Hillsborough County Metropolitan Planning Organization
Update of the Congestion Management Process

Phase I – Research

Final

September 2010

Prepared by the Hillsborough County Metropolitan Planning Organization, in cooperation with and funded by the Federal Highway Administration, Federal Transit Administration, Florida Department of Transportation, and the Hillsborough County Board of County Commissioners. CFDA Numbers: Federal Highway Administration's Highway Planning and Construction Grant (20.205) and Federal Transit Administration's Technical Studies Grant – Metropolitan Planning (20.505) (FM - 259284-1-14-12, FAP – 0059046)

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Introduction

A Congestion Management Process (CMP) provides information on transportation system performance and alternative strategies to alleviate congestion and enhance mobility of people and goods. It includes methods to monitor and evaluate transportation performance, assess and implement cost-effective actions, and evaluate the effectiveness of implemented actions. The federal government requires MPOs in designated Transportation Management Areas to maintain a CMP.

The ***2035 Long Range Transportation Plan*** (adopted December 2009) emphasizes a shift to a multi-modal transportation system including rail transit, increased bus service, and bicycling and walking facilities. The first and second priorities of the LRTP are, respectively, to increase safety and to reduce congestion.

The purpose of this task is to begin an update the CMP in the context of the LRTP's primary goal of safety for all users, focusing on an analysis of the overall system. A second phase will complete the update by analyzing conditions at the corridor level. The updated CMP will consider travel demand as well as traffic congestion, and will identify integrated multi-modal strategies including potential Intelligent Transportation System (ITS) improvements to address demand.

Scope

This is initial research on root causes of congestion in Hillsborough County. Operators of regional and local Traffic Management Centers (TMCs) were contacted to obtain and review traffic congestion patterns from archived data and/or standard reports. The data sought covers both limited access highways and major arterials and included vehicle traffic volumes, traffic incidents and type of cause, vehicle speeds, travel times, current and scheduled work zones, vehicle classification, etc. Documentation from the *2035 Long Range Transportation Plan* and other sources related to travel time and delay was also reviewed. The purpose of this white paper is to document typical causal factors of recurring (both scheduled and unscheduled) and non-recurring congestion in Hillsborough County now and in the future.

Findings

Non-recurring Congestion on Limited Access Highways

- There were over 67,000 incidents recorded in FY 2009 on the highways covered by the FDOT District Seven's Sunguide Traffic Management Center, equating to more than 184 per day throughout the District.
- The average duration per lane-blocking incident in District Seven was just under 45 minutes in FY 2009, down from 48 minutes in the previous year.
- Disabled vehicles accounted for two-thirds of the incidents, followed by abandoned vehicles, debris and crashes.
- No reports are readily available from the TMC to track incidents by location (e.g., "hotspots") or their effect on delay or system performance; however, these could be determined from the raw data on volumes, speed and lane occupancy collected by the TMC.

Recurring Congestion on Limited Access Highways

- In terms of congestion, travel times improved in FY 2009 compared to 2008 as measured by drops in Travel Time Indexes for segments of I-275 and I-4.
- However, the most highly congested segments remained so in FY 2009, and include:
    - Southbound I-275 from Livingston Ave. to downtown Tampa, both A.M. and P.M. peaks
    - Northbound I-275 on the Howard Frankland Bridge in the P.M. peak
    - Northbound I-275 from downtown Tampa to Busch Blvd. in the afternoon
- In terms of travel time reliability, in FY 2009 some Interstate segments had Buffer Time Indexes of greater than 0.80, meaning that travelers must allow 80% more time to be assured of reaching their destination on time.
- Some of the most congested segments of I-275 and I-4 are also the least reliable and included:
    - Southbound and northbound I-275 from Livingston Ave. to downtown Tampa, both A.M. and P.M. peaks, respectively
    - Northbound I-275 on the Howard Frankland Bridge in the P.M. peak
    - Eastbound I-4 from MLK Blvd. to CR 579 (Mango Rd.) in the P.M. peak
    - Westbound I-4 from MLK Blvd. to I-275 in the A.M. peak
- Raw data consisting of minute-by-minute traffic volume, speed and lane occupancy data is available from roadside vehicle detectors for a growing portion of limited access highways in Hillsborough County.
- An analysis of vehicle detector data for a typical day obtained from the Sunguide Traffic Management Center shows that:
    - Peak periods varied by location but ranged from 6:00 to 9:00 A.M. and from 4:00 to 6:30 P.M.; several locations also had a mid-day peak as well.
    - Lanes on many segments of I-275 and I-4 operate above 60 MPH throughout the day.
    - However, increased volumes accompanied by sharp drops in speed –to as low as 10 MPH – can be seen in morning, lunch and evening peak periods at certain locations.
    - Sharp drops in speed in outside lanes can be observed, suggesting that an incident or event may have affected traffic flow.

Recurring Congestion on Major Arterials

- City and County TMCs function primarily to manage traffic signals and change signal timing when traffic conditions warrant, e.g., clearing traffic after an accident.
- They do not produce readily available performance or operational reports, although Hillsborough County is expected to gain this capability within the next couple of years.
- Signalized intersections have a major effect on travel times compared to limited access roads; for example, a recent study shows that traveling west on Adamo Drive from US 301 to downtown Tampa takes 15 minutes longer in the morning compared to traveling on the parallel Selmon Expressway, and 13 ½ minutes longer than traveling west on I-4.
- Before-and-after evaluations suggest that signal timing improvements have a high benefit to cost ratio, and result in significant reductions in delay and improvements in travel time.
- Vehicle hours of delay per mile calculated by the Tampa Bay Regional Planning Model (TBRPM) suggest that in 2006 some arterials experienced more delay than the Interstates and limited access highways.
- Outputs from the TBRPM for 2006 suggests that some of the worst congestion occurs on major arterials such as Bruce B. Downs Blvd., Hillsborough Ave. and S.R. 60
- Under a "build nothing beyond committed improvements" scenario, the TBRPM forecasts vehicle hours of delay to increase dramatically by 2035 – in some cases by a factor of 4.

Non-recurring Congestion on Major Arterials

- Congestion and crashes are intertwined.
- A statistical comparison between high crash road segments in 2005 – 2007 shows that there is a slight positive correlation between the total number of crashes and congestion.
- The causal relationship – whether congestion leads to more crashes or crashes contribute to more congestion – is difficult to sort out without a detailed analysis of high crash locations.
- Many of the high crash locations were in the vicinity of entrance and exit ramps for limited access roads

Future Directions

- A free web-based tool known as the Statewide Transportation Engineering Warehouse for Archived Regional Data (STEWARD) is available and allows users to easily pull and analyze performance data obtained from TMCs.
    - Data covers limited access highways in Florida.
    - Data from the FDOT District Seven TMC will become available later this year.
- Performance measures such as Travel Time and Buffer Time Indexes can be valuable additions to the measures already used in the MPO's Congestion Management Process.
    - Currently data covers only portions of the Interstate system.
    - However, new, relatively low-cost technology is available to expand these measures to arterials using data from GPS providers.
- Travelers would like to see timely information on alternative routes
    - This would require strong collaboration between TMCs on route diversion plans and operations.

- FHWA has promoted "Integrated Corridor Management" to address the need for better institutional, operational and technical integration.

Review of Data from Traffic Management Centers

Limited Access Highways – FDOT District Seven Sunguide Center

Data Coverage

This center is located in Tampa and covers the Florida Department of Transportation (FDOT) District Seven. It operates a freeway management system that relies on video cameras, traffic detectors, and other sources to monitor conditions on Interstates I-4, I-75 and I-275. Traveler information is provided by dynamic message signs as well as to the 511 system and the news media.

Video is not recorded, however, the TMC compiles and archives operational and performance data as described below. Operational reports are also produced as discussed below.

Non-Recurring Congestion

The TMC reacts to incidents by alerting law enforcement, emergency services, Road Rangers, private towing and spill response companies. The FDOT collaborates with these partners to expedite the removal of vehicles, cargo, and debris from state highways and to restore, in an urgent manner, the safe and orderly flow of traffic. The FDOT reports on "incident duration" in the *ITS Performance Measures Annual Report* (**Appendix A**). In District Seven, for example, for FY 08/09 the average duration per lane-blocking incident was just under 45 minutes. This is an improvement over FY 07/08, when the average reported time to clear incidents was over 48 minutes and 35 seconds.

