STATEMENT OF PURPOSE – ADVISORY BICYCLE LANES

INTRODUCTION

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. The concept for advisory bike lanes is that the vehicular lane is a single, 14' – 18' wide lane for two-way traffic, with no centerline, while the bike lane is continually dashed on the outer edge to indicate that vehicles may cross over this line when necessary to give sufficient clearance to oncoming vehicles. This configuration will allow for bike lanes to be placed on more streets without affecting parking. An ancillary benefit is the anticipated reduction in vehicular speeds on neighborhood roads due to the narrower overall travel lane and absence of a centerline. Figure 1 presents a picture of an advisory bicycle lane.

Figure 1: Advisory Bicycle Lane [Courtesy of Google Images]

OBJECTIVES

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.

TASK 1: LITERATURE REVIEW

The project team will conduct a literature review on the subject matter. Similar studies conducted in the United States will be reviewed and summarized. Several sources will be used to conduct the literature review including papers and reports from the Transportation Research Information Systems (TRIS) and Transport Research International Documentation (TRID). TRID is the world's largest and most comprehensive bibliographic source on transportation information. It contains more than one million records of published and ongoing research, covering all modes and disciplines of transportation. Other search engines will also be used to identify relevant papers and reports. The summary of the review will be part of the report for this experimental study.

TASK 2: SITE SELECTION AND DATA COLLECTION

Task 2.1: Site Selection

Five corridors in the District of Colombia have been earmarked for this experiment. These corridors were selected based on the following criteria:

1. The width of each street must range between 40 to 48 ft
2. There should be no existing bicycle lanes on the corridors
3. The corridors must have low traffic volumes
4. The corridors must be in close proximity to both DDOT and FHWA for evaluation and observation purposes

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1. E Street, SE (11th Street, SE to 17th Street, SE)
2. Twelfth Street, SE (East Capitol Street to E Street, SE)
3. Kentucky Avenue, SE (East Capitol Street to Barney Circle)
4. 100 Block of North Carolina Avenue, SE
5. 200-500 Blocks of Tennessee Avenue, NE

Task 2.2: Data Collection and Extraction

The study team will use video technology in addition to traffic data collection equipment (traffic road tubes counters) to collect the data (volumes and speed) at the selected sites after which the variables required for the study will be extracted. The "Before" data observations for each segment/ location will be obtained prior to the installation of the advisory bicycle lanes. The

"After" data for the study segments/ locations will be collected 6 weeks after the installation of the advisory bicycle lanes. Another set of "After" observations will be made between 6 and 8 months following the installation to include all bicycle and vehicular data points for the corridors. The data collection for "After" scenarios will include typical weekday's (Tuesday, Wednesday, and Thursday) data collection for one week. Observations will be made once a year after implementation.

Video cameras will be installed at selected locations along the corridors to record vehicular and bicycle activities before and after the installation of the bike advisory lanes. By observing vehicular and bicycle activities from the video playback, the following questions will be answered for each corridor:

1. Where do bicyclists tend to ride? Does this vary by the presence of parked vehicles or oncoming vehicles?
2. Where do motorists tend to drive? Does this vary by the presence of bicycles or oncoming vehicles?
3. Are motorists yielding to bicyclists before merging into the advisory bike lane? (after only)
4. When a motorist overtakes a bicyclist, are they leaving a safe passing distance?
5. Do the advisory bike lanes and lack of centerline appear to create conflicts among bicyclists and motorists?
6. Does the lack of a centerline appear to create conflicts between motorists?
7. Are bicyclists using the treatment as intended?
8. Are motorists using the treatment as intended?

The video data will be obtained for 8 hours on a typical weekday (Tuesday – Thursday): 4 hours each in the morning (6:30 am – 10:30 am) and evening (3:00 – 7:00 pm) peak periods. The video equipment to be used and a snap shot of how it captures intersection/site activities are presented in Figure 2. The video equipment is non-intrusive and as such will have minimal influence on bicyclist and driver behavior.

Figure 2: CountCam Video Equipment and Typical Video Playback

From the observations made in the video playbacks the following data parameters regarding the usage of the street will be extracted for further analysis:

1. Total Number of bicyclists on the street during 4-hour duration, T_{BS}
2. Total Number of bicyclists on the sidewalk during 4-hour duration, T_{BW}
3. Total Number of bicyclists on the bicycle lane during 4-hour duration (only in the "After" Scenario), T_{BL}
4. Total Number of vehicles on the bicycle lane during 4-hour duration (only in the "After" Scenario), T_{CB}

Thus, the data obtained for the morning and evening peak period will be tabulated as presented in Table 1.

Table 1: Sample Data Extract from Video Playback

Corridor	***Before***		***After***			
	T_{BS}	T_{BW}	T_{BS}	T_{BW}	T_{BL}	T_{CB}
E Street, Southeast (11th Street, SE to 17th Street, SE)	*a*	*f*	*j*	*n*	*r*	*v*
Twelfth Street, Southeast (East Capitol Street to E Street, SE)	*b*	*g*	*k*	*o*	*s*	*w*
Kentucky Avenue, Southeast (East Capitol Street to Barney Circle)	*c*	*h*	*l*	*p*	*t*	*x*
100 Block of North Carolina Avenue, SE	-	-	-	-	-	-
200-500 Blocks of Tennessee Avenue, NE	*e*	*i*	*m*	*q*	*u*	*y*

Further, the following parameters regarding vehicular and bicycles conflicts will be obtained:

1. Total Number of motorists yielding to bicyclists during 4-hour duration, T_{MY}
2. Total Number of conflicts between motorists due to lack of centerline during 4-hour duration, T_{CM}
3. Total Number of conflicts between bicyclists and motorists due to lack of centerline during 4-hour duration, T_{BM}

The data obtained for the morning and evening peak period will be tabulated as presented in Table 2.

