

Exhibit A – Scope of Service
Demand Based Signal Retiming

The maximum amount of funding for this project is \$150,000.00.

The anticipated timeframe for this project is 18 months.

Background

The Florida Department of Transportation's (FDOT) Transportation System Management and Operation (TSM&O) program will improve safety and mobility through implementing real time strategies based on current performance and expected performance outcomes.

FDOT's Intelligent Transportation System (ITS) programs (managed by the Districts) currently collect vast amounts of data including speeds and volumes in order to measure the performance of the State's limited access facilities. On the State's arterial systems, local agencies and Districts are implementing similar ITSs that will collect similar data (speed, volumes and travel times*). How this data is used to operate the arterial network (in real time) will be defined over time, however, the problem when relying on volumes on urbanized arterials (and limited access facilities) is that often the current volumes or throughput of the facility is not equal to the actual traffic demand.

Traffic Flow Fundamentals (by Adolf May) defines traffic demand rate as:

...the number of vehicles that currently wish to pass a point or short section in a given period of time... If the traffic demand rates at various points in the system do not exceed their corresponding capacities, all vehicles that currently wish to pass can be accommodated, and the measured flow rate in the field is the traffic demand rate. However, if traffic demand rates exceed their corresponding capacities, the measured flow rates in the congested sections and downstream sections represent the number of vehicles (per unit of time) that can be handled, not the number of vehicles (per unit of time) that wish to be handled. Hence traffic demand rates are greater than measured flow rates and are unknown quantities.

When analyzing a network of arterials and considering strategies that involve optimizing signal operations, traffic demands should be considered in addition to traffic throughputs.

*Travel time collection on the arterials will utilize a probe/matching system

FDOT is interested in identifying a method that utilizes existing infrastructure (such as vehicle detection cameras) and/or new technology (that has a high Benefit to Cost ratio) to measure, report and use traffic demands to optimize the arterial network. The methodologies to be developed by this research project are meant to support an enhanced operation of a system such that a wide variety of traffic strategies (dynamic message signing (DMS), road ranger deployment, etc.) are triggered on a basis of traffic demand analysis.

Objective Statement

The objective of this research is to develop a method that can be implemented by a signal maintaining agency in Florida for measuring and reporting demand measures in both real time and predicted. Additionally, this research will define demand thresholds that would indicate safety and mobility problems on an arterial network. This research will focus on how to use the Advanced Transportation Management System (ATMS) and ATMS software that is and will be used in Broward County, however, consideration to how this strategy is transferable to other software packages used in Florida shall be given.

Considering the absence of an adaptive or responsive control system, the following objectives apply:

1. A method for reporting demand measures that is used to indicate the onset of arterial congestion is developed. The method shall utilize existing resources to the extent possible, such as existing software (signal system software, SunGuide, etc.), social media, and existing data collection infrastructure.

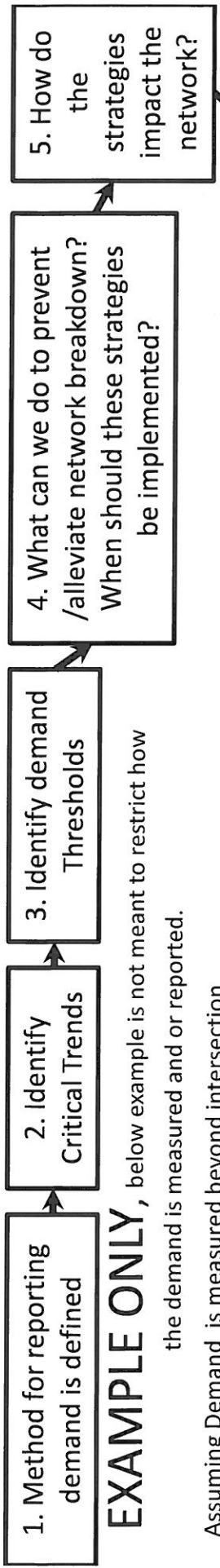
This research will focus on a study area in Broward County. The study area will include the intersections between SR-7 and US-1 along Broward Blvd. The upstream signalized intersections north and south of Broward Blvd. (Sunrise Blvd. and Davie Blvd. respectively) will also be included in this study area.

