Ohio’s Research Initiative for Locals
1980 W. Broad Street, MS 3280
Columbus, Ohio 43223

ORIL@dot.ohio.gov
(614)466-3029 / (614)387-7358
http://oril.transportation.ohio.gov

In cooperation with the
Ohio Department of Transportation, Office of Statewide Planning and Research
Ohio Department of Transportation, Ohio Local Technical Assistance Program and the
U.S. Department of Transportation, Ohio Division of the Federal Highway Administration
Ohio’s Research Initiative for Locals (ORIL) is a program designed to provide practice-ready solutions to real-world issues faced on Ohio’s local transportation system through research. A collaborative effort between the Ohio Department of Transportation, the Ohio Township Association, the County Engineers Association of Ohio, the Ohio Municipal League, and Ohio’s institutions of higher education, ORIL is overseen by a Board consisting of 15 voting members and 3 support members.

**ORIL Mission:**

*ORIL develops, funds, and oversees transportation research projects to meet the needs of local agencies for the safety and economic well-being of the traveling public.*

**ORIL Vision:**

*ORIL with self-sustaining funding, identifies, manages, and facilitates strategic research that solves local transportation challenges with implementable and cost-effective solutions.*

**ORIL Board:**

<table>
<thead>
<tr>
<th>Organization Represented</th>
<th>Members</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Voting Board Members</strong></td>
<td></td>
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</tbody>
</table>
| County Engineers Association of Ohio | Brett Boothe, Gallia County  
Bill Lozier, Licking County  
Steve Luebbe, Fayette County  
Warren Schlatter, Defiance County |
| Ohio Municipal League | Terry Lively, Belmont County  
Paul Schmelzer, City of Findlay  
Leo Shanayda, City of Springfield  
Hassan Zahran, City of Columbus |
| Ohio Township Association | Greg Butcher, Violet Township |
| Ohio Department of Transportation | Jennifer Elston, District 8  
Anna Kuzmich, District 11  
Jack Noble, District 4  
Brian Olson, District 4 |
| Academia/Researchers | Rui Liu, Kent State University  
Eric Steinberg, Ohio University |
| **Support Board Members** |         |
| FHWA Ohio Division Office  
Ohio LTAP Center  
ODOT Statewide Planning & Research | Frank Burkett  
Mike Fitch  
Vicky Fout |
2016 Strategic Research Focus Areas:

Safety
Ensuring the safety of those utilizing and maintaining our transportation system is a priority for all transportation agencies. The traveling public expects the system to meet their individual needs in a manner that is safe, convenient, economic, and efficient with minimal disruption to their daily routines. In addition, protection for roadway crews working on-location is a prominent concern. Identifying, developing, and implementing corrective strategies before hazardous events occur is key to advancing a safe and reliable transportation system. For local agencies the identification of cost appropriate, yet effective, safety measures can often be a challenge.

Renewal/Infrastructure
Without meeting basic maintenance needs, pavements, bridges, signs, guardrail, pavement markings and other roadway features would degrade to the point of being hazardous. The major challenge is to sustain these conditions in a time of declining resources. As our infrastructure ages, it is important to find ways to preserve existing facilities, especially pavements and bridges, while improving design and construction methods which produce reliable, long-lasting facilities.

Operations & Business Practices
Local transportation agencies face a variety of challenges based on their geography, traffic, population density, funding, equipment, staffing, local expectations, governmental structure and history. The identification and evaluation of best practices can be difficult, given the uniqueness of individual organizations. The ability to be aware of existing research and its local applicability can be a challenge for local agencies.

Program Funding:

Funding for ORIL research projects is provided through the Ohio Department of Transportation’s (ODOT’s) State Planning and Research Part 2 (SP&R2) program. A total of $500,000 was initially budgeted in ODOT’s SP&R2 program to support ORIL projects during fiscal year (FY) 2016. All FY2016 ORIL funding is at a ratio of 80% federal SP&R2 funds with the mandatory 20% matching funds provided by ODOT utilizing state funds. ODOT’s Research Section provides oversight of all federal and state funds utilized by ORIL. In addition, ODOT’s Research Section acts as the contracting agent for ORIL and provides administrative support.

In support of research projects that incorporate aspects of both the state and local transportation systems, ODOT’s Research Section has collaborated with ORIL to initiate more comprehensive studies. In these instances, ODOT’s Research Section has provided financial contributions to the projects through its traditional SP&R2 program at a funding ratio of 80% federal funds and 20% state funds. The program overview (page 3) denotes the difference between the ORIL (i.e.: local focused) and ODOT (i.e.: state focused) budgets/programs. A total budget is provided to highlight the overall value of ORIL, the local research program.

