



User's Manual for Research and Innovation

**Joint Transportation Research Program
of the
Indiana Department of Transportation
and
Purdue University**

Discovery with Delivery Since 1937

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The Joint Transportation Research Program

USER'S MANUAL FOR RESEARCH AND INNOVATION

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**Joint Transportation Research Program
Lyles School of Civil Engineering
Delon & Elizabeth Hampton Hall of Civil Eng.
Purdue University
550 Stadium Mall Drive Room 4103
West Lafayette, IN 47907 - 2051
Ph: 765-494-6508
E-mail: jtrp@purdue.edu
<http://www.purdue.edu/jtrp>**

**Indiana Department of Transportation
Office of Research and Development
1205 Montgomery Street
PO Box 2279
West Lafayette, IN 47906
Ph: 765-463-1521
Fax: 765-497-1665
E-mail: bpartridge@indot.in.gov
<http://www.in.gov/indot/2700.htm>**

Foreword

From the Indiana Department of Transportation's perspective, research is a means to proactively address challenges and opportunities through investigation and data-driven decision making and to introduce innovation into INDOT business processes. The Research Program and the individual research projects provide direct support to INDOT's Strategic Plan and its successful implementation. One of the Strategic Objectives in the INDOT Strategic Plan is Innovation and Technology, which is a primary focus of the INDOT Research Program.

Research findings frequently provide benefits such as cost savings, better performance, safer infrastructure, and faster delivery of goods and services. INDOT research generally is applied research addressing specific problems or needs. While research sponsored through the Joint Transportation Research Program of the Indiana Department of Transportation and Purdue University primarily benefits INDOT customers and stakeholders, it also benefits the transportation industry and the community at large, including Indiana counties, cities, and towns. Technology transfer and the implementation of viable research findings into operations is a priority of the program and is one of the primary measures of success. Research, coupled with implementation, is one of the key drivers of innovation at INDOT.

The **mission** of the JTRP is to conduct, oversee, and partner in cost-effective transportation research that benefits our customers and supports INDOT's Strategic Plan; perform specialized testing on behalf of the department; assist in technology development, identification, and transfer; provide expertise and technical assistance in solving INDOT's transportation problems; proactively address challenges and opportunities; and introduce innovation into INDOT business processes. The research program is a mandated part of the Federal-Aid program, and is a match program (80 percent federal - 20 percent state match) utilizing dedicated State Planning and Research (SPR) federal funding.

As a condition for receiving federal research dollars for transportation research, peer exchanges are required of State Departments of Transportation. The most recent peer exchange for the research program was conducted October 16–18, 2018. Some of the outcomes of the peer exchange were as follows:

- The INDOT Research and Development (R&D) Division runs a sound program that is addressing the right needs, delivering useful products, communicating well, and making a positive impact.
- The program utilizes an effective top-down method for identifying relevant topics and needs for research.
- Research products provide a direct, measurable impact on agency operations.
- Although the INDOT R&D program is very good, opportunities exist for improvement that can foster a great program, such as greater value creation through effective, consistent, and more rapid implementation.
- Recommendations were provided in the following themes;
 - Theme #1: Awareness
 - Theme #2: Innovation
 - Theme #3: Processes
 - Theme #4: Workforce Preparedness
 - Theme #5: Measurements/Accountability
 - Theme #6: Partnerships
 - Theme #7: Messaging & Communications

The positive findings of the October 2018 peer exchange are a direct result of the involvement of INDOT executive staff and their staff members, as well as the involvement of countless external transportation professionals in the research program: researchers, those serving on technical committees, peer groups and focus groups.

INDOT customers and stakeholders have found that the research program provides not only a venue to solve problems and make data-driven decisions but also, as one of the program's performance measures, indicates a way to reduce costs and stretch transportation dollars.

INDOT Research Program Benefit Cost Analysis (Return on Investment) reports for Projects completed in FY16, DY17 and FY 18 found that for each dollar invested in the research program, an average of up to twenty one dollars (with respect to agency cost) and also up to twenty one dollars (as a result of travel time saving and crash reduction for road users).

The Research Program also offers opportunity for networking between transportation professionals and professional staff development. INDOT staff who serve as Business Owners or on Study Advisory Committees (SAC) in the Research Program have highlighted the professional growth and engagement opportunities the program offers.

Early on 2019 the Commissioner of Indiana Department of Transportation (INDOT) announced the **2019 Strategic Plan**. This Strategic Plan was the result of significant collaboration across the entirety of INDOT, and became even more meaningful as INDOT celebrates 100 years of public service. The 2019 Strategic Priorities are;

- **Safety**
- **Mobility**
- **Asset Sustainability**
- **Customer Service**
- **Organization & Workforce**
- **Economic Competitiveness**
- **Innovation & Technology**

In the past several years Indiana has seen an unprecedented increase in the advancement of implemented research and new technologies, along with major shifts in demographic and economic profiles. The coming years will undoubtedly hold even more exciting research implementation, innovation and change. All these elements impact the broad set of modes that INDOT supports throughout the state, including automobiles, rail, and aviation. As a result, INDOT realized the need to evolve some of the fundamental aspects of its strategy and focus on preparing to successfully navigate through an exciting future comes through in a refined strategy for the agency.

Table of Contents

	Page
1. Program Administration	1
1.1 Research Funding	1
1.2 JTRP Executive Committee and INDOT R&D Office Responsibilities	2
1.3 RD&T Management Process Certification	4
1.4 Public-Private Partnerships	4
2. Identifying Research Needs	5
2.1 The Peer Group - Focus Group Process	5
2.2 Research Need Statements	8
2.3 Ranking of Research Needs	8
2.4 Peer Group - Focus Group Reporting	8
2.5 Assignment of Project Personnel	8
2.6 Final Approval of the Research Program	9
3. Research Team Members and Responsibilities	10
3.1 Business Owner (BO)	10
3.2 Principal Investigator (PI)	11
3.3 Project Advisor/Administrator (PA)	11
3.4 Study Advisory Committee (SAC)	12
4. Research Proposal Development and Modifications to the Work Plan	13
4.1 Research Proposal Contents	13
4.2 Involvement of SAC in Proposal Development	14
4.3 Proposal Review Policy and Procedures	15
4.4 Proposal Approval Process	15
4.5 Changes to the Approved Proposal	17
5. Study Advisory Committee Meetings	18
6. Research Payments, Travel Approval, Equipment Use, and Safety Training	19
6.1 Research Payments	19
6.2 Out-of-State Travel	20
6.3 Equipment Purchase and Disposition	21
6.4 Research Team Facilities Use, Orientation, and Safety Training	22
7. Reporting Research Progress	23
7.1 Progress Reports	23
7.2 Interim Reports	24
8. Reporting Research Results	25
8.1 Final Report Features	25

	Page
8.2 Draft Final Report Review	25
8.3 INDOT Research Project Implementation Form	25
8.4 Final Report Dissemination	26
8.5 Publication Provisions and Proprietary Rights	26
9. Implementing Research	27
9.1 Funding Implementation Activities	28
9.2 Progress Report for Implementation of Projects	28
9.3 Return of Investment (ROI)	28
Appendix A. JTRP Contract between INDOT and JTRP (Purdue)	
Appendix B. Research Need Statement Template	
Appendix C. Review Policy for JTRP Projects	
Appendix D. Sample Progress Report	
Appendix E. Example Implementation Plan	
Appendix F. JTRP - Key items for INDOT Management Information Systems Involvement	

1. Program Administration

This chapter provides general information pertaining to the conduct of research and implementation sponsored by the Joint Transportation Research Program (JTRP) of the Indiana Department of Transportation (INDOT) and Purdue University. The information consists of general definitions, research policy, and the responsibilities of individuals related to administration of the program.

All procedures outlined in this guide follow the contracts and lease agreements between INDOT and Purdue University (see Appendix A).

1.1 Research Funding

Research projects may be supported or financed through a variety of state and federal research funding programs.

The majority of JTRP research and implementation projects are funded through the State Planning and Research (SPR) Part II research program. JTRP administrative costs may also be funded with SPR funds. In addition, SPR funds are also used to support a number of national and regional research programs every year such as the National Cooperative Highway Research Program (NCHRP), the Transportation Research Board (TRB) and Pooled Fund Studies. Typically, SPR Part II funds require a minimum 20 percent State of Indiana cost share match. If a study is determined by the FHWA to address an issue of national interest, it may be funded completely with 100 percent federal funds.

INDOT must submit a *Work Program and Cost Estimate* to the FHWA before the start of each fiscal year (Code of Federal Regulations, 23 CFR § 420). This document includes proposed and ongoing SPR Part II research projects, a summary of the use of funding for the fiscal year, and the amount of funding required. As required by the federal transportation bills of both (MAP-21) and FAST ACT, INDOT is to spend a minimum of 25 percent of its annual SPR funds on research, development, and technology transfer activities. States, however, can opt to spend a higher percentage of SPR funding on research.

23 CFR § 420 notes that these funds must be spent on research within three years following the end of each highway bill (e.g., MAP-21 & FAST ACT) or they are lost to the state. Although obligation authority may be flexed during any bill, if the allocated SPR Part II funds are not spent in this time frame, then the state's obligation authority may be reduced by the unspent amount.

1.2 JTRP Executive Committee and INDOT R&D Office Responsibilities

JTRP is administratively housed in the Lyles School of Civil Engineering at Purdue University in West Lafayette, Indiana. Management and coordination of the research program is handled through the INDOT Division of Research and Development (R&D) in coordination with the JTRP Office. JTRP operates under the guidance of an Executive Committee. The INDOT Commissioner appoints the INDOT Chairperson of the JTRP Executive Committee. The Head of the Lyles School of Civil Engineering at Purdue University appoints a Purdue faculty member to serve as the JTRP Director.

Members of the JTRP Executive Committee are appointed as follows:

- The JTRP Chairperson appoints INDOT personnel to serve as voting members.
- The JTRP Director serves as a nonvoting member and may recommend additional Purdue personnel to also serve as nonvoting members.
- The FHWA Indiana Division appoints FHWA personnel to serve as nonvoting members.

Responsibilities of the Executive Committee members:

- Oversee and assist in fulfilling the mission and responsibilities of the JTRP.
- Assist INDOT business units and executive staff in identifying research needs.
- Final approval of funding for research program and JTRP expenditures.
- Final approval of research proposals.
- Oversee implementation of cost-effective research results.
- Final approval of the annual *Work Program and Cost Estimate* to be submitted to the FHWA.
- Communicate to the Executive Staff, direct reports, and other INDOT staff the resources available through the research program to address transportation issues.
- Communicate to the Executive Staff and other stakeholders the findings and benefits from the research program.

Responsibilities of the Executive Committee Chairperson:

- Chair JTRP Executive Committee meetings.
- Act on behalf of INDOT Commissioner on research matters.
- Assist INDOT business units in identifying major research needs of INDOT.
- Actively promote implementation of cost-effective research findings.
- Recommend INDOT staff members for appointments to the JTRP Executive Committee.
- Coordinate and promote research program roles and capabilities with INDOT executive staff.

Responsibilities of Purdue-JTRP Director:

- Serve as the director of JTRP.
- Serve as the principal liaison between JTRP and other academic institutions and private and public organizations on matters related to transportation research.
- Oversee the planning and execution of the annual Purdue Road School.
- Recommend Purdue personnel as members of the JTRP Executive Committee.
- Prepare the agenda for Executive Committee meetings, report on JTRP activities at Executive Committee meetings, and supervise the preparation of minutes.
- Submit draft annual *Work Program and Cost Estimate*, semi-annual progress reports, budget estimates, and financial statements.
- Request research ideas and need statements from JTRP researchers and provide guidance with proposal development.
- Supervise personnel employed by JTRP, monitor project expenditures, and maintain equipment inventories.
- Review proposals and final reports of all JTRP research.
- Review time extensions and budget extensions requests.
- Encourage dissemination and implementation of research results.
- Ensure compliance with JTRP policies and procedures.
- Provide engineering and technical training support to INDOT business units and executive staff.
- Enter new research into the Research in Progress (RiP) database.

