FY 2025 INDOT Research Program Summary of IMPACT

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Impacting INDOT's Strategic Objectives: Safety, Mobility, Economic Competitiveness, Customer Service, Asset Sustainability, Organization & Workforce, and Innovation & Technology

Forward:

Introduction: The INDOT/JTRP Research Program is an established and nationally recognized state DOT Research Program that has partnered with stakeholders, practioners, academia, and industry since 1937 to address Indiana's transportation needs and challenges. Several state DOTs have modeled their state research programs after the Indiana program and the program has received national recognition for its impact on national transportation issues.

*The **mission** of the INDOT Research Program and JTRP is to conduct, oversee, and partner in cost-effective transportation research that benefits our customers and supports INDOT's Goals and 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.*

Each year, the Indiana DOT highlights the benefits delivered by the program. The summary of IMPACT report presents the qualitative benefits derived from the program. A Return on Investment (ROI) report quantifies the cost savings to customers (user costs and safety) and to INDOT (agency savings) *INDOT Research Program Return on Investment*. Together, these reports provide a comprehensive snapshot of the benefits, savings and impacts from the INDOT/JTRP Research Program. As research findings can significantly impact DOTs resulting in large returns on investment, it behooves researchers to quantify and qualify these benefits and savings to provide credibility to the program and in turn market this message to leadership. These ROI and IMPACT reports help to validate stakeholders and others the value of the research program. A prior INDOT Commissioner noted that *a viable research program was essential for a DOT to remain competitive and to continue to advance when there is a climate of scarce resources*.

Even when resources are not scarce, DOTs must position themselves as good stewards and forward thinking. A good DOT research program is one way to accomplish this end.

INDOT's 2026 Agency Goals include a Focus on Safety, Plan for the Future, Excellence in Core Services and Organizational Excellence. Strategic Priorities include Safety, Mobility, Asset Sustainability, Customer Service, Organization & Workforce, Economic Competitiveness, and Innovation & Technology.

This summary highlights projects completed in FY 2025. Additional accomplishments are also included such as awards, contributions from specialized testing programs, performance metrics, continuous improvement initiatives, and the relatively new forensic investigation program.

This report contains the following information on IMPACT areas with page number references to select research projects and activities that resulted in qualifiable benefits.

Strategic Plan Impact Areas

IMPACT on Safety & Mobility *(individual project information can be downloaded from https://docs.lib.purdue.edu/jtrp/)*

- **SPR-4153, INDOT Highway Lighting Support Services (https://doi.org/10.5703/1288284317274)**
- **SPR-4628, Exploration of Color Patterns for Improving Work Zone Safety and Perception**
- **SPR-4630, Impacts of Autonomous Truck-Mounted Attenuator (ATMA) on INDOT Work Zone Safety, Mobility, and Crews' Perception/Behavior/Productivity (https://doi.org/10.5703/1288284317754)**

- **SPR-4735, Development of Latitude/Longitude (and Route/Milepost) Model for Positioning Traffic Management Cameras (https://doi.org/10.5703/1288284317720)**

- **SPR-4736, A Study of Suburban Arterial Safety Performance Based on Median Type (https://doi.org/10.5703/1288284317848)**

- **SPR-4737, Business Processes to Prioritize Traffic Signal Re-Timing and Assess Impact of Re-Timing Activities (https://doi.org/10.5703/1288284317807)**