All projects listed in this program book are also included in ODOT’s FY2016 Research, Development and Technology Transfer program book, which was approved by the Ohio Division of the Federal Highway Administration on June 30, 2015.
## FY2016 Proposed Projects
(Projects anticipated to being after July 1, 2015)

<table>
<thead>
<tr>
<th>RFP #</th>
<th>Project Title</th>
<th>Project Duration (months)</th>
<th>ORIL Budget (estimated)</th>
<th>ODOT Budget (estimated)</th>
<th>Total Budget (estimated)</th>
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<tbody>
<tr>
<td>2016-ORIL1</td>
<td>Best Practices of Road User Maintenance Agreements Amongst Local Government Agencies in Ohio</td>
<td>16</td>
<td>$130,696.90</td>
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<td></td>
<td>Agency: Ohio University</td>
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<td></td>
<td>PI: Roger Green</td>
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<td>2016-ORIL2</td>
<td>Synthesis of Research on Load Capacity of Concrete Slabs Without Plans</td>
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<td>$59,530.20</td>
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<td>Agency: University of Cincinnati</td>
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<tr>
<td></td>
<td>PI: Richard Miller</td>
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<td>2016-ORIL3</td>
<td>Structural Benefits of Concrete Paving of Steel Culvert Inverts</td>
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<td>$190,802.20</td>
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<td>PI: Teruhisa Masada</td>
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<td>2016-ORIL4</td>
<td>Recommendations and Strategies for IRP Truck Licensing Impacts for Ohio Counties</td>
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<td>Agency: University of Kentucky</td>
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<td></td>
<td>PI: Andrew Martin</td>
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**TOTAL ESTIMATED BUDGET FOR FY 2016:** $421,029.30

## FY2016 Active Projects
(Projects began prior to June 30, 2015. All funds encumbered during FY2015.)

<table>
<thead>
<tr>
<th>SJN</th>
<th>Project Title</th>
<th>FY2015 ORIL Funding</th>
<th>FY2015 ODOT Funding</th>
<th>Total Funding</th>
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<tr>
<td>134997</td>
<td>Evaluation and Design of a TL-3 Bridge Guardrail System Mounted to Steel Fascia Beams</td>
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<td>Agency: RoadSafe, LLC</td>
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<tr>
<td></td>
<td>PI: Chuck Plaxico</td>
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<td>134847</td>
<td>Waterproofing Details of Connections for Adjacent Precast Concrete Box-Beam Bridges</td>
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<td>Start Date: January 16, 2014</td>
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<tr>
<td></td>
<td>PI: Anil Patnaik</td>
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<tr>
<td>134991</td>
<td>Investigation of In-Situ Strength of Various Construction/Widening Methods Utilized on Local Roads</td>
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<tr>
<td></td>
<td>PI: Shad Sargand</td>
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<td>134989</td>
<td>Analysis of Ground Tire Rubber (GTR) in Mix Design on Local Roadways in Ohio</td>
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<td></td>
<td>PI: Munir Nazzal</td>
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<td>134988</td>
<td>Assessment of IRP Truck Licensing for Ohio Counties</td>
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<td></td>
<td>PI: Andrew Martin</td>
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<td>135031</td>
<td>Inspection, Repair, Retrofit Procedures, and Design Recommendations for Non-Redundant Steel Structures</td>
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<td></td>
<td>PI: James Swanson</td>
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<td>134990</td>
<td>Storm Water Best Management Practices for Local Roadways</td>
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<tr>
<td></td>
<td>PI: Mark McCabe</td>
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<td>134933</td>
<td>Evaluation and Analysis of Liquid Deicers for Winter Maintenance</td>
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<td>Start Date: July 16, 2014</td>
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<tr>
<td></td>
<td>PI: Bill Schneider</td>
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<td>TPF-5(318)</td>
<td>Practical Design Guidelines for Replacement of Deficient Bridges with Low-Water Stream Crossing in the Rural Mid-West</td>
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<tr>
<td></td>
<td>PI: Susan Barker</td>
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<td>TPF-5(310)</td>
<td>11th International Conference on Low Volume Roads and Peer Exchange</td>
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<tr>
<td></td>
<td>PI: Vanessa Goetz</td>
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**TOTAL BUDGET FOR FY 2015:** $998,555.56

**Total Value of ORIL Program:** $1,419,584.86
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<th><strong>Project Title:</strong></th>
<th>Best Practices of Road User Maintenance Agreements Amongst Local Government Agencies in Ohio</th>
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<tr>
<td><strong>ORIL RFP#:</strong></td>
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<td><strong>State Job #:</strong></td>
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<td><strong>FY 2016 Funding:</strong></td>
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<td><strong>Funding Source:</strong></td>
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<td><strong>Start Date:</strong></td>
<td>September 21, 2015</td>
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<tr>
<td><strong>End Date:</strong></td>
<td>January 21, 2017</td>
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<tr>
<td><strong>Research Agency:</strong></td>
<td>Ohio University</td>
</tr>
<tr>
<td><strong>Researchers</strong></td>
<td>Roger Green</td>
</tr>
<tr>
<td><strong>ORIL TAC:</strong></td>
<td>Joe Bachman, Tuscarawas County</td>
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<td></td>
<td>Terry Bell, Jefferson County Township Association</td>
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<td>Greg Butcher, Violet Township</td>
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<td>Matt DeTemple, Ohio Township Association</td>
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<td>Anna Kuzmich, ODOT District 11</td>
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<td>Terry Lively, Belmont County</td>
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<td>Bill Lozier, Licking County</td>
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<td>Stephen McCall, Champaign County</td>
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<td>Travis McGarvey, Paulding County</td>
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<td></td>
<td>Roger Wright, Washington County</td>
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</table>