Responsibilities of the INDOT R&D Office:

- Update User's Manual and secure JTRP Board and FHWA approval
- Oversee and supervise the INDOT research program.
- Identify transportation research needs, conduct research, and assist in research implementation and technology transfer activities.
- Support and use the Transportation Research Information Service (TRIS) database for developing programs, reporting active RD&T activities, and inputting final report information.
- Develop, oversee, and execute the INDOT research program budgets.
- Prepare and submit the annual *Work Program and Cost Estimate* to the FHWA in accordance with federal requirements.
- Serve as principal liaison for INDOT on research activities with JTRP, FHWA, and national associations.
- Promulgate and approve research policies, including policies for consideration by the JTRP Executive Committee.
- Maintain internal records and performance measure for the research program.
- Process payments for research projects.
- Enter new inhouse research into the Research in Progress (RiP) database.
- Request audits of research projects and the research program.
- Ensure that the INDOT research program meets all requirements for use of federal transportation funds outlined in 23 CFR § 420.
- Assist the Executive Committee Chairperson with related responsibilities.
- Approve assignment, addition, and/or changes in appointments of Principal Investigators (PIs), Business Owners (BOs), Project Advisors/Administrators (PAs), and Study Advisory Committee (SAC) members.
- Final approval of project proposals or changes to approved proposals.

1.3 RD&T Management Process Certification

I **Ahmed Samy Noureldin**, INDOT JTRP Managing Director, of the State of Indiana, do hereby certify that the State is in compliance with all requirements of 23 U.S. Code 505 and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations, or administrative procedures which would affect such compliance.

Samy Noureldin

1.4 Public-Private Partnerships

In many cases research projects are of mutual benefit to INDOT and industry. Industry may partner with INDOT and academia toward funding solutions for common problems. JTRP actively works to promote such public-private partnerships and leverage resources and expertise. Partnering may include providing technical expertise, serving as a SAC member, and funding materials, equipment, and laboratories. Monetary contributors must agree that the tasks, objectives, and deliverables outlined in the JTRP research proposal represent their entire interest in the project, without any requirements for special reports, invoices, or additional work not outlined in the original JTRP project proposal. Furthermore, industry partners shall not construe their participation as endorsement by JTRP, INDOT, or Purdue University of their products, methods, or services.

2. Identifying Research Needs

2.1 The Peer Group - Focus Group Process

INDOT focus groups initiative was an outgrowth of the INDOT periodical research program peer exchange for State Departments of Transportation. That peer exchange participants recommended utilizing focus groups, aligned with INDOT business units and priorities, to identify priority research needs. The focus group process included meeting with INDOT executive staff, participating in brainstorming sessions with diverse transportation professionals, selecting priority needs by INDOT staff, and approving a recommended program and funding by the Executive Committee. The results of this focus group effort are reflected in the development of the annual *Work Program and Cost Estimate* for FHWA approval.

During FY 2016 a JTRP study was completed emphasizing “INDOT-JTRP Project/Program Implementation Improvement”. In addition, an “Innovation Office” was established by INDOT Executive Staff for the purpose of initiating and sustaining a culture of innovation, problem solving and continuous improvement. In addition, a link has been added to the IN.gov website under Innovative Programs that includes (1) a list of INDOT Innovation and research needs & Ideas and (2) Instructions for Submission of Research Ideas to INDOT. This link (<http://www.in.gov/indot/2404.htm>) allows faculty from any accredited University to submit transportation related research ideas to the Indiana Department of Transportation (INDOT) for consideration. This link also support INDOT’s compliance of Title VI program.

As a result of these initiatives,

- a) Focus Groups were integrated with existing INDOT Peer Groups of various INDOT Business Units, when Peer Groups existed and were active.
- b) Agency needs (including research needs & deployment of innovations) are compiled on a continuous basis (as compared to the previous annual batch by batch basis).
- c) Needs are aligned with the INDOT Goals, Strategic Plan & Objectives, Priority Areas and Organizational Key Performance Indicators (KPIs).
- d) JTRP research needs are further reviewed and compared against FHWA R&T Agenda to determine which needs are being addressed, partially addressed, or not addressed. Prioritized needs may be incorporated into JTRP, NCHRP or pooled fund studies.

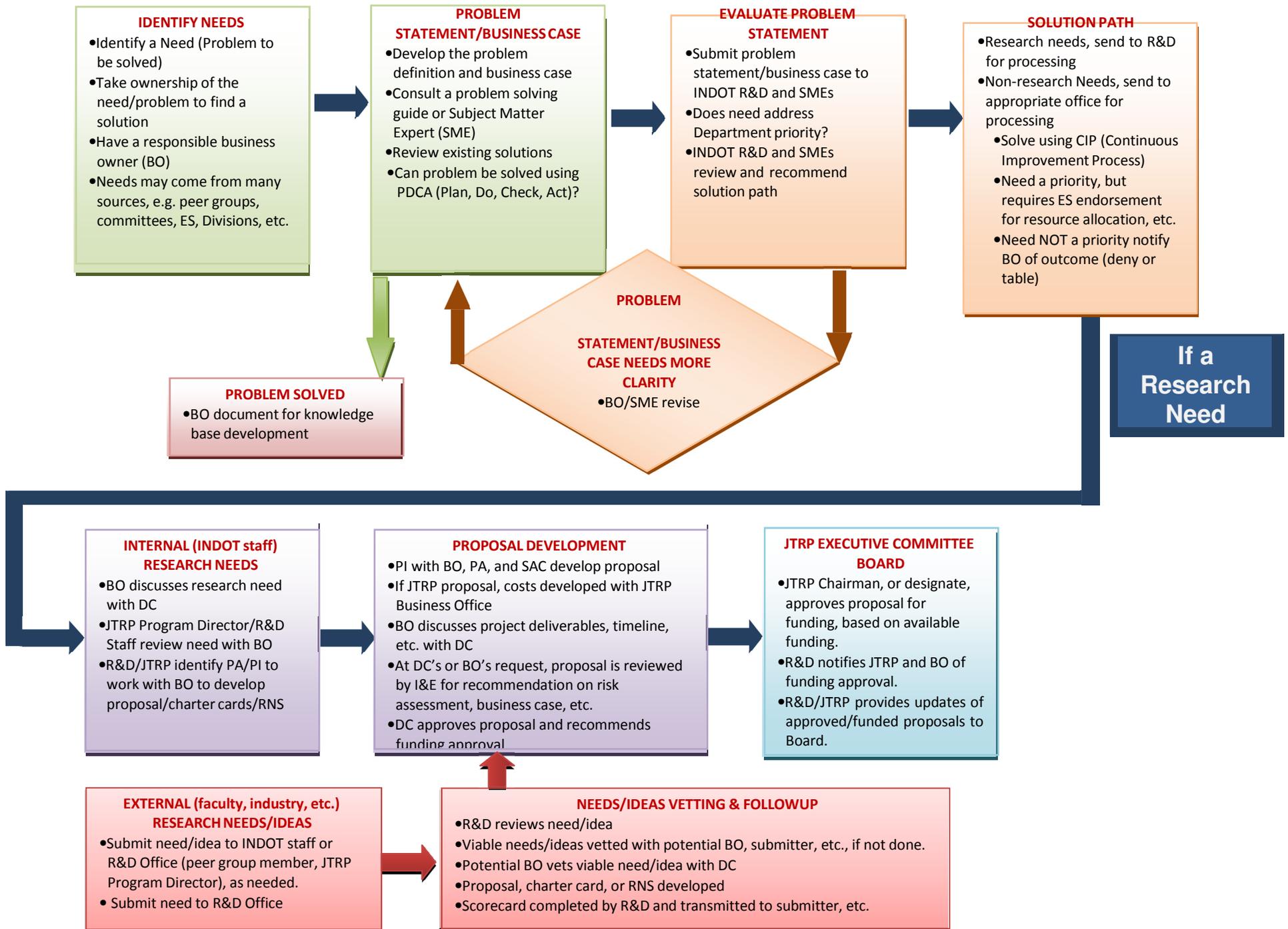
As part of the final prioritization of a need, the peer group leaders examine in consultation with subject matter experts whether this need is a research need or not. In addition, INDOT R&D representatives use the TRB’s Transportation Research Information Service (TRIS) database for developing programs, reporting active RD&T activities, and inputting final report information. In addition INDOT R&D representatives review existing knowledge from previous research, especially from the Transportation Research International Database (TRID), Research Needs Statement (RNS) and Research in Progress (RiP) databases, to avoid duplication of efforts related to a research need.

Current INDOT Focus groups, Peer Groups and proposed INDOT innovation process are shown on the following table (Table 1) and graph (Figure 1). It is recognized, in identifying research needs, that one process (or approach) may not fit all circumstances. Peer group/focus groups, participation in staff meetings, one-on-one interaction and networking in various forms is required to identify viable, priority research needs.

Table 1: INDOT Peer Groups & Focus Group

Peer Group	Focus Group
District Deputy Commissioners	District Operations, DDCs
District and Central Office Highway Maintenance Directors	Highway Maintenance Operations, MOP
District Technical Directors	Planning, Multimodal, Finance, Asset Management and Economic Impact, PMFAME
Asset Program Management Group	
Pavements	Pavements, Materials, Geotechnical and Construction, PMGC
HMA Technical Committee	
PCC Technical Committee	
New Product Evaluation Committee	
Pipe Committee	
District Testing Engineers	
Construction Directors	
Safety Directors	Statewide Safety, S
ASCE-INDOT Structures Committee	Structures (Bridges), Hydraulics and Environmental, SHE
INDOT Bridge Inspection	
Bridges Maintenance Group	
Bridges Asset Team	
District Traffic Engineers and Central Office Traffic Engineering Staff	Traffic Engineering, Safety, Mobility and Operation, TESMO
Traffic Safety Asset Team	
Traffic Safety Interagency	
District Traffic Operation Managers	

Figure 1: INDOT Innovation Process – Need Submission



2.2 Research Need Statements

A Research Need Statement (RNS) will be required for each priority research need under consideration by the Focus/Peer group. This research need statement can be in the form of a research Idea form, or a formal RNS. Templates for the research idea form, or formal RNS is provided in Appendix B. A well-written, complete RNS is needed for peer group ranking of research needs.

2.3 Ranking of Research Needs

INDOT Focus/Peer group members rank research needs. Faculty engagement in Focus/Peer groups is encouraged and their expressions of support, or concerns, for a specific research need or an innovation are considered in the ranking process. The Focus/Peer group is accountable for ranking its needs and should be able to explain their ranking to INDOT Executive Staff.

Focus/Peer group/focus group leaders will summarize the overall ranking of the RNSs based on the Departmental priorities in their area.

2.4 Focus/Peer Group Reporting

Focus/Peer group leaders will be responsible for completion and submission of identified, ranked research needs to the R&D Office. The R&D and JTRP Offices will combine the individual peer group reports into an accessible Smartsheet for Executive Committee review and approval.

2.5 Assignment of Project Personnel

When research needs have been submitted, the INDOT R&D Division and JTRP Office will identify and recommend project personnel. R&D Division staff will facilitate meetings between faculty, INDOT staff, etc. to discuss the research need and propose a course of action to address the need. Business Owners (BOs) and initial SAC members will be recommended by R&D Division to the JTRP Executive Committee.

Principal Investigators (PIs) may be recommended by the JTRP Office and approved by the R&D Office. Project Administrators/Advisors (PAs) will be selected by the INDOT R&D Division. Once project personnel have been selected, the recommendations will be visible in the Smartsheet to the Executive Committee for review. Available capacity of staff should be considered when selecting project personnel. PIs will be notified by the R&D Division and JTRP to begin proposal development in consultation with BOs and SAC members. PIs must commit to submitting the proposal by the established deadline.

Project personnel involved in submitting needs or ideas will receive a feedback from INDOT R&D about Need/Idea Disposition via an email and/or <http://www.in.gov/indot/2404.htm> which is Updated monthly (by the 5th of the month).

2.6 Final Approval of the Research Program

INDOT must submit a *Work Program and Cost Estimate* to FHWA before the start of each fiscal year. This document must include each proposed and ongoing SPR Part II research project and indicate proposed funding for the next fiscal year. The FHWA Division Office will review and approve the SPR Part II *Work Program* for each fiscal year. After approval of the *Work Program*, it is not necessary for INDOT to submit individual and detailed proposals for review and approval to the FHWA; however, changes to the total funding level or major additions to the *Work Program* must be submitted to FHWA via an amendment request.

