners were central office functional areas.
  - With units outside the agency—Research units formed external partnerships most frequently with academic institutions. These academic partners were most often universities within the state or province, many having a strong civil engineering program. In general, all research units responding to the survey reported that their agency was involved with at least one collaborative relationship with a university institute or university consortium.
  - With federal agencies—Research units participate in partnerships with federal agencies almost as frequently as with academia. Every state department of transportation (DOT) research unit participates in the State Planning and Research Program (SP&R), a federal-aid matching funding partnership. Most state research units also have experiences with federal-aid pooled-fund studies and the Local Technical Assistance Program, which can bring local governments into the federal–state partnership.

### *Key Finding*

- Internal partnerships produce more implementable results. Although external and internal partnerships

occur almost equally, on average 65% of the research units report that internal partnerships produce more implementable results.

- How Many Partnerships Do Research Units Manage?
  - Many at one time—On average, research units were involved with 17 different partnerships at the time of the survey. California reported the highest number of partnerships, 125. The next highest number of partnerships in a research unit was 40. When the data were analyzed without California’s significantly larger number, the average number of partnerships was reduced only by 4, to 13.

### *Key Finding*

- The high rate of commitment to transportation research partnerships will be stable for the next 3 to 5 years. Some additional funds may be committed to the same number of partnerships, although a substantial increase in the activity is not anticipated. This stable level is due in part to the level of anticipated research funding during the next 3 to 5 years, as well as to aspects of research unit staffing. Partnership management is a labor-intensive activity. Because there is little opportunity in most agencies for increased research staffing, there may not be sufficient staff to properly manage added partnerships.

- How Many Partners?
  - On average two to three. Sixty percent of state and provincial transportation research unit partnerships have two or three partners. The predominance of these numbers indicates that fewer partners correlates well with success for the types of partnerships conducted by transportation research agencies. Although the average supports a low number of partners, the major factor that drives the number of partners is the project itself and the resources required to accomplish it.
- Primary Public-Sector Contribution in Partnerships
  - Funding—Funding is the primary contribution of DOTs, provincial research units, and other government units (federal and local) to partnerships.
- Agreement Preferences and Funding for Partnerships



- Formal contracts and memorandums of understanding—These agreements define the goals and purpose of the partnership, describe the role each partner plays, and define respective resource contributions. The degree of specificity varies with each document.
  - Approximately half of SP&R federal-aid research funds go to research partnerships—Research units on average commit 53% of their **federal-aid research funds** to partnership activities. The remaining federal-aid funds are used for research projects that are accomplished through in-house staff or by contract.
  - Almost 40% of the state’s own funds go to research partnerships—State research units on average commit 38% of their **state research funds** to partnership activities. Likewise, the remaining state funds are used for research by in-house staff or through contracts.
- Few Tools or Guidelines Exist for Research Partnership Formation

#### *Key Findings*

- There are few models or guidelines. Partnerships have myriad variables, unique circumstances, individual objectives, and an infinite source of participants, each with an agenda and expectations. Because there are no precise models, standard guidelines, or simplified operating procedures makes these collaborative arrangements a tool that, for most research units, requires substantial “starting from the ground up” each time a new partnership is created.
- Partnerships are usually formed on an ad hoc basis. In this respect, state and provincial research units emulate U.S. companies. Only 3 of the 41 responding research units had research partnership policies, and 5 research units had partnership tools or guidelines. Although formal policies and procedures were scarce, there were indications that research units rely on some accepted informal methods to approach the formation of partnerships.

Interestingly, approximately 20% of the research units that answered specific questions about beneficial partnerships reported that the partnership would be used as a model for other partnerships. Furthermore, only 10% of the beneficial partnerships were viewed as enabling organizational learning about partnerships.

- Motivations for Entering into a Partnership
  - To gain technical expertise and to leverage funding—The primary motivation of state and provin-

cial transportation research units in forming partnerships is to gain technical expertise. In addition, leveraging funding may be an important reason for entering into a partnership as well as a valuable benefit. Nevertheless, the focus on funding to the exclusion of other critical factors is counter-productive.

- Approximately one-half of the partnerships had established goals—Of the beneficial partnerships, 52% had defined goals. These goals were achieved 88% of the time.

#### *Key Findings*

- Sharing resources is basic. Of all the variability that accompanies partnerships, there is one area of agreement that stands out—sharing of resources. It is the most basic function of any participant in a collaborative arrangement.
- Funds were leveraged. On average, research units reported that they leveraged funds by 2.3 to 1 in the partnerships that were reported in the survey.

#### • Length of Time for the Partnership

- Long-term partnerships exist—A number of long-standing DOT and university partnerships exist, such as the Virginia Transportation Research Council partnership between the Virginia DOT and the University of Virginia, or the Indiana DOT’s and Purdue University’s Joint Transportation Research Program. Both partnerships are more than 50 years old.
- Most started after 1985—However, many research partnerships have not been in existence for a great many years. Encouraged by the liberalized technology partnership laws enacted in the 1980s, the majority of transportation research partnerships were created after 1985.
- Average length of time, 3 years—For all of the beneficial partnerships with a defined term of the partnership the average length of the association was 3 years. For less than successful partnerships the average term of the partnership was a little more than 2 years. A briefer term for these less than successful partnerships may reflect the understanding that after 2 years the state or province was not willing to pursue the relationship for a variety of reasons.

#### • Important Elements in Forming and Sustaining Partnerships

- Mutuality and resources are important for forming partnerships—The state and provincial research units consider the most important elements in forming a research partnership to be common

goals and expectations, mutual interest, and resource availability, particularly funding.

