Deriving Bus Travel Speed/Dwell Time Using Automatic Passenger Counter (APC) Data

presented to

MTF Transit Committee

presented by

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Study Purpose

- Improve input values (bus travel time/dwell time) for the Transit Boarding and Estimation Simulation Tool (TBEST).

- Derive bus travel time/dwell time for different time periods.

- Provide data that could be used in the calibration and validation of the FSUTMS model.

Background

- **Why is transit travel time important(1)?**
  - **Used to calculate the transit impedances in mode choice**
  - **In Small/New Starts evaluation, almost all of the user benefits come from transit travel time savings**
  - **Need the actual transit travel time to do all the model calibration and validation**
- **AVL/APC Data have the information for actual travel time. The APC data have passenger on and off counts, arrival time, dwelling time, and department time for each stop.**
- **Most transit agencies have the AVL/APC data, few are using it for capturing bus speeds on roadway segment level!**

(1) David Schmitt & Ashutosh Kumar, Modeling Mixed-Flow Transit Travel Times in FSUTMS Voyager, Florida Model Task Force Meeting, Nov,9,2009.

Background

- **Our Previous study**
  - **Kittelson & Associates, Inc. worked with Washington Metropolitan Area Transit Authority (WMATA) to evaluate bus performance by corridor.**
  - **The analysis used GPS data collected through WMATA's Automatic Vehicle Location (AVL) system.**
  - **Results are summarized in the speed maps for all-day, weekday PM peak (3pm – 6pm), and weekday AM peak (6am – 9am) conditions.**


C2
The Washington Post
COMMUTER
No easy route to faster bus trips
Metro looks to ease congestion on busy corridors, saving time and millions
Closed corridors
DR. GRIDLOCK
Riders down on escalator repair
DR. G'S TIPS