3. Research Team Members and Responsibilities

Each JTRP research project is owned by a Business Owner (BO) with an assigned Principal Investigator (PI), a Project Advisor (PA), and a Study Advisory Committee (SAC). At the completion of the research project, the BO, in consultation with the PA, PI, and SAC, completes an Implementation Plan (IP; see Appendix F) and submits it to the R&D Office within 30 days after the completion of the research (research project completion date) for inclusion in a Smartsheet indicating implementation tasks and timeline. Research team members' responsibilities are outlined below.

3.1 Business Owner (BO)

The INDOT BO is the primary owner of the research product and is designated by his or her supervisor and Deputy Commissioner (DC). The BO ensures that deliverables meet INDOT needs and that research results are incorporated into INDOT operations as early as possible. The BO also develops and submits the signed Implementation Plan (IP). The responsibilities of the BO are as follows.

- Has ownership of the research and ensures (before initiation, during the conduct and at delivery) that the research addresses INDOT needs.
- Participate actively with the PI and PA during the research proposal development process.
- Communicates to his or her supervisor and the DC the need for the research, their support of the research, and how the results will be implemented in INDOT operations.
- Team with the PI and PA in presenting the proposal to the JTRP Executive Committee for approval, if requested by the Board. Conveys support of the research and intended use of the research deliverables to the Executive Committee.
- Attends and participates in SAC meetings. SAC meetings are not be held without the participation of the BO.
- Reviews and approves, minutes of SAC meetings, interim reports (if any), final reports, technical summary and project deliverables.
- Reviews and gives initial approval to proposed project scope changes, project expansions/extensions, reallocation of proposal budgets, approval to purchase equipment/computers (not specified in the original proposal).
- Works with the PI and PA to keep projects on time and on budget, identify intermediate deliverables and concurrent implementation opportunities, and resolve any project issues/conflicts.
- Raises concerns to the R&D Director or JTRP Chairperson if the research is not addressing the department's needs.
- Develops and executes (including obtaining signatures and transmitting) the IP.

- Communicates with the PA and DC throughout the research and implementation process regarding the project status, project deliverables, status of implementation, and any implementation roadblocks (e.g., funding issues, policy needs, legislative issues, and the like).
- Maintains and updates the Implementation Status in Smartsheet. Presents to their respective DCs, in a timely manner, any issues regarding successful implementation of project findings.
- Responds to the project close-out customer satisfaction survey to keep the research program continue on the path of continuous improvement.
- Along with the PI, PA, and the JTRP Office, promotes the dissemination of viable research findings, innovation, cost savings, and potential press releases to INDOT users and decision-makers throughout the research and implementation process. Assists R&D Division and JTRP in capturing and presenting successful implementation.

3.2 Principal Investigator (PI)

The following are the responsibilities of the PI.

- Prepares and submits the research proposal in conjunction with the BO, PA, and SAC. Dates of BO and PA approvals must accompany the submitted proposals.
- Conducts and supervises the research and insure that the project is on-time and on-budget in accordance with approved proposal.
- Calls, facilitates and documents (using approved minutes) SAC meetings at least every six months. Agenda and associated materials of these meetings should be sent to the SAC prior to these meetings.
- Prepares semi-annual progress, interim and final reports.
- Prepares and submits requests for changes to the approved research project in conjunction with and the approval of the BO, PA, and the SAC.
- Conducts a project closeout meeting with the BO, PA, and SAC.
- Provides project updates/summaries to the Executive Committee, as requested.
- Complies with all JTRP policies and procedures outlined in this manual and elsewhere.

Co-PIs of studies (if any) are responsible for assuming the roles of the PI in any event the PI is not capable to continue his/her roles and responsibilities.

3.3 Project Advisor (PA)

The PA is the representative of the INDOT R&D Division who has expertise or (working knowledge) in the subject area to act as the Project Advisor and working knowledge of project management to act as a Project Advisor. The PA has the following roles and responsibilities.

- Works with project personnel, particularly the BO and PI to ensure that project deliverables are achieved within the project budget, scope, and time frame.
- Provides technical guidance to the research.
- Ensures the research proposal follows sound research principles and practices

- Seeks the timely and proactive resolution of any project concerns.
- Works closely with the BO to ensure user needs are met.
- Assists in the transition of the research findings into the implementation phase by assisting the BO in developing and submitting the signed IP to the R&D Office within 30 days after the completion of the research.
- Assists with the marketing and communication of the research effort and research findings.
- Encourages the timely dissemination of implementable research findings to INDOT users and decision-makers throughout the research process.

3.4 Study Advisory Committee (SAC)

A SAC typically consists of the following individuals:

- The PI (faculty, consultant, or in-house researcher)
- The BO (required)
- The PA (required)
- INDOT technical experts and stakeholders
- Additional external experts and stakeholders such as an FHWA Indiana Division representative, industry representatives as appropriate, and possibly other state agencies.

A SAC meeting must have at least the participation of the, PI, PA and BO as participants. The roles and responsibilities of SAC members include the following.

- Ensure that the research meets the needs of INDOT and other designated users and fulfills the objectives and deliverables of the proposal within the proposal budget and time frame.
- Assist the PI in preparation of the research proposal and provide initial approval.
- Provide technical guidance to the PI during conduct of research.
- Attend SAC meetings.
- Review and provide initial approval of changes to the proposal scope, work plan, and/or budget as proposed by the PI.
- Review and provide comments for draft final reports.
- Provide initial approval of interim and final reports and project deliverables.
- Assist the BO in developing the IP.
- Attend the project closeout meeting.

4. Research Proposal Development and Modifications to the Work Plan

4.1 Research Proposal Contents

A research proposal should contain, as a minimum, the following elements.

- **JTRP proposal route sheet completed with the following information:** Study title, PI(s) (name and title), research agency (name and address), project number, project period, funding request, SAC members, SPR number, and current JTRP projects.
- **Introduction:** Background information leading to the research project, including the preliminary literature review.
- **Problem statement:** Concise statement indicating the need for the research.
- **Objectives or purposes:** What the research is to accomplish.
- **Work plan:** How each objective will be achieved? The work plan should tell what, how, and where the study will be conducted. It should include such information as sampling plans, method of construction, tests to be used, number of test sections, statistical analysis approaches, data collection methods, use or development of models, frequency of inspections, and criteria used to judge the results.
- **Expected benefits, deliverables, anticipated implementation, and cost savings:** This section should clearly describe expected benefits resulting from the research project deliverables, anticipated cost savings, and how the research results can be implemented by INDOT. Benefits resulting from the research could be expressed as improved procedures or operations, cost savings, improved quality, or increased efficiency. This section should describe in detail the project deliverables (e.g., software, design guide, specifications).
- **Reporting plan:** Completion dates of interim, draft final, and final reports should be specified. Interim reports may not be required but are recommended when significant findings are found, allowing for early implementation by INDOT. A draft final report must be submitted four months prior to the project end date indicated in the proposal. The draft final report is subject to SAC review and must include as a minimum a BO and PA review, unless otherwise specified by the R&D Office. The final report is then prepared, addressing review comments, by the project completion date.
- **Work time schedules:** A time bar chart is to be included showing the scheduling of the individual tasks of the study. This bar chart further becomes part of the semi-annual progress report indicating completed work by task versus planned work by task. Time periods should be expressed as months. The completion date should allow no more than four months for review of the draft final report.

- **Cost estimate:** The JTRP budget form should be completed. The estimated cost should be broken down by fiscal year and by item, such as salaries, equipment, subcontracts, in-state travel, out-of-state travel, and supplies. Equipment purchases should be individually identified as much as possible. The amount of effort to be funded for the academic year and the summer months must be identified in this section for each PI and all graduate students employed on the project.
- **BO, PA, SAC members, and DC:** The BO, PA, SAC members, and the DC are to be identified in the proposal. Member affiliations should also be noted.
- **Research team qualifications:** All research team members (i.e., PI(s), graduate research assistants, and technical staff) should be specifically identified in the proposal. The credentials and experience of the PI(s) should be presented, which may be in the form of a résumé or vita attachment at the end of the proposal.

Some projects, such as short duration or high profile projects, may at the PA discretion require;

- Proposals to have a deadline and/or a **critical timeline** so everyone understands how fast the project needs to be completed.
- A clear and documented agreement should be reached by the BO, PI, and PA regarding the **criteria for success** for the project including deliverables, timeframes and communication plan.
- **Ongoing implementation plans** should be part of the project from the beginning and updated as the project progresses. It is recommended that all SACs add an agenda item to their meetings regarding the current status of the implementation plan.
- **A communication plan** is needed to ensure timely, clear, concise and targeted information specifically for Business Owners.

4.2 Involvement of SAC in Proposal Development

SAC members (including the PA and BO) are assigned to JTRP projects to provide technical guidance to the PI in developing the proposal. The PI shall communicate with the SAC members throughout the proposal writing process, and their approval is required prior to the PI's submission of the proposal to the JTRP Office. A proposal will not advance to the JTRP Executive Committee without the approval of, at minimum, both the BO and the PA. A discussion should be held with the SAC members during the proposal development. When required, the BO is required to participate in the JTRP Executive Committee meeting, when a proposal presentation is requested, to voice their need and support for the proposal. BOs are required to discuss the proposal with their DC prior to the proposal's submission to the Executive Committee for approval.

4.3 JTRP Office Review Policy and Procedures

The JTRP Executive Committee believes that requiring a methodical development and approval of research proposals is a worthwhile effort as it enhances the quality of proposals and the subsequent quality and impact of research results. Similarly, all JTRP projects by faculty PIs will be subject to the review policy and procedures of the JTRP Office, as outlined in “Review Policy for JTRP Projects” (see Appendix D).

4.4 Proposal Approval Process

- Research needs can be identified through a variety of sources such as peer groups, focus groups, staff meetings, direct reports/individuals, etc. Needs can be submitted throughout the fiscal year.
- Research Needs should be discussed with the appropriate Deputy Commissioner (DC). The JTRP Program Director/R&D Staff will review the need with the BO. R&D/JTRP will identify a PA/PI to work with the BO to develop the proposal/charter cards/RNS.
- The PI in conjunction with BO, PA, and SAC will develop the proposal. As a minimum, the BO and PA must approve the final proposal.
- If a JTRP Proposal, proposal costs are to be developed in conjunction with the JTRP Office/Business Office.
- BO must discuss the final proposal with the appropriate DC. Proposal timelines, deliverables, costs, etc. should be discussed with the DC. If the DC, approves the proposal, the proposal is approved and recommended for funding.
- The JTRP Chairman, or his designate, approves the proposal for funding, subject to available funding/priorities.
- R&D notifies JTRP and BO of funding approval. For JTRP proposals, once a proposal has been approved for funding, R&D will issue a letter of approval for the research project to proceed. The JTRP Office will forward the award letter to Sponsored Program Services for setup of the award. Upon award setup, the business office sends award notification to the PI, which includes the expectations for the project’s completion in accordance with the approved proposal.
- R&D provides periodic updates of approved/funded proposals to JTRP Board.
- Researchers who have past due projects may not be eligible to serve as a PI for new research proposals. A project is considered past due when the approved final (not draft) report has not been submitted for distribution by the scheduled completion date for the research project. Proposal routing sheets are to indicate whether the proposal PI or Co-PIs have a past due final report. If the PI has a past due final report, investigation into the reason for the past due final report will be conducted by R&D. If the reason, for the past due final report is due to an INDOT business owner, follow-up with the business owner will be conducted by the Project Advisor and documented with an action plan. If needed, this can escalate to the JTRP Executive Committee Board. If the reason for the past

due final report is due to the PI, follow-up with the PI and BO will be conducted by the Project Advisor and documented with an action plan. If the action plan is approved by INDOT, a copy of the action plan will be provided to JTRP. INDOT, at its discretion, may approve the new proposal, based on the approved action plan, or if INDOT deems the new research is critical. If the action plan is not approved by INDOT, any new proposals will not be approved by INDOT for a delinquent PI.

- For projects with past due final reports, INDOT, at its discretion, will contact the JTRP Office to coordinate a meeting with the PI to finalize submittal of the final report. In general, if a final report has not been submitted within 4 months of the project completion date, INDOT will request the JTRP Office to coordinate a meeting with the PI and to escalate the process through the respective university administration to finalize the final report. In extreme circumstances, INDOT, at its discretion, may request repayment in part, or in whole, to INDOT of expended research funds for the past due projects.