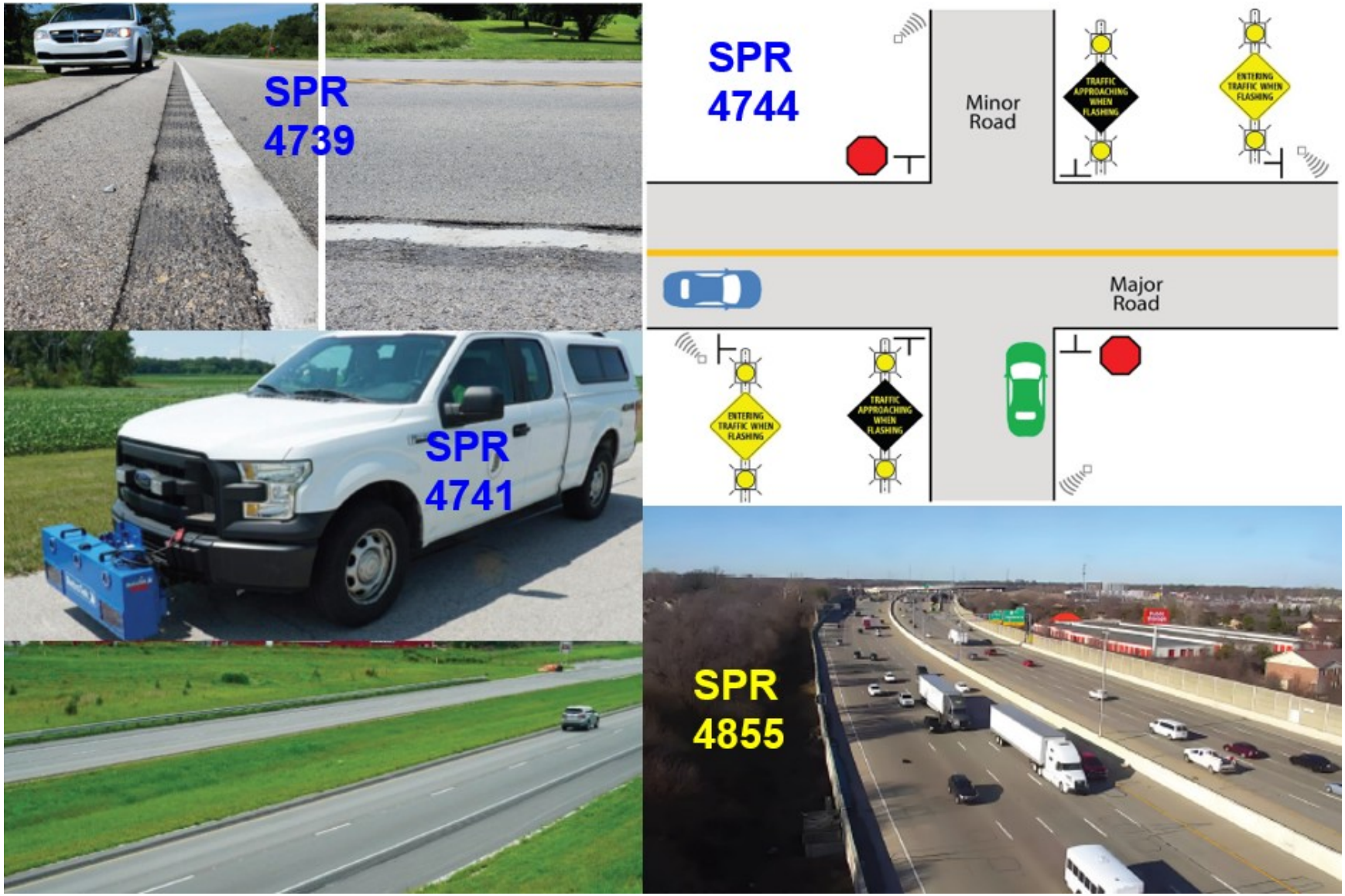
- **SPR-4739, Longitudinal Sinusoidal Rumble Strips Measures of Effectiveness (https://doi.org/10.5703/1288284317847)**

- **SPR-4741, Leveraging LiDAR Intensity to Evaluate Roadway Pavement Marking Retro-Reflectivity (https://doi.org/10.5703/1288284317806)**

- **SPR-4744, Investigate Safety Performance of Non-Signalized Traffic Control Strategies (https://doi.org/10.5703/1288284317849)**

- **SPR-4855, Anomaly Detection in Traffic Patterns Using INDOT Camera System (https://doi.org/10.5703/1288284317778)**

Select Project Pictures



Select Project Pictures

IMPACT on Asset Sustainability *(individual project information can be downloaded from https://docs.lib.purdue.edu/jtrp/)*

- **SPR-3902, Performance Acceptance and Monitoring of Pavement Using the FWD & IRI (https://doi.org/10.5703/1288284317877)**

- **SPR-4327, Compaction Control Guidelines for Aggregate Drainage Layers and Evaluation of In Situ Permeability Testing Methods for Aggregates (https://doi.org/10.5703/1288284317769)**

- **SPR-4329, Verification Testing of MSE Wall Foundation Bearing Capacity Based on the CPT & DCPT (https://doi.org/10.5703/1288284317845)**

- **SPR-4431, A New Approach to Accelerated Fabrication of Steel Bridges: Design, Optimization, and Demonstration (https://doi.org/10.5703/1288284317814)**

- **SPR-4521, Comprehensive Pavement Patching Tools and Web-based Software for Pavement Condition Assessment and Visualization (https://doi.org/10.5703/1288284317770)**

- **SPR-4623, Improved Light Weight Deflectometer Test (LWD) and Analysis (https://doi.org/10.5703/1288284317813)**

- **SPR-4716, Lessening Density Requirement and Adjusting Density Pay Factors for Asphalt Pavements in Poor Sublayer Conditions (https://doi.org/10.5703/1288284317815)**

- **SPR-4724, Detection and Assessment of Sulfates in the Pavement Subgrade (https://doi.org/10.5703/1288284317808)**