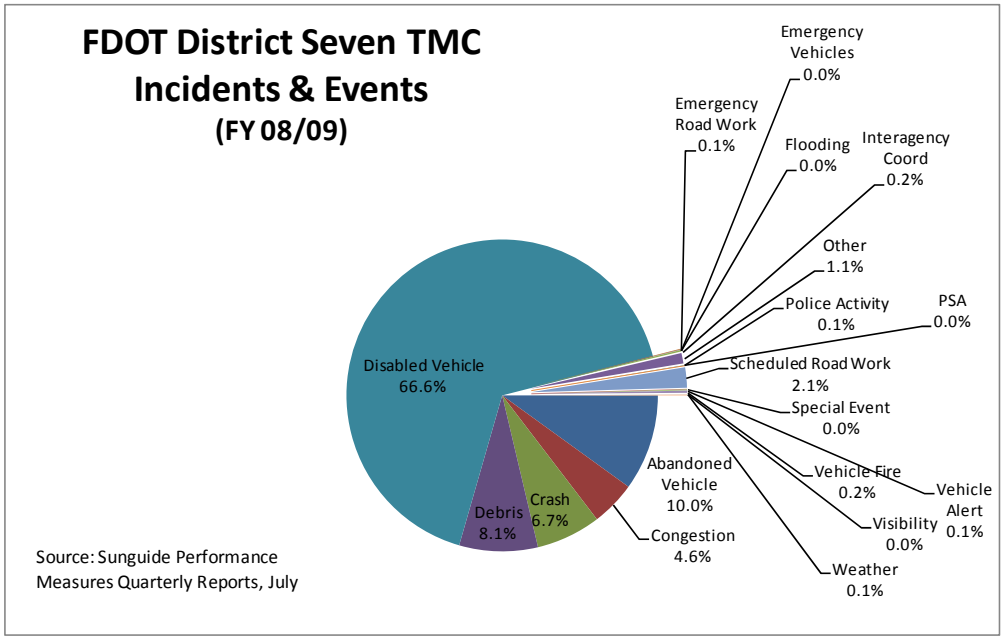
FDOT produces quarterly reports on the duration and type of incidents or events recorded by the TMCs. **Appendix A** includes the latest four quarterly reports for FDOT District Seven. **Table 1** and **Figure 1** show the number and type of incidents or events in District Seven for FY 2009/10 (July 2009 through June 2010). There were over 67,000 incidents or events recorded on the Interstates covered by this TMC, with disabled vehicles accounting for two-thirds of the total. Abandoned vehicles, debris and crashes were the next most prevalent, followed by numerous other types of incidents or events. Scheduled or emergency road work makes up only two percent of the total. Statistics reported by Road Rangers for 2007 and 2008 are consistent with this distribution of incident types, with disabled vehicles accounting for approximately 60% of the total.

Congestion per se accounted for less than five percent of the total, although any of the reported incidents or events can lead to back-ups or slow downs. It should be noted that a large percentage of rear-end collisions can be attributed to congestion. No readily available reports are available from the TMC to track incidents by location (e.g., "hotspots") or their effect on delay or system performance. Such cause-and-effect relationships could be obtained from raw data on speed and volume compiled by the TMC, but it would require a more detailed analysis that is beyond the scope of this white paper.

Table 1

FDOT District Seven TMC - Incidents & Events					
Entire District - FY 08/09					
Event	**July-Sept**	**Oct-Dec**	**Jan-Mar**	**Apr-June**	**Total**
Abandoned Vehicle	1,672	1,743	1,578	1,713	6,706
Congestion	535	772	865	943	3,115
Crash	1,092	1,062	1,304	1,068	4,526
Debris	1,233	1,396	1,205	1,650	5,484
Disabled Vehicle	10,436	11,342	10,676	12,364	44,818
Emergency Road Work	2	11	17	21	51
Emergency Vehicles	8	6	6	7	27
Flooding	3	-	-	-	3
Interagency Coord	24	33	17	30	104
Other	249	154	161	161	725
Police Activity	15	11	8	11	45
PSA	2	-	-	-	2
Scheduled Road Work	165	321	313	614	1,413
Special Event	1	-	-	2	3
Vehicle Alert	12	22	27	26	87
Vehicle Fire	24	47	36	40	147
Visibility	2	5	7	-	14
Weather		25	18	12	55
Total	**15,475**	**16,950**	**16,238**	**18,662**	**67,325**

Figure 1



Freeway Congestion and Travel Time Reliability

The TMC also manages day-to-day traffic conditions through a system of roadside transportation sensors. "Miles managed by ITS" is defined as contiguous, continuously operated and maintained centerline mileage that has:

- Traffic probes and/or sensors;
- Real-time traffic information reporting coverage;
- Real-time incident response capabilities; and
- Availability of real-time traffic data to FDOT.

Currently, only a portion of the Florida Intrastate Highway System (FIHS) in District Seven is managed by ITS, although the goal is to expand the coverage as ITS deployment and Interstate reconstruction occurs. Notably, the segment of I-275 from downtown Tampa to the Howard Frankland Bridge is not covered. As of FY 08/09, the following segments were managed in District Seven:

ITS Miles Managed by FDOT	Road	Limits (Mile Posts)
13	I-275	25.5 – 38.5
11	I-275	43 – 54
12.5	I-75	253.2 – 265.7
22.5	I-4	0 – 22.5
	Segments Under Design	
5.8	I-275	1 mile north of Bearss Ave to I-75
5.4	I-75	Bruce B. Downs Blvd. to SR 56

The traffic data obtained by this system is extremely detailed, capturing minute-by-minute readings by facility, segment (section), station and lane. The system records traffic volumes, speeds and lane occupancy (i.e., vehicles occupying the lane, not to be confused with vehicle occupancy) for each sensor. Consequently, the archived data is voluminous; for example, data obtained from District Seven for the last two years comprises 60 gigabytes. Digesting and interpreting this amount of raw data is beyond the scope of this report, therefore only a very small sample was analyzed in detail.

To provide a context for the analysis of the sample of raw data, summary information was obtained from FDOT's ITS Performance Measures Annual Reports for FY 07/08 and FY 08/09. FDOT uses two performance measures to report on congestion and travel time reliability:

- Travel Time Index (TTI), which is a measure of congestion. TTI is calculated as the ratio of average peak travel time to an off-peak (free-flow) standard, in this case 60 mph for freeways. For example, a value of 1.20 means that average peak travel times are 20 percent longer than off-peak travel times.
- Buffer Time Index (BFI), which is a measure of the reliability or predictability of travel. The Buffer Index is calculated as the ratio between the difference of the 95th percentile travel time and the average travel time divided by the average travel time, i.e. (95th travel time - average travel

time)/average travel time. For example, a value of 0.4 means that a traveler should budget an additional 8-minute buffer for a 20-minute average peak trip time to ensure 95 percent on-time arrival.

Table 2 shows the TTI and BFI for the segments of I-275 and I-4 for which peak period data was available for FY 07/08 and FY 08/09. Using these performance measures, the shaded cells show the five most congested and the five segments that were least reliable in terms of travel time in each year. Although the TTI generally declined in FY 08/09 compared to the previous year, the data shows considerable consistency in terms of the most congested and least reliable segments. For example, in the morning, the southbound segments of I-275 from Livingston Avenue to downtown Tampa were both congested and unreliable in terms of travel time. Likewise, the northbound direction of the Howard Frankland Bridge was both highly congested and unreliable in the afternoon. Segments of I-4 in from I-275 to east of I-75 were unreliable in the morning or afternoon, depending on the direction of travel.

Table 2: Congestion & Reliability Performance Measures for ITS Managed Facilities in FDOT District 7

SECT_ID	Road	Direction	From To	Length	PERIOD							
					AM_PEAK				PM_PEAK			
					TTI (08/09)	TTI (07/08)	BTI (08/09)	BTI (07/08)	TTI (08/09)	TTI (07/08)	BTI (08/09)	BTI (07/08)
1	I-275	NB	from 38th Av to Howard Frankland Br	6.50	1.00	N/A	0.00	N/A	1.02	N/A	0.12	N/A
2	I-275	NB	Howard Frankland Bridge	6.40	1.03	N/A	0.15	0.36	1.35	1.27	0.83	0.68
3	I-275	NB	from Hillsborough River in downtown to Busch Blvd	6.90	1.00	N/A	0.01	N/A	1.23	1.19	0.38	N/A
4	I-275	NB	from Busch Blvd to Livingston Av	3.80	1.09	N/A	0.06	N/A	1.16	N/A	0.10	N/A
5	I-275	SB	from Howard Frankland Br to 38th Av	6.50	1.00	N/A	0.00	N/A	1.06	N/A	0.26	N/A
6	I-275	SB	Howard Frankland Br	6.35	1.00	N/A	0.00	N/A	1.01	N/A	0.00	N/A
7	I-275	SB	from Busch Blvd to Hillsborough River in downtown	7.15	1.38	1.49	0.42	0.48	1.18	1.2	0.29	N/A
8	I-275	SB	from Livingston Av to Busch Blvd	3.90	1.31	1.46	0.81	1.06	1.00	N/A	0.00	N/A
9	I-4	EB	from I-275 to MLK Blvd	4.95	1.00	N/A	0.00	N/A	1.02	N/A	0.09	N/A
10	I-4	EB	from MLK Blvd to CR579	5.10	1.00	N/A	0.00	N/A	1.15	N/A	0.64	0.61
11	I-4	WB	from MLK Blvd to I-275	5.15	1.12	N/A	0.49	N/A	1.08	N/A	0.38	N/A
12	I-4	WB	from CR579 to MLK Blvd	5.25	1.01	N/A	0.00	N/A	1.01	N/A	0.00	N/A
13	I-4	EB	from CR579 to CR601	12.05	1.01	N/A	0.01	N/A	1.04	N/A	0.18	N/A
14	I-4	WB	from CR601 to CR579	12.10	1.02	N/A	0.07	N/A	1.01	N/A	0.04	N/A