4.5 Changes to the Approved Proposal

The JTRP and the Executive Committee expect all projects to finish on time and within the project budget. However, as the work of a project progresses, it is possible that changes to the original study may occur that could alter the study's objectives, work plan, budget, reporting plan, and so forth. These changes may necessitate a time extension or budget expansion in order for the work to be completed; or in extreme circumstances, when it becomes apparent that the research cannot be satisfactorily performed, it may be necessary to terminate a project without finishing the work plan and associated reporting.

- Requests for changes in study objectives, time extensions, or budget expansions for studies need to be justified.
- The PI must obtain the written approval of the project's SAC in writing prior to formally requesting the extension and/or expansion from the JTRP Office, evidence of which must be provided with the formal change request to the JTRP Office. It is recommended that the PI hold a SAC meeting to discuss this request if a SAC meeting has not been held recently. At a minimum, approval by the PA and BO must be obtained for the extension and/or expansion request to be considered. Approval by e-mail or by virtue of SAC meeting minutes will suffice as written evidence. This step is meant to provide the SAC members an opportunity to provide comments related to how the proposed extension and/or expansion will impact INDOT needs with regard to the project. SAC approval does not constitute final approval of the proposed extension and/or expansion. Time extensions should be submitted no later than two months prior to the project completion date.
- The proposed changes will be forwarded by the JTRP Office to the R&D Office for consideration of final approval.
- The R&D Office may terminate a project at any time as outlined in the current contract between JTRP (Purdue) and INDOT.
- Note that a time extension of more than six months or a budget expansion of more than \$5,000 may also require approval by the JTRP Executive Committee, as well as an appearance at a regularly scheduled meeting of the board. The JTRP Office will advise the PI when this process is required.

5. Study Advisory Committee Meetings

SAC meetings are considered the communications plan of a project. They are mandatory and should be held during the proposal development phase and approximately every six months (or critical checkpoints) during the conduct of the research. In addition, a final closeout SAC meeting must be scheduled to review the final report and assist the BO in developing an Implementation Plan (IP). SAC meetings frequency is monitored by the JTRP administration and considered a measure for evaluating the success in communication amongst research team members. More frequent SAC meetings are encouraged when necessary.

A complete list of each project's SAC members and their contact information is provided to the Principal Investigator(s) with the JTRP award letter, and this listing is also available in the project's "SAC" folder at the JTRP website <http://www.purdue.edu/jtrp>.

The JTRP Office can assist the PI in scheduling SAC meetings, including deciding on the meeting format, arranging a location and time and ensuring the availability of equipment.

- Materials to be discussed during the SAC meeting should be distributed to the SAC members at least two days before the SAC meeting is held.
- Minutes of the SAC meeting must be submitted (after SAC concurrence) to the JTRP Office within two weeks after the SAC meeting for posting in the project's "SAC" folder at the JTRP website <http://www.purdue.edu/jtrp>

6. Research Payments, Travel Approval, Equipment Use, and Safety Training

6.1 Research Payments

The cost principles and eligibility of direct and indirect cost items relative to federally funded research activities are set forth in the Code of Federal Regulations, Title 48, Contract Cost Principles and Procedures, Subpart 31.3 (OMB Circular A-21). Direct costs only will be claimed for reimbursement when in the form of expenses for personnel, travel, and equipment, rental of special space, and materials and services, as further defined in the JTRP contract.

Charges made by JTRP to INDOT are to be actual expenditures for personnel time, travel and subsistence, expendable and nonexpendable equipment, supplies, and miscellaneous services, including computational expenses and other incidental items. Invoices are submitted monthly by Purdue Sponsored Program Services to INDOT on supplementary vouchers.

INDOT maintains the right to withhold an agreed upon percentage of study funds until final deliverables, as outlined in the proposal, are satisfactorily received by INDOT. Furthermore, with written notification to JTRP prior to proposal approval, INDOT reserves the right to assign and make payments for study activities to deliverables identified in the proposal; JTRP retains the right to decline participation in such proposals.

The name(s) of faculty/students/staff to be involved in a project must be identified in the proposal, when known, including the percentages of effort for which they will be paid. Personnel time will be charged (1) for hourly employees, only that time actively spent on the approved project and (2) for salaried faculty and professional staff, only that percentage of effort actively expended on a project, including for both hourly and salaried personnel vacations and sick leave allowances according to the policy of the research agency at the basic rate of pay of their persons employed, plus the research agency's payments for fringe benefits.

For hourly employees, records of time actually spent on each project by each employee will be maintained and available for review. For salaried faculty and professional staff, a certification is made on Personnel Activity Reports (PAR) of the percentage of effort actually expended by each employee during the previous PAR period on each project. These too will be maintained and available for review for the time period outlined in the JTRP contract.

Totals of salaries and wages will be listed on all invoices and will be supported by payroll records showing basic rates of pay; all loadings will be added as separate items

or on a percentage basis applied to the total salaries. There will be no charge for Facilities and Administration (F&A) costs by Purdue University, as Purdue University will contribute office space, heat, utilities, and other services usually associated with F&A costs to the transportation research program of the State of Indiana.

6.2 Out-of-State Travel

- Research-related out-of-state travel may be needed during the course of a study. Whereas it is recognized that travel to conferences, seminars, and meetings is often beneficial to the successful conclusion of research, such travel is encouraged within the following guidelines. Furthermore, the travel budget restrictions many agencies face are recognized and, therefore, only those persons providing direct and lasting benefits to the JTRP research program should be approved for reimbursement for travel with research funds. Consequently, faculty and INDOT representatives should receive preference for approved travel reimbursement.
- It is the responsibility of those involved with administering the JTRP research program to ensure that only appropriate travel is approved. Furthermore, it is the responsibility of each researcher to ensure that the proposed travel directly benefits the research and that the following travel guidelines are followed. Failure to do so may result in delays or disapproval for reimbursement.
- The use of funds for out-of-state travel must be specified in the research proposal. For a research project, the funds for out-of-state travel generally should be less than 3 percent of the total budget. If the proposed travel budget exceeds the suggested maximum percentage, the researcher must justify this in the proposal.
- Research funds must be spent on travel that is of direct benefit to ongoing or planned research, and only the portion of the trip that is related to the research is eligible for reimbursement with project funds. In general, for multifaceted conferences, seminars, and meetings, such as the TRB Annual Meeting, research funds may be used as reimbursement for up to two days and nights of travel costs for each research project.
- For each research project, the accumulated total out-of-state travel costs cannot be greater than the approved out-of-state travel budget in the proposal. If the accumulated total travel costs exceed the approved out-of-state travel budget, prior approval of the SAC must be obtained before spending study funds for out-of-state travel.
- Only researchers who do not have any past due projects are eligible for out-of-state travel with research funds. A project is considered past due when the approved final (not draft) report has not been submitted for distribution by the scheduled completion date for the research project. If a researcher has one or more past due projects at the time of the out-of-state travel, no JTRP research funds from any of the researcher's projects may be used for out-of-state travel.

- Researchers should share results of their meeting with their SAC and, although not required, are encouraged to bring to the JTRP Executive Committee information that significantly impacts their study. Each researcher must include all trips taken during the last period and trips planned for the next period in the following progress report.
- Research-related trips to be taken by INDOT representatives utilizing project funds must be approved in advance by the PI and the JTRP Executive Committee Chairperson, or their designee. Travel funds must be available in the project travel budget.
- Approved project travel funds cannot be used for travel outside of the United States.

6.3 Equipment Purchase and Disposition

- All purchases of nonexpendable equipment, including computers and computer-related devices, purchased through JTRP and initially costing more than \$5,000 must be included on the JTRP equipment inventory list. This inventory list will be maintained by the JTRP Office for studies performed through JTRP, and a copy of will be forwarded to the INDOT R&D Division by April 15 of each calendar year.
- Equipment purchases shall be itemized as much as possible in the study proposal. Approval of the proposal constitutes approval of purchase of the equipment. If the cost of an approved piece of equipment exceeds the itemized cost by \$5,000 or more, SAC approval is recommended. If only the total estimated equipment cost is included in the approved proposal, but the equipment items are not listed, further approval is required from the project's SAC when individual pieces of equipment are purchased costing \$5,000 or more.
- No equipment purchases are allowed after submission of the draft final report for review without the approval of the SAC.
- If a piece of equipment is no longer being used on a JTRP project, or at INDOT's discretion, INDOT can take ownership of the equipment and has first opportunity for ownership. If INDOT decides not to take ownership of the equipment and JTRP decides not to retain the equipment, it may be sold to a third party outside INDOT and JTRP at salvage value and removed from the JTRP inventory list. Funds from the salvage will be returned to the JTRP Residual Account. When INDOT takes possession of a piece of equipment, the equipment will be removed from the JTRP inventory list and added to the INDOT inventory list.

6.4 Research Team Facilities Use, Orientation, and Safety Training

- **Use of INDOT Facilities**

All JTRP research team members are required to obtain proper orientation and safety training on all equipment residing at the INDOT R&D Division when applicable. The PA assigned to the project can assist with the scheduling of this training. Proper certification of this training must be submitted upon completion. JTRP research team members are also required to sign a liability waiver.

- **Roadside Safety Training**

Very often the conduct of JTRP research requires that researchers collect data along Indiana highways. All faculty, staff, and graduate and undergraduate students participating in JTRP research projects must take part in roadside safety training produced and coordinated by the JTRP Office at Purdue University.

Verification of participation in this training must be submitted via the online training certification before or immediately following the project award. The training is available here:

<https://engineering.purdue.edu/Intranet/Groups/Schools/CE/Safety/roadside-safety/RST-confirmation>. The appropriate roadside safety equipment shown in the training video is available from the Purdue Civil Engineering Transportation area for checkout, and all researchers are expected to make use of this equipment while doing their fieldwork. JTRP and INDOT puts a great emphasis on roadside safety. Failure by any researcher to comply with this requirement may result in loss of funding. All questions regarding the roadside safety training and equipment should be directed to the JTRP Office.

7. Reporting Research Progress

INDOT and the FHWA require that the progress of research projects be monitored throughout the duration of the project. Additionally, as with all SPR Part II projects (unless otherwise permitted), a report must be prepared that outlines the research that was conducted as well as the research results, conclusions, and implementation recommendations. This chapter covers the requirements for research progress reporting and report development.

7.1 Progress Reports

Progress reports must be prepared for all SPR Part II funded studies. Other types of studies (e.g., totally federally funded projects) may also require progress reports.

Progress reports should contain the following items:

- Project identification: title, SPR number
- Personnel: PIs, research team members, and SAC members
- Project start date
- Project completion date
- Research agency: JTRP, INDOT, other
- Progress:
 - Description of major progress in the proposed research tasks since last progress report
 - Dates of all SAC meetings held and a copy of the last SAC meeting minutes
 - Pictures of research and/or implementation activity during the past six months (pictures should be high resolution and submitted as separate files)
- Problems encountered
- Work planned during next reporting period
- Completed reports, papers, and presentations
- Implementation of results to date
- Out-of-state travel during the last reporting period or planned for the upcoming reporting period
- Project progress schedule: time bar chart expressed in months showing expected progress and actual progress to date for the individual tasks of the study identified in the approved proposal
- Finances: total project budget, total expenditures to date, and expenditures for present reporting period (the JTRP Office will insert this information)

Progress reports are due in electronic version by January 15 and July 15 of each calendar year during the duration of the research project. The JTRP Office will send out progress report due date reminders. Completed reports are to be forwarded by the PI to the JTRP Office. Reports not containing the necessary information will be returned to the PI for completion. A sample progress report is shown in Appendix E.

7.2 Interim Reports

While not required for all research projects, an interim report may be requested by the SAC for a particular research project, typically during proposal development. While there are no established format requirements for interim reports, it is anticipated that final report formatting requirements will be followed. PIs are to submit interim reports to the SAC and the INDOT R&D Division. A formal review may be required.