- **SPR-4728, Stone Matrix Asphalt (SMA) Overlay Performance Evaluation (https://doi.org/10.5703/1288284317853)**

- **SPR-4841, Investigation into the Fatigue Strength and Ductility of Steel Plates with Holes made from Plasma Cutting Methods (https://doi.org/10.5703/1288284317767)**

Select Project Pictures

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Impact on Innovation & Technology and Economic Competitiveness *(individual project information can be downloaded from https://docs.lib.purdue.edu/jtrp/)*

- **SPR-4549, Salt Monitoring and Reporting Technology (SMART): Development of a Photogrammetric System for Salt Inventory Reporting (https://doi.org/10.5703/1288284317650)**

- **SPR-4706, Electric Vehicles: Public Perceptions, Expectations, and Willingness-to-Pay (https://doi.org/10.5703/1288284317766)**

- **SPR-4714, Use of Machine Learning Methods to Obtain a Reliable Predictive Model for Resilient Modulus of Subgrade Soil (https://doi.org/10.5703/1288284317768)**

- **SPR-4742, Development of Web Portal for the Management, Visualization, and Analysis of Collected Mobile LiDAR Data along Indiana's Transportation Corridors (https://doi.org/10.5703/1288284317846)**

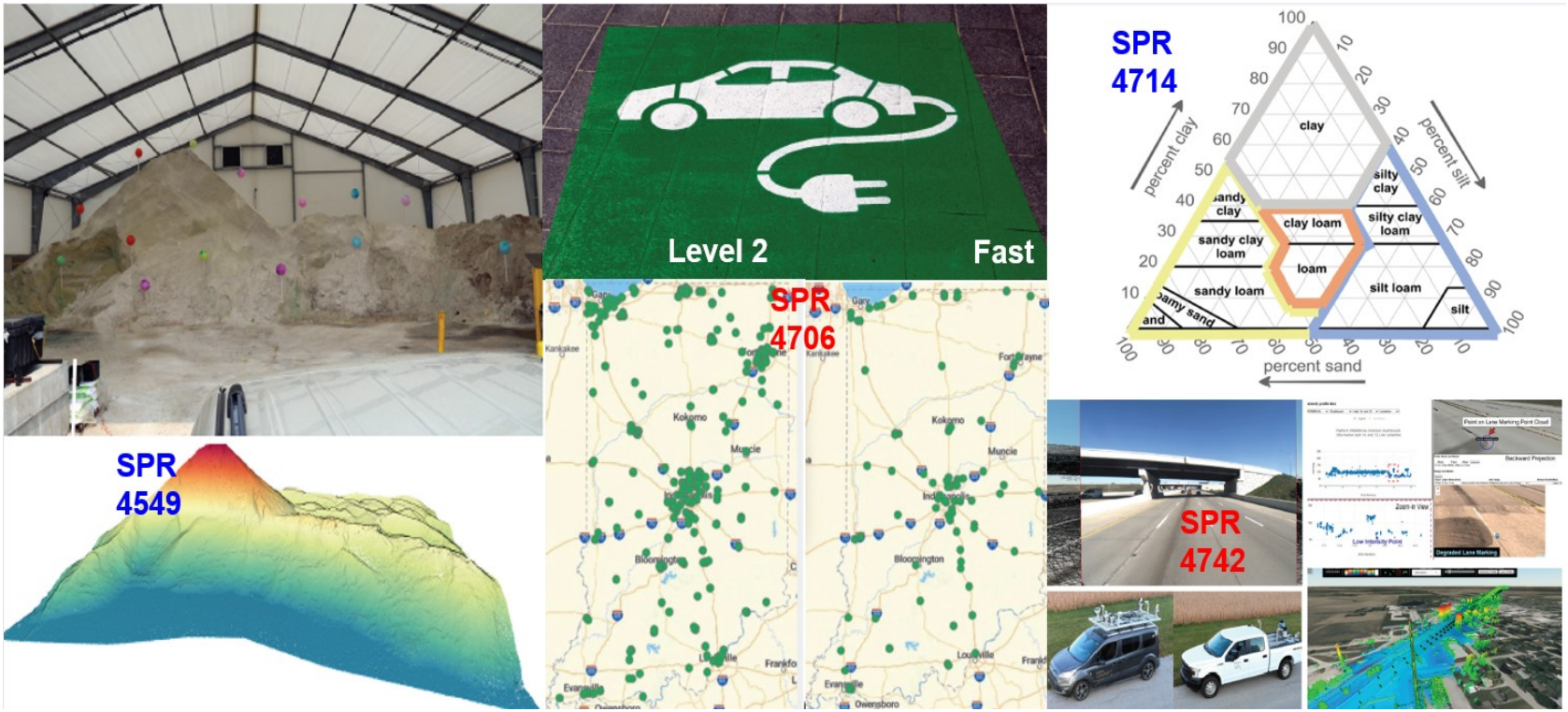
- **SPR-4800, Assessing the Asset Management Programs of Locals including Bridges and Pavement Conditions (https://doi.org/10.5703/1288284317841)**

