



District Department of Transportation

State Planning & Research Part II Work Program

Research, Development, & Technology Transfer Program

**Fiscal Year 2020
for the period January 1 – September 30, 2020**

**Revision #2
September 2020**

In Cooperation with the US Department of Transportation
and Federal Highway Administration

SPR Part II Work Program

Research, Development, & Technology Transfer Program

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Summary of Revisions

ID	Item	Budget v3	Change	Notes
2020-01	Research Program Administration and In-House Research	\$183,503	\$0	
2020-011	Research Program Administrator	\$109,072	\$0	
2020-012	DDOT Librarian	\$70,448	\$0	
2020-013	Internal intern	\$3,983	\$0	
2020-02	Academic and Administrative Support Services	\$355,267	\$32,756	
2020-021	Administrative Support	\$221,186	\$57,756	For fall semester
2020-022	Subcontracting costs	\$0	\$0	
2020-023	Peer Reviewers	\$4,000	\$0	
2020-024	Research Internship Program	\$120,080	\$0	
2020-025	Peer Exchange	\$10,000	-\$25,000	Virtual exchange
2020-03	Collaborative Research Efforts	\$100,645	\$0	
2020-031	TRB Dues	\$75,645	\$0	
TPF-5(315)	National Accessibility Evaluation	\$0	\$0	
TPF-5(370)	Fostering Innovation in Pedestrian and Bicycle Transportation	\$25,000	\$0	
TPF-5(440)	Support for Urban Mobility Analyses	\$0	\$0	
2015-12/ NITC 1269	Exploring Data Fusion Techniques to Derive Bicycle Volumes on a Network	\$0	\$0	
2020-04	Quick Response and Literature Reviews	\$30,000	-\$20,000	
2020-041	Advisory Bicycle Lane Evaluation (Phase 1)	\$10,000		Newly identified project
2020-042	Projects TBD	\$20,000		
2020-10	Research Projects	\$186,930	\$36,229	
2020-101	Pedestrian and Cyclist Intersection Safety Sandbox	\$186,930	\$36,229	Increase for negotiated budget
2020-102	Full Evaluation of a Low-Income Transit Fare Pilot Program in DC	\$0	\$0	
2020-103	Mode Shift Study: The Impact of Micro-mobility on Capital Bikeshare and Transit	\$0	\$0	
2017-11	Vision Zero Risk Analysis Model	\$0	\$0	
	IDCR	\$70,664	\$4,164	
	TOTAL	\$856,344	\$48,984	

The rest of the document reflects these changes. The obligation for the recurring annual activities, FAP 2020(005), covers items 2020-01 through 2020-04. No additional obligation will be needed as that budget had previously decreased (v2). Project 2020-101 will require additional obligation.

Overview

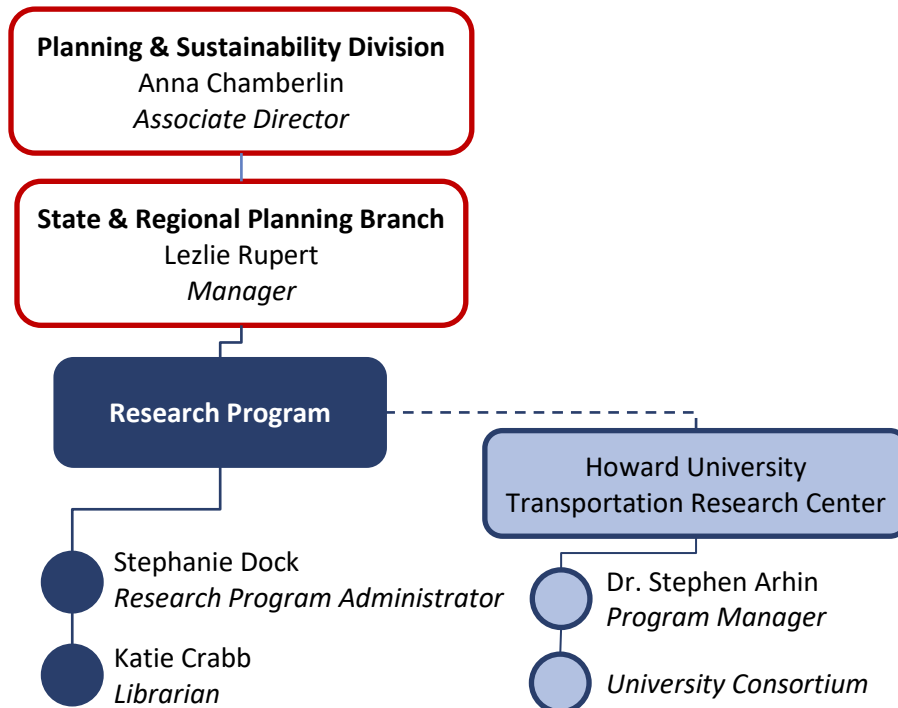
Title 23 of the United States Code provides federal funding for state research programs by requiring that at least a minimum of ½ percent of certain federal funds apportioned to a state be used for research, development, and technology transfer (RD&T) programs. These activities involve research on new areas of knowledge, adapting findings to practical application by developing new technologies and the transfer of these technologies, including the process of dissemination, demonstration, training, and adoption of innovations by users.

This work program identifies the work to be accomplished and cost estimates by activity for the use of State Planning & Research (SPR) funds for research purposes during Fiscal Year 2020.

Mission

The mission of the District Department of Transportation's (DDOT) Research Program is to facilitate and promote innovative transportation research, implementation, outreach, and technology transfer activities in order to improve the efficiency and effectiveness of DDOT's service delivery. To do this, the Research Program convenes and guides a structured approach to research, provides research material, and manages research projects.

Organization Chart



DDOT Statement of Compliance

I, Jim Sebastian, Associate Director of the Planning & Sustainability Division of the District Department of Transportation, do hereby certify that the District is in compliance with all requirements of 23 U.S.C. 505 and its implementing regulations with respect to the research, development, and technology transfer program, and contemplate no changes in statutes, regulations, or administrative procedures which would affect such compliance.