Case Study

- **LYNX**

AVL Data

- **Lynx is working to build its Computer-Aided Dispatch (CAD)/AVL system**

APC data

- **April – August, 2011**
- **Over 3,000,000 stop level observations**

APC Data

- Passenger Count
- Location
- Arrival Time
- Departure Time

Data Reduction

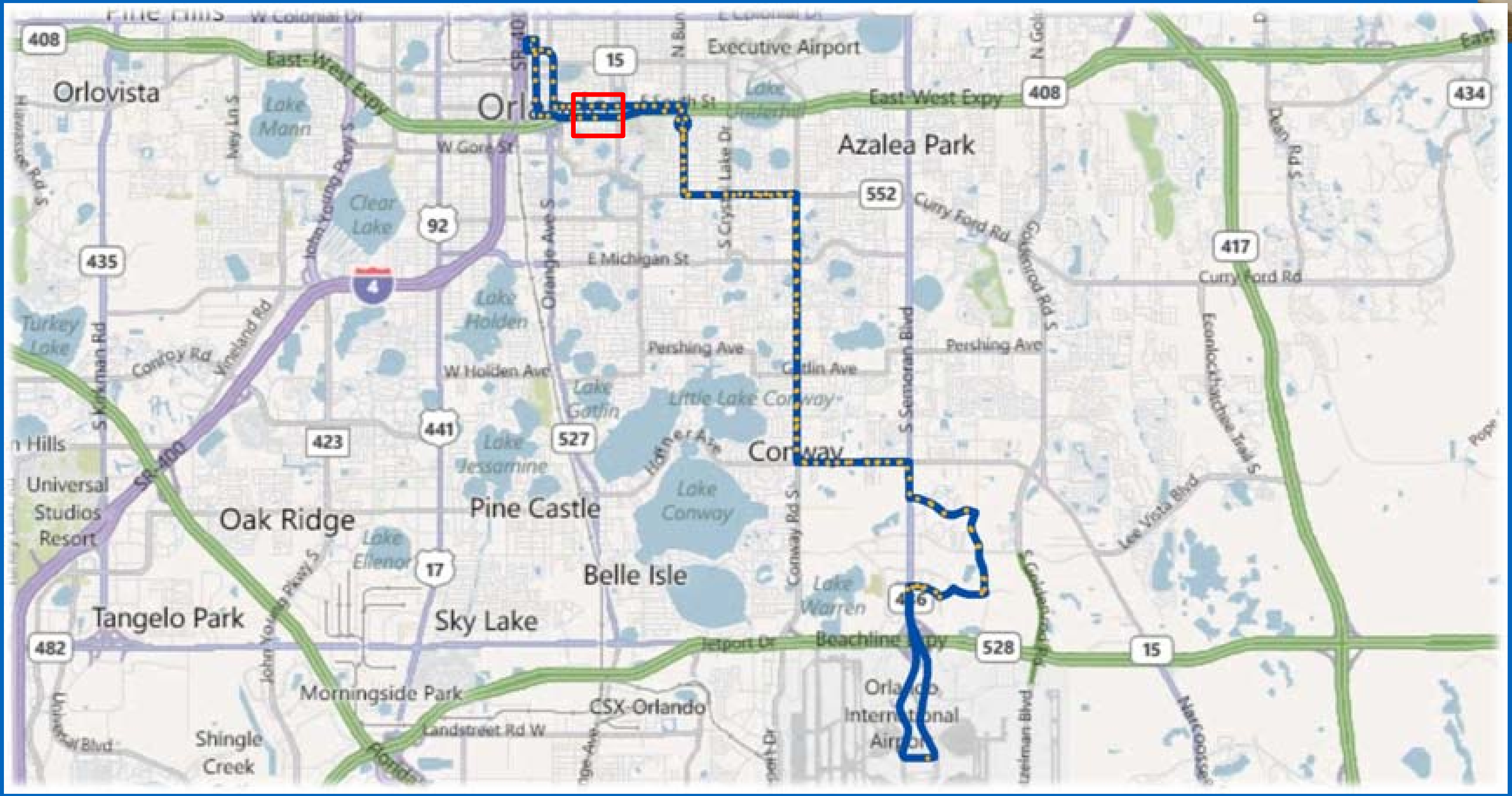
Stop Level Records

- **Stop A | Attributes**
- **Stop B | Attributes**