- **SPR-4819, Synthesis Study: Review of Durability and Performance of the Latest Epoxy-Coated Rebar (https://doi.org/10.5703/1288284317844)**

- **SPR-4843, Advancing Accelerated Bridge Construction and Fabrication in Indiana**

- **SPR-4861, Updating Cost Allocation and Revenue Attribution (https://doi.org/10.5703/1288284317764)**

- **SPR-4865, INDOT Research Program Benefit Cost Analysis – Return on Investment (ROI) (https://doi.org/10.5703/1288284317842)**



Select Project Pictures

Of particular interest

SPR 4861

SPR 4843

Select Project Pictures

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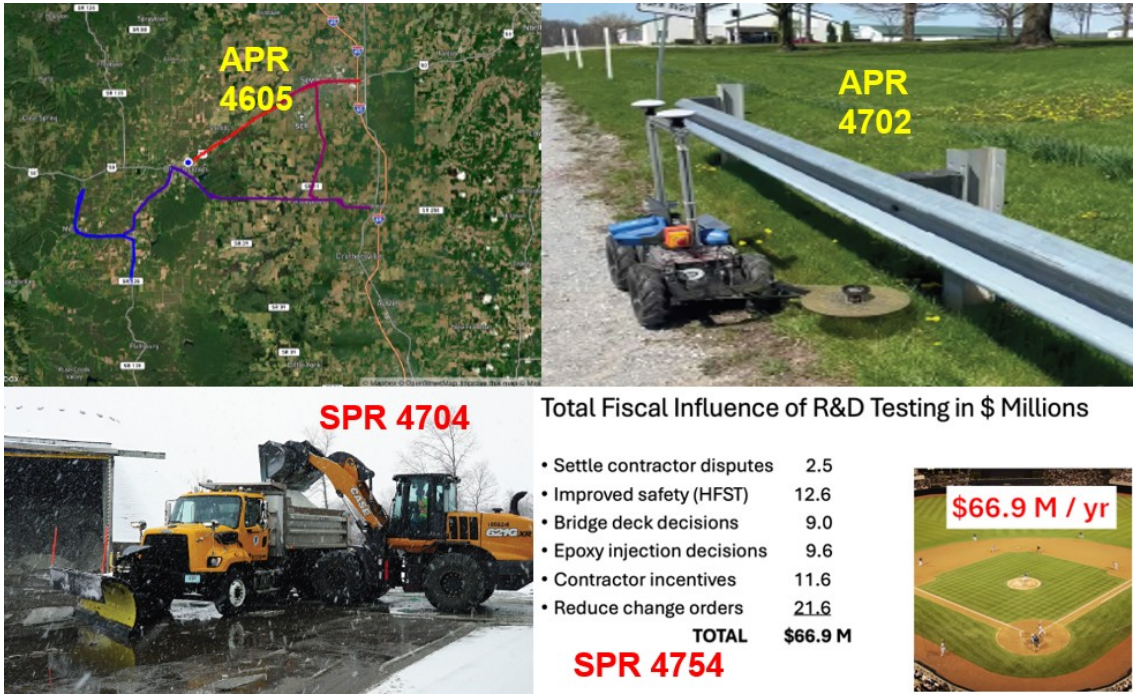
IMPACT on Customer Service and Organization & Workforce *(individual project information can be downloaded from https://docs.lib.purdue.edu/jtrp/)*

- **SPR-4605, Automated Record Keeping for Maintenance Operations via Tracking of Maintenance Vehicles using Telematics Tracks**
- **SPR-4702, Autonomous Mower Pilot Project (https://doi.org/10.5703/1288284317840)**
- **SPR-4704, Evaluating Robustness of MDSS Forecast and Compliance with Recommendations (https://doi.org/10.5703/1288284317805)**
- **SPR 4754, INDOT Research & Development Testing Assessment**
- **INDOT staff serving as business owners/SAC with faculty, practitioners, other DOT staff (INDOT staff indicates positive professional development from SAC engagement)**



Select Project Pictures

Additional Program Impact Areas:

Every Day Counts (EDC) & State Transportation & Innovation Council, STIC, (National IMPACT select examples)

- **Partnership with FHWA in EDC Initiatives**
- **Facilitating the 7 Innovations in EDC 7 (Listed Below)**
- **Participated in National STIC Meetings and winning the 2024 STIC Excellence Award**
- **$M1.125 STIC Incentives leveraging 11 INDOT studies.**
- **Participated in National Pooled Fund Studies, PFS.**