Jim Sebastian
Associate Director
Planning & Sustainability Division
District Department of Transportation

Proposed Funding

Estimated SPR Part II Funding in FY2020

Line Item	Description	Salary	Fringe	Total	Federal	District
	Research Program Administrator	\$85,213	\$23,860	\$109,072	\$87,258	\$21,814
	DDOT Librarian	\$55,037	\$15,410	\$70,448	\$56,358	\$14,090
	Internal Intern	\$3,112	\$871	\$3,983	\$3,186	\$797
2020-01	Research Program Administration and In-House Research Subtotal	\$143,362	\$40,141	\$183,503	\$143,616	\$35,904
2020-02	Academic & Administrative Support Services			\$355,266	\$284,212	\$71,053
2020-03	Collaborative Research (TRB + Pooled Fund) ¹			\$100,645	\$85,516	\$15,129
2020-04	Quick Response and Literature Reviews			\$30,000	\$24,000	\$6,000
2020-04	Research Projects ¹			\$186,930	\$149,544	\$37,386
	Contractual Services Subtotal			\$672,841	\$543,273	\$129,568
	IDCR (8.5%)²			\$70,664	\$56,531	\$14,133
	TOTAL			\$927,008	\$743,420	\$179,605

¹ There are continuing projects that do not have new funding in FY2020.

² IDCR does not apply to Pooled Fund contributions

01 Research Program Administration and In-House Research

Work Item Budget	Total Amount:	\$183,503
	Federal Portion:	\$146,802
	District Portion:	\$36,701

Line Item Budget Details:

- **Manager:** Stephanie Dock, Research Program Administrator, Planning & Sustainability Division
- **Work Conducted By:** DDOT Staff
- **Planned Completion:** October 2020

Line Item	Positions	\$/Hr. (w/benefits)	Hours	Estimated Cost FY20
2020-011	Research Program Administrator	\$69.92	1,560	\$109,072
2020-012	DDOT Librarian	\$45.16	1,560	\$70,448
2020-013	Internal Intern	\$12.45	320	\$3,983

Funding Category Purpose & Objectives

The Research Branch is responsible for encouraging, managing and implementing all Research Program activities. The branch is comprised of a program administrator and a librarian. This work program covers nine months of fully loaded staff salaries.

The Research Program, with the support of the FHWA Division Office, has been working on returning to program fundamentals for the last several years. These efforts are bearing fruit and the program will again be initiating projects this year. A continued emphasis on program fundamentals will ensure the program's long-term sustainability and success. Critical activities for this are:

- Hosting a peer exchange in the spring/summer 2020
- Finishing the close out on earlier work program federal aid projects (FAPs) as projects complete
- Continuing to revise and expand the standard operating procedures for program activities

Staff will continue to support core program activities funded through this budget, namely:

- Monitoring active research projects from prior work programs
- Administering the university support contract with Howard University
- Managing the research internship program
- Managing the DDOT Library and library services
- Coordinating the TRB relationship
- Supporting agency research and innovation efforts, through the State Transportation Innovation Council and Every Day Counts initiatives, market scans, and assisting with research funding applications as appropriate
- Conducting internal research

Line Item 2020-011

Title: Research Program Administrator

The Research Program Administrator oversees the development, coordination, management, and administration of the federally funded SPR Part II transportation research program. Prepares the annual work program and prepares quarterly and annual progress reports on the work program. Reviews research problem statements, proposals, and work plans for research projects. Attends administrative or technical meetings and workshops associated with research, development, and technology transfer. Serves as TRB State Representative and EDC Coordinator.

Conducts in-house research. Expected projects and activities this year include:

- Implementation of the vetting process for pilots, demonstrations, and testing to support effective development and technology transfer for new and emerging technologies
- Support for evaluations of pilots and demonstrations led by other DDOT staff
- Data governance process development and technology transfer for pooled fund activities around accessibility and urban mobility.

Line Item 2020-012

Title: DDOT Librarian

The DDOT Librarian manages the DDOT Library and provides library services to the agency, including conducting literature reviews, digitization of the archives, and cataloging and making available DDOT's research (as well as national research). Assists external researchers seeking to use DDOT's collections (generally archival materials). Manages the intern program and supports the Research Program Administrator in other program activities and in-house research.

Expected projects and activities this year include:

- Digitization of the DDOT archives and posting through the DDOT Back in Time website.
- Library collection management – refine and identify funding for acquisitions plan, implement weeding plan to de-accession items not needed in preparation for eventual office relocation.

Line Item 2020-013

Title: Internal Intern

As part of DDOT's program to support women in the agency, the Research Program is testing out allowing one of the DDOT safety technicians who is in a graduate degree program to take on an intern position supporting several small, internal research efforts.

02 Academic and Administrative Support Services

Work Item Budget	Total Amount:	\$355,266
	Federal Portion:	\$284,212
	District Portion:	\$71,053

Line Item Budget Details:

- **Manager:** Stephanie Dock, Research Program Administrator, Planning & Sustainability Division
- **Work Conducted By:** Howard University
- **Planned Completion:** December 2020 (will end early if can shift to FY21 earlier)

Line Item	Description	Estimated Cost FY20
2020-021	Administrative Support	\$221,186
2020-022	Subcontracting costs	\$0
2020-023	Peer Reviewers	\$4,000
2020-024	Research Internship Program	\$120,080
2020-025	Peer Exchange	\$10,000

Funding Category Purpose & Objectives

The Research Program utilizes the resources of area universities to expand the program's capacity and to support transportation research at those universities. HUTRC leads a consortium of local universities to support the Research Program. The funding category covers compensation for the staff at HUTRC for their time to support DDOT and administer the consortium and the internship program; costs of the internship program; and support for the peer exchange DDOT will conduct this year.

Line Item 2020-021

Title: Transportation Research, Evaluation and Technology Development

University costs are assumed to include applicable overhead rates and fringe benefits for staff salaries. Typically, the program support staff salaries are paid from this budget area. Where university staff members paid from this budget are engaged as Principal Investigators on research projects, those projects will be conducted at a reduced cost.

This cost estimate assumes partial salaries for 3 staff at Howard University (program director and 2 other staff) from January to December.