8. Reporting Research Results

8.1 Final Report Features

INDOT typically requires a final report for each SPR-funded research study. For implementation studies funded with SPR funds, the SAC may require only a short summary of work completed and deliverables. JTRP author guidelines for technical reports are located here: http://docs.lib.purdue.edu/jtrp/style_guidelines.pdf

8.2 Draft Final Report Review

Four months prior to the completion of the research project, the PI is required to submit a draft copy of the final report to the Purdue e-Pubs system. This four-month period is included to provide sufficient time for review and revision of the draft final report. The JTRP report publishing process with guidelines for submission, review, and publication of the final report can be found here: http://www.lib.purdue.edu/sites/default/files/epubs/JTRP_report_publishing_process.pdf

A closeout SAC meeting will be required just prior to the completion of the project. The JTRP Office can assist with the scheduling of this meeting. The closeout meeting is not meant to supersede the review procedure discussed previously. Topics for the closeout meeting can include the following:

- How the PI addressed the SAC members' review comments
- Comments or concerns regarding the final report
- Adequacy of the technical summary
- Proposed implementation and finalizing the Implementation Plan (IP)

8.3 INDOT Research Project Implementation Plan Form

Emphasis is always placed on accelerating and concurrent implementation of research findings into INDOT operations. PIs and SACs should look for early and concurrent implementation opportunities during proposal development, during conduct of the research, and in developing IPs. It should be recognized that delaying implementation of research results is a delayed- or lost-opportunity cost. Additionally, if possible, to maximize the return on the research investment (ROI), broad statewide implementation should be the goal. During the conduct of the IP, if a delay or issue is encountered by an implementer—typically the BO—the implementer should bring this to the attention of his or her supervisor or DC. The BO is to submit a signed, approved IP to the R&D Division within 30 days after the completion of the research (project completion date). Approval to close out a project is not dependent on the BO's submission of the IP. While

all SAC members may sign the IP, only the implementers, PA, and BO signatures are required.

8.4 Final Report Dissemination

The JTRP Office will provide electronic copies of the final reports to the appropriate agencies and repositories as defined in the document titled *JTRP Report Publishing Process* (see section 8.2). JTRP Final Reports will be made available for viewing, downloading, and/or purchase of a print-on-demand copy at the JTRP e-Pubs repository: <http://docs.lib.purdue.edu/jtrp/>

8.5 Publication Provisions and Proprietary Rights

Publication provisions and proprietary rights shall be in accordance with the current contract language and federal and state law.

At least 50 percent of all royalties will be forwarded to the JTRP Office for utilization in the JTRP research program.

9. Implementing Research

The benefit of applied research is realized when research results are utilized in operational practice and innovation is not what Innovators do, it is what Customers and Clients adopt. Research results typically will not be fully or cost-effectively incorporated into operations without deliberate forethought and planning. Successful implementation begins during the identification of research needs and is integrated into development of the proposal. Opportunities for accelerated and concurrent implementation should be identified and reflected in the proposal time line and deliverables. There is a missed-opportunity cost when research results are not quickly and fully implemented. **The underlying goal is to implement viable research results into practice as soon as possible, and as fully as possible.** Each proposal is to include a section discussing proposed implementation, including potential ownership and use of research results, obstacles, resource requirements, policy issues, etc.

A completed and signed Implementation Plan (IP; see example in Appendix F) is required as part of each project. The IP is to be developed by the project BO in consultation with the SAC, PA, and PI. A good practice is to complete the IP at the closeout SAC meeting. NOTE: An IP can include multiple individuals and steps to address in order to fully implement the research findings. As indicated in the IP, a time line of implementation activities is to be included. A research project is not completed until a detailed and signed IP is submitted by the BO. IPs are documented in a Smartsheet for the BOs, Director Owners and Executive staff review, update and monitoring.

The signed IP will be distributed to INDOT leadership and staff responsible for implementation. Primary responsibility and accountability for implementation rests with the designated implementers identified in the IP. The IP should be considered not only as a plan to implement, but a working document that needs to be reviewed frequently and updated as needed, by the implementer(s). If resources such as PI time (e.g., for training, workshops) and purchase of prototype equipment are required for successful implementation, the INDOT R&D and JTRP Offices are willing to provide assistance where possible and should be contacted.

A new resource for researchers is the Purdue University Research Repository (PURR), which is a university Research Core (<http://www.purdue.edu/research/cores>) for Purdue faculty, graduate students, and staff. PURR provides a free service and platform for the creation of funder-compliant data management plans, a collaborative project space for data management, and a wizard for the publication of datasets with digital object identifiers (DOIs). In addition, PURR ensures the long-term preservation of research data.

To learn more about the Purdue University Research Repository, watch the PURR introductory video (<http://www.youtube.com/watch?v=Yw0Ij7FqA8>) or visit the PURR website (<https://purr.purdue.edu>).

9.1 Funding Implementation Activities

Implementation of research results is an approved expenditure within R&D work program outlined in the annual *Work Program and Cost Estimate* (with some limitations). Consequently, Implementation Proposals can be submitted as other research proposals for funding. They are generally submitted near the completion of a research project. Implementation Proposals are developed, approved, and conducted in the same manner as research proposals, except that the deliverables of the project are the actual implementation of research results. As such, a final report may not be required for an Implementation Project; however, semi-annual progress reports are required for these projects.

To encourage implementation of viable research results, an implementation line item is included in the annual *Work Program and Cost Estimate* prepared by the INDOT R&D Division. These funds are set aside specifically for implementation activities and projects. Accessing these funds should be done in coordination with the project PA and/or the INDOT R&D Division.

9.2 Implementation Plans

Implementation Plans (IP) are developed at the end of each completed research project by the Principal Implementer (generally the same person as the project BO). IPs are due no later than 30 days after project closeout. BOs are responsible for completion of the IP and forwarding a completed/signed copy to R&D by the 30 day period. R&D/JTRP will transfer IP details to the Smartsheet tab for implementation. DCs/Direct Reports have access to the Smartsheet tab and can track the implementation status. The Principal Implementer is responsible for updating and maintaining the project status in Smartsheet.

Implementation assistance may be available through the research program, if requested by the Principal Implementer. The status of IPs may be discussed at JTRP Board meetings.

9.3 INDOT Research Program IMPACT and Return on Investment (ROI)

INDOT R&D Division compiles and reports on the status of implementation projects, including developing an annual IMPACT summary and ROI reports.

Evaluating the ROI is good business practice when practical and where data exists (e.g., cost factors). INDOT R&D conducts an ROI based on benefit-cost analysis of quantifiable benefits projects to demonstrate the cost savings, impact of research and the overall effectiveness of INDOT Research program.

The annual IMPACT summary and the ROI (of completed projects) are published at <http://www.in.gov/indot/2404.htm>.

Appendix A

JTRP Contract between INDOT and JTRP (Purdue)

**CONTRACT
BETWEEN
PURDUE UNIVERSITY
WEST LAFAYETTE, INDIANA
AND
INDIANA DEPARTMENT OF TRANSPORTATION
STATE OF INDIANA
FOR THE
JOINT TRANSPORTATION RESEARCH PROGRAM**

EDS # A 249-18-01180087

This Contract, made and entered into on this 5th day of June, 2018, by and between the Indiana Department of Transportation, hereinafter referred to as "INDOT," and Purdue University hereinafter referred to as "PURDUE," on behalf of its Joint Transportation Research Program, hereinafter referred to as "JTRP."

WITNESSETH

WHEREAS, INDOT is faced with certain basic technical problems in its operations and in connection with its planning of future operations; such problems warranting considerable study and research; and

WHEREAS, the JTRP is a cooperative effort created by the Indiana Legislature by its Acts of 1990 and codified at IC §8-23-9-56, as a means of providing research and development for the best methods of improving and maintaining the state transportation system; and

WHEREAS, the JTRP is housed at PURDUE; and

WHEREAS, PURDUE has the technical staff and facilities capable of doing such research work; and

WHEREAS, INDOT expects that the United States Department of Transportation ("USDOT") – Federal Highway Administration ("FHWA") and other agencies within the USDOT will participate financially with INDOT in paying the attendant costs of federally funded research studies and activities, such studies and activities hereinafter referred to as "SPR," and other Federally Funded Studies and Activities; and

WHEREAS, INDOT expects to pay the total attendant costs of totally state funded studies and activities, such studies and activities hereinafter referred to as "JTRP Studies and Activities;" and

WHEREAS, it is required by the FHWA and other agencies within the USDOT, and in the best interest of INDOT, that the basic provisions pertinent to the conduct of work performed by the JTRP be enumerated in a contract, hereinafter referred to as "Contract;" and

WHEREAS, PURDUE will submit on behalf of the JTRP to INDOT various "Proposals for Research Studies," hereinafter referred to as "Proposals" and each will include a statement of objectives, work plan, deliverables, business case, anticipated benefits and implementation of the study, and total cost and timeline and will by reference incorporate the provisions of this Contract; and

WHEREAS, the Proposals will be approved by the INDOT Commissioner (or his designee) and the JTRP Executive Board.

NOW THEREFORE, IT IS AGREED that PURDUE shall conduct all JTRP research work in accordance with the following:

SPECIFIC PROVISIONS

PURDUE agrees to undertake and perform completely each approved research project, including such investigations, services, activities, consultations, data-gathering, and other related work and studies as it may feel necessary to arrive at satisfactory conclusions pertinent to the specific problems posed, including a final report (and other deliverables identified in the proposal) with recommendations germane to such conclusions. The term "research project" as used herein shall include planning technical investigations and other data gathering and analysis activities as these may be defined in approved Proposals.

FOR SPR AND OTHER FEDERALLY FUNDED OR STATE FUNDED STUDIES AND ACTIVITIES THE FOLLOWING PROVISIONS ARE A PART OF THIS CONTRACT:

- I. Term. The term of this Contract shall be for five years from the date of the last signature to this Contract, subject to either Party's right to terminate the Contract at any time upon thirty (30) days written notice. If approved research or extension activities are cancelled under this provision, INDOT shall reimburse PURDUE for all work completed to that date and for all irrevocable commitments entered into prior to the date of termination notice. Upon termination, all data, results, reports and other materials developed by the JTRP will become property of PURDUE, subject to INDOT's right to inspect such documents.
- II. SPR Studies are typically funded using federal and state funds. Other studies and activities may have different funding splits. INDOT, through its annual budgeting process, authorizes an annual appropriation for research assistance and administration at PURDUE. This budgeted amount is made available to PURDUE in advance of disbursement by PURDUE. The exact amount is recommended to the JTRP Executive Board for approval by the JTRP Executive Board and requisitioned by voucher from PURDUE to INDOT as per an annual purchase for the JTRP services made by INDOT.

Legislation authorizes this annual research funding by INDOT to PURDUE for research and extension. Payment of the research funding is obtained by filing a voucher for the amount authorized by INDOT and is not based on the JTRP expenditures by PURDUE. However, to ensure INDOT constantly has knowledge of how the funds are being used and/or accumulated, PURDUE will submit a quarterly estimate of expenses for each succeeding quarter and report the actual expenses of the most recent quarter for which such expenses are available to the JTRP Executive Board.

- III. Maximum Fee: The total sum paid PURDUE under approved study proposals shall not exceed the estimated total cost included in the approved Proposal without written approval as specified in the JTRP Executive Board, approved "User's Manual for Research and Innovation." The basis of payment from INDOT to PURDUE will be actual costs incurred by PURDUE in conducting the research.
- IV. Purchase Orders. If the Commissioner of INDOT (or his designee) and the JTRP Executive Board approves the Proposal, INDOT will issue a Purchase Order per study to PURDUE for the JTRP's expenses.
- V. Cost Principles: The cost principles and eligibility of direct and indirect cost items relative to federally funded research activities are set forth in the Code of Federal Regulations, Title 48, Contract Cost Principles and Procedures, Subpart 31.3 (OMB Circular A-21). Direct Costs only will be claimed for reimbursement when in the form of expenses for personnel, travel, equipment, rental of special space, materials and services, as further defined within the provisions for this Contract.

Charges made by PURDUE to INDOT and payable by INDOT for JTRP, SPR and other federally funded studies and activities are to be actual expenditures for personnel time, travel and subsistence, expendable and non-expendable equipment, supplies, and miscellaneous services, including computational expenses and other incidental items, to be billed monthly or quarterly by PURDUE to INDOT on supplementary vouchers. Such vouchers will be supported by copies of the original documents covering the charges. Such supporting documentation will be maintained at PURDUE.