**Project Summary:**

Road User Maintenance Agreements (RUMAs) are legal agreements between local governments and for-profit organizations outlining the responsibility for road construction and repairs resulting from excessive damage to local infrastructure caused by those organizations activities. These RUMAs can also stipulate travel routes for heavy equipment haulers in order to ensure safety and help minimize damage to roadways as well as specify testing methods and rating criteria organizations are required to follow. The recent boom in the oil and gas industry in eastern Ohio has brought the use of RUMAs to the forefront. In 2012, Ohio passed Senate Bill 315 which requires well operators to enter into RUMAs or demonstrate a good-faith effort to do so. ODOT in collaboration with the Ohio Department of Natural Resources, the County Engineer's Association of Ohio, and various local transportation officials created a RUMA template to assist local governments in developing RUMAs, but is not a mandated/standard document. Many counties and townships have taken this template and modified it to meet their specific purposes. As a result, a plethora of RUMA versions are in existence within Ohio. As industries such as oil and gas, wind power, coal, and timber expand or relocate production in Ohio, the utilization of RUMAs varies. The variations in requirements, language, and execution of Ohio RUMAs can lead to confusion not only among local governments, but also with the organizations/industries attempting to enter into these agreements. The issue is further complicated as some local governments may be using RUMAs in situations where they are not necessarily appropriate. A fair amount of research has been conducted nationally on the subject of RUMAs; however, it is not necessarily easily manageable or accessible to local transportation officials. A focused synthesis study to identify the current best practices for RUMAs is needed.

The goal of this research is to conduct a synthesis of current practices related to the development and execution of RUMAs. The objective of this research is to identify current best practices and provide recommendations for RUMA development to assist Ohio's local transportation officials. The results of this research will highlight the practices that have produced the best return on investment in a clear and concise manner. This will provide inexperienced agencies with a better understanding on how to approach these agreements while more experienced agencies will have exposure to different philosophies and applications. Not only will local governments benefit from this research, but the industries/organizations that typically enter into these agreements may also benefit. This research can provide them with a better understanding of what local governments are trying to accomplish with RUMAs. A thorough review of the findings may also help industries to anticipate what may be required by the RUMAs used in specific counties, thereby helping them to estimate potential costs and efforts for their expanded development into a particular region.
Project Title: Synthesis of Research on Load Capacity of Concrete Slabs Without Plans

ORIL RFP#: 2016-ORIL2  State Job #: 135245

PID: 100776  Agreement #: 27226

FY 2016 Funding: $59,530.20  Funding Source: ORIL - SP&R2

Start Date: TBD  End Date: TBD

Research Agency: University of Cincinnati  Researchers Richard Miller, Bahram Shahrooz

ORIL TAC: Jim Branagan, Jefferson County  
Rui Liu, Kent State University  
Steve Luebbe, Fayette County  
Frederick Pausch, County Engineers Association of Ohio  
Eric Steinberg, Ohio University  
Amjad Waheed, ODOT Office of Structural Engineering

Project Summary:
Approximately 6,550 small span concrete slab bridges exist in Ohio. Of these bridges, approximately 1,234 (19%) do not have any plans. Many of these structures, still in-service today, were built decades ago; some dating as far back as the 1930s. The vast majority of these bridges are on the local system as less than 20 can be found on state routes. Some counties have as many as 30 of these slab bridges with no plans while other counties find a significant portion of their inventory (approximately 31% or 133 bridges) comprised of these structures all without plans. While these structures are routinely inspected and given a general appraisal rating, a mechanism for load rating these structures is either unavailable or unknown by county engineers. As a result, county engineers rely on past performance and engineering judgment to determine the approximate load capacity of the structure. This likely leads to an overly conservative evaluation. Exacerbating this issue, recent developments in industries, such as oil and gas, have some counties experiencing sudden and significant increases in heavy truck traffic on these structures. These bridges were not built with the expectation of the size and quantity of this traffic. In order to optimize the usefulness of these bridges and ensure the safety of the traveling public, a simple, low-cost scientifically-based method for determining the load capacity of these structures is needed.

The goal of this research is to identify a simple, low-cost, reliable method for county and city engineers to use to evaluate the load capacity of concrete slab bridges without plans. The objective of this research is to perform an in-depth synthesis study to identify the current state of practice and, if an established method is not identified, indicate the future steps necessary in order to achieve the stated goal. The results of this research will aid in optimizing the usefulness of these structure, provide increased confidence in the structure's performance and anticipated lifespan, and enhance the overall safety of the traveling public. As larger and heavier vehicles continue to expand their use of the local system, having greater confidence in the load capacity of these structures becomes a more pressing concern. This research will not only improve the understanding of the current condition of these structures, but assist local transportation officials in understanding their true capacity and limitations.
Project Title: Structural Benefits of Concrete Paving of Steel Culvert Inverts

ORIL RFP#: 2016-ORIL3  State Job #: 135248

PID: 100810  Agreement #: 27231

FY 2016 Funding: $190,802.20  Funding Source: ORIL - SP&R2

Start Date: TBD  End Date: TBD

Research Agency: Ohio University  Researchers Teruhisa Masada

ORIL TAC: Doug Gruver, ODOT District 8
Ed Herrick, Franklin County
Frederick Pausch, County Engineer’s Association of Ohio
Mike McColeman, ODOT Office of Hydraulic Engineering
Warren Schlatter, Defiance County

Project Summary:
Over time, a steel culvert invert will experience invert material loss due to corrosion and abrasive flow. The material loss progresses from minor perforations to ultimate invert loss if corrective action to protect the culvert invert is not taken. Invert material loss can lead to erosion of the supporting backfill which is an integral component for the structural integrity of a steel culvert. A common corrective maintenance action is to place 4-6 inches of concrete onto the invert of the steel culvert for the bottom 1/3 of the rise of the culvert. Light reinforcing mesh is attached to the culvert and concrete is poured and shaped to the bottom of the barrel in most applications. If total invert loss or significant backfill erosion has occurred and the exiting shape is unaffected, additional measures may be required such as: additional reinforcing steel and replacement of the backfill with cementitious materials.