Line Item 2020-022

Title: Subcontracting Costs

Per the contract with Howard University, projects that are conducted by university consortium members have a subcontracting fee associated with them for the management of those subcontracts. Based on the selected projects, estimate assumes one project will be conducted by a university partner. This item will not be needed if Howard University conducts the work directly.

Line Item 2020-023

Title: Peer Reviewers

Expert peer reviewers are engaged to support research projects and ensure quality products by reviewing methodology, interim deliverables, and the final report. Reviewers are offered a small stipend in return for their time for projects, based on the expected level of engagement. Estimate assumes 2 paid reviewers per project for 3 projects.

Line Item 2020-024

Title: Transportation Research Internship Program

The internship program is administered by the university, who is responsible for recruitment, hiring, and payment. Intern research projects are identified throughout DDOT and intern work is overseen by agency staff. The cost estimate for the internship program is based on ten full time interns during the summer and three part-time interns during the semester, though the exact numbers of interns will vary based on level (graduate/undergraduate), number of requests, and available budget.

Line Item 2020-025

Title: Peer Exchange

This item will be used to support the peer exchange, to be held in the spring or summer of 2020. Howard University will provide someone to coordinate the peer exchange, assist in preparations for the peer exchange (logistics and materials), and cover the travel costs for out-of-state participants. The cost estimate is based on the costs for the last research peer exchange held in 2013 and has been adjusted down for a virtual exchange (no participant travel costs now).

03 Collaborative Research Efforts

Work Item Budget	Total Amount:	\$100,645
	Federal Portion:	\$85,516
	District Portion:	\$15,129
	Other Funds:	\$25,000

Line Item Budget Details

Line Item	Description	Estimated Cost FY20	Prior Contributions	Expected Future Contributions	Total Cost Estimate
2020-031	TRB Dues	\$75,645	Annual	Annual	\$75,645
TPF-5(315)	National Accessibility Evaluation	\$0	\$160,000	TBD*	\$160,000
TPF-5(370)	Fostering Innovation in Pedestrian and Bicycle Transportation	\$25,000	\$50,000	\$25,000	\$100,000
TPF-5(440)	Support for Urban Mobility Analyses	\$0	\$0	\$0	\$0
2015-12/ NITC 1269	Exploring Data Fusion Techniques to Derive Bicycle Volumes on a Network	\$0	\$10,850	\$0	\$10,850

*This study has reached the 5-year term for TPF projects and is expected to have a new solicitation posted to continue the work. The content of that solicitation will determine future DDOT participation.

Funding Category Purpose & Objectives

This work item covers collaborative research efforts in which DDOT participates. The Research Program pays the costs for TRB dues and contributes to Transportation Pooled Fund (TPF) projects. DDOT is currently committed to three pooled fund studies, two of which are paid from SPR Part II funds and are listed below with their TPF numbers.

Project 2020-031

Title: TRB Dues

This item is for the District's dues to TRB. This amount is an estimate for the July 2020-June 2021 dues, assuming a small increase from prior years. These funds are paid to TRB directly, not via the pooled fund mechanism

- **Manager:** Stephanie Dock, Research Program Administrator, Planning & Sustainability Division
- **Work Conducted By:** Transportation Research Board
- **Planned Completion:** Funds transferred by September 30, 2020

- **Estimated Cost:** \$74,000

Project TPF-5(315)

Title: National Accessibility Evaluation

This pooled fund project has two main objectives. First, it will create a new, national Census block-level accessibility dataset that can be used by partners in local transportation system evaluation, performance management, planning, and research efforts. Second, it will produce and publish a series of annual reports describing accessibility to jobs by driving and by transit in metropolitan areas across America.

DDOT has participated in this study since its inception in 2015 and has contributed to 5 of the 6 years. This project will likely have a new TPF number for 2020, but the expectation is this project will continue. This project is approved for 100% SPR funds and therefore no District share is included for this project.

- **Manager:** Stephanie Dock, Research Program Administrator, Planning & Sustainability Division
- **Lead Agency:** Minnesota DOT
- **Planned Completion:** 2019 for current project; new solicitation is for 2021-2025 (TPF-5(455)).
- **FY2020 Contribution:** \$0

Project TPF-5(370)

Title: Fostering Innovation in Pedestrian and Bicycle Transportation

Transportation agencies across the country are seeking ways to improve pedestrian and bicyclist safety and mobility. This TPF study will supplement existing research venues and fill an important missing gap by emphasizing short turnaround practical research on issues immediately relevant to practitioners. It will focus on bicycle and pedestrian network planning, safety, design issues, traffic control devices, and other relevant issues as designed by TPF participants.

DDOT has participated in this study since its inception in 2017 and has contributed to 3 of the 4 years. DDOT expects to contribute to the final, 5th year of the program in 2021. This project is approved for 100% SPR funds and therefore no District share is included for this project.

- **Manager:** Will Handsfield, Bicycle Program Specialist, Planning & Sustainability Division
- **Lead Agency:** Federal Highway Administration
- **Planned Completion:** Funds transferred by August 2020; project is ongoing through 2021.
- **FY2020 Contribution:** \$25,000

Project TPF-5(440)

Title: Support for Urban Mobility Analyses

The pooled fund study scope focuses on mobility and reliability performance measures, data and issues. New emphasis areas include emerging data sources, freight movement, arterial street mobility issues, reliability performance measures, and addressing the agency challenges for FAST Act requirements.

SPR Part II Work Program

For over 30 years, TTI's urban mobility research efforts have developed and refined a comprehensive set of performance measures and the tools to measure and monitor mobility conditions in urban America. Since 1998, the study has been a pooled fund effort involving a combination of state departments of transportation (DOTs) (currently 15), FHWA and other sponsors from metropolitan planning organizations and Transport Canada. The analysis procedures and resulting performance measures have been used in multi modal performance measurement efforts by numerous state DOTs, metropolitan planning organizations (MPOs) and in other countries.

