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<tr><th colspan="4">Request for Research Funding for FY 2021–2022</th></tr>
<tr><td>Requesting Office</td><td>Safety Office</td><td>Priority
Highest</td><td>1 of 1 (projects may not have the same ranking – no ties)</td></tr>
<tr><td>Proposed Title</td><td colspan="3">Development of Best Practice Guide and Toolbox Towards Leading Bicycle Interval (LBI) Implementation in Florida</td></tr>
<tr><td>Justification</td><td colspan="3">
Describe the current situation, why the research is needed, and how the research affects your office's mission critical focus areas

Florida has led the nation with the largest number of bicyclist fatalities and the highest bicyclist fatality rate for several years. One of FDOT's top priorities is to improve bicycle safety, and reduce bicyclist fatalities, injuries and crashes. In Florida in 2018 and 2019, there were 13,254 bicycle crashes due to various common crash types including wrong-way bicycling, motorist right-turn crashes, collisions of bicyclists and motorists at an intersection, and others. Of these crashes, 316 were bicyclist fatalities, 1,612 were bicyclist incapacitating injuries, and 10,800 were bicyclist other injuries (DHSMV). Of the 857 bicyclist fatalities that occurred nationwide in 2018, 19% occurred in Florida (NHTSA). A 2017 report by Florida International University for the Florida Department of Transportation (FDOT) included a statewide analysis of bicycle crashes by type and bicycle facility type and of crash hot spots. The analysis indicated that signalized intersections had a large number of bicycle crashes and that more crashes occurred on urban roadways (Alluri et al., 2017).

As urban mode shifts to more bicycling and micromobility throughout Florida cities, bicycle facility improvements and innovative countermeasures are needed to keep up with vulnerable user travel demand. More bicycle safety and infrastructure research is needed to improve safety countermeasures based on past recommendations at the city, state, and national levels. FDOT District 7 implemented Florida's first protected cycle track in Downtown Tampa, a groundbreaking effort showing that new safety measures for bicycle safety are taking place throughout the state. Also implemented were bicycle signal heads at intersections that communicate traffic movements along the cycle track.

In locations where a bikeway on a through movement conflicts with turning traffic, a Leading Bicycle Interval (LBI) along with a Leading Pedestrian Interval (LPI) could be considered. An LBI can clear the intersection of all cyclists quickly and help prevent right-turn collisions. There are many potential benefits of LBIs and bicycle signals:

• Separate bicycle movements from conflicting motor vehicle, streetcar, light rail, or pedestrian movements.
• Provide priority to bicycle movements at intersections.
• Accommodate bicycle-only movements at signalized intersections (e.g., providing a phase for a contra-flow bike lane that otherwise would not have a phase); through bicycle travel may also occur simultaneously with parallel auto movement if conflicting automobile turns are restricted.
• Protect bicyclists in an intersection, which may improve real and perceived safety at high-conflict areas.
• Improve operation and provide appropriate information for bicyclists.