EDC-7 Innovation	INDOT SME	FHWA Counterpart	Baseline Status	Goal Status (to be attained)
Nighttime Visibility for Safety	Dan McCoy, Dave Boruff	Eryn Fletcher; eryn.fletcher@dot.gov	Assessment	Institutionalized
Next Generation TIM: Technology for Saving Lives	Ed Cox, Hillary Lowther	Karen Stippich; karen.stippich@dot.gov	Development	Demonstration
Integrating GHG Assessment and Reduction Targets in Transportation Planning	Alison Shaner, Nunnally, Baukert	Patrick Carpenter patrick.carpenter@dot.gov Kari Carmany-George k.carmanygeorge@dot.gov	Development	Demonstration
Enhancing Performance with Internally Cured Concrete (EPIC2)	Matt Beeson, Mike Nelson	Tom Duncan; thomas.l.duncan@dot.gov	Assessment	Assessment
EPDs for Sustainable Project Delivery	Beeson, Elena Cruz	Tom Duncan; thomas.l.duncan@dot.gov	Development	Demonstration
Rethinking DBE for Design-Build	Casson, Kiefner	Kenneth Woodruff; kenneth.woodruff@dot.gov	Institutionalized	Institutionalized
Strategic Workforce Development	Elizabeth Kiefner	Kenneth Woodruff; kenneth.woodruff@dot.gov	Institutionalized	Institutionalized

EDC-7 Projects

Project STIC Funding by FY

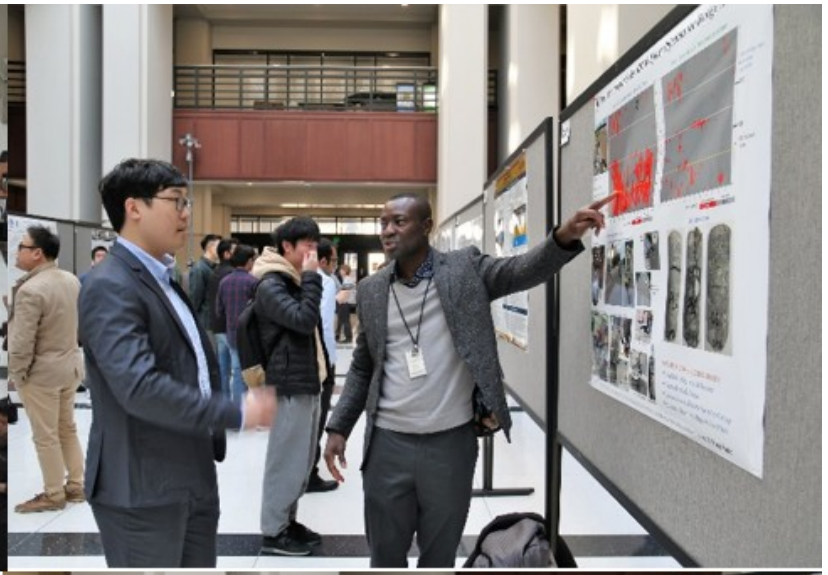
Fiscal Year	STIC Incentive Project	Funds Allocated
2025	Development of Incident Management Performance Measure Database and IN Time Training Material	$120,000
2024	Connected Vehicle Trajectory Data to Screen Network for Hard Braking and Hard Acceleration Events	$125,000
2023	Host Midwest Regional Innovation Peer Exchanges	$50,000
2022	Apply origin-destination data patterns in Freeway Weaving Areas	$100,000
2021	Upgrade web-based Winter Operations Dashboard using enhanced probe data	$100,000
2020	1. Implementation of Enhanced Probe Data for Tactical Work Zone Operations ($41,000) 2. Expand project bundling with machine learning for local agencies ($35,000) 3. Expand current Virtual Public Involvement (VPI) efforts ($24,000)	$100,000
2019	Develop Mobile Mapping System Manual of Operations.	$100,000
2018	Implementation of Intelligent Snowplow System	$100,000
2017	Implementation of Connected Vehicle Corridor Deployment and Performance Measures for Assessment	$100,000
2016	Implementation of LiDAR-Based Mobile Mapping System for Lane Width Evaluation and Reporting in Work Zones for INDOT Traffic Management	$100,000
2014	Development of Intelligent Compaction standard specification for soil embankment and subgrade compaction	$80,000

Enhancing Internal Services, Intentional Partnership and Engagement & Networking (select examples)