This corrective maintenance action is cost effective and widely used because it seals the culvert invert, prevents backfill loss, and provides a protective layer between the abrasive flow and the steel material. However, the impact of this corrective maintenance action on the structural integrity of the culvert is unknown. Additionally, it is unknown if additional reinforcement is required when there is total invert loss and the existing shape is unaffected. While it is clear that the pipe has been weakened by the loss of the steel section, it is unclear if the stiffness of the added concrete compensates and restores the culvert to its original strength. Furthermore, once the floor is sealed with concrete, inspectors are unable to visually confirm additional damage to the remaining steel. This could adversely impact load capacity ratings causing some culverts to receive a higher load rating than is actually warranted. Research is needed to verify the viability of this practice and provide engineers with scientifically-based guidance on its proper application.

The goal of this research is to enhance the understanding of the mechanics of steel culverts and the impact that this common corrective maintenance action has on the structural integrity of the steel culvert. The objectives of this research are to: (1) determine and quantify the influence the repair has on the structural integrity of the culvert system, (2) determine if additional reinforcing steel is required when there is total invert loss, and (3) develop a scientifically-based, cost effective, repeatable methodology engineers can use to evaluate repairs to steel culvert inverts with deteriorated inverts. The results of this research may influence ODOT’s current standard specifications for metal culverts (item 611.11). The findings will enable engineers to make more informed decisions on which culverts are ripe for the invert rehabilitation and the most appropriate application of this practice.
Project Title: Recommendations and Strategies IRP Truck Licensing Impacts for Ohio Counties
ORIL RFP#: 2016-ORIL4
State Job #: TBD
State Job #: TBD
Agreement #: TBD
Agreement #: TBD
FY 2016 Funding: $40,000.00
Funding Source: ORIL - SP&R2
Funding Source: ORIL - SP&R2
Start Date: TBD
End Date: TBD
Start Date: TBD
End Date: TBD
Research Agency: University of Kentucky
Researchers: Andrew Martin
Researchers: Andrew Martin
Jennifer Walton
Jennifer Walton
ORIL TAC: Quan Boyd, Ohio Department of Public Safety – Bureau of Motor Vehicles
Quan Boyd, Ohio Department of Public Safety – Bureau of Motor Vehicles
Stephanie Cook, Ohio Department of Public Safety – Tax Distribution Section
Stephanie Cook, Ohio Department of Public Safety – Tax Distribution Section
Paula Gilleland, Xerox – Ohio’s IRP Consultant
Paula Gilleland, Xerox – Ohio’s IRP Consultant
Duke Hobson, Ohio Department of Public Safety – Bureau of Motor Vehicles
Duke Hobson, Ohio Department of Public Safety – Bureau of Motor Vehicles
Jeff Honefanger, ODOT’s Office of Permits
Jeff Honefanger, ODOT’s Office of Permits
Leora Knight, Ohio Department of Public Safety – Tax Distribution Section
Leora Knight, Ohio Department of Public Safety – Tax Distribution Section
Anna Kuzmich, ODOT District 11
Anna Kuzmich, ODOT District 11
Jeff Linkous, Clinton County
Jeff Linkous, Clinton County
Terry Lively, City of Marion
Terry Lively, City of Marion
Sarah Lown, Western Reserve Port Authority
Sarah Lown, Western Reserve Port Authority
Randy Partika, Mahoning County
Randy Partika, Mahoning County
Tom Stiver, Xerox – Ohio’s IRP Consultant
Tom Stiver, Xerox – Ohio’s IRP Consultant

Project Summary:
The goal of this research is to expanded upon a previously conducted study (SJN: 134988) aimed at assessing the economic impact of non-Ohio registered commercial vehicle fleets based within Ohio jurisdictions. The objective of this project is to provide recommendations for short- and long-term solutions to address the registering and/or fee allocation process for IRP registration within Ohio. As a result, this will enhance the state’s ability to ensure the appropriate retrieval and allocation of IRP registration revenue for maintaining Ohio’s roadways. It will also equip local officials with the tools needed to conduct their own investigations as the economic and business situation of their locality changes over time.
Project Title: Evaluation and Design of a TL-3 Bridge Guardrail System Mounted to Steel Fascia Beams

ORIL RFP#: 2015-ORIL1  State Job #: 134997
PID: 98644  Agreement #: 26602
FY 2015 Funding: $291,875.67  Funding Source: ORIL - SP&R2
Start Date: January 5, 2015  End Date: May 5, 2017
Research Agency: RoadSafe, LLC  Researchers Chuck Plaxico Malcolm Ray

ORIL TAC: Brett Boothe, Gallia County
Scott Coleman, Logan County
Dennis Gonano, US Bridge
Sean Meddles, ODOT Structural Engineering
Eric Steinberg, Ohio University

Project Summary:
For structures with concrete bridge decks, the railing system is typically connected to the deck. However, for bridges on Ohio's local road system, non-concrete bridge decks (e.g. timber, asphalt filled steel stay-in-place forms, fiber reinforced composite, etc.) are very common and require the railing connection to be located on the fascia beam. Although this fascia mounted system is performing well on the local system, a crash tested version is not available and it is ineligible for use on federal aid projects. Research is needed to evaluate and, if necessary, improve the design of a bridge guardrailing system with steel bridge posts mounted to steel fascia beams.