The major objective of this project is to research and identify national best practices for LBIs that can be used for Florida's development towards LBI implementation to effectively and significantly reduce bicyclist fatalities, injuries, and crashes. This initial research phase will help practitioners understand the safety benefits of using LBIs at locations such as cycle tracks, intersections, roadways, and urban districts. The research team will compile the results of a literature review, interviews, and case studies and will develop a practice guide, implementation guidelines, and a toolbox for city, county, and state planners, engineers, and decisionmakers to consider installation of LBIs. Although bicycle signal heads are not currently included in the Manual of Uniform Traffic Control Devices (MUTCD), the National Committee on Uniform Traffic Control Devices has formed a Task Force that is considering adding such guidance to the MUTCD. The State of California added it to its version of the MUTCD in Section 4D.104(CA), and the State of Oregon is considering similar legislation (NACTO).
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	Because LBIs are not included in the MUTCD, this research effort would be regarded as a highly innovative and progressive effort towards bicycle safety infrastructure enhancements. Florida has the opportunity to lead the nation in this research effort and provide future pilot implementation infrastructure to complement the research gained during this initial research phase. Improving safety, enhancing mobility, and inspiring innovation are inclusive components for new strategies that make LBI guidance Florida's next nationwide leading contribution to bicycle safety. FDOT's mission is to provide a safe transportation system that ensures the mobility of people and goods, enhances economic prosperity, and preserves the quality of Florida's environment and communities. The mission of the FDOT Safety Office is to continually improve the safety of the traveling public. This proposed project fully supports the missions of FDOT and the Safety Office on safety and mobility to mitigate fatalities, injuries, and injuries, especially for vulnerable bicyclists.
Impact	**How shall the results impact practice? Consequences of not doing the research?** The proposed research will include an in-depth analysis of efforts conducted nationwide to implement LBI technology and associated countermeasures. Understanding existing barriers and the countermeasures employed by agencies and cities across the U.S. can improve bicyclist safety and contribute to overall improvement in safety performance metrics desired by FDOT. Research has found that pedestrian signal timing can be inappropriate for bicyclists who travel at higher speeds; therefore, output from this project will provide key guidelines on safely implementing LBIs. With the onset of the COVID-19 pandemic, cities across the nation have experienced a significantly higher share of bicycle users on their streets. To accommodate this new demand and to cater to the attractiveness of this emerging mode choice, studies need to be conducted to accurately understand all factors to be considered for safety implementations in Florida. The proposed research study involving in-depth literature review, case study analyses, and survey interviews with nationwide stakeholders will provide crucial insights on effective implementation strategies that can be undertaken by FDOT and other Florida agencies. The results from this proposed research will produce key best practices, guidelines, and a toolbox for implementing LBIs on Florida roads. These outcomes could assist various coalitions in focusing effective outreach for FDOT and other agencies on challenges faced by bicyclists in urban settings and strategies to implement LBIs with focus on saving lives and injuries as well as changing unsafe behaviors. The effective strategies and approach identified from this research project could also lead to changes in policy/practice, resulting in major safety improvements and integration into statewide local traffic agency policy/practices at little additional expense. Consequences of <u>not</u> conducting the research include the following: • FDOT would not obtain the results and findings from a comprehensive literature review and expert interviews regarding approaches used across the U.S to implement LBIs. • FDOT will not have essential information about the success stories of meaningful implementation of LBI and all-bike phases that provide significant safety benefits to road users. • FDOT will not have access to a best practices guide, guidelines, and a toolbox for implementation of LBIs to affect change.
Affected Offices	**Identify any office that will need to be involved in the scoping or conduct of the research, will be affected by implementation of the results, or will need to participate in the implementation process—including OTIT, if enterprise data/network software application will be a deliverable, and district staff, as appropriate, e.g., through statewide meetings. If the requesting office will not be the implementing office, please identify which office will have to serve in that capacity—has it been involved?** FDOT Safety Office; FDOT Traffic Operations
Existing Work	Although there is little work on the implementation and effectiveness of LBIs from a design and operations perspective, following is a selection of pre-existing work that describes the considerations for LBI implementation across the U.S.:

	• *Guidance to Improve Pedestrian and Bicyclist Safety at Intersections, NCHRP Research Report 926, 2020* – provides up-to-date knowledge for practitioners to identify and apply proven treatments (including LBIs) to make intersections safer for all users; includes a detailed report on LBI implementation on a general scale, its applicability, and effectiveness in improving intersection safety. • *Urban Bikeway Design Guide, National Association of City Transportation Officials, 2011* – provides detailed guidance on bicycle signal design, implementation, and operation to understand the influence of various factors that guide the creation of safer intersections. • *Don't Give up at the Intersection: Designing All Ages and Abilities Bicycle Crossings, National Association of City Transportation Officials, 2017* – discusses developments after production of the *Urban Bikeway Design Guide* in 2011; provides insights into more recent design strategies for intersections that reduce vehicle-bike conflicts, including signal phasing strategies such as LBIs; key reference used by cities to build comprehensive, connected, safe bike networks. • *Separated Bike Lane Planning and Design Guide, Massachusetts Department of Transportation, 2017* – provides a framework for determining when separated bike lanes are appropriate and feasible as well as guidance on signal phasing considerations for LBIs. • *Addressing Bicycle-Vehicle Conflicts with Alternate Control Strategies, Kothuri et al., Transportation Research and Education Center (TREC), 2018* –analysis of operational impacts of traditional concurrent phasing, LBIs, split LBIs, and exclusive bike phasing in a microsimulation environment; exploration of safety impacts of traditional concurrent phasing, LBIs, split LBIs, and mixing zones using video-based conflict analysis via microsimulation analysis; provides broad-based recommendations on appropriate treatment to be implemented to reduce right-hook conflicts. • *Effectiveness of Bicycle Signals for Improving Safety and Multimodal Mobility at Urban Intersections, Seok et al., Transportation Research Center for Livable Communities (TRCLC), 2018* – evaluation of two bicycle crash countermeasures with bicycle signal treatments using a before-after survey and subsequent microsimulation analysis; results showed effectiveness of approaches such as LBIs along with other interventions in reducing vehicle-bike conflicts and enhancing intersection safety. • *Statewide Analysis of Bicycle Crashes, Alluri et al., Florida Department of Transportation (FDOT) Contract Number BDV29-977-23, 2017* – statewide analysis of bicycle crashes by bicycle crash types, crash hot spots, and bicycle facility type; investigation of bicycle crash countermeasures in existence; indicated signalized intersections showed large number of bicycle crashes and more crashes occurring on urban roadways. • *Bicyclists Use of Leading Pedestrian Intervals: Pilot Program Results, New York Department of Transportation, 2019* – evaluated potential impacts of allowing bicyclists to benefit from using installed LPIs for conflict-free head start; results showed that while there are benefits form using existing LPIs, challenges still exist in high bicycle throughput intersections. • *Why Salt Lake City Chose to Build the First Protected Intersection for Bicycling in the U.S., Goodyear, S, City Lab, May 2015* – discusses why Salt Lake City's approach for intersection design was most sensible solution for a practical problem. • *Protected Intersections in the U.S.: From Zero to 12 in Two Years, Andersen, M., Streetsblog USA, Jan 2017* – discusses why newest innovation in protecting intersections is effective in improving safety. • *Phoenix Gets Its First Bike Traffic Signal, City of Phoenix, Apr 2016* – details development of new protected bike lanes in Phoenix including LBIs to decrease risks between bicyclists and turning traffic. • *Data*: Protected Intersection Inventory (updated 2017) https://docs.google.com/spreadsheets/d/1eu0cjAaTP7jLRhF61UYKuK2bH18vqBDrpzx1AxvFDoc/edit#gid=3
Keywords Used in Existing Work Search	Bicyclist safety, bicycle policy, signal phasing, pedestrian safety, Leading Bicycle Interval, LBI