- **Manager:** Kelli Raboy, ITS Manager, Traffic Engineering & Safety Division; Ting Ma, Performance Manager, Performance Management Division
- **Lead Agency:** Texas DOT
- **Planned Completion:** Funds transferred by August 2020; project is ongoing through 2021.
- **FY2020 Contribution:** \$25,000 in SPR-A funds [listed here for consolidated pooled fund tracking]

Project 2015-12 / NITC 1269

Title: Exploring Data Fusion Techniques to Derive Bicycle Volumes on a Network

Planners and decision makers have increasingly voiced a need for network-wide estimates of bicycling activity. Recently, new sources of bicycling activity data have emerged. These derive primarily from GPS-based smartphone apps (e.g. Strava, Ride Report, Map My Ride) and GPS-enabled public bicycle sharing systems. These emerging data sources have potential advantages as a complement to traditional count data, and have even been proposed as replacements for such data, since they are collected continuously and for larger portions of local bicycle networks. However, the representativeness of these new data sources has been questioned, and their suitability for producing bicycle volume estimates has yet to be rigorously explored. The project will develop a method for evaluating and integrating emerging sources of bicycle activity data with conventional demand data and methods, and then apply the results to several locations to predict network-wide bicycle volumes.

DDOT is participating in this pooled fund-type project through the National Institute for Transportation and Communities (NITC), a university transportation center (UTC) at Portland State University. A project selected for funding in 2015 was very similar to this topic and so that funding was redirected to support this project (at a lower dollar value) instead of duplicating research. No additional support is needed beyond the original contribution.

- **Manager:** Will Handsfield, Bicycle Program Specialist, Planning & Sustainability Division
- **Lead Agency:** Portland State University
- **Planned Completion:** June 30, 2020
- **FY2020 Contribution:** \$0

04 Quick Response and Literature Reviews

Work Item Budget	Total Amount:	\$30,000
	Federal Portion:	\$24,000
	District Portion:	\$6,000

Line Item Budget Details

Line Item	Description	Estimated Cost FY20	Prior Contributions	Total Cost Estimate
2020-041	Advisory Bicycle Lane Evaluation (Phase 1)	\$10,000	\$0	\$10,000
2020-042	Projects TBD	\$20,000	\$0	\$20,000

Funding Category Purpose & Objectives

The Research Program sets aside funds for quick response projects to respond to requests from upper management and literature review and market scan efforts that are too large to be conducted internally. These funds are not programmed in advance because quick response and literature review projects are by their nature uncertain at the time of work plan development. The use of these funds requires approval from DDOT leadership (PSD Associate Director, DDOT Chief of Staff, or DDOT Director). Project details will be added and numbered when (and if) projects be identified and approved.

The cost estimate for this project is based on the last several years of requests and known items that may be in the works. On average, requests have averaged \$30,000-\$35,000 per year, but expenditures in years the funds are used are typically higher.

Year	# of Projects	Expenditures	Notes
2015	1	\$110,135	
2016	0	\$0	Line item re-budgeted
2017	3	\$49,600	
2018	0	\$0	No work program for FY2018
2019	0	\$0	\$25,000 requested but not funded due to proximity to end of the program year and project timeline; \$5,000 item discussed but not formally requested before year end

Project 2020-041

Title: Advisory Bicycle Lane Evaluation (Phase 1)

In October 2019, the FHWA granted DDOT permission for a trial of the advisory bike lane pattern on five corridors in the Capitol Hill area of the District of Columbia. This experiment is aimed at determining the

effectiveness of the new advisory bike lanes that are to be installed on five corridors in the Capitol Hill area in the District of Columbia. The experiment will consist of an evaluation process to observe bicyclists' and motorists' behavior along the subject streets before and after the application of the experimental devices. A survey to assess bicyclists' sense of safety along with motorists' understanding of the purpose of the advisory bike lanes will also be included in this experiment.

This Phase 1 of the analysis will conduct the first 2 tasks of the planned scope of work – the literature review and analysis of the previously collected before data.

- **Manager:** Will Handsfield, Bicycle Specialist, Planning & Sustainability Division
- **Work Conducted By:** Howard University
- **Expected Date of Issuance:** September 2020
- **Planned Completion:** December 2020 (3 month project)
- **Cost Estimate:** \$10,000

Project 2020-042

Title: TBD

Manager, timeline, entity to conduct the work, and tasks are defined as requests come in.

10 Research Projects

Work Item Budget	Total Amount:	\$186,930
	Federal Portion:	\$149,544
	District Portion:	\$37,386
	Other Funds:	\$0

Line Item Budget Details

Line Item	Description	Estimated Cost FY20	Prior Contributions	Total Cost Estimate
2020-101	Pedestrian and Cyclist Intersection Safety Sandbox	\$186,930	\$0	\$186,930
2020-102	Full Evaluation of a Low-Income Transit Fare Pilot Program in DC	\$0	\$0	\$0
2020-103	Mode Shift Study: The Impact of Micro-mobility on Capital Bikeshare and Transit	\$0	\$0	\$0
2017-11	Vision Zero Risk Analysis Model	\$0	\$176,584	\$176,584

Funding Category Objectives

Research projects are selected through the process described in the Research Manual. A call for projects is typically issued annually and projects are ranked by the Research Project Selection Committee (RPSC), a group comprised of the agency's senior leadership. There were 6 projects submitted and championed for FY2020 funding. Those projects were presented to and ranked by the RPSC on October 28, 2019. Three projects are proposed for funding this year. These projects will each be individually, separately obligated.

The complete project descriptions are included in Appendix B.

Project 2020-101

Title: Pedestrian and Cyclist Intersection Safety Sandbox

Intersection crossing is increasingly a challenge for distracted pedestrians, seniors, and individuals with disabilities (e.g., low vision or mobility issues). DC's Vision Zero Initiative seeks to reach zero fatalities and serious injuries to travelers of DC's transportation system, through more effective use of data, education, enforcement, and engineering. Part of both Vision Zero and DDOT's long-range transportation plan, MoveDC, is a commitment to increase pedestrian and cyclist safety at intersections.

As the Nation's Capital, DDOT receives numerous vendor pitches for emerging technology solutions. However, because of the nascent nature of these solutions, their potential benefit to the agency is often difficult to assess and, if deemed suitable, often difficult to champion toward implementation.

