FY 17 Research Program IMPACT Report

20 Year Plan Next Level Roads - Economic Competitiveness & Quality of Life - Great Service - 21st Century Workforce

On-Time, On-Budget – Take Care of What We Have – Customer Satisfaction
Challenges to Research Program

- **Next Level Roads**
  - 5 Year impact
  - 122 lane miles
  - 9,628 lane miles resurfaced
  - 1,295 bridges for rehabilitation or reconstruction

- **Total projects**
  - FY 2018: 670 projects
  - FY 2019 to 2022: 700 to 900 projects each FY

- **Challenges**
  - More specialized Testing requests
  - More pavement investigation requests
  - More focus research projects to resolve issues in the field
  - More new innovations to be studied and implemented in the field
FY2017
RESEARCH PROGRAM IMPACT REPORT
IMPACT Areas

1. Operational Excellence
2. Professional Development
3. Engagement and Networking
4. State and National Recognition
5. Forensic Investigation and Specialized Testing Programs
6. Legislation, Innovations, and Economic Development
7. Program Goals and Metrics
Report Outline

Operational Excellence

Professional Development

Engagement and Networking

State and National Recognition

Forensic Investigation and Specialized Testing Programs

Legislation, Innovations, and Economic Development

Program Goals and Metrics
High Friction Surface Treatment Selection (SPR-3832)
- Improve friction on horizontal curves, interstate ramps, and bridges
- Reduce weather related accidents
- Curves: 28% of all highway fatalities

Site Selection for New Lighting Technologies (SPR-3833)
- >30% energy savings
- 20% reduction in crashes due to lighting issues
- Low maintenance
Centerline/Edge Line rumble strips
- Reduce accidents on rural two lane roads
- Reduced noise level with innovative sinusoidal profile

Performance of Alternative Diamond Interchanges (SPR-3866)
- Innovative interchange design
- Higher traffic capacity, decreased delays
- Reduced construction costs
- Reduced crashes
Development of a Cost Effective Bridge Preservation and Rehabilitation Program (SPR-3320)
- Better selection of preservation treatments (crack sealing & deck sealing)
- Increase in deck service life

Precast Slab Pilot Implementation (SPR-3947)
- Faster construction technique to open to traffic
- Increased mobility, reduced travel time
- Reduced User Costs
- Longer lasting pavement patching
IMPACT on System Preservation

- **LiDAR Applications for Safety & Asset Management**
  - Innovative technology
  - Work Zone safety, MOT compliance
  - MSE wall performance

- **NDT testing of bridge decks, SHRP 2 Implementation funding for network level assessment**
  - Innovative technology – nondestructive evaluation
  - Early detection/prevention
  - High ROI
  - Better data – better, cost effective rehabilitation strategies
  - Better selection of bridge candidates for preservation and rehabilitation
IMPACT on Process Improvements

- **LPA Process Improvement (SPR-3823)**
  - Streamlining of local contract processes
  - Local ownership and accountability

- **Smoothness Specifications Implementation**
  - Fair and balance bidding process
  - Objective, more accurate measurements
  - Longer lasting pavement
  - Replaces profilograph with inertial profilometer
Virtual Construction Inspection Technology (SPR-3945), best practices for:

- Pavement
- Bridges
- MSE Walls
- Soil and Geotechnical Investigations
- Innovative technology

IMPACT on Process Improvements

Operational Excellence High Impact Research
IMPACT on Strategic Goals

- **S-BRITE, Bridge Inspector - training/certification**
  - Better bridge inspection procedures and capabilities
  - Better trained bridge inspectors
  - Talent Management & human resource development

- **Unmanned Aircraft System (UAS) Flight Demonstration on 01/21/2017**
  - New technology applications
  - Easier and Safer to reach sites for inspection and monitoring
  - Global view of the whole structures/projects
  - Potential in accident investigations
Improving Energy Efficiency of Facilities
- Facility energy audits and monitoring using EnergyStar
- Reduced energy costs
- Uniform energy design practices

Weigh-In-Motion: feasibility study
- New WIM technology
- Validated WIM system for compliance & accuracy
- Gov. Office request
- INDOT looking at existing WIM and potential retrofits

Operational Excellence  High Impact Research
Cost Allocation, Vehicle Mile Travelled and Revenue Generation Studies
- Legislative impact
- Found truck classes 5 to 13 underpaying
- Found truck classes 1 to 4 overpaying
- Impacted HB1002 & Cambridge Systematics study