- **Stop C | Attributes**

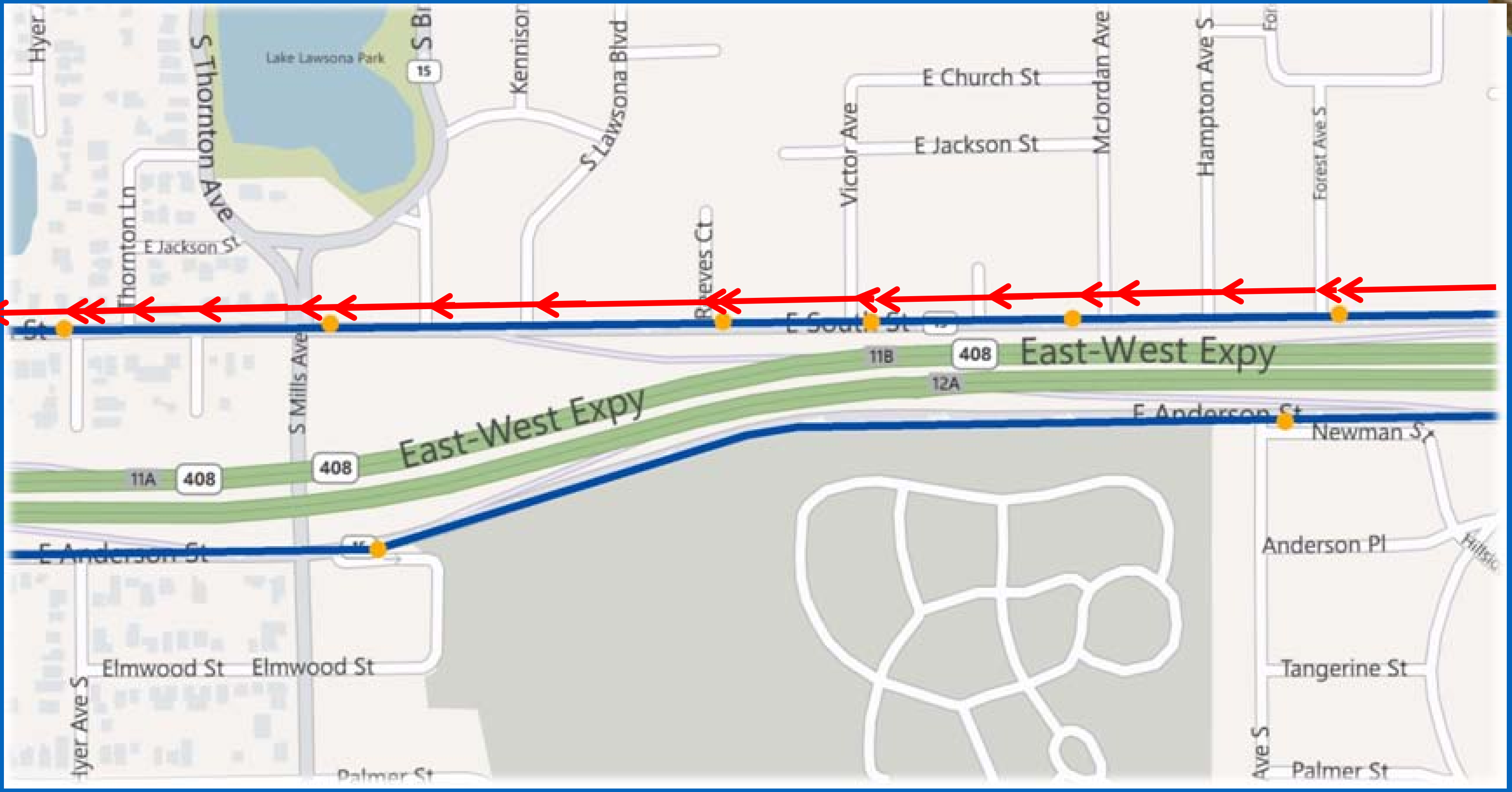
Link Level Records

- **Stop A – Stop B | Attributes**
- **Stop B – Stop C | Attributes**

Geometric Relationship