Toward a more strategic approach for testing applications of innovative solutions for Vision Zero, DDOT intends to implement one or more pilot or demonstration projects that use emerging technology solutions to improve pedestrian and/or cyclist safety in intersections. In technology development, the term “sandbox” is used to refer to a testing environment that allows for safe testing of new software or code before implementation in a program or service. Borrowing from this idea, this project will designate a “sandbox” of a single intersection or corridor within the District to be used to safely pilot new technologies

This project will implement the sandbox with several emerging solutions and evaluate the outcomes. It is expected that many of the solutions will still be in research and development phases and that this project can help to shape those products while also providing valuable lessons learned for DDOT staff.

- **Manager:** Kelli Raboy, ITS Manager, Transportation Operations & Safety Division
- **Work Conducted By:** Consultant (A&E Schedule)
- **Expected Date of Issuance:** October 2020
- **Planned Completion:** February 2022 (18 month project)
- **Cost Estimate:** \$186,930

Project 2020-102

Title: Full Evaluation of a Low-Income Transit Fare Pilot Program in DC

This project has been canceled this year due to COVID-19. Transit services and travel behavior are disrupted, and the other funds supporting this project are no longer available.

Project 2020-103

Title: Mode Shift Study: The Impact of Micromobility on Capital Bikeshare and Transit

This project has been canceled due to Covid-19. In-person surveys are infeasible this year and travel behavior is greatly disrupted.

Continuing Research Projects

Project 2017-11

Title: Vision Zero Risk Analysis Model

The main objective of this proposal is to develop a comprehensive Vision Zero Risk Analysis Model which will measure risk using a multivariate statistical analysis superior to the Composite Crash Index model currently used in the Highway Safety Improvement Program. Such a model will work to effectively reduce crashes and fatalities for *all* roadway-users within the District, expanding beyond motor vehicle users to include cyclists and pedestrians by using a forward thinking methodology to more accurately predict and identify high risk areas that should be a priority for DDOT to address.

Currently, DDOT's policy, safety, and technology offices do not have staff dedicated to this task. The undertaking of such a task as a Research Project will build from existing expertise at DDOT, including the existing Crash Composite Index and Highway Safety Improvement Program, and the work of the Highway Safety Office to produce a predictive model. An end-product will include utilizing a multivariate analysis, geo-spatial analysis (GIS), and predicative modeling in combination with transportation safety knowledge. Fortunately, DDOT has already collected an expansive amount of applicable data, thus the Vision Zero Risk Analysis model would focus more on the analysis portion.

Note that the full value of this project is carrying forward because while work is underway, no invoices have yet been submitted.

- **Manager:** Emily Dalphy, Transportation Engineer, Vision Zero Division
- **Work Conducted By:** University consortium
- **Date of Issuance:** April 2019
- **Planned Completion:** May 2020
- **Cost Estimate:** \$176,584 (FY2017 funds)

Appendix A. Regulatory Compliance Checklist

REGULATION REQUIREMENT	23 CFR 420 Section	DDOT Compliance
The Program must be implemented in compliance with its approved work program.	117, 205	x
Annual approval of State DOT Research and Development Work Program.	111, 115, 209	x
Documentation that describes the State DOT's management process and the procedures for selecting and implementing RD&T activities must be developed by the State DOT and submitted to the FHWA Division office for approval. Significant changes in the management process must be submitted by the State DOT to the FHWA for approval.	115, 209	Updated and in review
Periodic reviews of the State DOT's Management Process of the RD&T.	209	x
The State DOT's RD&T work program must, as a minimum, consist of a description of RD&T activities to be accomplished during the program period, estimated costs for each eligible activity, and a description of any cooperative activities including the State DOT's participation in any transportation pooled fund studies and the NCHRP. The State DOT's work program should include a list of the major items with a cost estimate for each item. The work program should also include any study funded under a previous work program until final report has been completed for the study.	207	x
The State DOT's RD&T work program must include financial summaries showing the funding levels and share (Federal, State, and other sources) for RD&T activities for the program year.	207	x
The State must use an interactive process for identification and prioritization of RD&T activities for inclusion in an RD&T work program.	209 (a)(1)	x
The State must use all FHWA planning and research funds set aside for RD&T activities to the maximum extent possible.	209 (a)(2)	x
The State must have procedures for tracking program activities, schedule, accomplishments, and fiscal commitments	209 (a)(3)	x
The State must use support and use of the TRID database for program development, reporting, and input of the final report information.	209 (a)(4)	x
The State must have procedures to determine the effectiveness of the State DOT's management process in implementing the RD&T program, to determine the utilization of the State DOT's RD&T outputs, and to facilitate peer exchanges of its RD&T Program on a periodic basis	209 (a)(5)	x
The State must have procedures for documenting RD&T activities through the preparation of final reports. As a minimum the documentation must include the data collected, analyses performed, conclusions, and recommendation. The State DOT must actively implement appropriate research findings and should document benefits.	209 (a)(6)	x
The State must participate in peer exchanges of its RD&T management process and other State DOTs' programs on a periodic basis. Note: FHWA has guidance defining "period" as at least once every 5 years for a minimum of 2-3 days.	209 (a)(7)	Planned for this year

REGULATION REQUIREMENT	23 CFR 420 Section	DDOT Compliance
The State DOT must include a certification that it is in full compliance with the requirements of this subpart in each RD&T work program. Note: the language to be used for this certification is specified in the regulation.	209	x
Suitable reports that document the results of activities performed with FHWA planning and research funds must be prepared by the State DOT or subrecipient and submitted for approval by the FHWA Division Administrator prior to publication. The FHWA Division Administrator may waive this requirement for prior approval.	117 (e)	x
The FHWA's approval of reports constitutes acceptance of such reports as evidence of work performed but does not imply endorsement of a report's findings or recommendations. Reports prepared for FHWA-funded work must include appropriate credit references and disclaimer statements.	117 (e)	x
The State DOT must administer the RD&T program consistent with their overall efforts to implement section 1001(b) of The Transportation Equity Act for the 21st Century and 49 CFR part 26 regarding disadvantaged business enterprises.	121 (c)	x
The nondiscrimination provisions of 23 CFR 200 etc. with respect to Title VI of the Civil Rights Act of 1964 and the Civil Rights Restoration Act of 1987 apply to all programs and activities of recipients, subrecipients, and contractors receiving FHWA research funds, whether or not those programs or activities are federally funded.	121 (h)	x
Procedures for the procurement of property and services with FHWA research funds must be in accordance with 49 CFR and/or other applicable regulations.	121 (j)	x
(A) Costs are eligible for FHWA participation provided that the costs: 1) are for work performed for activities eligible under the Section of title 23 applicable to the class of funds, 2) are verifiable from the State DOT's or the subrecipient's records, 3) are necessary and reasonable for the proper and efficient to accomplish of project objectives and meet the other criteria for allowable costs in the applicable cost principles, 4) are included in the approved budget or amendments thereto, 5) were not incurred prior to FHWA authorization, and (B) indirect costs are allowable if supported by a cost allocation plan and indirect cost proposal prepared, submitted, and approved as required	113	x
The State DOT must submit performance and expenditure reports, including a report from each subrecipient that contain as a minimum: (i) Comparison of actual performance with established goals; (ii) Progress in meeting schedules; (iii) Status of expenditures in a format compatible with the work program, including a comparison of budgeted (approved) amounts and actual costs incurred; (iv) cost overruns or underfunds; (v) approved work program revisions; and (vi) other pertinent supporting data.	117 (b)	x