Economic Development Impact of Corridor Improvements and Preservation Projects (SPR-3912)
- Additional $150,000 from SHRP 2 Implementation funding.
- Model goes beyond typical economic analysis
IMPACT on Legislative, Planning and Finance Policies

- Ohio River Bridge, East End Crossing Project AAR of Procurement Models (SPR-4200)
  - Captures Best Practices for P3

- Damage-Wise
  - Increasing revenue by better documentation
  - Record number of Invoices and amount invoiced
  - FY17, $10M in receipts
Attracted External Funding & Partnerships
- $200,000 State Transportation Innovation Council (STIC)
- $635,000 SHRP Implementation Assistance

Coordinated 22 projects on EDC 3 and EDC 4
- Ready to Implement technologies
- Additional funding/leveraging opportunities
Impacting INDOT Innovation and Staff Development

- Section 1304 (reduced match for innovation) - Karen Hicks
- 3D Engineered Models – Mike Jenkins
- Data-driven safety analysis – Mike Holowaty (also Brad Steckler & John Wright)
- eConstruction – Mike Jenkins and Mark Miller
- GRS-IBS – Patrick Conner with LTAP
- Improving collaboration and environmental documentation – Laura Hilden
- Improving DOT Railroad coordination – Doug Gannaway
- LPA stakeholder partnering – Kathy Eaton-McKalip
- Road diets – Roy Nunnally, (and Laura Slusher with LTAP)
- Smart work zones – Ed Cox and Darcy Bullock
- Ultra-high performance concrete connections – Jeremy Hunter and Anne Rearick
Innovations, Market-ready Technologies, Partnering, Leveraging

- Automated Traffic Signal Performance Measures (ATSPMs)
- Accelerating Traffic Incident Management (TIM) Data Collection
- Advanced Hydraulic Modeling Tools
- Community Connections
- Data-Driven Safety Analysis (DDSA)
- e-Construction and Partnering: A Vision for the Future
- Integrating NEPA and Permitting
- Pavement Preservation (When, Where, and How)
- Road Weather Management – Weather-Savvy Roads
- Safe Transportation for Every Pedestrian (STEP)
- Ultra-High Performance Concrete Connections for PBES
## IMPACTed by SHRP 2 Implementation Assistance Funding

<table>
<thead>
<tr>
<th>Fourth Round Products</th>
<th>Proof of Concept Pilot</th>
<th>Lead Adopter Incentive</th>
<th>User Incentive</th>
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<tbody>
<tr>
<td><strong>June 2014</strong></td>
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<tr>
<td><strong>R09: Managing Risk in Rapid Renewal Projects</strong></td>
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<td>8 $30,000</td>
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<td><strong>R10: Innovative Strategies for Managing Complex Projects</strong></td>
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<td><strong>R06C: Rapid Technologies to Enhance Quality Control on Asphalt Pavements</strong></td>
<td>2 (GPR) $50,000</td>
<td>5 – 10 (IR) $60,000</td>
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<td><strong>R06E: Real-time Smoothness Measurements on PCC</strong></td>
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<tr>
<td><strong>C03/C11: T-PICS/Economic Analysis Tools</strong></td>
<td>6 $125,000</td>
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<td><strong>R06A: Nondestructive Testing Technologies for Concrete Bridge Decks</strong></td>
<td>Up to 8 $100,000</td>
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<td>Sixth Round Products, June 2015</td>
<td>Proof of Concept Pilot</td>
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<td>Utility Investigation Technologies, (R01B)</td>
<td>Up to 5 $150,000</td>
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<td>Precast Concrete Pavement, (R05)</td>
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<td>Up to 4 $300,000</td>
<td>Up to 5 $75,000</td>
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<td>Identifying and Managing Utility Conflicts, (R15B)</td>
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<td>New Composite Pavement Solutions, (R21)</td>
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<td>WISE: Work Zone Impacts and Strategies Estimator Software, (R11)</td>
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<td>Plan Works; Better planning, Better projects, (C01)</td>
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<td>Up to 7 $300,000</td>
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<td>7th Round Products, June 2016</td>
<td>Proof of Concept Pilot</td>
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<td>Utility Investigation Technology Bundle (R01A/R01B/R15B)</td>
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<td>Up to 15 $150,000</td>
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<td>Reliability in Simulation and Planning Models (L04)</td>
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<td>Reliability Data &amp; Analysis Tools (L02/L05/L07/L08/C11)</td>
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<td>Plan Works: Better planning. Better projects. (C01)</td>
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<td>Regional Operations Forum (L36)</td>
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<td>Railroad-DOT Mitigation Strategies (R16)</td>
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<td>Up to 8 $75,000</td>
<td>Up to 12 $25,000</td>
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<td>Nondestructive Testing for Tunnel Linings (R06G)</td>
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<td>Up to 8 $30,000</td>
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EVOLVE field trips
- ORB Construction Project Field Visit
- Subaru of Indiana
- Port of Indiana
- INDOT staff, ES, faculty, students (future INDOT employees)