Table 2: Sample Data Extract for Observed Conflicts

Corridor	*Before*			*After*		
	T_{MY}	T_{CM}	T_{BM}	T_{MY}	T_{CM}	T_{BM}
E Street, Southeast (11th Street, SE to 17th Street, SE)	*a*	*f*	*j*	*n*	*r*	*v*
Twelfth Street, Southeast (East Capitol Street to E Street, SE)	*b*	*g*	*k*	*o*	*s*	*w*
Kentucky Avenue, Southeast (East Capitol Street to Barney Circle)	*c*	*h*	*l*	*p*	*t*	*x*
100 Block of North Carolina Avenue, SE	-	-	-	-	-	-
200-500 Blocks of Tennessee Avenue, NE	*e*	*i*	*m*	*q*	*u*	*y*

Task 2.3: Bicyclist and Motorist Surveys

Bicyclists will be surveyed at the selected sites to gauge their perception of safety after the addition of the advisory bicycle lanes. In order to achieve a 95% confidence level for a population of 18,000 bicyclist and 521,056 motorist with a confidence interval of 3 units, a total of 300 bicyclists and 350 motorists will be needed to be surveyed via electronic survey instrument. The survey instruments for bicyclists and motorists are presented in Figures 3 and 4 respectively.

The following are the preliminary questions to be posed to bicyclists:

1. Gender:

- ○ Male
- ○ Female
- ○ Other

2. Age Group:

- ○ Teenagers
- ○ Adults
- ○ Seniors

3. Bicyclists feel safer with the addition of the advisory bicycle lanes

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

Figure 3: Bicyclist Survey Form

The following are the preliminary questions to be posed to motorists:

1. Gender:

- ○ Male
- ○ Female
- ○ Other

2. Motorists understand the purpose of the advisory bicycle lanes

- ○ Strongly Agree
- ○ Agree
- ○ Neutral
- ○ Disagree
- ○ Strongly Disagree

Figure 4: Motorist Survey Form

Task 2.4: Crash Data

Crashes reported at study sites 2 years prior to the commencement of the experiment and over the duration of the experiment will be extracted from DDOT's crash database. This will include frequencies, types, severity, and contributing factors. In addition, the crashes will be further analyzed by reviewing the narrative from the Metropolitan Police Department crash reporting forms (PD-10).

TASK 3: DATA ANALYSIS

Field Observations

Based on the data extracted from the video files and the pneumatic tube counters, the "Before" and "After" measures of effectiveness (MOE) will be compared using charts and graphs. The MOEs to computed are

1. The compliance rates of bicyclists and motorists using the advisory bicycle lanes.
2. The conflict rates of motorists and bicyclists.

In addition, a statistical test will be used to determine whether there is a significant difference in the MOEs for "Before" and "After" conditions at a 95% confidence interval. Separate analysis will be conducted for the morning and evening peak periods.

Crashes

The crashes on the corridors "Before" and "After" the installation of the advisory bicycle lanes will be compared in terms of frequencies, crash rates, and crash type. Based on these variables, reductions (or increases) that could be attributed to the advisory bicycle lanes will be explored.

Surveys

The results of the survey will be complied and presented. This will include the percentage of responses of the questions posed to bicyclists and drivers. The results will be presented in the form of charts and graphs.

TASK 4: DRAFT & FINAL REPORT

The research team will prepared a draft final report that will document the procedures, data collection, analyses, results, recommendations, and conclusions of this study. The format of the report will be consistent with that recommended by the DDOT. The final report will be prepared and submitted to DDOT based on comments and recommendations from the reviews of the draft.

PROJECT DURATION & PROGRESS REPORTS

The study team will submit quarterly progress reports to enable DDOT to track progress. Semi-annual reports will be prepared from the quarterly reports for submission to FHWA.

PROJECT TEAM

Dr. Stephen Arhin, PE, PTOE, PMP, CRA, Fellow ITE

Dr. Arhin has 21 years of experience in all facets of traffic engineering including traffic safety and operations, highway engineering, planning and ITS. Dr. Arhin also has been involved in research project management and has extensive experience working with state and local transportation agencies on a wide variety of safety, operations and design projects. He also has experience in developing driver simulator algorithms, modeling and simulation, signal design, capacity analyses, statistical analysis, transportation planning and highway design. Dr. Arhin conducted three similar experiments on behalf of DDOT: Sports Logos on Guide Signs in DC, Countdown Pedestrian Signals in DC and Predicting Acceptable Wait Times for Patrons at Transit Bus Stops by Time of Day in DC. He will lead this study with oversight from the DDOT Research Unit as well as project steering committee members from the following consortium universities:

- George Washington University
- Morgan State University
- Virginia Polytechnic Institute
- University of the District of Columbia
- George Mason University

Research Assistants

The DDOT University Research Consortium has at its disposal a pool of graduate and undergraduate students who will serve as research assistants to support the evaluation team with various aspects including: literature review, data collection, reduction and analysis. The research assistants will be recruited from the universities in the consortium and beyond based on their research experience and background.

PROPOSED BUDGET

The proposed cost is $25,000.