Measures for demand, including the formulas, required inputs and methods for collecting the inputs will be identified. Using this method:

- a. Critical Network Demand Trends are defined. These trends should indicate safety and/or mobility problems on the arterial network. It is expected that if these trends are known, they can be used to predict network performance allowing agencies to proactively optimize signal operation and ATMS strategies. A minimum of 3 trends will be identified and could include trends associated with lane blocking incidents and special events.
- b. Demand Thresholds are defined. Using the trends defined in step 2; identify thresholds for when a strategy should be implemented based on predicted demands. Thresholds will be defined for different components of the Broward

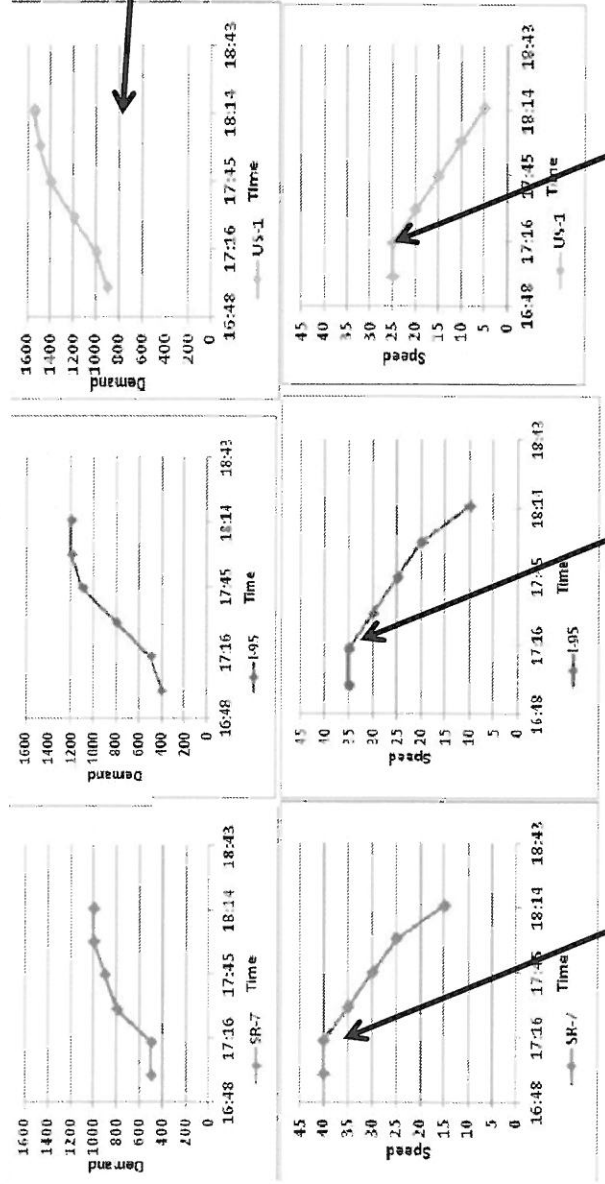
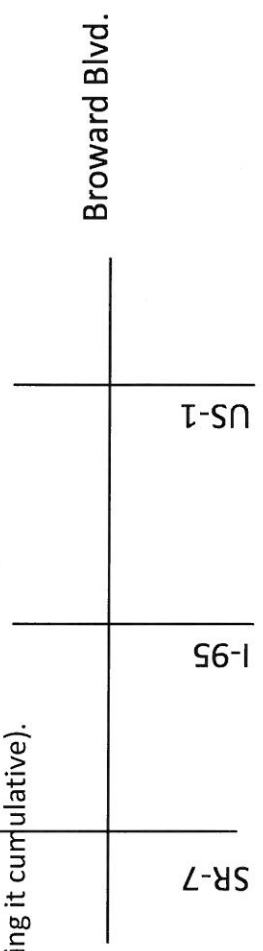
County network (grade crossings, arterials with heavy transit use, oversaturated intersections, significant emergency vehicle activity, etc.).

- c. TMC Operating Guidelines for the events are developed. This includes a description of the types of ATMS strategies (signal retiming, DMS messaging, Road Ranger deployment, etc.) that could be applied when the thresholds defined in step b are met and an implementation plan (including a beta test plan) for automating traffic demand reporting to the TMC operators. The performance objective for the operating strategies should focus on how to improve throughput and travel time. This project may lead to a future project in which a tool is procured or developed that provides and defines a course of action based on the demand information in order to facilitate efficient and effective decision-making.
2. The estimated benefits from operating the network utilizing the Operating Guidelines are reported. A method for measuring and reporting the impacts on arterial operation resulting from demand-based signal retiming and other strategies will be developed by the research team and used to estimate the benefits.
3. The proposed method for reporting Demand is demonstrated in Broward County. The method's accuracy will be reported by the Team.