INDOT maintains the right to withhold an agreed upon percentage of study funds until final deliverables, as outlined in the proposal, are satisfactorily received by INDOT. Furthermore, with written notification to PURDUE prior to Proposal approval, INDOT reserves the right to assign and make payments for study activities to deliverables identified in the Proposal(s); PURDUE retains the right to decline participation in such Proposals.

Personnel time will be charged 1) on hourly employees for only that time actively spent on the project and 2) on salaried professional staff for only that

percentage of effort actively expended on a project, including for both hourly and salaried personnel vacations and sick leave allowances according to the policy of PURDUE at the basic rate of pay of their persons employed, plus PURDUE payments for fringe benefits.

For hourly employees, records of time actually spent on each project by each employee will be maintained by PURDUE and available for review by INDOT.

For salaried professional staff, a certification shall be made on payroll forms at the end of each month of the percentage of effort actually expended by each employee during the previous semester on each project. These too will be maintained by PURDUE and available for review by INDOT.

Totals of salaries and wages shall be shown on all billings and will be supported by copies of payrolls showing basic rates of pay, and all loadings will be added as separate items or on a percentage basis applied to the total salaries. There will be no charge for Facilities & Administration ("F&A") costs. PURDUE will contribute office space, heat, utilities, and other services usually associated with F&A costs to the transportation research program of the State of Indiana, although the JTRP Executive Board, at their discretion, may allocate funds for F&A costs in special circumstances.

VI. Equipment Purchase and Disposition:

All purchases of nonexpendable equipment purchased through PURDUE initially costing more than the amount specified in the JTRP Executive Board approved, "User's Manual for Research and Innovation" must be accounted for with the equipment maintained on an inventory. This inventory will be maintained by the JTRP Director for studies performed through the JTRP, and a copy of the inventory in the JTRP Executive Board approved format will be forwarded to INDOT's Research & Development Office by April 15th of each year. The equipment will likewise be inventoried in PURDUE's Property Accounting System.

Equipment purchases shall be itemized as much as possible in the study proposal. Approval of the proposal constitutes approval of purchase of the equipment. If the approved proposal includes itemized equipment costs, no further approval of purchasing these equipment items is necessary. If only the total estimated equipment cost is included in the approved proposal, but the equipment items are not listed, further approval is required by the Study Advisory Committee ("SAC") and the JTRP Executive Board when individual pieces of equipment are purchased costing more than the amount specified in the JTRP Executive Board approved, "User's Manual for Research and Innovation." If the cost of an approved piece of equipment exceeds the itemized cost by the amount specified in the JTRP Executive Board approved, "User's Manual for Research and Innovation," SAC approval is recommended.

At the end of each research project, the JTRP Executive Board is to be notified what equipment was purchased as a result of the project and whether PURDUE desires to retain possession of the equipment for future INDOT research projects. INDOT can take ownership of the equipment and has the first right-of-refusal to acquire said ownership. If INDOT decides not to take ownership of equipment and PURDUE decides not to retain the equipment, it may be sold to a third party outside INDOT and PURDUE at salvage value and removed from the PURDUE inventory. Funds from the salvage will be returned to the JTRP for use in the JTRP research and administration and identified in the PURDUE quarterly estimate of expenditure report. When INDOT takes possession of a piece of equipment, the equipment will be removed from the PURDUE inventory and added to the INDOT inventory.

VII. Records: PURDUE shall maintain accounting records and other evidence pertaining to the costs incurred on each project. This data will be made available for inspection by INDOT, FHWA or any authorized representative of the State and Federal Government at all reasonable times at PURDUE during the study period and for three (3) years after the date of the final payment of funds to PURDUE with respect to the study. Copies of such records shall be furnished if requested.

VIII. Proprietary Rights: It is agreed that if patentable discoveries or inventions should result from research described herein, such findings shall be promptly reported to INDOT and FHWA. PURDUE will have the right to retain all rights, title and interest in patentable inventions and copyrightable materials including software subject to:

A. A nonexclusive, nontransferable, irrevocable, paid-up license to the United States in accord with the provisions of Title 37, *Patents, Trademarks, and Copyright, Part 401 – Rights To Inventions Made By Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts, and Cooperative Agreements*; and

B. A nonexclusive, nontransferable, irrevocable, paid-up license to the State of Indiana for governmental purposes; and

C. JTRP Executive Board approved, “User’s Manual for Research and Innovation.”

Purdue may license such patentable inventions, copyrightable materials, and software to third parties. When such licenses are royalty bearing, INDOT and Purdue agree to equally share all net royalty income (Net Royalty Income = Gross Royalty Income less direct legal expenses) except for Type One software as outlined below. INDOT designates its share of Net Royalty Income from the

sale of Type One software to the JTRP research and administrative expenses at Purdue.

Furthermore, the parties agree that PURDUE will retain all rights provided for the subgrantee or contractor, and the State of Indiana, acting through its Department of Transportation, will not, as a part of the consideration for awarding this or any future awards, obtain rights in the subgrantee's or contractor's subject inventions. 23 CFR § 420.121(j).

It is recognized that two types of software may be developed under this Contract:

- i. Type One: JTRP developed, supported and distributed software. Revenue generated from the sale of Type One Software will be used to offset JTRP expenses related to maintaining, supporting and updating the software.
- ii. Type Two: JTRP developed but distributed and supported by a third party under license from PURDUE. The license provides for full third party funding to produce, maintain, and improve the software. The license also provides for royalty payments to PURDUE based on the third party sales of the software.

Furthermore, any revenue generated from the sale of reports, publications, data, information, or electronic media described above by the JTRP will be used to offset JTRP expenses.

- IX. Period of Performance: Each study will be made during the period stated in the approved proposal, unless modified by written approval of INDOT Research and Development and the JTRP Executive Board (of its designee).
- X. Inspection of Work: INDOT, FHWA and other appropriate federal agencies, shall be accorded proper facilities for review and inspection of the work hereunder and shall at all reasonable times have access to the premises, to all books, records, correspondence, instructions, receipts, vouchers and memoranda of every description pertaining to the work hereunder. Arrangements for all reviews and inspections by FHWA or other Federal agencies, will be made by INDOT.
- XI. Travel: It is agreed that all out-of-state travel performed for, or expenses in connection therewith incurred against, a project shall be as specified in the JTRP Executive Board approved, "User's Manual for Research and Innovation," reported to the JTRP Executive Board on a quarterly basis.
- XII. Reports: It is agreed that PURDUE will furnish written progress reports as specified in the JTRP Executive Board approved, "User's Manual for Research and Innovation," on each JTRP project. It is provided that Interim Research

Reports, as appropriate, and the Final Research Report on each project will be prepared and submitted to the SAC and INDOT for review and comment prior to their publication or distribution. Acceptance of the final report by INDOT as satisfactory is a requirement for fulfillment of this Contract as it pertains to a study. Upon approval by INDOT, the JTRP will publish and distribute such interim and/or final reports on each project as specified in the JTRP Executive Board approved, "User's Manual for Research and Innovation."

All Interim and Final Reports published shall contain the following statement on the credit sheet: "The contents of this report reflect the views of the author(s) who is (are) responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the Indiana Department of Transportation or the Federal Highway Administration or the appropriate Federal agency. This report does not constitute a standard, specification or regulation."

XIII. Publication Provisions:

- A. Papers, interim or final reports, forms or other material which are a part of the work under an approved study will be copyrighted by PURDUE, with the provision that INDOT and FHWA or the appropriate Federal agency and the JTRP authors reserve a royalty-free, nonexclusive and irrevocable license to reproduce, publish, or otherwise use, and to authorize others to use, the work for government or academic purposes on condition that appropriate credit is given to the JTRP as the place of first publication. (Refer to Article VIII for a more detailed discussion regarding Proprietary rights.)
- B. Prior to acceptance of a final report, either party to the Contract or FHWA, or the appropriate Federal agency, may initiate a request for publication of a final or interim report, or any portions thereof. No other reports may be published, except as provided in Section H below.
- C. Neither party shall publish nor otherwise disclose, nor permit to be disclosed or published, the results of any investigations herein contemplated, or any particulars thereof, during the period of each project or after the completion of each project without notifying the other and securing its review in writing, except as provided in Section H below. A copy of any proposed publication or presentation by PURDUE personnel, based on a final report, that reveals any aspect of a research project conducted under this Contract (hereinafter called "Manuscript") will be submitted to INDOT by the PURDUE principal investigator at least thirty (30) days in advance of submission for publication or presentation. INDOT will have thirty (30) days to review the Manuscript from the date the Manuscript is received. If INDOT notifies the principal investigator in writing that the Manuscript contains any unauthorized disclosure of INDOT intellectual property, or

INDOT confidential information, the PURDUE principal investigator shall remove the reference to INDOT intellectual property or INDOT confidential information from the Manuscript.

- D. The parties to this Contract shall have equal responsibility to review material for publication, except that INDOT reserves the right to initially publish the final report.
- E. In the event of failure of agreement between INDOT and PURDUE relative to the publication of a final report, or any interim reports during the period of a project, INDOT reserves the right to publish independently, in which event the non-concurrence of PURDUE shall be set forth, if requested by PURDUE.
- F. If INDOT does not elect to publish a final report, publication by PURDUE shall then be a matter within the province of PURDUE policy; but, if PURDUE then elects to publish independently, the non-concurrence of INDOT and FHWA, or the appropriate Federal agency shall be set forth, if requested by INDOT or FHWA, or the appropriate Federal agency.
- G. When the scheduled time for presentation of a paper containing previously undisclosed findings does not permit formal review and approval of a complete report, abstracts may be used for notification of intent to present a paper based on the study. Such presentation must protect the interests of the other party by the inclusion of a statement in the paper and in the presentation to the effect that the paper has not been reviewed by the other party or FHWA, or the appropriate Federal agency. Lectures to other groups which describe research plans, but disclose neither data nor results, are permissible.
- H. Publication by either party shall give credit to the other party and to FHWA, or the appropriate Federal agency unless, upon failure of agreement on any report of the study, FHWA, the appropriate Federal agency or either of the contracting parties requests that its credit acknowledgment be omitted.
- I. After acceptance of a final report, PURDUE, INDOT and FHWA, or the appropriate Federal agency is free to use the data and results without restriction. If patentable items are involved, this paragraph is subject to the provisions of Section VIII.

XIV. Study Advisory Committee: The parties to this Contract, with the consent and approval of the individuals and agencies concerned, will appoint a SAC for each research project as specified in the JTRP Executive Board approved, "User's Manual for Research and Innovation." All agencies cooperating directly with INDOT shall be represented on the SAC. The SAC shall provide the principal investigator of the project with technical advice and with suggestions for work

programming to promote the efficient and prompt attainment of the research objectives and the implementation thereof as set forth in the approved Proposal for each project. The SAC will provide approvals as outlined in the JTRP Executive Board approved, "User's Manual for Research and Innovation."

- XV. Termination of Previous Agreement: This Contract will become applicable to all future JTRP research projects, thereby terminating and superseding the provisions of the document entitled "A Compilation of Established Policies for Cooperative Special Study Projects" as compiled November 2, 1961 and revised February 1, 1970 and April 4, 1979. Furthermore, this contract terminates and supersedes the Memorandum of Understanding, dated September 22, 1999, as well as three addenda dated June 18, 1980, August 27, 1987, and July 1, 2000 and the contracts dated April 30, 2008 and June 21, 2013.
- XVI. Rental of Space, Special Equipment or Facilities: The actual cost to PURDUE of renting additional space, special equipment or facilities, not owned by PURDUE but required for a JTRP project, will be approved by INDOT through a listing in the proposal. The cost thereof shall be included in the total cost of the study.
- XVII. Ownership of Data: The ownership of all data, drawings, charts, etc., which are prepared or produced under this Contract shall be vested in PURDUE with the understanding INDOT has access to such data, drawings, charts, etc., as desired, during each project period and for a period of at least three (3) years following the completion of each study.
- XVIII. Subcontracting: It is agreed that PURDUE will not enter into contracts with a third party to execute any part of a project, without prior written approval of INDOT. It is agreed, however, that this provision shall not be interpreted to prevent PURDUE from obtaining professional assistance at reasonable cost or at no cost from any of its departments or units, or from INDOT.
- XIX. Change in Study: Any alteration, extension, expansion, supplement, or modification of the scope of work and method of study as detailed in an approved proposal must be prior-approved by the SAC, the JTRP Executive Board, and INDOT's Commissioner or his designee, as specified in the JTRP Executive Board approved "User's Manual for Research and Innovation."
- XX. To facilitate the fiber optic communication line that allows direct-access to the Purdue University Computing Center, by the INDOT Office of Research & Development, INDOT will provide funding to the JTRP administrative core funds equal to the actual cost for the monthly service fees. The fiber optic line is installed in support of the Joint Transportation Research Program of INDOT and PURDUE. It is anticipated that INDOT will provide funding for the access and maintenance fees for as long as the JTRP exists at PURDUE.