Indicates one of the five most congested or least reliable segments in that year

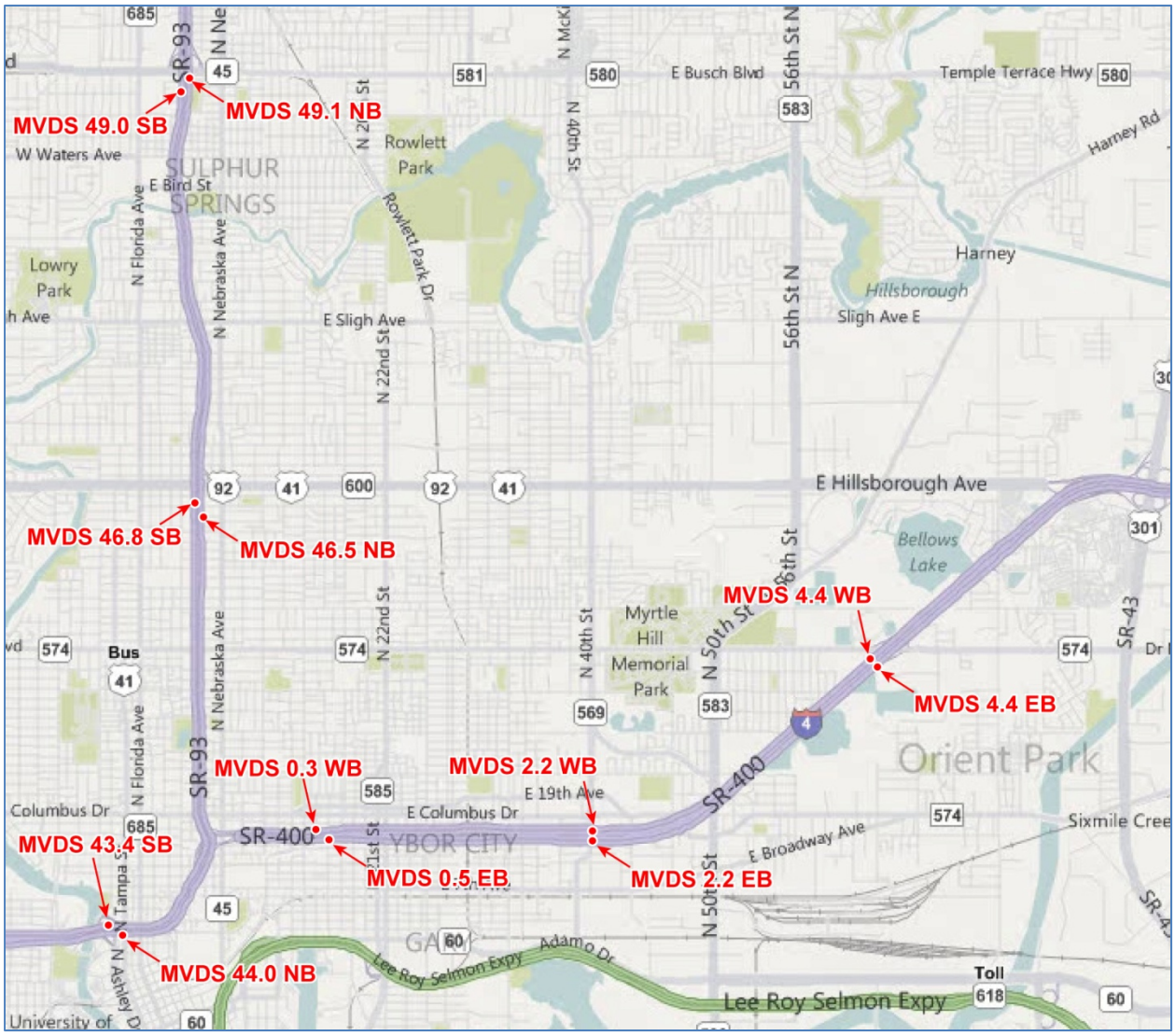
TTI = Travel Time Index BTI = Buffer Time Index

Source: FDOT ITS Annual Performance Measure Reports for 2008 and 2009. Note: Summary data for I-275 from H. Frankland Bridge to Hillsborough River and I-75 was not available. TTI and BFI data for FY 07/08 were not available beyond the five most congested and least reliable segments.

Detailed Analysis of TMC Data

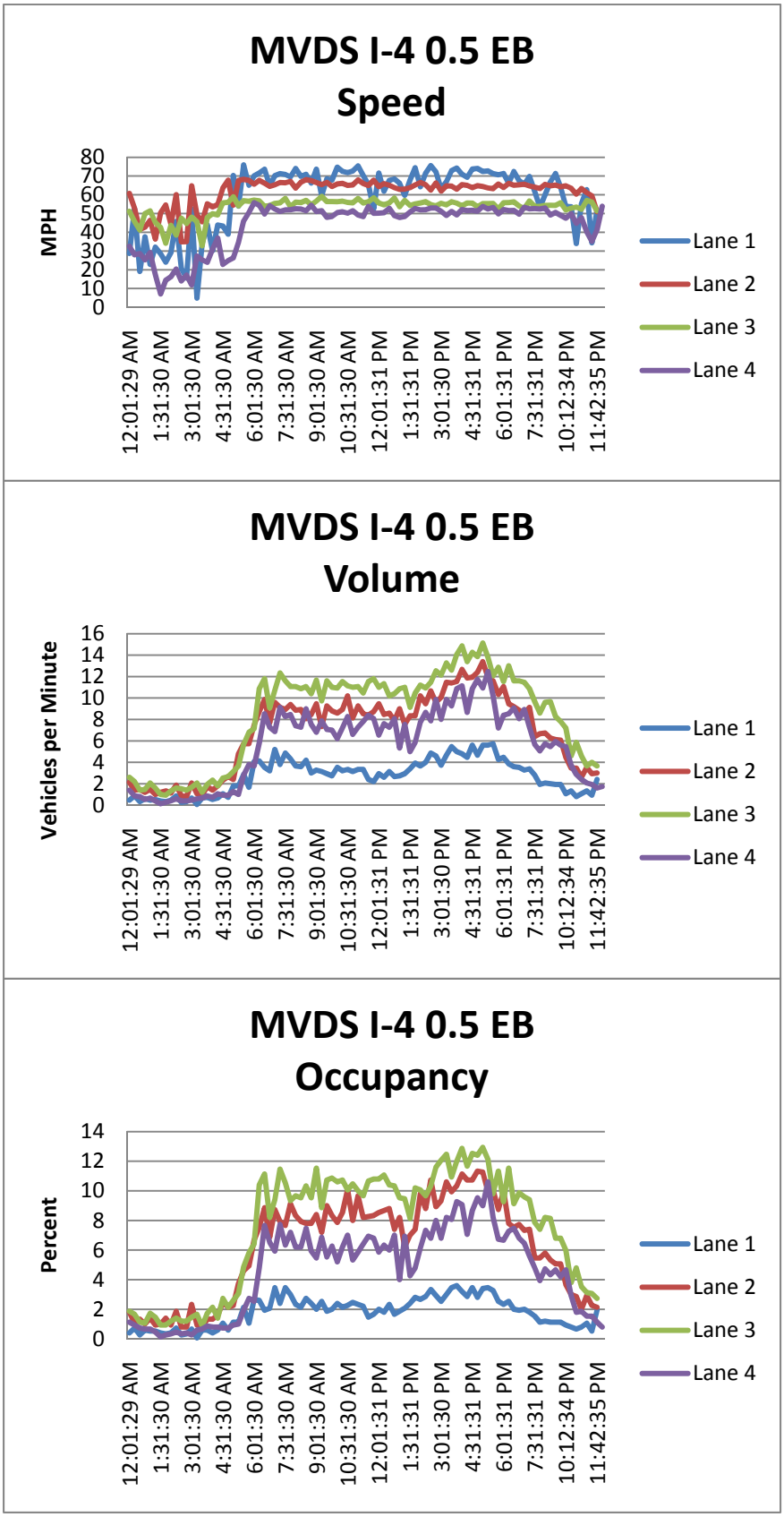
Based on the information in presented in Table 2, data for a typical day – in this case, Tuesday, March 10, 2009 – was summarized to depict fluctuations in traffic speeds and volumes for the most congested segments of I-275 and I-4. **Figures 2 through 5** illustrate how speed, volume, and occupancy (percentage of time a vehicle is occupying the lane) vary by lane, location, time (calculated in 15 minute intervals), and direction for 12 selected Microwave Vehicle Detector Stations (MVDS – which are pole-mounted sensors capable of detecting the presence and speed of vehicles within adjacent lanes traveling in the same direction) as shown in **Map 1**. Note that lanes are numbered 1, 2, 3, etc., with the inside lane closest to the median indicated as number 1 and moving out from there.