- **Pre-Strategic Steering Committee Planning Meeting (August 7, 2024)**
- **NCHRP 20-44(49) Virtual Interview – Learning from INDOT/JTRP Research & Implementation (August 16, 2024)**
- **FY26 INDOT/JTRP Research Program Overview – All Faculty Meeting (September 23, 2024)**
- **FY 26 INDOT/JTRP Research Program All Focus Groups Initiation meeting (October 22, 2024)**
- **Japanese Delegation Makes Special Trip to learn from INDOT – Inside INDOT October- November 2024**
- **DC Roland Fegan Visit (November 22, 2024)**
- **2025 TRB Annual meeting (presentations, papers, posters)**
- **Annual Research Fair (February 19, 2025)**
- **Road School 2025**
- **INDOT Executive Staff Visit to Purdue Campus (April 10, 2025)**
- **NCHRP, TRB, AASHTO Committees membership.**

Left – CLP Site Visit to INDOT R&D (October 18, 2024)

Bottom – INDOT Executive Staff Visit to Purdue Campus (April 10, 2025)



Scenes from last year's Research Program Innovation Fair at IGCS This year's fair is March 4

2025 TRB Annual Meeting in Washington, D.C.


Road School 2025
INDIANA TRANSPORTATION INNOVATORS
PURDUE ROAD SCHOOL 2025
PEOPLE'S CHOICE AWARD
Vincennes District Deputy Commissioner Rusty Fowler (from left) and LaPorte District Technical Services Director Sarah Ford.

State and National Recognitions (select examples)

- **ERIN and Inside INDOT newsletter articles**
  - **STIC Excellence Award**
  - **SPR-4642 "Effectiveness of Contrast Markings on Roadways and Orange Markings in Work Zones" - 2025 Sweet 16 AASHTO Award.**
  - **Road School Presentation: Solar Panel Project – Barry Partridge, March 18, 2025**
  - **ASCE TECHNICAL NOTES – First-ever pedestrian bridge inspection process proposed – Cited in June 2025 and referencing related INDOT Study**
  - **Announcement from Secretary Duffy has several elements that align with work underway in SPR 4928 Connected Vehicle Trajectory Data to Screen Network for Hard Braking and Hard Acceleration Events and related segment analysis**
  - **Article on Which State has the Best Road Conditions.**
  - **Indiana EDC 7 – Innovator, Issue104, Jan/Feb 2025**
  - **R&D Staff Markets Amazing Benefits of INDOT Research, February 2025INDOT**
  - **Ohio DOT & Indiana DOT Help Test Autonomous Trucks**
  - **Crews Spend a Week Helping Devastated Michigan – Inside INDOT, April 2025**

INDOT's Dave Boruff (from left), Dr. Michael Williamson, and INDOT's Tim Wells

Which states have the best road conditions?

The states with the best roads are highly rural, proving that extensive remote road networks can be effectively maintained despite environmental challenges. Several of these states experience harsh winters, requiring proactive maintenance to keep roads safe and drivable year-round.

The following states have the best roads in America:

1. Indiana

The Hoosier State earned the top rank for overall road conditions with a combination of a low rate of traffic fatalities and impressive road quality. Its rural and urban road roughness rank third and second best, respectively. The state also has the seventh-lowest fatality rate in the U.S.

Indiana's great road quality is reflected in its commitment to infrastructure maintenance. In November 2024, the state awarded $139 million in Community Crossings Matching Grants to 223 communities for road and bridge improvements. The Indiana Department of Transportation's 2024 to 2028 plan also prioritizes upgrades to both urban and rural road networks.

Indiana boasts the following stats:

- **Percentage of urban roads in poor condition:** 5.3%
- **Percentage of rural roads in poor condition:** 2.5%
- **Traffic fatalities per 100M miles traveled:** 0.99

Source: FHWA, BTS

AID Demonstration Grants Awarded to Nine Projects

The Federal Highway Administration (FHWA) has announced $7.6 million in new grants from the Accelerated Innovation Deployment (AID) Demonstration program's fiscal year (FY) 2023 cycle. The grants will go to nine projects in eight States to accelerate implementation of proven highway innovations and demonstrate state-of-the-art technologies.

Since the AID Demonstration program was launched in 2014, FHWA has awarded more than $103.4 million for 136 grants. AID Demonstration Program Manager Fawn Thompson noted that the benefits of this funding will spread beyond for enhancing safety while reducing traveler delays and secondary crashes.

The **Indiana DOT** (INDOT) is piloting a work zone safety automated enforcement project. INDOT will monitor the effects of automated enforcement technology, which detects and captures images of speeding vehicles, at four active construction work zones. The project will also demonstrate new business practices for automated enforcement program delivery and funding. Automated enforcement systems have been shown to reduce work zone crashes and promote safer construction along roadways.

EXECUTIVE PRIORITY POINTS

Executive Priority Points focus on important agency information or actions that all INDOT employees should know.

☑ Managers: Please share and discuss these priority points with your employees.

☑ Employees: If your manager has not discussed these with you by the end of business tomorrow, please seek them out.