- XXI. JTRP Director Responsibilities: The JTRP Director is responsible for the overall operation of the JTRP. In this capacity, the Director is responsible for the timely submission of project reports, meeting program requirements and deadlines, and assuring compliance with JTRP Executive Board and PURDUE policies, procedures, and guidelines including the JTRP Executive Board approved, "User's Manual for Research and Innovation." The Director will monitor all JTRP projects to assure such compliance. The Director will report any faculty and staff failure to comply to the appropriate PURDUE academic or fiscal administrator. PURDUE will take appropriate action to either remedy the immediate problem and/or prevent future occurrences by such faculty or staff member.

The Director will review all PURDUE proposals prepared for submission to the JTRP Board. If acceptable, the Director will submit the proposal, through normal PURDUE procedures, to the JTRP Executive Board for consideration. PURDUE will ensure that procedures are in place to ensure that proposal budgets (including budget changes and expansions) are reasonable and accurately reflect the level of effort required to successfully accomplish project objectives outlined in the proposal and that expenditures against such budgets are properly made and invoiced.

- XXII. Termination of Contract: Either party may terminate this Contract by giving the other party thirty (30) days written notice of its election to do so. If research projects are cancelled under this provision, INDOT shall reimburse PURDUE for all work completed to that date and for all commitments entered into prior to the date of termination notice. Upon termination, all data, results, reports, and other materials developed by PURDUE during JTRP projects will become the property of INDOT.

- XXIII. Compliance with Laws:

- A. PURDUE shall comply with all applicable federal, state and local laws, rules, regulations and ordinances, and all provisions required thereby to be included herein are hereby incorporated by reference. The enactment or modification of any applicable state or federal statute or the promulgation of rules or regulations thereunder after execution of this Contract shall be reviewed by the State and PURDUE to determine whether the provisions of this Contract require formal modification.
- B. PURDUE and its agents shall abide by all ethical requirements that apply to persons who have a business relationship with the State as set forth in IC §4-2-6 *et seq.*, IC §4-2-7, *et. seq.*, and the regulations promulgated thereunder. **If PURDUE has knowledge, or would have acquired knowledge with reasonable inquiry, that a state officer, employee, or special state appointee, as those terms are defined in IC §4-2-6-2, has a financial interest in the Contract, PURDUE shall ensure compliance with the**

disclosure requirements in IC §4-2-6-10.5 prior to the execution of this Contract. If PURDUE is not familiar with these ethical requirements, PURDUE should refer any questions to the Indiana State Ethics Commission, or visit the Inspector General's website at <http://www.in.gov/ig/>. If PURDUE or its agents violate any applicable ethical standards, the State may, in its sole discretion, terminate this Contract immediately upon notice to PURDUE. In addition, PURDUE may be subject to penalties under IC §§4-2-6, 4-2-7, 35-44.1-1-4, and under any other applicable laws.

- C. PURDUE certifies by entering into this Contract that neither it nor its principal(s) is presently in arrears in payment of taxes, permit fees or other statutory, regulatory or judicially required payments to the State. PURDUE agrees that any payments currently due to the State may be withheld from payments due to PURDUE. Additionally, further work or payments may be withheld, delayed, or denied and/or this Contract suspended until PURDUE is current in its payments and has submitted proof of such payment to the State.
- D. PURDUE warrants that it has no current, pending or outstanding criminal, civil, or enforcement actions initiated by the State, and agrees that it will immediately notify the State of any such actions. During the term of such actions, PURDUE agrees that the State may delay, withhold, or deny work under any supplement, amendment, change order or other contractual device issued pursuant to this Contract.
- E. If a valid dispute exists as to PURDUE's liability or guilt in any action initiated by the State or its agencies, and the State decides to delay, withhold, or deny work to PURDUE, PURDUE may request that it be allowed to continue, or receive work, without delay. PURDUE must submit, in writing, a request for review to the Indiana Department of Administration ("IDOA") following the procedures for disputes outlined herein. A determination by IDOA shall be binding on the parties. Any payments that the State may delay, withhold, deny, or apply under this section shall not be subject to penalty or interest, except as permitted under IC §5-17-5.
- F. PURDUE warrants that PURDUE and its subcontractors, if any, shall obtain and maintain all required permits, licenses, registrations, and approvals, and shall comply with all health, safety, and environmental statutes, rules, or regulations in the performance of work activities for the State. Failure to do so may be deemed a material breach of this Contract and grounds for immediate termination and denial of further work with the State.
- G. PURDUE affirms that, if it is an entity described in IC Title 23, it is properly registered and owes no outstanding reports to the Indiana Secretary of State.

- H. As required by IC 5-22-3-7:
- (1) PURDUE and any principals of PURDUE certify that:
 - (A) PURDUE, except for de minimis and nonsystematic violations, has not violated the terms of:
 - (i) IC §24-4.7 [Telephone Solicitation Of Consumers];
 - (ii) IC §24-5-12 [Telephone Solicitations]; or
 - (iii) IC §24-5-14 [Regulation of Automatic Dialing Machines];in the previous three hundred sixty-five (365) days, even if IC § 24-4.7 is preempted by federal law; and
 - (B) PURDUE will not violate the terms of IC §24-4.7 for the duration of the Contract, even if IC §24-4.7 is preempted by federal law.
 - (2) PURDUE and any principals of PURDUE certify that an affiliate or principal of PURDUE and any agent acting on behalf of PURDUE or on behalf of an affiliate or principal of PURDUE, except for de minimis and nonsystematic violations,
 - (A) has not violated the terms of IC §24-4.7 in the previous three hundred sixty-five (365) days, even if IC §24-4.7 is preempted by federal law; and
 - (B) will not violate the terms of IC §24-4.7 for the duration of the Contract, even if IC §24-4.7 is preempted by federal law.

XXIV. Drug-Free Workplace: As required by Executive Order No. 90-5 dated April 12, 1990, issued by the Governor of Indiana, PURDUE hereby covenants and agrees to make a good faith effort to provide and maintain a drug-free workplace. PURDUE will give written notice to the State within ten (10) days after receiving actual notice that PURDUE, or an employee of PURDUE in the State of Indiana, has been convicted of a criminal drug violation occurring in the workplace. False certification or violation of this certification may result in sanctions including, but not limited to, suspension of contract payments, termination of this Contract and/or debarment of contracting opportunities with the State for up to three (3) years.

In addition to the provisions of the above paragraphs, if the total amount set forth in this Contract is in excess of \$25,000.00, PURDUE certifies and agrees that it will provide a drug-free workplace by:

- A. Publishing and providing to all of its employees a statement notifying them that the unlawful manufacture, distribution, dispensing, possession or use of a controlled substance is prohibited in PURDUE's workplace and specifying the actions that will be taken against employees for violations of such prohibition;
- B. Establishing a drug-free awareness program to inform their employees of:
 - (1) the dangers of drug abuse in the workplace;
 - (2) PURDUE's policy of maintaining a drug-free workplace;
 - (3) any available drug counseling,

rehabilitation, and employee assistance programs; and (4) the penalties that may be imposed upon an employee for drug abuse violations occurring in the workplace;

- C. Notifying all employees in the statement required by subparagraph (A) above that as a condition of continued employment the employee will: (1) abide by the terms of the statement; and (2) notify PURDUE of any criminal drug statute conviction for a violation occurring in the workplace no later than five (5) days after such conviction;
- D. Notifying the State in writing within ten (10) days after receiving notice from an employee under subdivision (C)(2) above, or otherwise receiving actual notice of such conviction;
- E. Within thirty (30) days after receiving notice under subdivision (C)(2) above of a conviction, imposing the following sanctions or remedial measures on any employee who is convicted of drug abuse violations occurring in the workplace: (1) taking appropriate personnel action against the employee, up to and including termination; or (2) requiring such employee to satisfactorily participate in a drug abuse assistance or rehabilitation program approved for such purposes by a Federal, State or local health, law enforcement, or other appropriate agency; and
- F. Making a good faith effort to maintain a drug-free workplace through the implementation of subparagraphs (A) through (E) above.

XXV. Funding Cancellation Clause: When the Director of the State Budget Agency makes a written determination that funds are not appropriated or otherwise available to support continuation of the performance of this Contract, this Contract shall be canceled. A determination by the Director of the State Budget Agency that funds are not appropriated or otherwise available to support continuation of performance shall be final and conclusive.

XXVI. Non-Discrimination:

- A. Pursuant to IC §22-9-1-10 and the Civil Rights Act of 1964, PURDUE shall not discriminate against any employee or applicant for employment, to be employed in the performance of work under this Contract, with respect to hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment, because of race, color, religion, sex, disability, national origin, ancestry or status as a veteran. Breach of this covenant may be regarded as a material breach of this Contract. Acceptance of this Contract also signifies compliance with applicable federal laws, regulations, and executive orders prohibiting discrimination in the provision of services based on race, color, national origin, age, sex, disability or status as a veteran.

B. PURDUE understands that INDOT is a recipient of federal funds. Pursuant to that understanding, PURDUE agrees that if PURDUE employs fifty (50) or more employees and does at least \$50,000.00 worth of business with the State and is not exempt, PURDUE will comply with the affirmative action reporting requirements of 41 CFR 60-1.7. PURDUE shall comply with Section 202 of executive order 11246, as amended, 41 CFR 60-250, and 41 CFR 60-741, as amended, which are incorporated herein by specific reference. Breach of this covenant may be regarded as a material breach of Contract.

XXVII. Payment: All payments shall be made thirty-five (35) days in arrears in conformance with State fiscal policies and procedures and, as required by IC §4-13-2-14.8, the direct deposit by electronic funds transfer to the financial institution designated by PURDUE in writing unless a specific waiver has been obtained from the Indiana Auditor of State. No payments will be made in advance of receipt of the goods or services that are the subject of this Contract except as permitted by IC §4-13-2-20.

XXVIII. Notices: Notices and communications regarding the Contract will be addressed to the party to receive such notice or communication at the address given below, or such address as may hereafter be designated in writing.

A. Notices to the State shall be sent to:

Director, Office of Research & Development
1205 Montgomery Street – P. O. Box 2279
West Lafayette, IN 47906

B. Notices to PURDUE shall be sent to:

Director, Joint Transportation Research Program
Purdue University
1284 Civil Engineering Building
West Lafayette, IN 47907

And

Sponsored Program Services
Purdue University
302 Wood Street, Young Hall
West Lafayette, IN 47907-2108

XXIX. Governing Law: This Contract shall be governed, construed and enforced in accordance with the laws of the State of Indiana, without regard to its conflict of laws rules. Suit, if any, must be brought in the State of Indiana.

[REMAINDER OF PAGE INTENTIONALLY LEFT BLANK]

Non-Collusion

The undersigned attests, subject to the penalties for perjury, that the undersigned is PURDUE, or that undersigned is the properly authorized representative, agent, member or officer of PURDUE. Further, to the undersigned's knowledge, neither the undersigned nor has any other member, employee, representative, agent or officer of PURDUE, directly or indirectly, has entered into or been offered any sum of money or other consideration for the execution of this Contract other than that which appears upon the face hereof. **Furthermore, if the undersigned has knowledge that a state officer, employee, or special state appointee, as those terms are defined in IC §4-2-6-1, has a financial interest in the Contract, PURDUE attest to compliance with the disclosure requirements in IC §4-2-6-10.5.**

In Witness Whereof, PURDUE and INDOT have, through duly authorized representatives, entered into this Contract. The parties having read and understood the forgoing terms of this Contract, do by their respective signatures dated below hereby agree to the terms thereof.