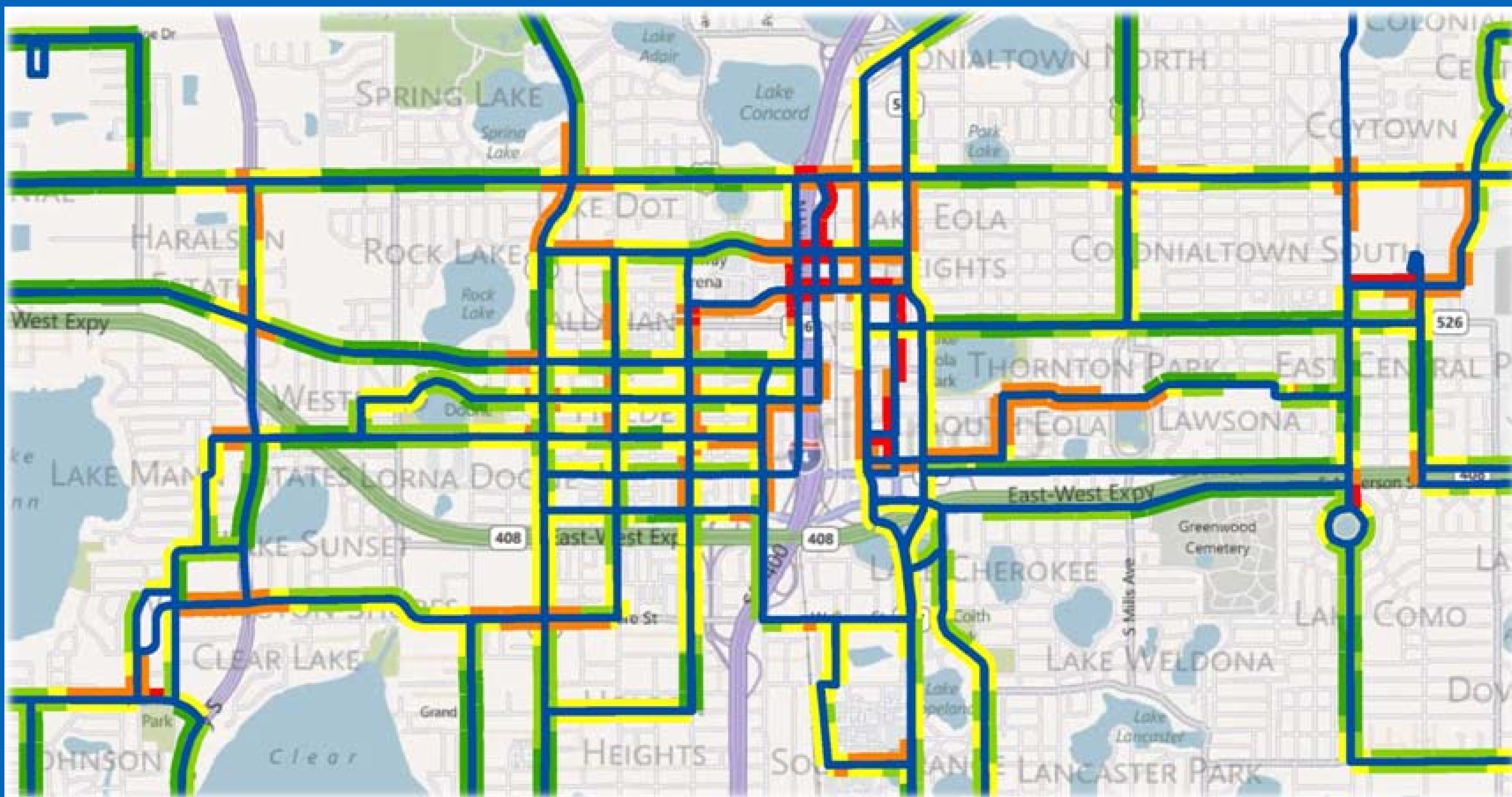
Geometric Relationship



Travel Time Analysis

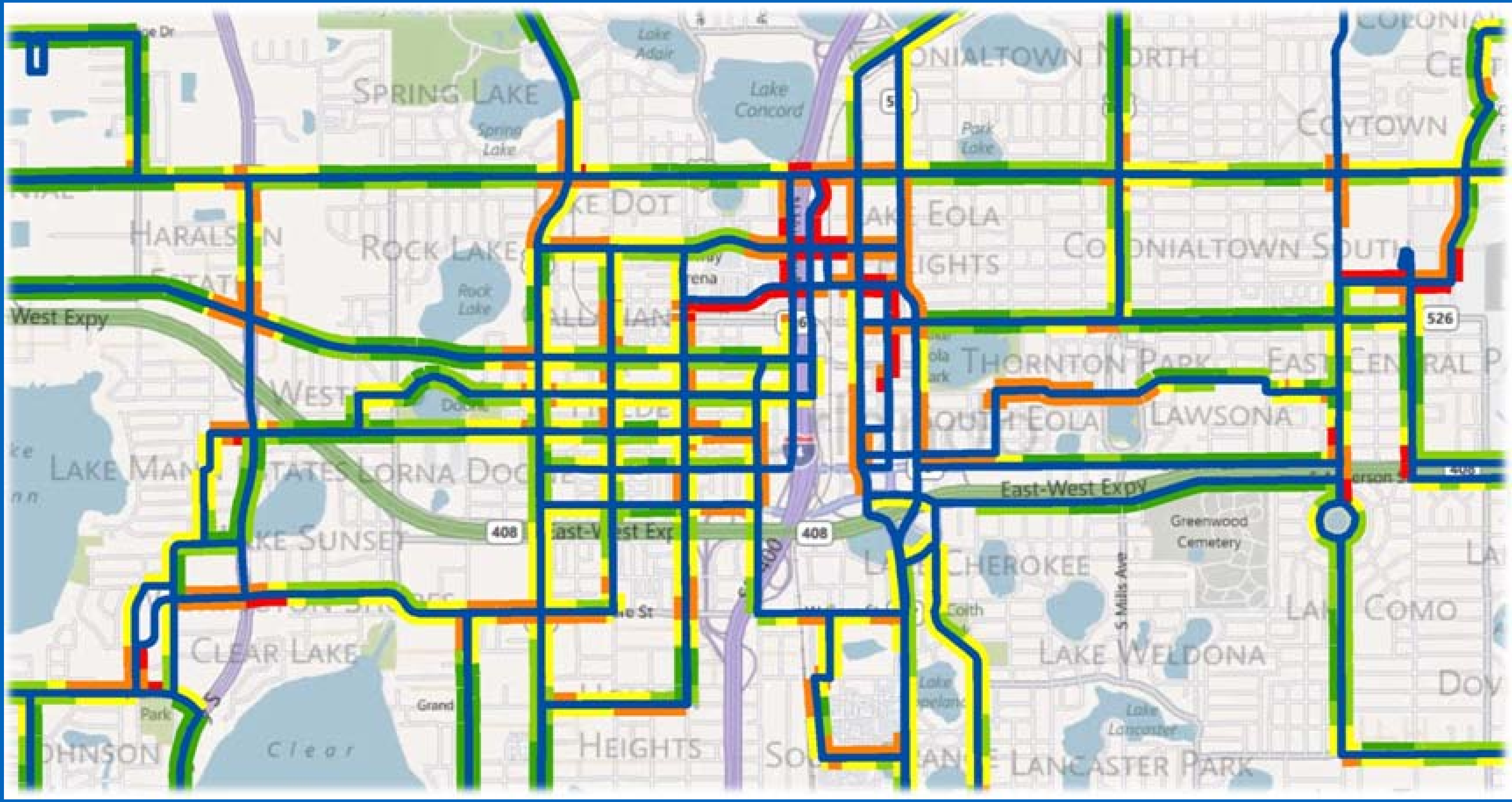
- **Any subset of data**
  - **Time**
  - **Day of Week**
  - **Route**
  - **Sub-Area**