The goal of this two-phased research project is to analyze and design a steel fascia beam mounted railing system for use on Ohio's local transportation system. The objective is to obtain MASH TL-3 approval of the designed system to allow for its use on federal aid and credit bridge projects. Since the connection would occur at the beam as opposed to the deck, the application of the system would be suitable with a myriad of bridge deck types. The ability to utilize materials other than concrete for bridge decks results in substantial cost savings for locals. Furthermore, the use of an approved railing system will enhance the overall safety of the traveling public and confidence in Ohio's local transportation system.
Project Title: Waterproofing Details of Connections for Adjacent Precast Concrete Box-Beam Bridges

ORIL RFP#: 2015-ORIL2  State Job #: 134847

PID: 97083  Agreement #: 26163 A

FY 2015 Funding: $270,446.00  Funding Source: ORIL – SPR2 $60,446.00
ODOT – SPR2 $210,000.00

Start Date: April 10, 2014  End Date: January 6, 2016

Research Agency: University of Akron  Researchers: Anil Patnaik

ORIL TAC: Waseem Khalifa, ODOT District 11
Steve Luebbe, Fayette County
Warren Schlatter, Defiance County
Eric Steinberg, Ohio University
Jim Welter, ODOT Construction Administration
James Wiechart, Mercer County

Project Summary:
Adjacent box-beams need to work together for a bridge to function effectively as a single unit. Structural performance of non-composite box-beam bridges is greatly dependent on the shear key, the connection details including the grout, waterproofing, and the tie rods. Severe leakage is commonly documented. Water leakage leads to premature aging and is the primary cause for corrosion of the prestressing strands and non-prestressed steel, which causes spalling and snapping of strands.

Prevention of water leakage is critical to minimize corrosion related deterioration at the longitudinal joints of adjacent box-beams. Any cracking along the joints and differential deflection of adjacent beams causes water proofing membrane to get damaged making water leakage inevitable. Most times the seeping water is contaminated with chloride from deicing materials which makes the concrete susceptible to corrosion related damage such as cracking and spalling.

This research was initiated by ODOT to establish the sources, causes and effects of inadequate waterproofing at joints and develop preventive measures through careful evaluation of alternatives on the state system. The scope of work was expanded to incorporate aspects specific to the local system such as: (1) analysis of adjacent precast reinforced concrete box-beams to establish the sources, causes and effects of inadequate waterproofing at the joints; (2) an evaluation of peel-and-stick waterproofing as a membrane alternative, (3) an analysis of grouting options/alternatives for keyway joints; and (4) develop preventive measures for existing and new box-beam bridges. The results of this research will provide a basis for better preparation of local officials to deal with system degradation of these structure types and maintenance of existing structures in addition to providing an opportunity for improvements in planning and design of new structures.
**Project Title:** Investigation of In-Situ Strength of Various Construction/Widening Methods Utilized on Local Roads

**ORIL RFP#:** 2015-ORIL3  
**State Job #:** 134991

**PID:** 98611  
**Agreement #:** 26597

**FY 2015 Funding:** $147,948.11  
**Funding Source:** ORIL - SP&R2

**Start Date:** August 11, 2014  
**End Date:** February 11, 2016

**Research Agency:** Ohio University  
**Researchers**  
Shad Sargand  
Roger Green

**ORIL TAC:**  
Adam Au, ODOT Pavement Engineering  
Mitch Blackford, ODOT District 6  
Anna Kuzmich, ODOT District 11  
James Wiechart, Mercer County  
Warren Schlatter, Defiance County

**Project Summary:**
A common practice among local public agencies in Ohio is to reuse materials (e.g.: asphalt, concrete, Portland cement concrete, etc.) from projects to widen existing roads or backfill at other locations. A variety of other methods may also be utilized in conjunction with the repurposed materials (e.g.: fly ash, lime, fabric, etc.). The utilization of these techniques may be driven, in part, by budgetary constraints or material availability. While it is easy for local transportation officials to compare these methods based on costs, there is a lack of information available to compare the overall effectiveness of these methods in terms of projected strength or relative load capacity. In order to provide local governments with the tools necessary to assist in system preservation decisions, research into the performance of these methods is needed.

The goal of this research is to establish a range of structural coefficients (or moduli) for various materials utilized to widen/construct roads on Ohio's local system. The objective is to provide locals with a repeatable, non-destructive methodology to characterize the strength/load capacity of materials used in road widening/construction when established values are unavailable. The results of this research will provide local officials with enhanced knowledge and understanding of the potential structural integrity of materials being considered for use in roadway maintenance, improvement and construction projects. This will lead to more efficient design and greater confidence in the load carrying capacity of rural roads. It will provide a scientific basis for material selection to complement the readily available cost data, which will aid locals in managing budgets and ensuring the fiscal integrity of local pavement preservation programs.
Project Title: Analysis of Ground Tire Rubber (GTR) in Mix Design on Local Roadways in Ohio

ORIL RFP#: 2015-ORIL4

State Job #: 134989

PID: 98609

Agreement #: 26595

FY2015 Funding: $176,288.66

Funding Source: ORIL - SP&R2

Start Date: September 2, 2014

End Date: September 2, 2016

Research Agency: Ohio University

Researchers Munir Nazzal
Sang-Soo Kim

ORIL TAC: JuanPablo Ascarrunz, City of Akron
Mitch Blackford, ODOT District 6
Michael Huber, City of Akron
Robert Liang, University of Akron
Rui Liu, Kent State University
Perry Ricciardi, ODOT District 3
Michael Teodecki, City of Akron
Hassan Zahran, City of Columbus