Purdue University

Indiana Department of Transportation

Executed by:

Recommended for Approval By:

SCOTT M LEVANS

Steve Duncan

Scott M Levans
Sponsored Program Services

Steve Duncan
Director of Contract Administration

Date: May 2 2018

Date: 5-14-2018

Dr. Barry K. Partridge

Dr. Barry K. Partridge, Director
Office of Research & Development

Date: 5/9/2018

Joseph McGuinness (for)

Joseph McGuinness
Commissioner

Date: 5/14/2018

**APPROVALS
STATE OF INDIANA**

State Budget Agency

Jason D. Dudich (for)
Jason D. Dudich, Director

Date: 5/31/18

Department of Administration

Lesley A. Crane (for)
Lesley A. Crane, Commissioner

Date: 5.21.18

Approved as to Legality and Form:

Donald Hannah (for)
Curtis T. Hill, Jr.
Attorney General of Indiana

Date: 6-5-18

Appendix B

Research Need Statement Templates

INDOT/JTRP RESEARCH IDEA FORM

(Maximum half page)

Title of the Research Idea:

Brief Description of the idea:

Benefits of the idea to INDOT:

INDOT/JTRP FY-201X Strategic Research Plan

Research Needs Statement (RNS)

RNS Title:

Peer/ Focus Group:

INDOT Primary Contacts:

Background & Problem Statement:

Proposed Scope of Work: (include items such as: research approach, deliverables, timeframes, project cost, etc.) Complete Estimated Cost Table below.

Implementation Potential: (describe items such as: project deliverables, how the deliverables will be implemented, person(s) responsible for implementation, timeframes for implementation, resources/funding available, resources/funding needed, any policy or specification changes needed to implement, etc. Please consider especially opportunities for concurrent or accelerated implementation)

INDOT Strategic Priorities Impacted (select the primary priority area implementation of this project will impact):

- Safety**
- Mobility**
- Asset Sustainability**
- Customer Service**
- Organization & Workforce**
- Economic Competiveness**
- Innovation & Technology**

INDOT KPI Impacted (Select the primary KPI – select only one)

	<i>KPI #1: State Controlled Road in Fair or Better Condition</i>
	<i>KPI #2: State Owned and Maintained Bridges Available for Use as Intended</i>
	<i>KPI #3: Construction Contracts Closed on Budget</i>
	<i>KPI #4: Construction Contracts Completed on Time</i>
	<i>KPI #5: Severe Crashes on State Controlled Roads</i>

Implementation Benefits

Describe the expected benefits of the research results in the following table and rank order the benefits in order of importance (with 1 being the most important).*

Rank	BENEFITS	DESCRIPTION OF BENEFIT
	Cost Savings (avoidance and revenue enhancement)	
	<i>(such as: construction costs, material costs, early project completion, in-house labor and equipment costs, improve design to avoid over design, permit fees, direct revenues, etc.)</i>	
	Safety	
	<i>(such as: crash mitigation, reducing truck and vehicles conflicts, reducing INDOT's tort exposure, etc.)</i>	
	Mobility/Reduced Congestion	
	<i>(such as: travel time reliability, customer satisfaction in travel times, congestion relieve, ride quality, maintaining speed limit in construction zones, etc.)</i>	
	Quality	
	<i>(such as: improved processes/procedures, asset preservation, improved design, updated specifications, extends the life of infrastructure, etc.)</i>	
	Time Savings	
	<i>(such as: improve construction scheduling, early project completion, quicker maintenance or rehabilitation, etc.)</i>	
	Other (other tangible and intangible benefits)	
	<i>(such as: employee development/training, economic development, proof of concept, etc.)</i>	

** If there is no benefit in a particular category rank that category as 0.*

Estimated Cost Table

Proposed Project Period:

Estimated Level of Effort (JTRP Office will coordinate with Pre-award for \$ estimates based on Person-Month effort)				
	Y1	Y2	Y3	Total
Person-Months of Faculty Effort: One line for each faculty identified. (AY+SU)				
Person-Months of Staff Time: One line for each staff member identified.				
Person-Months of Grad Student (We will budget at PhD Level)				
Hours of Undergraduate time (We will budget at \$10/hr unless specified differently)				
Other Estimated Direct Costs				
Travel				
Supplies				
Capital				
Other (Specify)				

Total Estimated Costs:

Appendix C

Review Policy for JTRP Projects

Review Policy for JTRP Projects

Development, approval, initiation, progression, completion, and implementation of a JTRP research project through the JTRP Office is a collaborative effort involving the steps listed below. The primary responsible person/entity for completing these steps with the JTRP Office is indicated in the following table, although it is understood that each project is a collaborative effort that may involve multiple parties at each step.

PI = Principal Investigator; BO = INDOT Business Owner; SAC = Study Advisory Committee; JTRP = JTRP Office; R&D = INDOT Research and Development Division; EC = JTRP Executive Committee; IP = Implementation Plan; HVR = High Value Research

	Time Line	Primary Responsibility				
		PI	BO	JTRP	R&D	EC
Executive committee approval/start date of project						
Prepare Progress Report and submit to JTRP Office	Jan. 31; July 31	●				
Call SAC meeting	At least every 6 months	●				
Requests of Time Extensions	2 months prior to expiration	●				
Draft Final Report submitted to e-Pubs	4 months prior to expiration	●				
Technical review by BO, PA, and SAC	2–4 months prior to expiration		●		●	
Reviews distributed to PI	2 months prior to expiration			●		
Call closeout SAC meeting	1 month prior to expiration	●				
PI submits final report to e-Pubs	1 month prior to expiration	●		●		
JTRP Office submits final report to R&D office for approval to close out	1 week prior to expiration			●		
R&D Office approves/disapproves project closeout	1 week prior to expiration				●	
Project expiration						
Prepare IP and submit signed document to R&D office	1 month after project closeout		●			
R&D Office approves/disapproves IP and transmits approved IP to stakeholders	1 month after project closeout				●	
Execute IP	Ongoing		●			

JTRP and R&D Offices track and report status of IP for HVR	Ongoing	●		
Production editor prepares report for typesetting and sends for processing	1 month after approval to publish	●		
Proof sent to PI for review	2 months after approval to publish	●		
PI approves report		●		

Report is published on e-Pubs and available print-on-demand

Appendix D

Sample Progress Report

Semi-Annual Report: January - June 2016

PURDUE UNIVERSITY
LYLES SCHOOL OF CIVIL ENGINEERING
JOINT TRANSPORTATION RESEARCH PROGRAM

1. **Project Identification:** Indiana **SPR-3832**
Purdue Grant 207271

Project Title: Friction Surface Treatment Selection

Principal Investigator(s): Shuo Li and Yi Jiang
2. **Date Started:** 01/01/2014
3. **Completion Date:** 12/31/2016
4. **Research Agency:** Joint Transportation Research Program, Purdue University
5. **Progress:**
 - All lab tests and data analysis completed.
 - Crash data analysis completed.
6. **Problems:**
No.
7. **Work Next Six Months:**
 - Field testing on the test patches in September, 2016
 - Family curves for friction performance of pavement preservation treatment
 - Harmonization of pavement friction and crash data
 - Development of CMFs for HFST
 - LCCA worksheet
 - Draft final report
8. **Reports:** No.
9. **Research Implementation:** No.
10. **Personnel:** A post-doctoral research assistant hired for the study.

Appendix E

Example Implementation Plan



INDOT RESEARCH PROJECT IMPLEMENTATION PLAN

The Project Advisor (PA) is responsible for completing the first section of this form (Section 1). The INDOT Business Owner (BO) is responsible for coordinating proper completion of the remainder of the form (Section 2), obtaining the necessary signatures, and returning the completed form to the PA within 30 days. Please note, while ownership of the Implementation Plan (IP) rests with the INDOT Business Owner, the PI, PA, and SAC are tasked with assisting in completion of the IP.

Section 1:

Research Project Number:

High Profile Project (Y/N):

Research Project Title:

Principal Investigator (PI):

Project Advisor (PA):

INDOT Business Owner (BO):

INDOT Director Owner (DO):

Responsible Deputy Commissioner:

Date IP Sent to BO:

Section 2:

INDOT STRATEGIC PRIORITIES IMPACTED (Select the Primary Area - Select Only One):

- Safety & Mobility
- Customer Service
- Asset Sustainability
- Economic Competitiveness
- Innovation & Technology
- Organization & Workforce

INDOT KPI Impacted (select the primary KPI - *select only one*):

- KPI #1: State Controlled Road in Fair or Better Condition (2014)
- KPI #2: State Owned and Maintained Bridges Available for Use as Intended (2014)
- KPI #3: Construction Contracts Closed on Budget (2014)
- KPI #4: Construction Contracts Completed on Time (2014)
- KPI #5: Severe Crashes on State Controlled Roads (2014)
- N/A



INDOT RESEARCH PROJECT IMPLEMENTATION PLAN

Multiple Implementers: If more than one implementer (Project Manager/Business Owner), please complete the information separately for each implementer’s tasks.

Name of Primary Implementer (Project Manager/Business Owner):

Document all implementation tasks, including any concurrent and interim implementation activities that occurred during the project period. Include the target start date and end date for each task. Additional rows may be added as needed.

Implementation Tasks (list each separately)	Start Month/Year	End Month/Year	Help or resources needed for completion
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Signature of Primary Implementer (Project Manager/Business Owner):

Date:

Name of Additional Implementer (Project Manager/Business Owner), if applicable:

Document all implementation tasks, including any concurrent and interim implementation activities that occurred during the project period. Include the target start date and end date for each task. Additional rows may be added as needed.

Implementation Tasks (list each separately)	Start Month/Year	End Month/Year	Help or resources needed for completion
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Signature of Additional Implementer (Project Manager/Business Owner):

Date:



INDOT RESEARCH PROJECT IMPLEMENTATION PLAN

Name of Additional Implementer (Project Manager/Business Owner), if applicable:

Document all implementation tasks, including any concurrent and interim implementation activities that occurred during the project period. Include the target start date and end date for each task. Additional rows may be added as needed.

Implementation Tasks (list each separately)	Start Month/Year	End Month/Year	Help or resources needed for completion
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			

Signature of Additional Implementer (Project Manager/Business Owner):

Date:

Section 3:

Final Signatures, after the BO has returned the completed/signed form to the Project Advisor (PA)

Signature of Project Advisor: _____ *Date:* _____

JTRP Program Director: _____ *Date:* _____

Appendix F
JTRP - Key items for INDOT
Management Information Systems
Involvement

JTRP - Key Items for MIS Involvement

The following is a list of key items to look for when reviewing JTRP prospectus for MIS involvement:

Hardware:

- If INDOT needs to purchase, configure, or deploy any IT related hardware to staff. This includes desktop PC, laptops, tablets, phones, mifi or GPS/camera enabled data collection devices.
- Need to use server technologies that would be housed with IOT. We can assist with either virtual or physical server hosting arrangements.
- Any cloud based 3rd party hosted technologies at least need to be reviewed with MIS and IOT to meet current state security standards for off site server hosting of state services.

Commercial Software:

- Any software used in the research process but will not be used or maintained by INDOT after research does not need our attention.
- Any software requirements for implementation of research projects at INDOT does need review with MIS. We can assist with validating compatibility with INDOT hardware and compatibility with other software. We can assist in identifying comparable software that may already be in use at the state. We can assist with procurement and researching existing state contracts, purchase agreements, GSA agreements, etc...
- We can work with IOT to create software deployment packages of software if a large distribution is needed.

Purdue Written Software:

- Any software used by Purdue for Purdue only use on research projects does not need to be reviewed by MIS.
- Any plans for writing any type of software code that will be ultimately turned over to INDOT for use, support and maintenance needs to be reviewed by MIS staff.
- Software code may include applications, scripts, procedures, web services, and customizations to off the shelf software products needs to be reviewed by MIS staff.
- The research projects that include this type of custom code needs MIS representation on the SAC.

Data:

- Any project that the results of the project creates a method for collecting and storing data for implementation needs MIS review.
- If the collection of data is just for the project and during the project then MIS does not need to review.
- If the project needs source data from INDOT systems, MIS should review to assist with data sources, quality issues, and to assist in gaining access to the source data for the research team.
- Any third party data sources should also be reviewed with MIS. The state has access to hundreds of data sources from local, state, federal governments as well as several commercial products that may be available for use on the research project.

INDOT MIS will work on updating a program policy.