1. **Indiana State Fair:** We have an extremely limited number of available volunteer spots left for the fair if you are interested! Sign up here.

2. **Research:** INDOT was honored as one of the Sweet 16 selections among the annual High Value Research Project submissions by the American Association of State Highway and Transportation Officials (AASHTO) Research Advisory Committee. The national competition emphasizes the benefits of research and implementation strategies by state DOTs. Indiana's project, "Impacts to Traffic Behavior from Queue Warning Truck: Current Pilot Project", was led by Purdue Professor Darcy Bullock, in conjunction with INDOT's Research & Development Manager Tim Wells and Seymour DDC Tony McClellan. This project demonstrated the potential to reduce hard-braking and crash risks by 80% by deploying Queue Warning Trucks in work zones with queuing. This research has led INDOT to implement this technology. Additionally, this has been implemented on a national scale by other states.

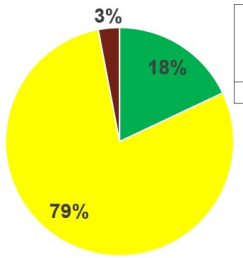
7 Years Moving Average Research Program Return on Investment (ROI)

❖ **251 Completed Projects**

Agency B/C 10:1

None-Agency B/C Ratio 7:1

Total B/C Ratio 17:1



Quantifiable Benefits Project	Qualitative Benefits Projects	Projects Not Successfully Implemented
46	199	6

- Quantifiable Benefits Project
- Qualitative Benefits Projects
- Projects Not Successfully Implemented

Ohio DOT, Indiana DOT Help Test Autonomous Trucks

AASHTO Journal - April 18, 2025

Photo by the Ohio DOT

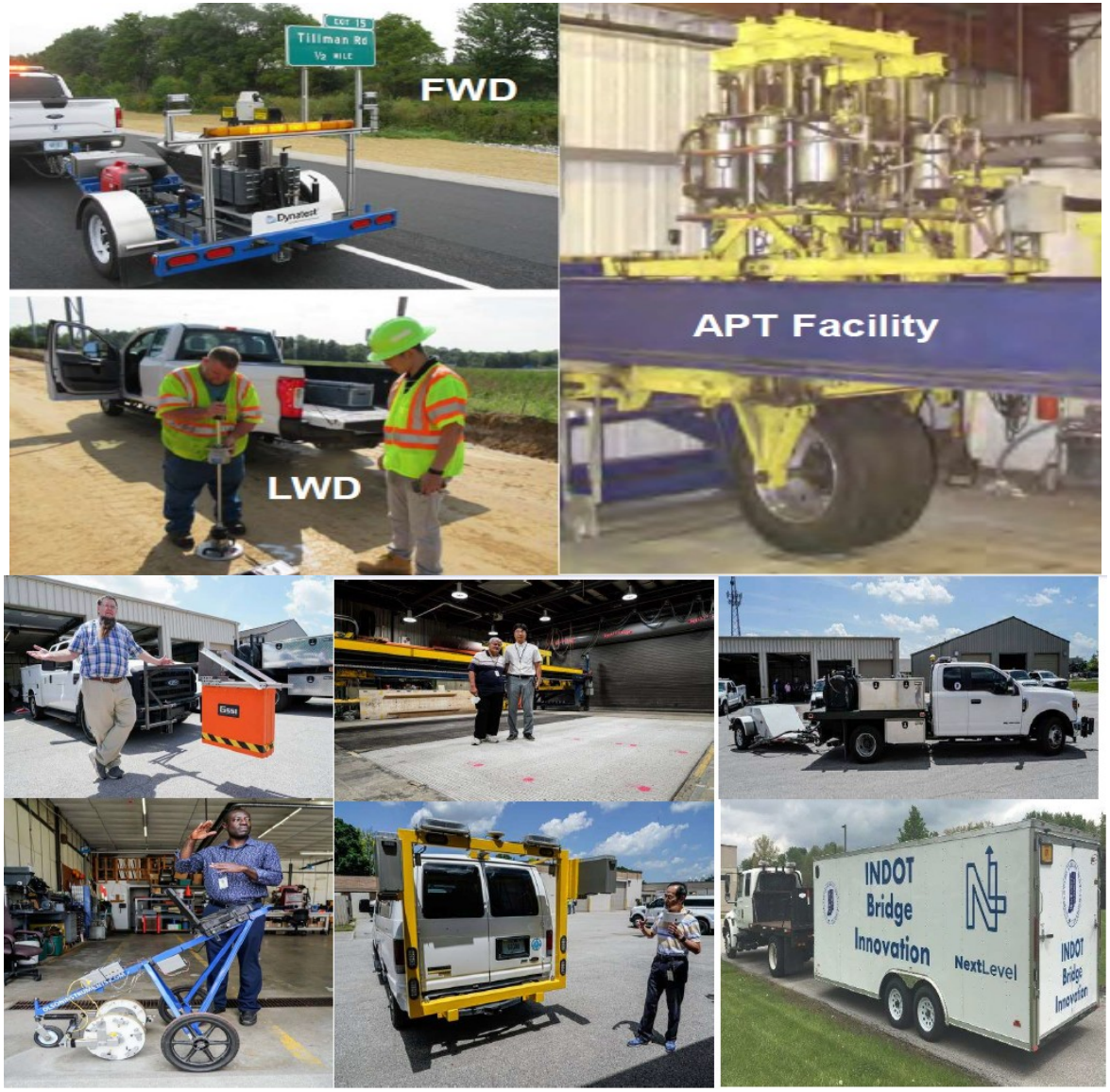
Forensic Investigations and Specialized Testing Programs (select examples)