- Research results and resources are important for sustaining partnerships—To sustain a research partnership it is important to generate positive research results or show progress and successes. The presence of stable resources, including maintaining technical expertise and funding, is vital as well.

#### *Key Finding*

- Commitment to a well-defined project having clear goals is advisable—Commitment to the research project results encourages innovative means to overcome problems and difficulties that could otherwise result in failure. Projects showing tangible results have been those that have had readily identifiable goals for all partners. In contrast, creating the structure of the partnership first, with projects to be defined later, tends to be more difficult.
- Benefits of Research Partnerships
  - Implementable research results—On average, the beneficial partnerships described by research units implemented eight research results in the past 5 years.

#### *Key Findings*

- Gained technical expertise and leveraged funding are the primary benefits. State and provincial transportation research units reported that the top two benefits of research partnerships are enhanced technical expertise and cost savings. These benefits correlate with the motivations for forming partnerships.
- Project benefits are the only benefits currently being measured. Measuring the benefits of research partnerships is generally accomplished by evaluating the research project results. There is no definitive methodology to determining the benefits of the partnership compared with traditional ways of accomplishing research.
- People Are a Critical Success Factor Partnership
  - Partnerships are relationships—Successful partnerships are grounded in excellent relationships among the people involved. Organizations often spend more time screening other partners or being concerned with finances and administrative duties, whereas managing the relationship is most critical. When well grounded at every required

level, partnerships can withstand a great deal of turbulence and still be successful.

- Staff changes are a major hurdle—Research units found that changes in key staff were one of the most difficult hurdles to overcome in sustaining a partnership. Much care must be taken to select appropriate replacements, and considerable effort must be made to reestablish critical relationships with partners.

#### *Key Findings*

- Successful partnerships require trust. Trust is identified in the literature as one of the most important elements of the partnership relationship. It does not happen automatically; opportunities must be provided to foster trust in the partnership relationships.
- Bridging differences in organizational cultures requires extra effort. Cultural differences occur among partners. –Methods of operations and organizational goals and objectives are dramatically different between the public sector and private sector and the public sector and academia. For a partnership to work well, significant attention must be made to mitigate the negative influences of these cultural differences. State and provincial research units commit substantial efforts to bridging the differences among partners. However, it was determined that many differences in organizational cultures still exist between the state and local research units and their academic
- **Partnership** or alliance managers are essential—Considered an essential element of private-sector partnerships, these individuals are responsible for the progress of the alliance or partnership for their respective partner organizations. The individual should be especially talented in diplomacy and negotiation skills, socially adept and flexible, persistent, and results oriented. The alliance manager reflects his or her organization's culture and values and is able to identify with and understand the motivations and needs of the partners. Little mention was made by the state and provincial research units of partnership or alliance managers except when their staff was asked about items that would facilitate successful partnerships. Personnel committed to managing the partnership were then ranked as one of the most important items. In general, research units did not seem to fully understand the importance of this position beyond the manager's commitment to the project.

The following are suggestions for implementation and future research.

- Identifying and training personnel to be alliance managers could greatly enhance the productivity and value of research partnerships. As with private-sector companies, research units could find the addition of these competent managers to be a factor influencing the success of the partnership. Research to identify the role and responsibilities of alliance managers is a productive avenue for future inquiry. Once these roles and responsibilities are identified, developing training for alliance or partnership managers will be essential.
- For agencies that already have alliance or partnership managers, mentoring opportunities should be developed to train others in the skills of alliance management.
- A series of in-depth case studies of common partnership structures and operating procedures might be helpful for research units as they continue forming partnerships. Detailed examples could assist in eliminating some of the duplication currently made when establishing partnerships (that is, starting from the ground up for a new partnership).
- Identification and development of generic policies and procedures for partnerships could be a particular help in forming productive partnerships. The challenge is to develop items that would allow the necessary flexibility and foster the informal inner workings that are so critical to partnerships.
- Research units can use their own successful partnerships as models for future partnership activities. Guidance in preparing example partnerships might be necessary. A workshop or seminar on developing such models could fulfill this need.
- Two tools mentioned in the literature for enhancing the value of partnerships are (1) capturing best practices and sharing these practices within the organization and (2) institutionalizing skills required for participating in, forming, and sustaining partnerships.
- The list of practices relating to partnerships from the peer exchange meeting, as given in chapter seven, could help initiate a best practices analysis. Development of measures to evaluate practices is necessary. Additionally, research to compile a comprehensive list of those requirements and skills essential to forming and sustaining partnerships is needed. This list could be the starting point of a guide to show research units what must become part of their standard approach to creating and conducting research partnerships. Efforts to foster development of such tools for the research units could be quite beneficial.
- Research is needed to develop a better understanding of differences in organizational cultures, and to document the strategies that break down barriers to success and that encourage better use of existing expertise and resources. Such research might enable research units to overcome significant difficulties that currently impede successful partnerships.
- Currently, although anecdotal information supports the role and value of partnerships for research, there is no definitive methodology for determining the benefits of conducting research through partnerships compared with other traditional means of conducting research. With benefits quantified through study, there could be an even more effective use of research partnerships. The stewardship of research funds might be improved as well.
- Research is needed for identifying and developing appropriate training tools for building interpersonal partnership skills for research unit and other agency staff involved in partnerships. This training would involve
  - Building relationships,
  - Building trust at all levels in partner organizations,
  - Bridging the gap of cultural differences, and
  - Increasing the awareness of the importance of partnership/alliance manager responsibilities.