Project Summary:
For decades, transportation agencies have considered the incorporation of crumb rubber, now referred to as ground tire rubber (GTR), in asphalt mixtures to enhance the durability and longevity of pavements. In addition to the improvements in pavements, GTR has demonstrated the potential for positive environmental impacts through its reuse of recycled tires. While the benefits of using GTR appear to be great, the initial cost to implement GTR can often render the material as being cost-prohibited. ODOT has various specifications concerning asphalt mix designs (e.g.: Nos. 446 and 448) including GTR (e.g.: No. 887). While these specifications address the utilization of materials on interstates and highways, their direct application to local roadways may not be appropriate. Factors such as variations in traffic volume and traffic patterns (e.g.: intersections) may influence the performance of GTR resulting in the ODOT specifications being either over or under designed for local roads. Furthermore, advances in technology over the years have increased the options available to transportation agencies in regards to both application methods and products. Since 2005, GTR has been used on approximately 33 local roads and 3 state highways. This presents Ohio with the opportunity to analyze the actual in-field performance of GTR, assess the pros and cons of using the material, and determine if the life-cycle cost of the materials offsets the installation costs.

The goal of this two-phased research project is to assess the true life-cycle cost of GTR mixes on local roads within Ohio and identify opportunities for GTR to be more affordable. The objective is to develop specifications and supplemental QC/QA testing and acceptance criteria for GTR additive/mixture use on municipal and local roads. The results of this research will provide local officials with enhanced knowledge and a field validated assessment of the life-cycle cost of GTR enhanced mixes on its use and performance. The development of a specification for GTR use on local roads will encourage uniformity and provide clear guidance. This information will be of assistance to local decision makers in managing budgets and the proper utilization of GTR on their respective projects.
Project Title: Assessment of IRP Truck Licensing for Ohio Counties

ORIL RFP#: 2015-ORIL5  State Job #: 134988
PID: 98607  Agreement #: 26594
FY 2015 Funding: $46,772.48  Funding Source: ORIL - SP&R2
Start Date: November 3, 2014  End Date: September 3, 2015
Research Agency: University of Kentucky  Researchers Andrew Martin
Jennifer Walton

ORIL TAC: Quan Boyd, Ohio Department of Public Safety – Bureau of Motor Vehicles
Stephanie Cook, Ohio Department of Public Safety – Tax Distribution Section
Paula Gilleland, Xerox – Ohio’s IRP Consultant
Duke Hobson, Ohio Department of Public Safety – Bureau of Motor Vehicles
Jeff Honefanger, ODOT’s Office of Permits
Leora Knight, Ohio Department of Public Safety – Tax Distribution Section
Anna Kuzmich, ODOT District 11
Jeff Linkous, Clinton County
Terry Lively, City of Marion
Sarah Lown, Western Reserve Port Authority
Randy Partika, Mahoning County
Tom Stiver, Xerox – Ohio’s IRP Consultant

Project Summary:
International Registration Plan (IRP) is an agreement among 48 states, 10 Canadian Provinces and the District of Columbia whereby a motor carrier can register commercial vehicle fleets for travel in all IRP jurisdictions by filing the paperwork with the home (base) jurisdiction. Fees associated with the registration of these vehicles are apportioned to each IRP jurisdiction based on various factors including total mileage driven within a given jurisdiction. As an IRP participating state, Ohio’s Department of Public Safety (ODPS) coordinates the apportionment of IRP registration fees between Ohio and other participating states. In addition, ODPS coordinates the distribution of registration revenue between Ohio’s various state agencies, counties, townships, and municipalities.

While registration revenue is distributed to local public agencies, there is a perception of a disconnect between the percentage provided to locals versus the actual impact commercial vehicle fleets have on local roads. While the state system is designed to accommodate large quantities of commercial vehicles, local roads are less equipped and are therefore more susceptible to pavement deterioration and stress promulgated by these types of vehicles. As a result, local governments may find it necessary to perform rehabilitation and repair activities more frequently or even earlier than anticipated. However, the revenue stream from the registration of these vehicles does not seem to be keeping pace. A locally conducted case study has identified a situation in which this disparity exists. There is a presumption that this is not an isolated event and local governments may be missing out on revenues needed to maintain the integrity and safety of Ohio’s local roadways. Research is needed to investigate the overall impact of IRP truck registration to Ohio counties and to provide recommendations for improvements (if warranted).

The goal of this research is to conduct an analysis to assess the economic impact of non-Ohio registered commercial vehicle fleets based within Ohio jurisdictions. The objective is to determine the appropriateness for developing short- and long-term recommendations that address the registering and/or fee allocation process for IRP registration within Ohio. The findings of this research will either support or disprove a perception of disproportionate funding allocations related to IRP registration revenue. It will also equip local officials with the tools needed to conduct their own investigations as the economic and business situation of their locality changes over time.
Project Title: Inspection, Repair, Retrofit Procedures, and Design Recommendations for Non-Redundant Steel Structures

ORIL RFP#: 2015-ORIL6  State Job #: 135031

PID: 98639  Agreement #: 26601

FY 2015 Funding: $87,534.19  Funding Source: ORIL - SP&R2

Start Date: November 3, 2014  End Date: November 3, 2015

Research Agency: University of Cincinnati  Researchers James Swanson

ORIL TAC: Brett Boothe, Gallia County  
Mike Brokaw, ODOT Structural Engineering  
Scott Coleman, Logan County  
Dennis Gonano, US Bridge  
Bill Lozier, Licking County  
Matt Shamis, FHWA Ohio Division  
Eric Steinberg, Ohio University