Map 1: Microwave Vehicle Detector Station Locations Used to Obtain Sample Data



- Microwave Vehicle Detector Station Locations (# = milepost)

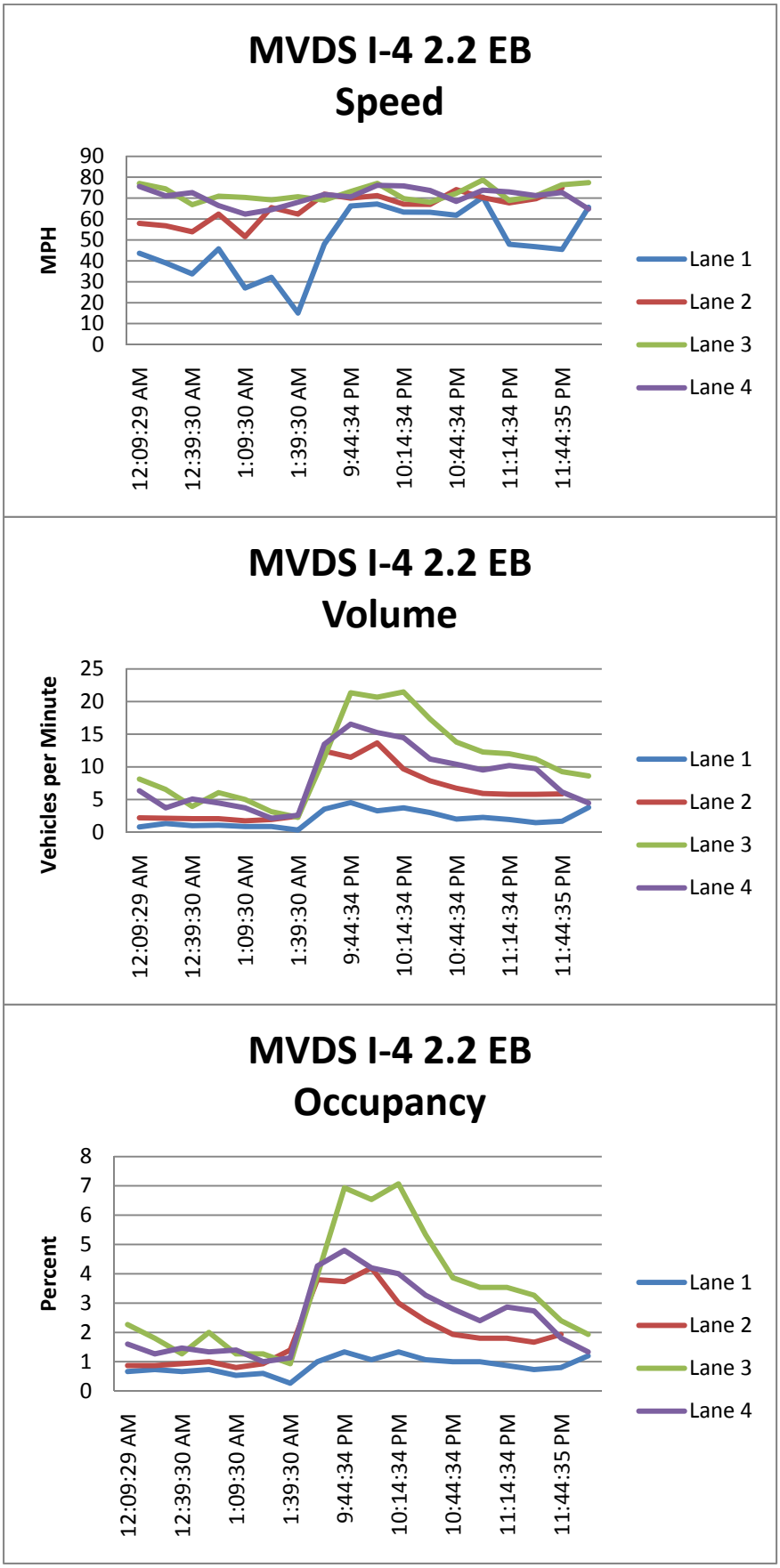
Figure 2: I-4 Eastbound (I-275 to MLK)



Highlights

- Lanes 1 & 2 (inside lanes) exceed 60 MPH most of the day
- The peak period for this direction of travel is during the evening rush hour
- Note that sensors do not produce accurate speed readings when occupancy is extremely low, e.g., early morning hours

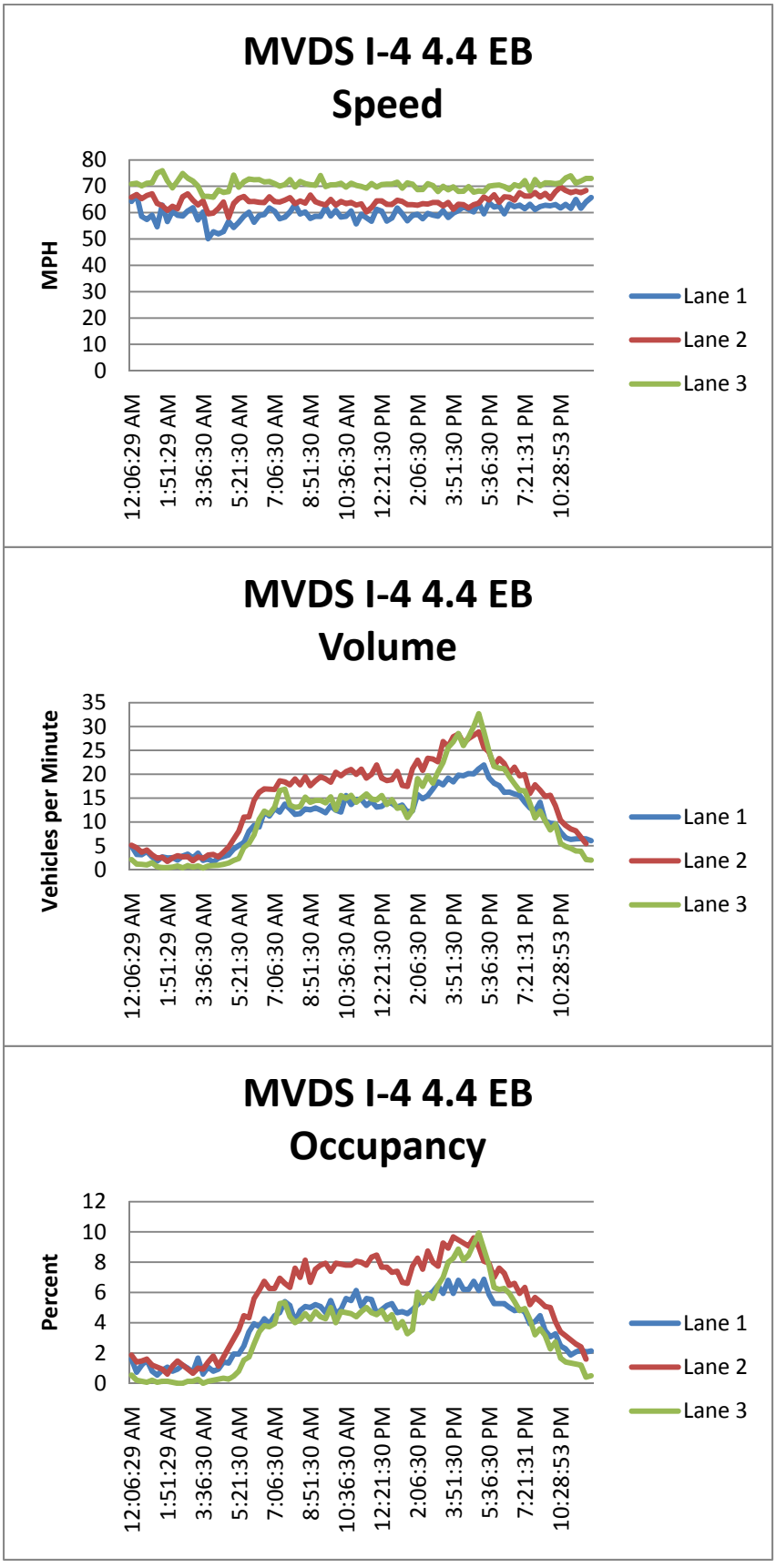
Figure 2 (Cont'd)



Highlights

- There is a gap between 1:40 AM to 9:45 PM, indicating that there was a problem with data reliability at this location and time
- Lanes 3 & 4 (outside lanes) exceed 60 MPH for times when data is available
- Lane 1 is a freeway ramp because of the relatively low volume

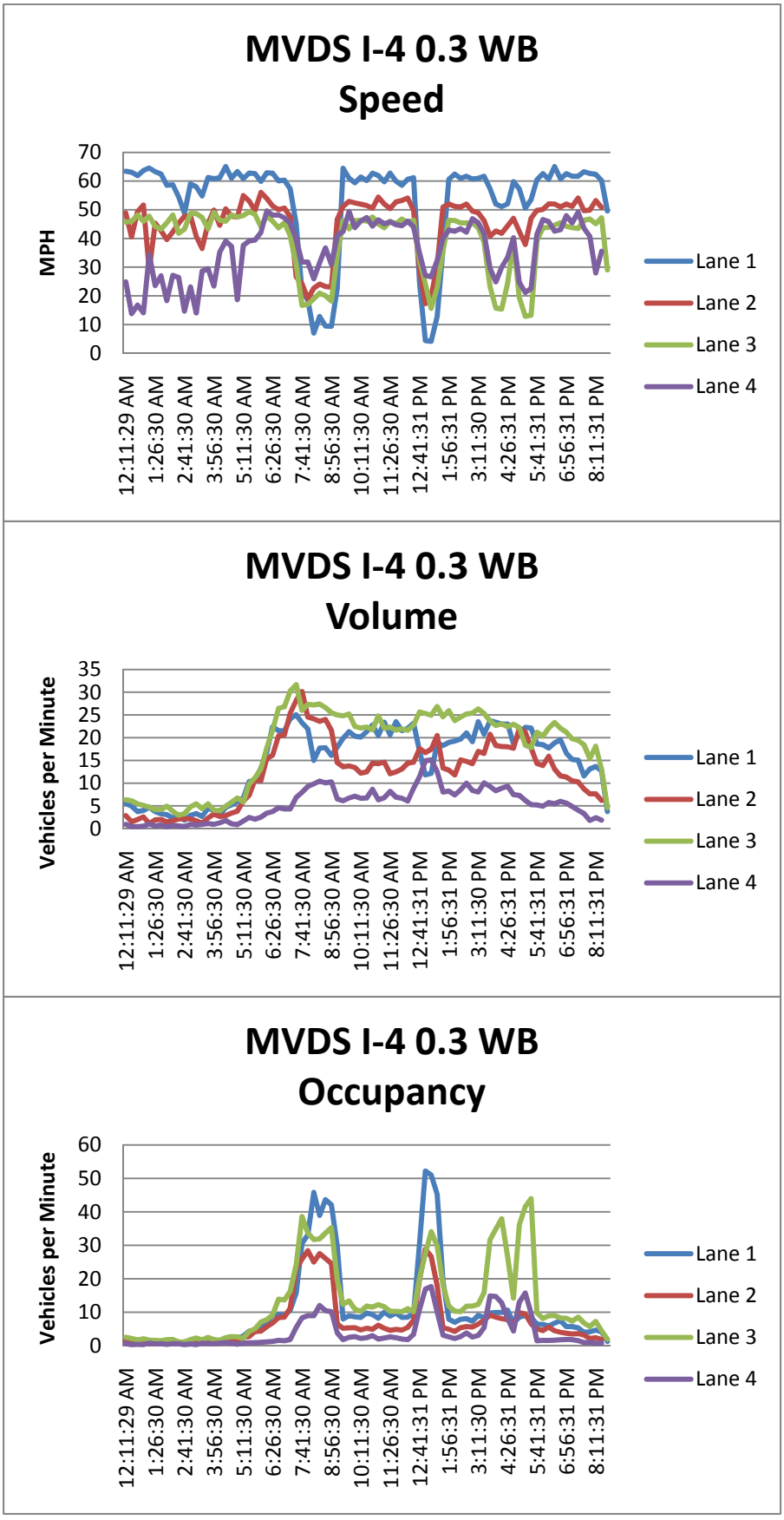
Figure 2 (Cont'd)