Appendix B: Project Descriptions

Pedestrian and Cyclist Intersection Safety Sandbox (2020-10-01)

ISSUE

Intersection crossing is increasingly a challenge for distracted pedestrians, seniors, and individuals with disabilities (e.g., low vision or mobility issues). Nationally, 5,376 pedestrians died in crashes in 2015, a 9.4% increase from the previous year. DC's Vision Zero Initiative seeks to reach zero fatalities and serious injuries to travelers of DC's transportation system, through more effective use of data, education, enforcement, and engineering. Part of both Vision Zero and DDOT's long-range transportation plan, MoveDC, is a commitment to increase pedestrian and cyclist safety at intersections.

As the Nation's Capital, DDOT receives numerous vendor pitches for emerging technology solutions. However, because of the nascent nature of these solutions, their potential benefit to the agency is often difficult to assess and, if deemed suitable, often difficult to champion toward implementation.

Given these issues, a more strategic approach for testing applications of innovative solutions for Vision Zero is needed.

BACKGROUND AND EXISTING KNOWLEDGE

A preliminary version of this proposal was submitted and accepted during the 2017 Call for Research Projects process, but ultimately did not move forward due to lack of funding. At that time the technical team worked extensively with the research team to expand and refine the scope, review literature on existing technologies, and develop an RFI and RFQ for solicitation. These materials have been shared with members of the Sustainable Transportation Branch, the Associate Director for Transportation Operations and Safety, and the former lead on Vision Zero.

SCOPE OF WORK

The research is intended to implement a sandbox for one or more pilot or demonstration projects that use emerging technology solutions to improve pedestrian and/or cyclist safety in intersections. The sandbox would encompass a single intersection or corridor within the District. Envisioned solutions include:

- Technology that enhances DDOT's situational awareness of intersection activity to inform safety improvements
- Technology that provides auditory or visual alerts for pedestrians, cyclists, and/or drivers approaching crosswalks based on real-time activity in the intersection

The research would fund a consultant to facilitate the program management and evaluation of this sandbox project. The primary tasks for the consultant would be to assist DDOT in finding an appropriate mix of vendors, facilitate pilots and provide incentive funds to help cover vendor pilot costs (using funds from project budget), and evaluate the pilots.

More detailed scopes of work for both the 1) program management and evaluation support and 2) the RFI intended to identify vendors interested in participating in the sandbox have been provided as separate attachments to this submission.

POTENTIAL BENEFITS AND IMPLEMENTATION

The research would result in implementation and evaluation of one or more pilot or demonstrations of emerging technology for pedestrian and/or cyclist safety in intersections. The implementation and

evaluation would further provide insight into the feasibility and usability of these technologies, thereby enabling DDOT to make more informed decisions on whether to pursue a full-scale implementation. Ultimately, this research would improve safety outcomes for pedestrians and cyclists in the District.

Additionally, as this would be the first instance of DDOT's use of a sandbox approach for procurement and evaluation of emerging technology solutions, it could be used as a model for future sandbox projects to address a variety of DDOT needs.

TIME/COST ESTIMATE

18 months; \$150,000

Full Evaluation of a Low-Income Transit Fare Pilot Program In DC (2020-10-02)

ISSUE

Low-income households are the most likely to be burdened by the costs of using public transit, the most likely to forego using transit due to cost, and the least likely to have alternative travel options. WMATA's ridership data shows us that:

- Over 65% of highest income rail customers receive a transit subsidy through employer-sponsored programs, compared to only 10% of DC's lowest income rail customers ([Nelson et al. 2007](#)).
- Low-income riders are more likely to spend more per month by purchasing individual rides rather than paying upfront for a discounted monthly pass.
- Low-income riders comprise 52% percent of DC's bus ridership, compared with 13% of rail ridership, which is likely due to the higher cost of rail trips, among other factors.

BACKGROUND

The cost burden of transit has a number of possible negative effects on low-income Washingtonians, including inhibiting their ability to get and maintain employment, use social services, obtain healthcare, and complete educational programs. Preliminary results from a low-income fare pilot in Boston show that low-income households receiving a discounted fare take about 30% more trips, including more health care/social service trips ([Rosenblum et al. 2019](#)). In addition, a 2011 experiment in DC found that even small transit subsidies offered to the unemployed increased job search activity by 19%, especially among those living far from employment opportunities ([Phillips 2014](#)).

These examples show initial changes in transit trips and job search, but there exists little evidence on the broader effects of subsidized fares on other measures of welfare and the implications for poverty and inequality in the US generally or DC in particular. Nationally, many jurisdictions are adopting transit fare subsidies for low-income riders but are doing so without first piloting them for feasibility, impact, and cost-effectiveness. Though some government programs and nonprofits provide transit subsidies, there is no universally-available fare product for low-income residents in DC.

SCOPE OF WORK

Objective: To learn whether and to what extent cost is a key barrier to transit equity, the DC Department of Transportation (DDOT) is partnering with The Lab @ DC, WMATA, the Department of Human Services (DHS), and the World Bank to conduct a randomized evaluation of a fully and partially subsidized Metro transit program. Can a subsidized fare program for low-income residents increase (1)

mobility through greater usage of public transit and (2) other measures of social and economic well-being?