Project Summary:
There are approximately 1500 structures in Ohio with the designation of fracture critical. Of these, approximately 900 pony trusses reside on the county system. As a result, counties are responsible for conducting specialized arms-length inspections on the fracture critical members (FCM) of these structures every twenty four months, in addition to the annual routine inspection. The FCM inspections are both costly and difficult to perform often due to the location of the members. While the tension zones in the steel pony members are categorized as fracture critical per FHWA's Bridge Inspection Reference Manual (BIRM), a detailed analysis may prove otherwise. Research is needed to develop a modeling standard to analyze these structures and establish protocols, consistent with provisions outlined by FHWA, in order to refine fracture-critical designations.

The goal of this research is to provide analytical evidence and protocols that allow for the reduction of the number of fracture critical members to inspect on pony trusses utilized on Ohio's local roadway system. In addition to the analytical goal, there is an objective to develop a repair/retrofit procedure to eliminate non-redundancy or fracture critical elements of pony trusses, thereby transitioning from a non-redundant to quasi-redundant designation. The results of this research will provide local engineers with enhanced knowledge and understanding of the function of this structure type. It will also aid to educate bridge inspectors as to the actual in-field performance of pony trusses. Positive findings from this research will position locals for potential savings in terms of cost and time through the elimination of excessive and onerous inspections. This would further increase the desirability of the pony truss as a viable option to own and maintain; thereby, expanding its consideration for use by local transportation officials.
Project Title: Storm Water Best Management Practices for Local Roadways

ORIL RFP#: 2015-ORIL7  State Job #: 134990

PID: 98610  Agreement #: 26596

FY 2015 Funding: $179,690.45  Funding Source: ORIL - SP&R2

Start Date: September 9, 2014  End Date: September 9, 2015

Research Agency: GS&P/OH, Inc.  Researchers Mark McCabe
Timothy Arendt
Melanie Knecht
Jonathan Haycraft

ORIL TAC: Jeff Agricola, City of Springfield
Greg Butcher, Violet Township
Jennifer Eismeier, Mill Creek Watershed Council of Communities
Tim Gilday, Hamilton County
Hans Gucker, ODOT’s Construction Administration
Becky Humphreys, ODOT’s Hydraulic Engineering
Terry Huxel, City of Wyoming
Christine Jonke, City of Akron
Bruce Koehler, OKI Regional Council of Governments
Rui Liu, Kent State University
Todd Long, Hamilton County
Michael Miller, University of Cincinnati
Jon Prier, Ohio Department of Natural Resources
Michael Teodecki, City of Akron
Hassan Zahran, City of Columbus

Project Summary:
Environmental Protection Agency (EPA) regulations require the implementation of storm water best management practices (BMPs) into roadway construction projects for post construction runoff. For local jurisdictions, the inclusion of these BMPs is difficult due to limited availability of space (i.e. right-of-way or easement). Urbanized areas pose additional challenges with the presence of sidewalks, houses, and businesses while many rural areas are faced with inadequate right-of-way widths. Further complicating the issue is the availability, or non-availability, of dedicated storm sewer systems in these areas.

A variety of products are commercially available for storm water management and a tremendous amount of research has been performed to establish BMPs. ODOT’s Location and Design (L&D) Manual Volume 2 outlines several BMPs that have been approved by the Ohio EPA for use on federal aid projects. While information on BMPs is available, it is not necessarily easily manageable or focused on local roadway applications. A focused synthesis study to collect and analyze storm water BMPs designed for utilization on Ohio’s local transportation system is needed to assist locals in the consideration of BMPs.

The goal of this research is to establish a methodology for recommending proven storm water BMPs for use on Ohio’s local roadway system that satisfy current regulations and are cost effective in terms of construction and maintenance by local governments. The objective of this research is to develop a matrix of storm water BMP alternatives for application on linear transportation projects on Ohio’s local system. The results of this research will provide local officials with a simplified tool to assist decision makers in selecting optimal BMPs for specific applications. Ultimately, access to the findings of this research will aid locals in implementing the most efficient and cost effective storm water BMPs enabling compliance with EPA regulations while adhering to budgetary constraints.
Project Title: Evaluation and Analysis of Liquid Deicers for Winter Maintenance

ODOT RFP#: 2015-01 State Job #: 134933

PID: 98396 Agreement #: 26517

FY 2015 Funding: $189,546.00 Funding Source: ODOT - SP&R2

Start Date: July 16, 2014 End Date: October 1, 2016

Research Agency: University of Akron

Researchers: Bill Schneider

TAC: Scott Lucas, ODOT's Maintenance Administration
Frank Phillips, ODOT District 4
John Washco, Chardon Township

Project Summary:
The purpose of this research is to provide stakeholders with information that will allow them to make informed decisions about safety for the traveling public as well as the cost effectiveness of each product available.

Ohio has a plethora of liquid deicers commercially available and the Ohio Department of Transportation would like to evaluate which deicers have minimal impacts on the environment, low corrosiveness, high melting capacity, and are compatible with ODOT's equipment and materials. This research will evaluate ODOT's current practices in the field and recommend deicers for various conditions. The recommended deicers will rank favorably in cost, have minimal environmental impact and corrosiveness. Melting capacity, longevity, compatibility and availability will also be considered.