Highlights

- All lanes are at or above 60 MPH most of the day
- The peak period for this direction of travel is during the evening rush hour, between 4 & 6 P.M.

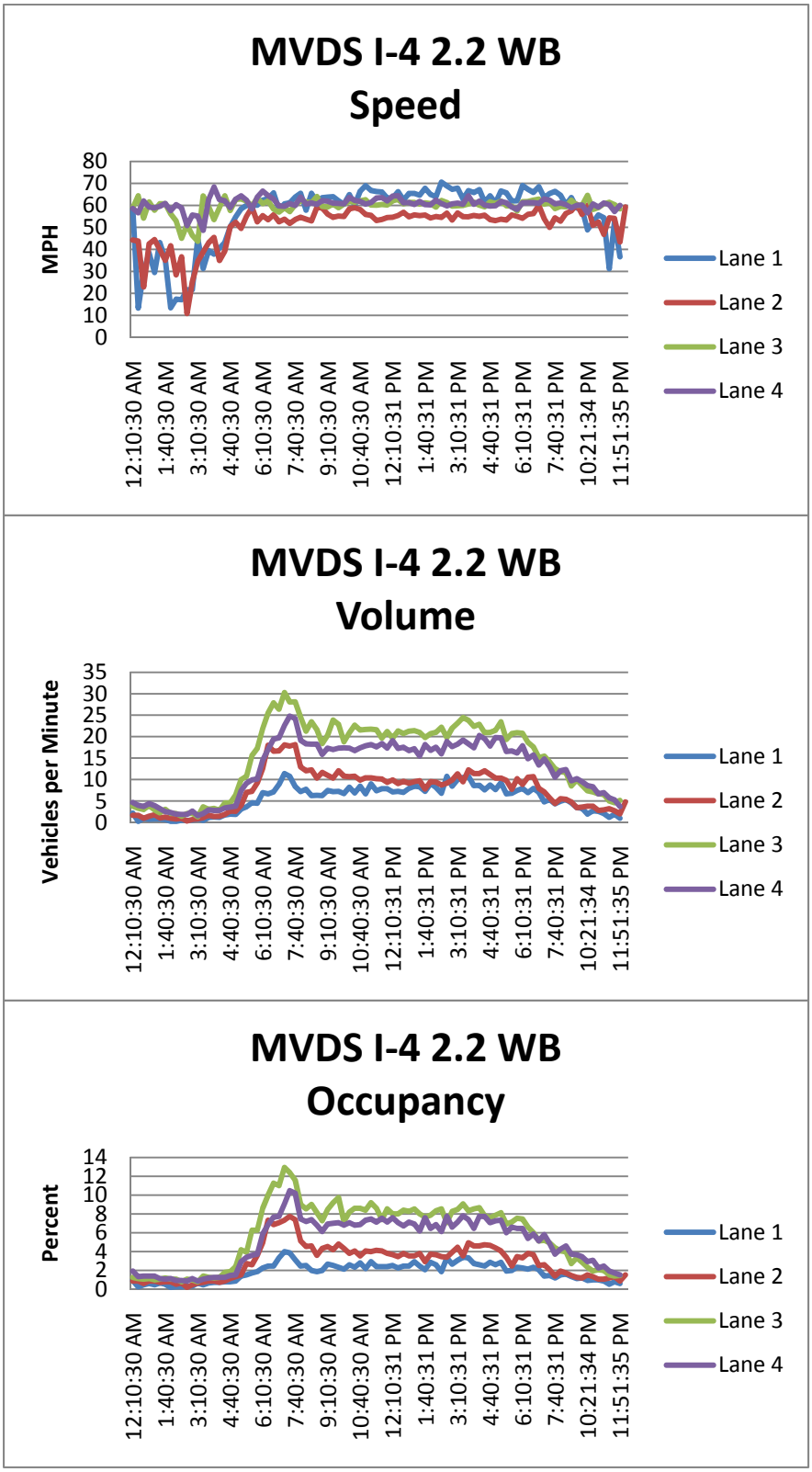
Figure 3: I-4 Westbound from MLK to I-275



Highlights

- Speed drops below 60 MPH in peak periods
- The peak period for this direction of travel is during the morning rush hour, between 6:30 & 9 A.M.
- Congestion on this segment of roadway is strongly affected by the morning, lunch, and evening peak periods, as indicated by the peaks on the Occupancy graph and their associated valleys on the Speed graph

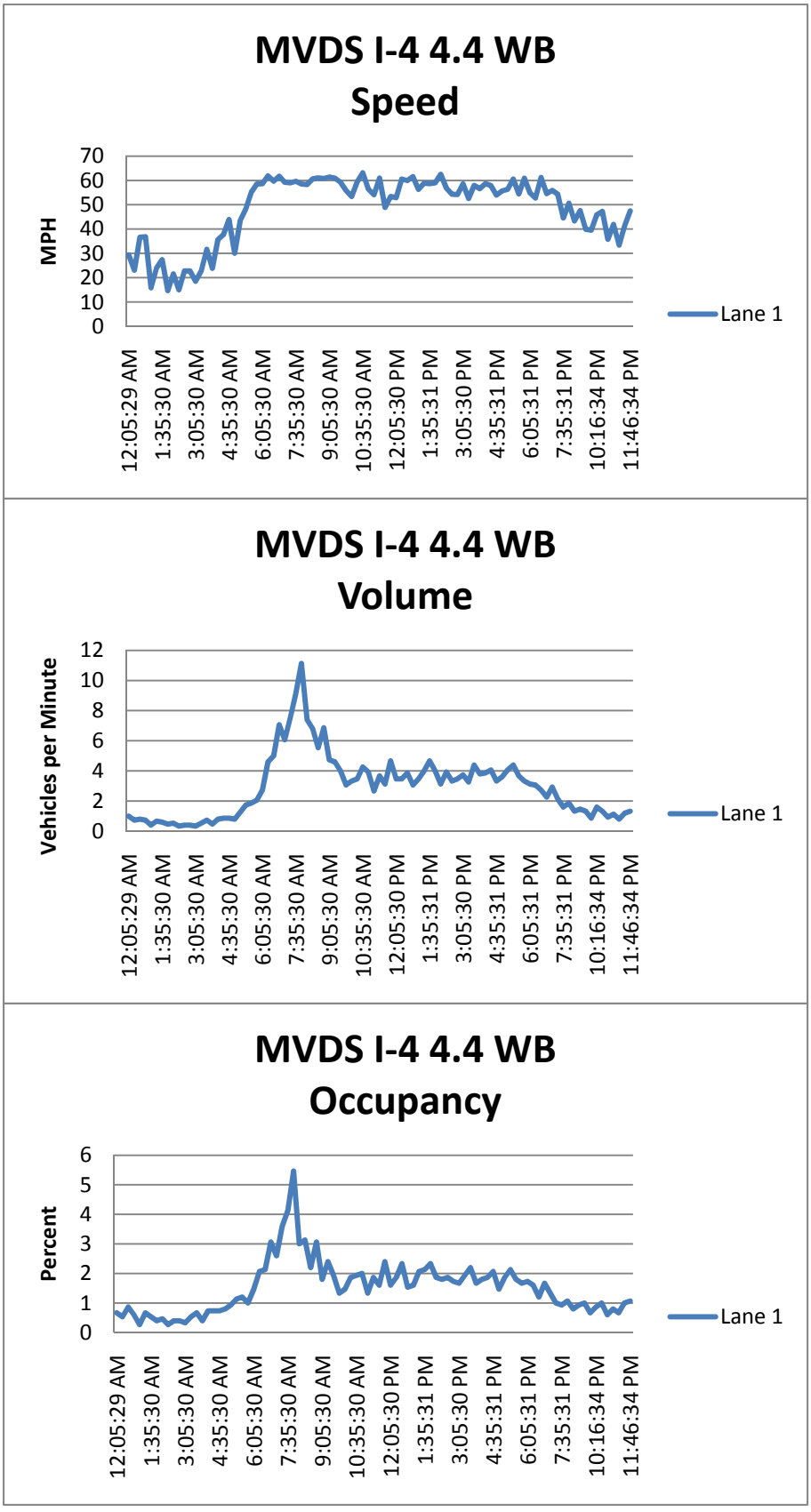
Figure 3 (Cont'd)



Highlights

- Only lane 2 is consistently below 60 MPH
- The peak period for this direction of travel is during the morning rush hour, between 6 and 8 A.M.