Travel Time Analysis - All Day

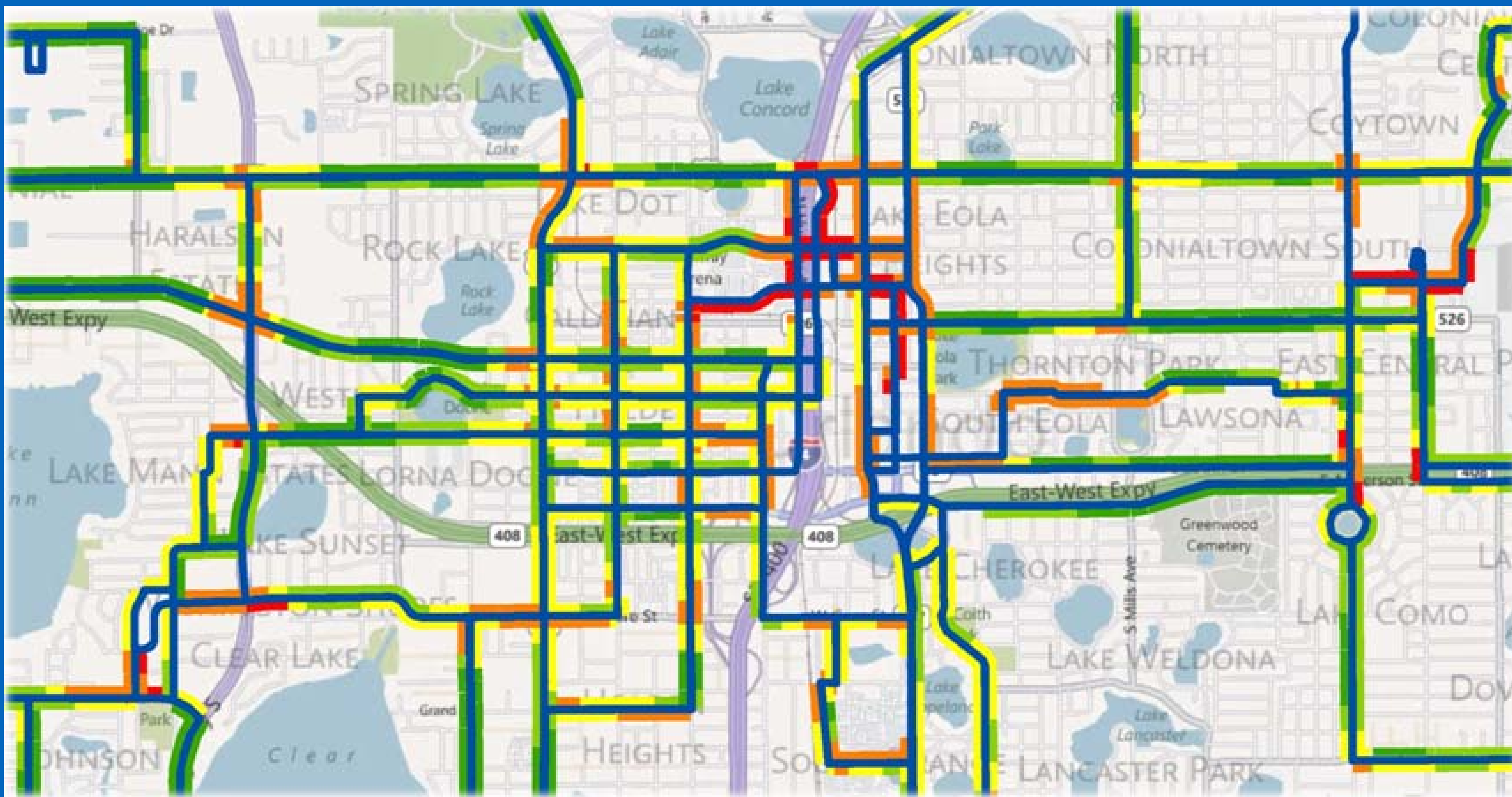


FLORIDA MODEL TASK FORCE

Travel Time Analysis – AM Peak



Travel Time Analysis – PM Peak

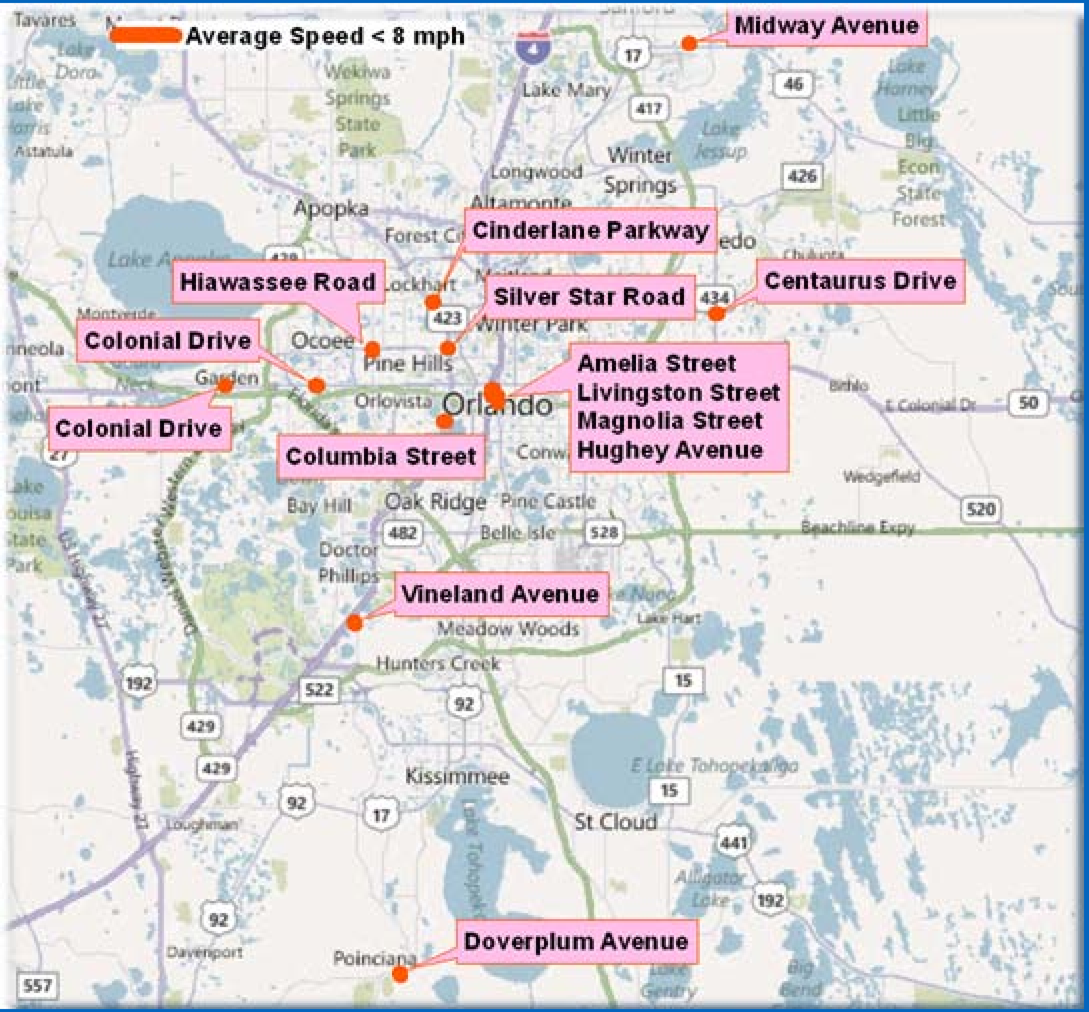


Most Congested Roadway Segments – All Day

Segment	From	To
W Livingston Street	Gertrude Ave	N Garland Ave
W Livingston Street	N Garland Ave	N Hughey Ave
Vineland Avenue	Arrezzo Way	Regency Village Dr
N Magnolia Avenue	Wall St	E Washington St
N Hughey Avenue	W Livingston St	Pitteman St
N Hughey Avenue	Pitteman St	Railroad
N Hiawassee Road	Silver Star Rd	Portage Ave
W Colonial Drive	S Park Ave	Main St
Midway Ave	Dolarway St	Greeen Way Ave
Midway Ave	Greeen Way Ave	Dolarway St
N Magnolia Avenue	E Washington St	E Jefferson St
W Amelia Street	N Garland Ave	N Hughey Ave
S Magnolia Avenue	W Central Blvd	W Pine St
S Magnolia Avenue	W Pine St	W Church St
N Hiawassee Road	Belroi St	Portage Ave
N Hiawassee Road	Almena St	Dendal St
N Hiawassee Road	Dendal St	Belroi St
N Hiawassee Road	Portage Ave	Silver Star Rd
W Amelia Street	Gertrude Ave	N Garland Ave

Most Congested Segments

- **Slowest segments are commonly minor approaches to major arterials**
- **Transit priority could be an effective improvement**



Other Potential Applications

- Help model predict transit speed more accurately based on observed data at the segment level, route level, or system level during different time periods.

- Better understand the relationship between bus and auto travel times (and speeds). This can be used to calibrate the curves in the travel demand model.

- Identify specific congestion locations in need of bus speed enhancing improvements during different time periods.

Questions?

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