EXAMPLE ONLY, below example is not meant to restrict how the demand is measured and or reported.

Assuming Demand is measured beyond intersection (making it cumulative).



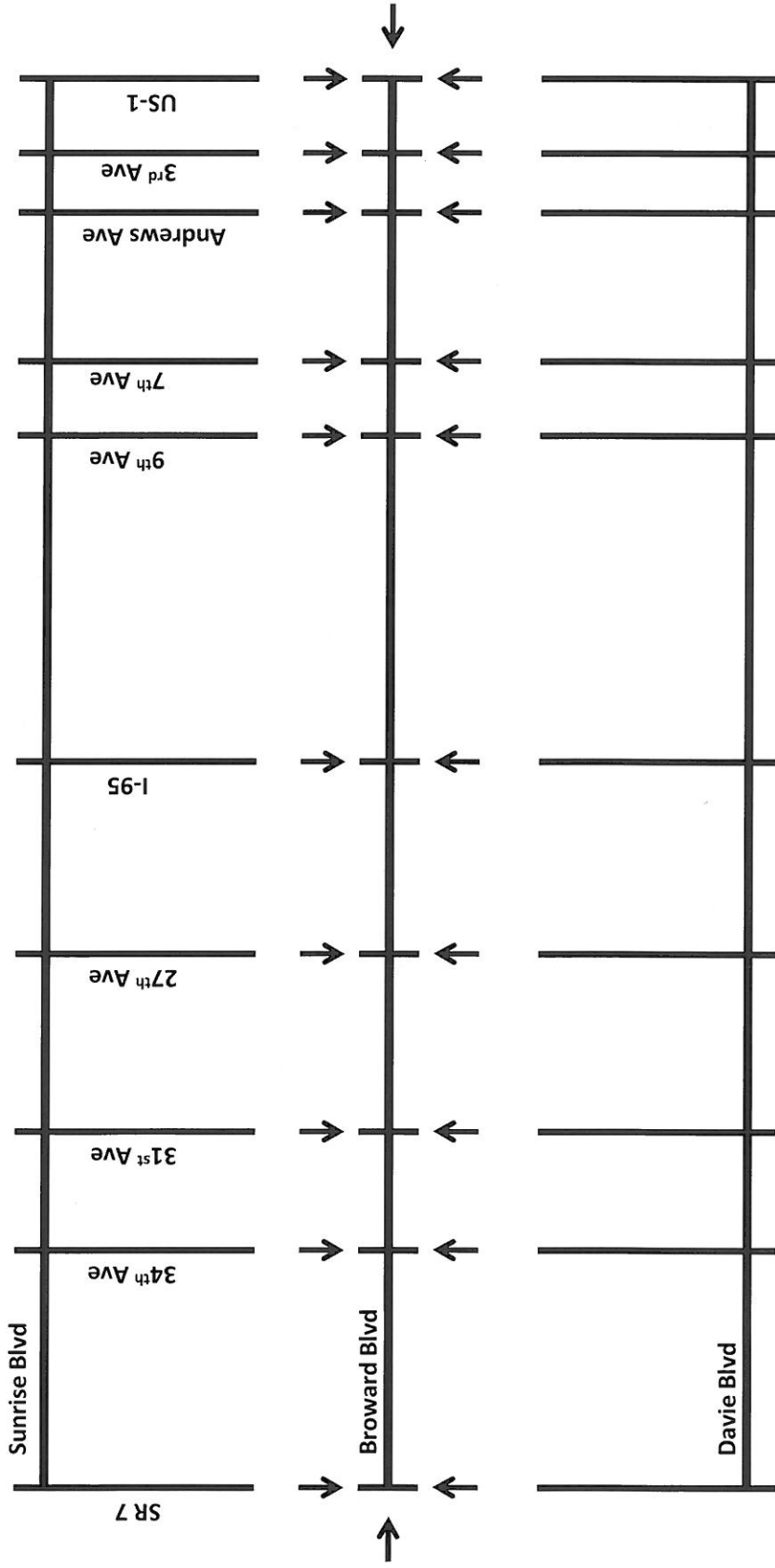
Step 4: Maybe meter traffic at SR-7 so less traffic is entering system, therefore flows are able to remain stable downstream?

Step 5: what was the impact?

Step 3

Study Area in Broward County

↑ = Demand



Study Area in Broward County

↑ = Demand
↑ = Demand > Capacity