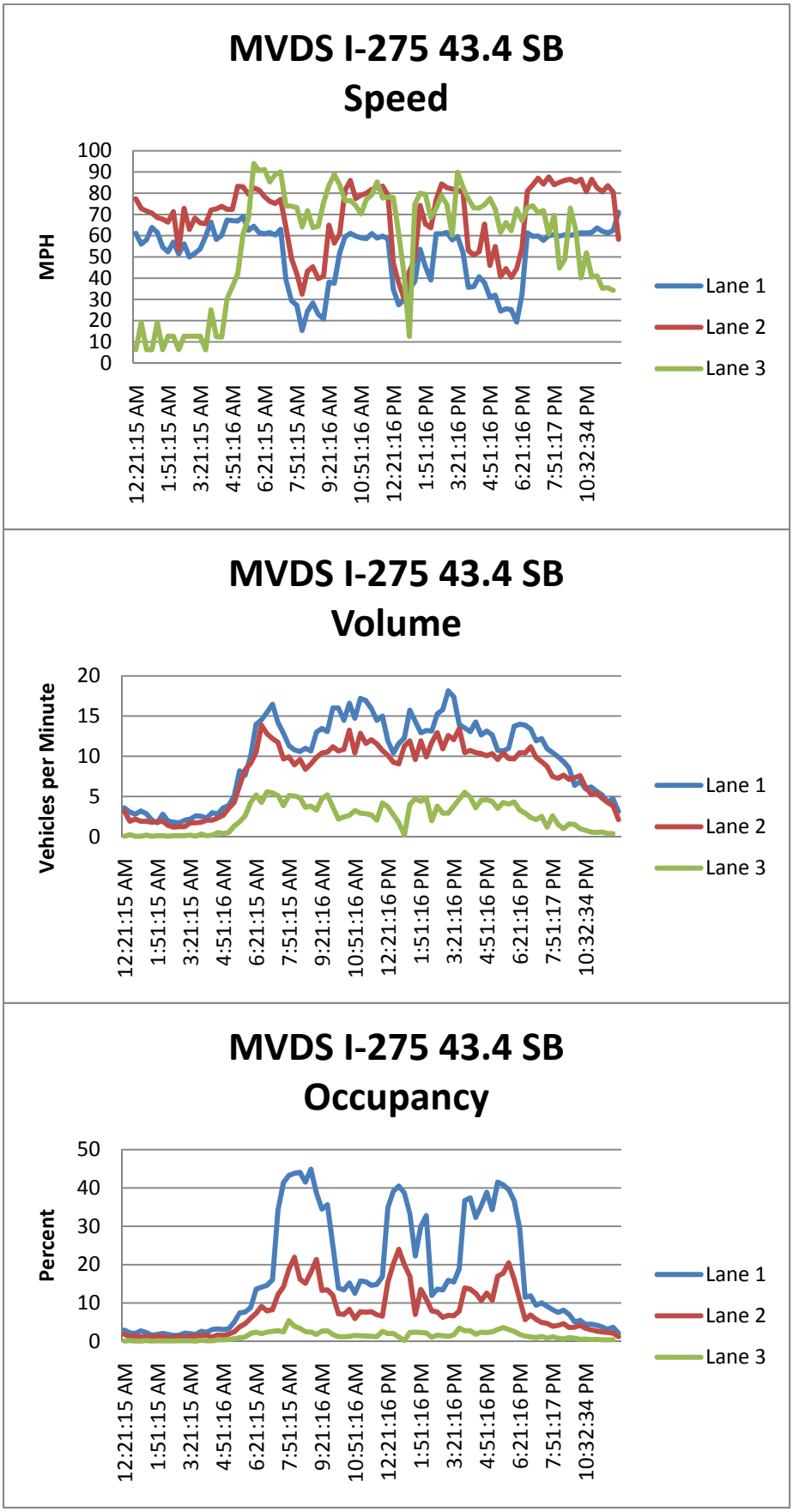
Figure 3 (Cont'd)



Highlights

- This is a single lane freeway ramp
- The peak period for this ramp is during the morning rush hour, between 6 and 9 A.M.

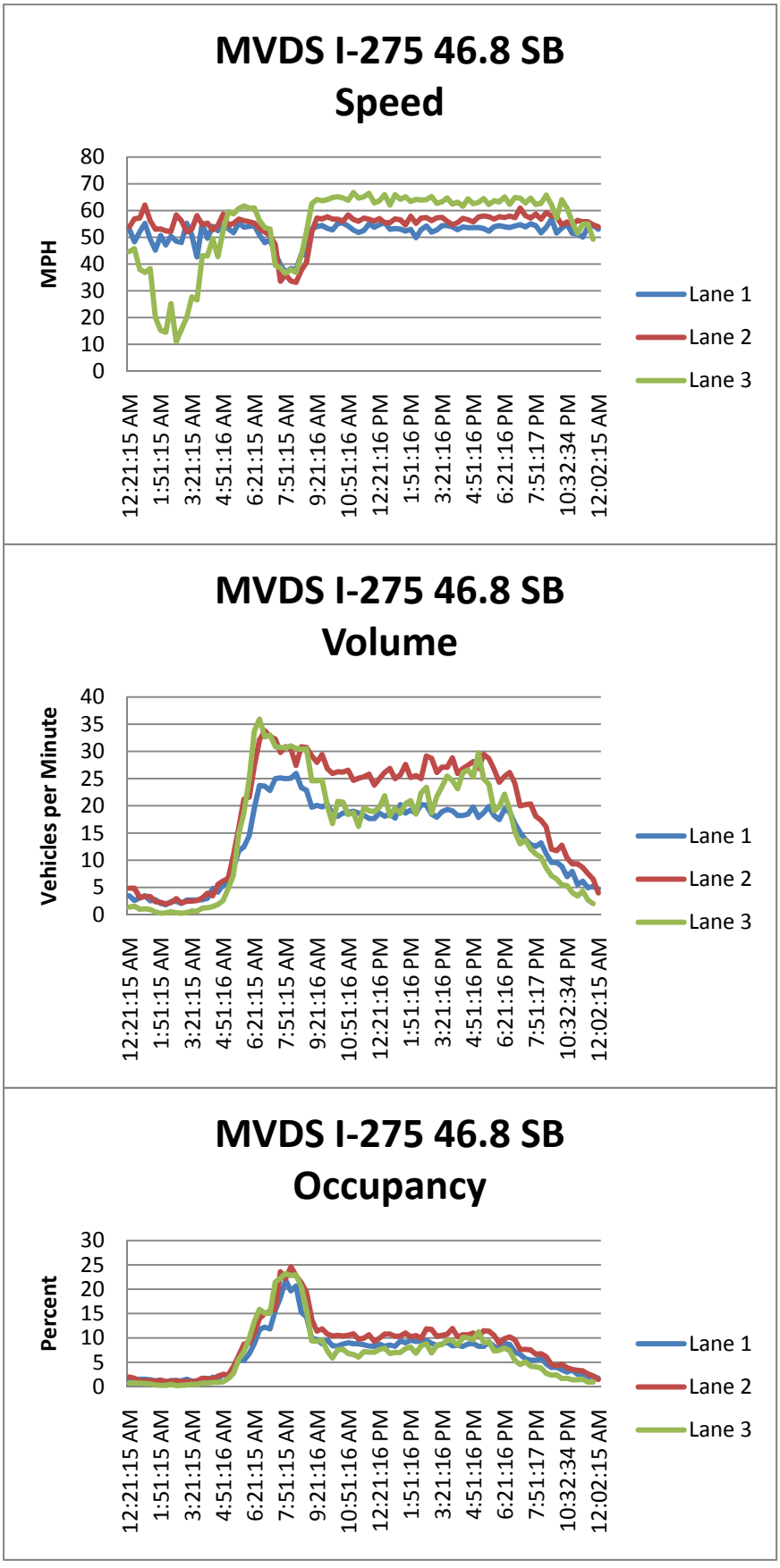
Figure 4: I-275 Southbound Busch Blvd to Hillsborough River



Highlights

- Speed drops below 20 MPH in peak periods
- The morning, lunch, and evening rush hours are all about equal in terms of volume
- Lane 3 has consistently less volume
- Congestion on this segment of roadway is strongly affected by the morning, lunch, and evening peak periods, as indicated by the peaks on the Occupancy graph and their associated valleys on the Speed graph