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Related Contracts (Give contract numbers)	N/A		
Funding Request	$120,000	**Anticipated Duration**	18 months
Project Manager	Trenda McPherson	**Contracting Method**	Direct contract with Center for Urban Transportation Research (CUTR) at the University of South Florida
Urgency	Score 1–5, with 1= highest, most immediate need **Score = 1**	Nationally, Florida has the 3rd-largest population and the 3rd-largest total annual vehicles miles traveled (VMT) in the U.S.; it also has the largest number of bicyclist fatalities, the 2nd-largest number of pedestrian fatalities, and the 3rd-largest number of traffic fatalities. Florida has the 3rd-highest pedestrian fatality rate and the highest bicyclist fatality rate in the nation. There is strong evidence from existing literature that effective implementation of countermeasures will play a major role in reducing fatalities and making intersections safer for bicyclists, pedestrians, and motorists. The proposed research study is especially pertinent in the area of pedestrian, bicycle, and traffic safety. Therefore, there is an urgent need to conduct the proposed research to identify best practices and develop best practice guide, implementation guidelines, and a toolbox in supporting FDOT for implementing LBIs in Florida to improve bicycle safety and build a bicycle-friendly environment.		
Implementability	Score 1–5, with 1 = greatest likelihood of and proximity to implementing results **Score = 1**	The products from this research including a best practices guide, implementation guidelines, and a toolbox for LBIs as key resources to inform and support policy and decision making in preparation for and implementation of LBIs in Florida. This will lead to tangible results in the short, medium, and long terms. The best practices guide and implementation guidelines for LBIs will outline benchmarks from design and operation/implementation perspectives and can be used by FDOT, cities, counties, and MPOs to prepare and implement LBIs to significantly improve bicycle safety at signalized intersections.		

Project Benefits (Succinct, complete explanation)		
Project Benefits **(Select all that apply and explain)**	**Quantifiable Benefits (units, dollars, etc.…if applicable)**	**Methodology or Data Sources Used to Determine Quantifiable Benefits. If not applicable, please give justification of project benefits.**
o Materials Enhancement		
o Materials Savings		
o Time Savings	Reduction of non-recurring congestion	The reduction of bicyclist fatalities, injuries, and crashes could lead to reduction of non-recurring congestion caused by bicycle crashes.
o Lives Saved/ Injuries Prevented	Reduction in number of bicyclist fatalities, injuries, and crashes	The results and outcome from this project could lead to future implementation of LBIs to significantly improve bicyclist safety at signalized intersections and reduce bicyclist fatalities, injuries, and crashes. Based on NHTSA data, 29% of

	Total estimated cost savings of lives and injuries could reach $157M per year	bicyclist fatalities occur at intersections. Based on the Traffic Crash Facts Annual report published by the Florida DHSMV, in 2019 there were 156 bicyclist fatalities, 774 bicyclist incapacitating injuries, and 5,455 bicyclist other injuries. Assuming a 5% reduction in bicyclist fatalities and injuries per year by implementing LBIs statewide, potentially about 8 lives, 39 incapacitating injuries, and 273 other injuries could be saved, with an estimated saving of $157M (=8 x $10,100,000 + 39 x $818,636 + 273 x $163,254) in social costs in terms of loss of productivity.
○ Other (Explain)	Best practice guide, LBI implementation guidelines, and toolbox	The best practice guide, implementation guidelines, and toolbox developed in this project can support FDOT and local agencies to prepare and implement LBIs in their jurisdictions to significantly improve bicycle safety at signalized intersections.

*Comments should explain and support urgency, financial benefit, and implementability scores