- **Forensic capabilities & data driven decision-making capabilities, direct result of research program.**
- **Bridge Deck Epoxy Injects INDOT with Asset Sustainability and Innovation**
- **New Trailer Helps INDOT Get Ahead in Bridge Innovation**
- **NDT of Bridge Decks Efforts – Results & Implications**
- **District recognitions for INDOT R&D testing efforts**
- **Friction and Texture Quality testing to ensure the material met specifications.**
- **Identification of bridges with low friction numbers**
- **Completion of 677 specialized testing and forensic investigations** assessing Indiana roadways and bridges providing design, maintenance, rehabilitation and reconstruction recommendations to decision makers. Specialized testing uses state-of-the-art non-destructive testing (NDT) equipment for data-driven decision-making. Amongst the special equipment used are the pavement stiffness falling weight deflectometer, pavement surface skid resistance, ground penetrating radars, 3D lasers and other nondestructive testing equipment.
- **R&D Specialized Testing is 3-5 times less costly than consultant testing.**
- **An independent consultant found specialized testing results impact $66.9M of departmental decisions annually**. **Forensic investigations impacted $2.5M/yr.**

- **Total Fiscal Impact from R&D Specialized Testing was:**
  - Settle contractor disputes 2.5
  - Improved safety (HFST) 12.6
  - Bridge deck decisions 9.0
  - Epoxy injection decisions 9.6
  - Contractor incentives 11.6
  - Reduce change orders 21.6

  TOTAL $66.9 M

- **Customers noted the following non-fiscal benefits:**
  - Trust & expertise
  - Avoiding conflicts of interest
  - Rapid response
  - Consistency of results
  - Refining mix specifications
  - High customer satisfaction
  - Confidence in INDOT decision-making
  - Positive litigation outcomes



Specialized Testing & Forensic Investigation Equipment – Pictures by Indy Star

Program Metrics & Venues for Continuous Improvement

Eight Objective Performance measures for INDOT Research Program;

#	Description	Goal
1	% Final Report submitted on time of Active Projects	>90%
2	% Successful Implementation of completed projects in a FY	>90%
3	Percent Customer Satisfaction Score Meeting or Exceeding Expectations	> 90%
4	# & Percent of Time Extensions	Specifying a Goal
5	% Progress reports submitted on time	100%
6	% Draft Final Report submitted on time	> 90%
7	% Successful Communications (documented timely SAC meetings)	> 90%

- **Continued Linkage of Peer Exchanges Results to User's Manual, Summary of Impact, Customer Service Surveys, Implementation Plans and Template Research Need Statements.**

- **Continue Mapping research projects to INDOT Goals & Strategic Priorities.**

- **Collaborate with the Innovation Office for opportunities, to share current innovations and how the two offices can support each other's mission.**

- **Continue exploring new methods to communicate research results and innovations using online webinars (mirror the TRB webinar format).**

- **Smartsheet tracking software used for project management (active projects, needs identified, tracking implementation status).**

Resources and Links

- **Indiana Government**
  www.in.gov

- **Indiana Department of Transportation, INDOT**
  www.in.gov/indot

- **INDOT Research & Development Division Contact Information**
  www.in.gov/indot/2700.htm
  - **Submission of Research Needs & Ideas *(www.in.gov/indot/2404.htm)***
  - **Innovative Research Needs & Ideas *(www.in.gov/indot/2404.htm)***
  - **Research Program IMPACT Report (www.in.gov/indot/2404.htm)**
  - **Research Program Return on Investment *(www.in.gov/indot/2404.htm)***

- **Research Program User's Manual**
  (https://engineering.purdue.edu/JTRP/files/UsersManual_2024_12.pdf)

- **Joint Transportation Research Program**
  https://engineering.purdue.edu/JTRP

- **Innovation Office and Submission Link (only through the intranet)**
  Innovation at INDOT