Research approach: This grant will allow us to expand the scope and improve the quality of data collected in an evaluation that is already in the planning stages. In the study, participants will be randomly assigned to one of three conditions: no transit subsidy, a partially subsidized fare, and a fully subsidized fare, i.e. free unlimited trips.

WMATA will create a discounted fare product that could be added to a SmarTrip card for eligible low-income individuals. DHS has committed to enroll participants from public assistance programs that already verify income and distribute income-based benefits as part of their standard business process. The project will rely partly on administrative data, which will capture the high-level impacts on the number of trips taken, jobs applied to, and job trainings completed, and employment status. The acquisition and analysis of this data will be done through The Lab @ DC, World Bank, WMATA, and the grant from JPAL North America without funds from this grant.

This grant will support this rigorous evaluation through (1) primary data collection on mobility and well-being outcomes and (2) data quality assurance for SmarTrip administrative data.

1. The primary data collection will provide vital data on outcomes not captured accurately or entirely by administrative data, allowing us to examine the effect of additional trips have on the quality of life of participants.
2. The accuracy of our administrative data relies on participants using the SmarTrip card registered to them in the study. To incentivize participants to keep and continue using those cards, we plan to regularly deposit a small amount of value onto the cards.

POTENTIAL BENEFITS AND IMPLEMENTATION

Outcomes: Our primary outcome of interest is mobility, measured by number of trips. We will also look at changes in trip length, total travel time, average travel time per trip, number of transfers, and mode used to explore the kinds of tradeoffs people are making to cost, travel time, and trip efficiency. In addition to mobility, we want to understand what else is affected when transit trips become less expensive. Measures of social and economic well-being would include job search activity, number of hours worked, job retention, trip purpose, engagement with DHS, and fare compliance.

Benefits to the District: At scale, the subsidy would represent a multimillion dollar annual investment from the District. While the number of trips taken will be an important outcome captured in administrative data, the additional data collection will capture a full picture of how lives change (or do not) when barriers to transit are lessened. The accuracy and completeness of the data collected will be vital to determining if a free or subsidized fare is worthwhile for the District. Measuring a wider scope outcomes during a pilot will also allow us to respond to inquiries from Council and the community at large about the potential benefits of improved transit equity.

TIME/COST ESTIMATE

Timeline: 18 months

The research team has already completed several milestones preparing for this pilot, so the timeline is already in motion:

June 2019	Joint proposal submitted to the City Administrator and approved
September 2019	Surveys to collect user feedback on fare product design completed

October 2019	Joint proposal submitted to the WMATA Board
November-December 2019	WMATA develops and user-tests the subsidized products; The Lab, DDOT, and DHS develop a detailed enrollment and data collection plan
January-November 2020	SNAP and TANF participants are enrolled and data is collected
December 2020-March 2021	The Lab and World Bank conduct data analysis
April 2020	Final report submitted to DDOT

Costs: The total cost of this project is expected to be \$1,168,933. This proposal seeks \$327,679 for SmarTrip data quality assurance and for non-administrative data collection costs.

Item	Amount budgeted	Covered by local funds	Covered by J-PAL	Requested from DDOT
1. Project Personnel	\$81,121	\$0	\$81,121	\$0
2. Fringe	\$15,089	\$0	\$15,089	\$0
3. Baseline Survey	\$18,169	\$0	\$1,453	\$16,716
4. Mobile Surveys	\$223,032	\$0	\$0	\$223,032
5. Supplies	\$2,337	\$0	\$2,337	\$0
6. Intervention Costs	\$741,254	\$741,254	\$0	\$0
7. Data Quality	\$87,930	\$0	\$0	\$87,930
Total	\$1,168,933	\$741,254	\$100,000	\$327,679

Mode Shift Study: The Impact of Micromobility on Capital Bikeshare and Transit (2020-10-03)

ISSUE

The fast-changing dynamics of dockless mobility services in the District, particularly micromobility (dockless bikes, scooters, and mopeds) has impacted Capital bikeshare revenues. As dockless services have become more prevalent, the casual user base of the Capital Bikeshare system has shifted away to the dockless vehicles while the commuters continue to use the reliable dock-based system. Very little is understood about the behavior and preferences of e-scooter and e-bike users vis-à-vis the station-based bikeshare system. This research would address the shift from Capital Bikeshare to dockless vehicles.

A significant amount of research has been conducted on the trip level and user level characteristics of Capital Bikeshare prior to the introduction of dockless devices. However, economic theories suggest that an introduction of a newer mode will have an impact on the ridership and the revenue of the older modes. Therefore, it is imperative to evaluate, model and predict the performance of these new modes of micromobility systems; to map their interdependencies within micromobility and across other modes of transportation such as public transit; and to articulate their importance to the individual consumer market.

BACKGROUND AND EXISTING KNOWLEDGE

The metro Washington D.C region is a pioneer in adopting emerging and innovative transportation technologies and services. The launch of Capital Bikeshare in September 2010 pioneered docked-based bike services among all major cities in the USA innovating and creating active transportation as public transportation. The District continued this tradition by permitting private operators to offer services in public space with the introduction of dockless bicycles in 2017. Further vehicle types personal mobility devices (PMDs) or e-scooters were introduced to the district in summer of 2018. DDOT has become a micromobility leader with the year-long permit program that launched for the 2019 calendar year. DDOT continually monitors the micromobility services for safety, efficacy and customer value in the region and across the nation.

A recent by the Portland Bureau of Transportation (PBoT) has evaluated the opinions and mode-choice behavior of its public by understanding the user demographics and usage statistics. A study by McKenzie et al. (2019) has evaluated the Lime e-scooter trips in association with Capital Bikeshare. Another recent study conducted by the researchers at George Mason University (GMU) found that e-scooters, e-bikes, and dock-based bikesharing by Capital Bikeshare cater to distinct needs of their users, based on trip length and purpose. The GMU study observed that users perceive e-scooters to be fun but expensive. The study also observed that dock-based bikeshare users perceive Capital Bikeshare to be an equally fun and healthy transportation mode.