Inside INDOT article:
"Young Professionals Experience Huge Learning Moments"
Pavement Training
- Complete training curriculum on pavement in 8 weeks
- Better analysis and decision making for INDOT program managers and engineers
- First round, 2012 to 2014, 26 participants
- Second round, 2016 to present, 28 participants
- Result: better, cost-effective pavement designs, longer service life for Indiana pavements

MSE Walls Training
- Better inspection procedure for inspectors
- Better trained inspectors
- Avoid costly mistakes
- IMPACTs performance, failed materials and litigation
- First round in 6 Districts, 475 participants
- Second round, TBA
Engagement IMPACTs: INDOT Staff Visit and TRB Visit

- JTRP Chairman & INDOT Executive Staff Visit R&D Facility and Purdue Campus
  - Focus: Engagement
  - November 1, 2016

- TRB State Visits
  - 2015, Focus: Pavement and Materials
  - 2016, Focus: Construction and Planning
  - 2017, Focus: Bridges and Structures
Engagement IMPACTs: New Transformational Technologies

- Connected and Autonomous Vehicles Workshop
  - Date: June 15, 2017

- Transportation Active Safety Institute (TASI) at IUPUI
  - Date: August 17, 2017

- Potential new partnering, cost sharing opportunities
National Recognition IMPACTs: AASHTO Sweet 16 Awards and TRB Papers

- **AASHTO Sweet 16 Award**
  - SPR-3833, Site Selection for New Lighting Technologies

- **AASHTO Subject Area Award**
  - SPR-3831, Safety Data Acquisition and Management

- **INDOT Traffic Signal Innovation**
  - TRB best paper award
  - Highlighted in Inside INDOT

- **Aggregate Durability Testing**
  - Shorter freeze and thaw testing time from 2 weeks to a few hours
  - Cost savings
Bridges under fire
- Investigate the integrity of concrete bridge after fire
- Possible damage wise claims

MSE Walls investigations, 25 + 11 sites
- Potential litigation case
- Better construction procedures

Pavement premature failure on SR-26
- Potential latent defect cases
- Better understanding of best practices in asphalt overlay
IMPACTs from Specialized Testing Programs

- **Falling Weight Deflectometer**
  - Pavement scoping
  - Pavement design
  - Pavement investigation

- **3D Laser Pavement Condition**
  - Precise crack width, length, depth
  - Super-elevation on slopes
  - Longitudinal and transverse profile
  - Smoothness and texture

- **Friction Testing**
  - To assure safety for the traveling public
  - Approval of aggregate materials

- **Network Level GPR Evaluation of 47 Bridge Decks**
  - Better scoping and bridge candidates selections
  - Data driven decision for preservation and rehabilitations

Forensic Investigation
February 15 Show Case & Peer Group meetings to identify research needs and on an ongoing basis
- 124 needs submitted thus far for FY 2018

FY 2017 INDOT Research Program
- 77 Research Needs submitted,
- 49 Research Projects initiated,
- 24 Completed Studies,
- 79 Active Studies
IMPACT on Customer Satisfaction

- **Research Projects**
  - 91% of INDOT 32 Business Owners indicated a response of very good or better (Qualtrics survey)
  - Research Program IMPACTs all areas of INDOT

- **Specialized Testing & Forensic Investigations**
  - 100% of respondents indicated meets expectations or better
  - Litigation cases settled in INDOT’s favor!

- **Satisfied Customers!**
Additional networking opportunities between INDOT, practitioners and academia

Developing a research and continuous improvement culture in INDOT Peer Groups

Better awareness and engagement of all interested faculty

Managing time extensions

Follow through on Implementation Plans

More needs than money

Others
ABOVE & BEYOND

When a team of dedicated individuals makes a commitment
to act as one...The sky’s the limit.