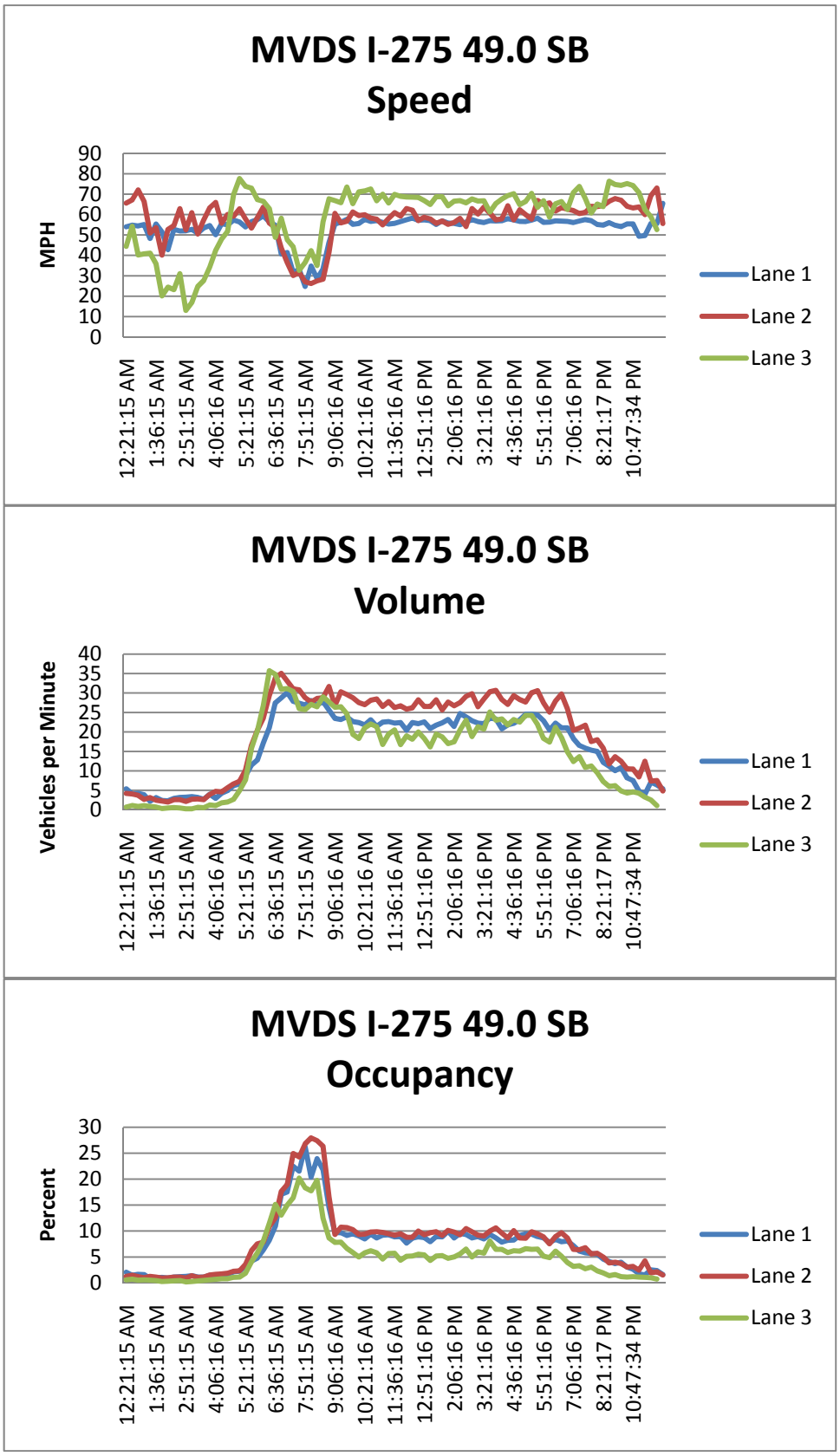
Figure 4(Cont'd)



Highlights

- Speed drops below 40 MPH in AM peak
- The peak period for this direction of travel is during the morning rush hour, between 6 and 9 A.M.

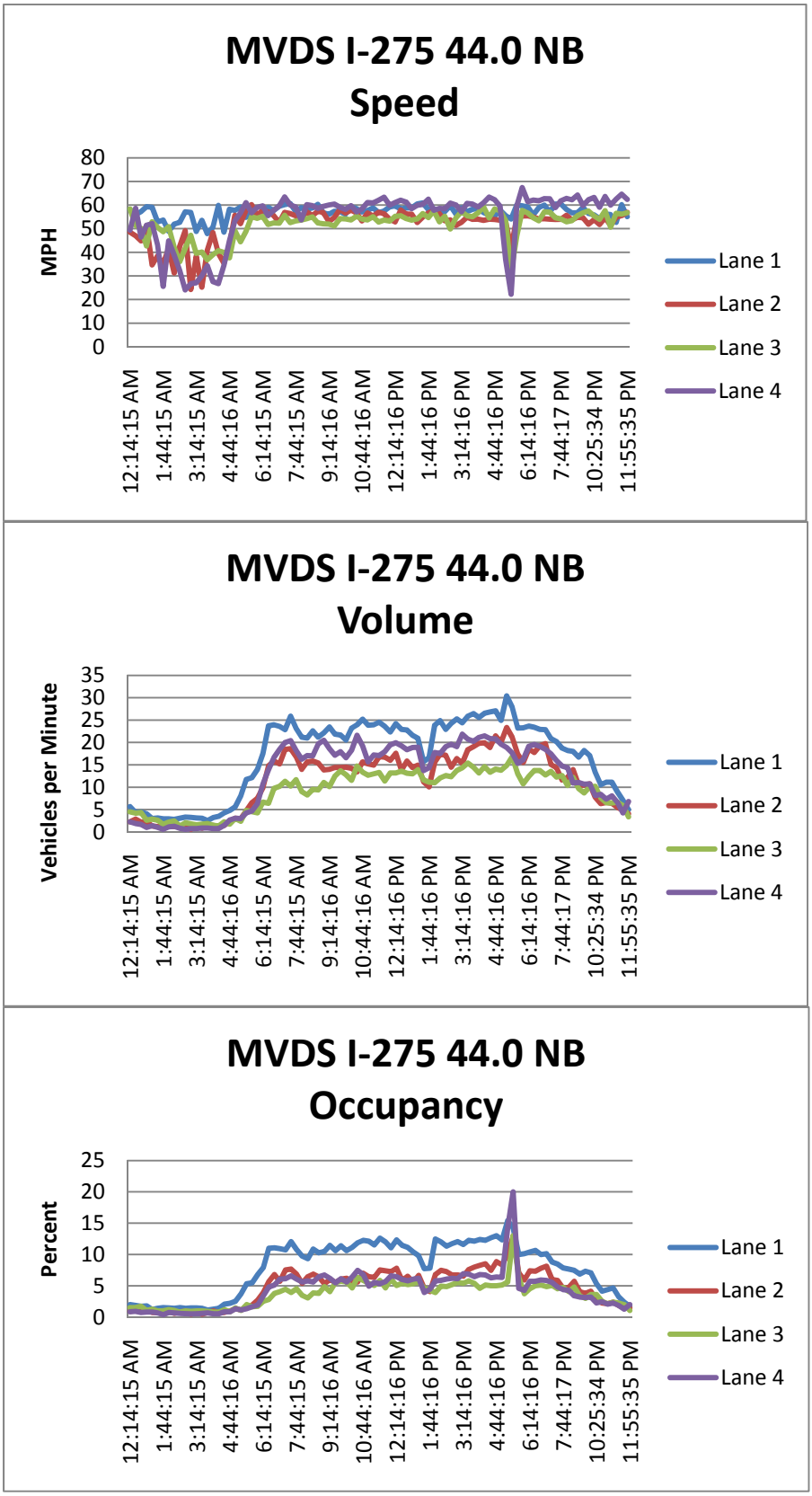
Figure 4 (Cont'd)



Highlights

- Speed drops below 30 MPH in AM peak
- Lane 3 is the fastest
- The peak period for this direction of travel is during the morning rush hour, between 6:30 and 9 A.M.

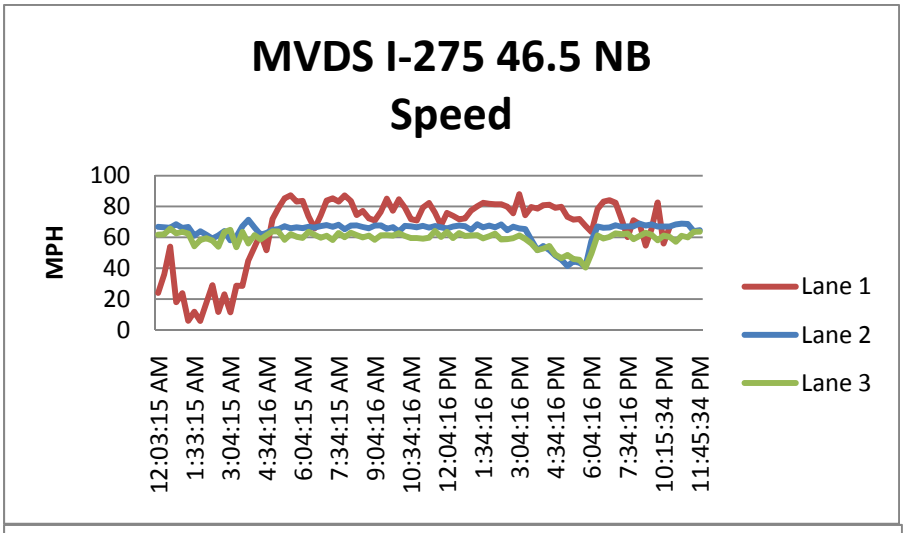
Figure 5: I-275 Northbound Busch Blvd to Hillsborough River