Although some research have explored into some facets of these micromobility systems, there is a dearth of understanding about the modal interdependencies within micromobility modes and across other modes and the individual factors that influence micromobility operations, ridership and revenue.

SCOPE OF WORK

The objective of this research is to study the impact of expanding micromobility services (such as e-bike, e-scooter, and moped share) on transit systems. The effort will require information about the profiles and preferences of micromobility users, the factors that impact the mode choice and ridership of each mode. These factors could include weather, diurnal factors, land use activity, and transit accessibility on the micromobility mode-choice of the users. While this would specifically focus on the shift away from Capital Bikeshare, other mode shift would need to be included.

I would envision this to be 2 intercept surveys ranged 6 months apart, one performed in April 2020 and one in October 2020 to collect data about modal shift. Data would be gathered from all 8 wards of the District.

POTENTIAL BENEFITS AND IMPLEMENTATION

This research is expected to explain the mode shift around micromobility vehicles, specifically the shift from Capital Bikeshare. This will assist DDOT in budgeting for the future of our public transportation, Capital Bikeshare. Other benefits of this research include:

- Mode-choice preferences of different end-users, for achieving equitable service standards.
- Infrastructure development: Bike lanes, sidewalks, and potential e-scooter corral locations.
- Demand-based service optimization
- Development of regulatory frameworks
- Development of fees around Capital Bikeshare and for land-use for public operators

TIME/COST ESTIMATE

12 months; \$120,000 [funded at \$100,000, based on RDT staff review]

SPR Part II Work Program

Vision Zero Risk Analysis Model (2017-11)

ISSUE

DDOT is the lead agency implementing Mayor Bowser's Vision Zero transportation safety initiative. Vision Zero aims for zero traffic fatalities and serious injuries in the District by the year 2024 through promoting safe conditions and responsible behavior for all travelers. This program is one of the Mayor's high-priority goals, and is also key to DDOT's own critical agency needs related to safety and performance management.

An important strategy within the Vision Zero action plan calls for DDOT to develop an improved methodology to guide street design and countermeasures. DDOT must develop a multimodal Risk Analysis Model to enhance the agency's ability to predict risk using key inputs. The new model will prioritize future safety improvements, shifting DDOT's focus from the examination of high-crash frequency locations to a preventative analysis of risk-factors inclusive of all roadway users.

BACKGROUND AND EXISTING KNOWLEDGE

Currently, DDOT's Highway Safety Improvement Program (HSIP) uses a Crash Composite Index (CCI) method to identify high hazard locations. The CCI method utilizes crash frequency, crash rate, and crash severity to characterize conditions. Three metrics (frequency, rate, and severity) are combined to create a ranking, using the following equation:

$$\text{Composite Crash Index} = 0.25*RF + 0.25*RR + 0.50*RS$$

Where: RF = Rank of crash frequency

RR = Rank of crash rate

RS = Rank of crash severity

The CCI formula sorts intersections according to their score, with the lowest CCI score representing the most hazardous intersection.

However, the CCI method can be improved in order to more accurately identify high-priority locations. The current methodology has two drawbacks: First, the crash rate variable is not indicative of the larger scale problem Vision Zero seeks to remedy (eliminating serious injuries and deaths for all roadway users) because the crash rate only accounts for motor-vehicle traffic. A crash rate variable would be more effective if it included travel volumes and crash data collected from pedestrians and bicyclists in addition to vehicle-related data. A newly developed Vision Zero Risk Analysis model would include bicycle and pedestrian volumes to calculate an accurate rate of crashes for all users.

Secondly, the data used in the CCI method is limited to historical crash data. This data does not include *close calls*, or unreported crashes, nor does it consider hazardous intersections avoided by users for that very reason. This limited crash data is not forward thinking or preventative, as Vision Zero requires. A Vision Zero Risk Analysis model would use data to predict future outcomes, allowing DDOT to more effectively prioritize the District's hazardous intersections and prevent traffic-related injuries. Examples of such data may include physical characteristics like roadway geometry, the number of and width of travel lanes, crossing distances, posted speed limit, signalization of intersections, etc. or behavioral data such as multi-modal travel volumes, vehicle speeds, violation data, etc.

In summation, a Vision Zero Risk Analysis model would improve upon the CCI model, including expanding data beyond motor vehicles to include all roadway users and incorporating hazardous traffic

conditions that may make future crashes more likely. Using such data as inputs, a multivariate statistical model can be created to better prioritize DDOT safety improvements.

SCOPE OF WORK

The main objective of this proposal is to develop a comprehensive Vision Zero Risk Analysis Model which will measure risk using a multivariate statistical analysis superior to the CCI model (discussed above). Such a model will work to effectively reduce crashes and fatalities for *all* roadway-users within the District, expanding beyond motor vehicle users to include cyclists and pedestrians by using a forward thinking methodology to more accurately predict and identify high risk areas that should be a priority for DDOT to address.

Currently, DDOT's policy, safety, and technology offices do not have staff dedicated to this task. The undertaking of such a task as a Research Project will build from existing expertise at DDOT, including the existing Crash Composite Index and Highway Safety Improvement Program, and the work of the Highway Safety Office to produce a predictive model. An end-product will include utilizing a multivariate analysis, geo-spatial analysis (GIS), and predicative modeling in combination with transportation safety knowledge. Fortunately, DDOT has already collected an expansive amount of applicable data, thus the Vision Zero Risk Analysis model would focus more on the analysis portion.

POTENTIAL BENEFITS AND IMPLEMENTATION

The desired outcome is to produce a Vision Zero Risk Analysis Model actively used by DDOT to promote public safety goals pertaining to Vision Zero. A Vision Zero Risk Analysis Model will be highly valuable and visible within the District Government. Such a model will be used to make future improvements of hazardous locations within the District by following prioritization informed by the risk analysis model. Prioritizing based on efficient data analyses will allow DDOT to identify areas of high-risk and improve safety for all District roadway users at those locations. This result is fully in line with Vision Zero's mission of zero traffic fatalities and serious injuries by the year 2024.

TIME/COST ESTIMATE

13 months / \$150,000