There are four main objectives:

1) Determine the deicers that are compatible with ODOT's equipment and materials with the lowest environmental impact and corrosiveness, and the highest melting capacity.
2) Conduct laboratory and field tests to evaluate the best deicers under various temperature, environmental, and roadway conditions.
3) Recommend deicers for various conditions that rank favorably in cost, minimal environmental impact, and minimal corrosiveness, melting capacity, longevity, compatibility and availability.
4) Evaluate the feasibility of implementation for liquid deicers based on ODOT's current equipment and storage capabilities.
Project Title: Practical Design Guidelines for Replacement of Deficient Bridges with Low-Water Stream Crossing in the Rural Mid-West

ORIL RFP#: Pooled Fund SOL:1373

State Job #: TPF-5(318)

PID: 101663

Agreement #: N/A

FY 2015 Funding: $30,000.00

Funding Source: ODOT - SP&R2

Start Date: May 2015

End Date: August 2016

Research Agency: Kansas DOT

Researchers Susan Barker

ORIL TAC: Terry Lively, Belmont County
Bill Lozier, Licking County

Project Summary:
This is a pooled fund study being led by the Kansas Department of Transportation. The research is expected to be conducted by Dr. Bruce McEnroe of the University of Kansas and will last a total of 18 months. This research is contingent upon meeting the funding commitment level established by the Kansas DOT.

Many county-owned rural areas bridges are deficient and in need of replacement. Counties cannot afford to replace all deficient bridges and must prioritize their expenditures. In many locations the type and volume of traffic is too low to justify the expense of bridge replacement. This situation is worsening as the rural population declines. Some counties are closing low-volume roads rather than replacing deficient bridges. In some locations a low-water stream crossing might be a practical low-cost alternative to road closure.

County engineers and engineering consultants need guidelines to assess the practicality of replacing a deficient bridge with a low-water crossing and to select the best type of crossing. They also need straightforward design procedures and general design details for common types of crossings. Some general guidance on low-water crossings can be found in reports by the U.S. Forest Service (2006) and Iowa State University (2003). However, these reports do not provide some of the specific information needed for site assessment and crossing design.

This pooled fund study will produce a report that provides practical engineering guidance for the replacement of deficient bridges with low-water stream crossings in the rural Midwest. The report will address the following issues:

1) Site assessment and economics.
2) Selection of crossing type. The two basic types of low-cost low-water crossings are the unvented ford and the vented ford.
3) Design of roadway profile and culvert pipes.
4) Selection of crossing materials. Low-water crossings can be built of concrete, crushed stone, natural stone, stone reinforced with geogrid or geotextile, stone-filled gabions and other materials. We will provide guidelines for materials selection.
5) General design details. We will provide general design details for unvented fords and vented fords constructed of different materials. We will also provide guidance on signage of low-water crossings.
Project Title: 11th International Conference on Low Volume Roads and Peer Exchange

ORIL RFP#: Pooled Fund SOL:1378  State Job #: TPF-5(310)

PID: 101657  Agreement #: N/A

FY 2015 Funding: $8,000.00  Funding Source: ORIL - SP&R2

Start Date: October 8, 2014  End Date: July 31, 2016

Research Agency: Iowa DOT  Researchers Vanessa Goetz

ORIL TAC: Greg Butcher, Violet Township
Terry Lively, Belmont County

Project Summary:
This is a pooled fund study being led by the Iowa Department of Transportation. Those participating on behalf of ORIL will be expected to provide a presentation/report on the information obtained to their respective organization(s) to encourage technology transfer.

The Transportation Research Board (TRB) is hosting the 11th International Conference on Low-Volume Roads, in Pittsburgh, Pennsylvania, USA on July 12 to 15, 2015. The conference, held every four years, will feature the latest information about low-volume road management, design, construction, safety, maintenance, and many other related topics.

At this conference, those who administer, plan, design, build, or maintain low-volume roads will learn innovative ways of managing low-volume road systems. The conference is organized for practitioners worldwide in local, state, and federal agencies; universities; private firms; and international organizations. Previous conferences typically have attracted 250 to 300 transportation professional from around the world.

The focus of this pooled fund project will be to encourage states and other agency participation in the Low Volume Roads Conference. The primary activities of this pooled fund project are technology exchange, information sharing, and the facilitation of partnering relationships among state agencies, FHWA and other appropriate associations. Specifically this pooled fund will:

1) Provide communication and information sharing among member states. Discuss research, development and technology transfer needs in the areas of design, construction, maintenance, and safety on low volume roads and provide research ideas to TRB in connection with the 2015 11th LVR Conference.

2) 11th International Low Volume Roads Conference: Provide a technology and knowledge exchange forum to enhance the practical knowledge of conference participants concerning low volume road management with a focus on encouraging State DOT participation in the conference.

3) State DOT Meeting on Low Volume Road Issues: Provide a technology and knowledge exchange forum focused on State DOT Low Volume Road Issues during a workshop at the conference. Topics may include agency collaboration, funding, asset management, shared ROW/utilities, safety programs, emergency response, training and certifications, maintenance of traffic, federal oversight, standards and specifications, contracting methods, environmental issues, energy development, maintenance, material sources and quality, and bonding.

Deliverables will include quarterly administrative progress report updates (FHWA standard pooled fund format) and two final reports: a final summary report of the conference and a final report of the State DOT session at the conference. A follow-up webinar may be provided as funds allow.