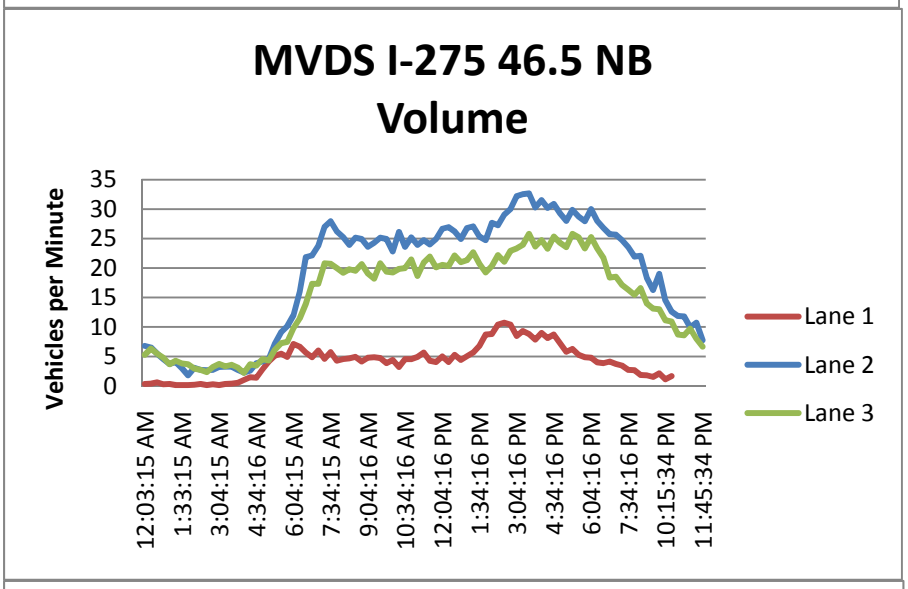


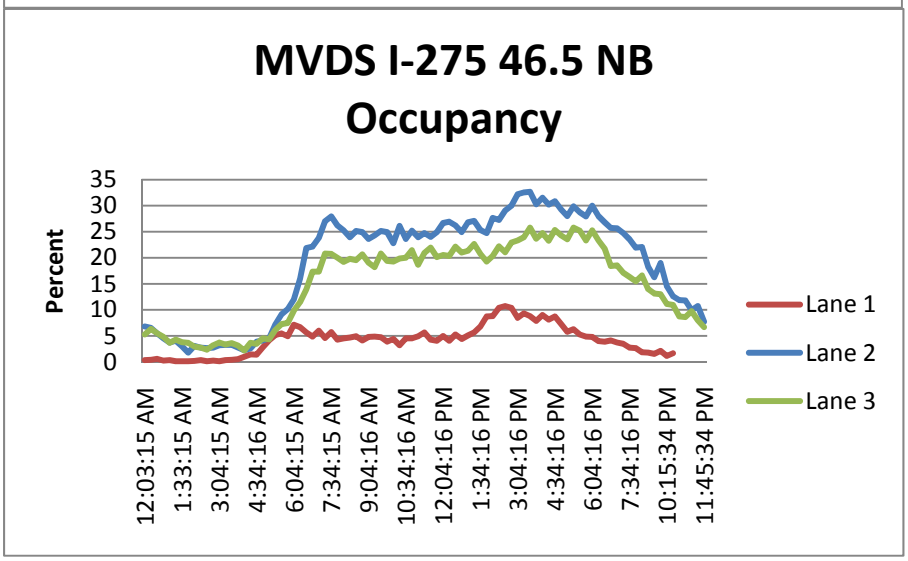
Highlights

- Speed is between 50 and 60 MPH most of the day
- The peak period for this direction of travel is during the evening rush hour, between 4:30 and 6:15 P.M.
- The large valley on the Speed graph for Lane 4 and its associated spike on the Occupancy graph indicates an incident that affects Lane 4 more strongly than the others, such as a vehicle with a flat tire that has pulled over to the shoulder adjacent to Lane 4.

Figure 5 (Cont'd)



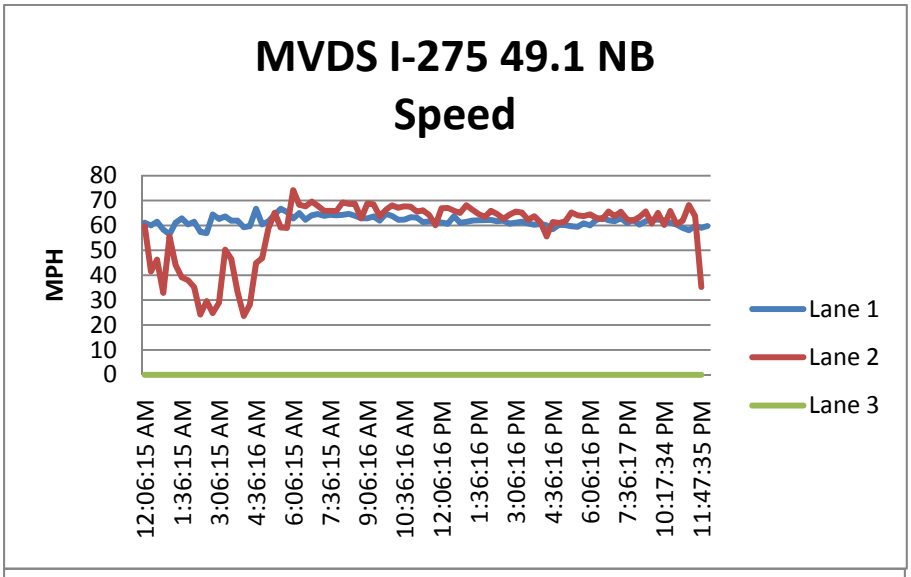


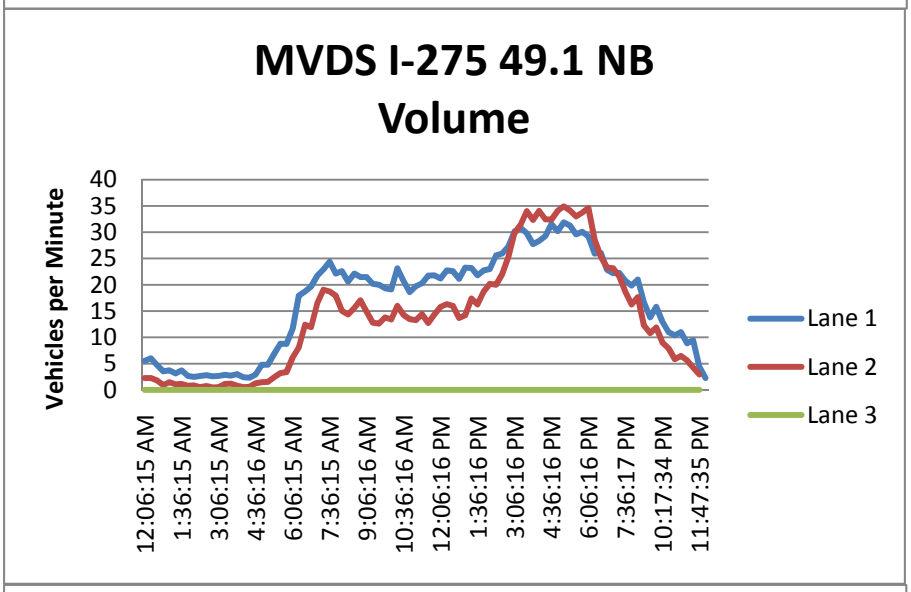


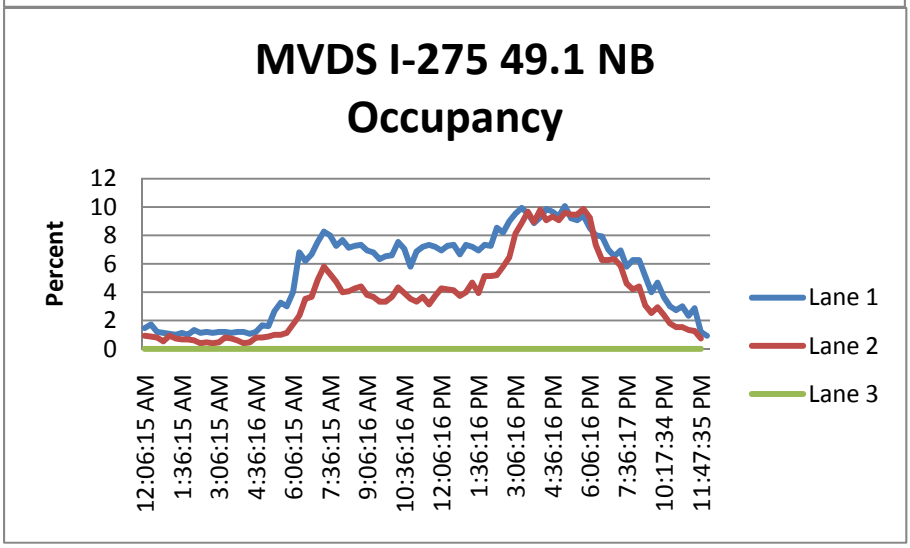
Highlights

- Speeds drop to 40 MPH in PM peak in lanes 2 & 3
- The peak period for this direction of travel is during the evening rush hour, between 4 and 6 P.M.

Figure 5 (Cont'd)







Highlights

- There were zero counts for this day on Lane 3. This could be due to a lane closure or due to a MVDS failure.
- Speeds are at or above 60 MPH for lanes 1 & 2
- The fast lane cannot be determined
- The peak period for this direction of travel is during the evening rush hour, between 4 and 6:30 P.M.

Future Data for Limited Access Highways

In collaboration with the University of Florida, FDOT has developed an archive for ITS data called STEWARD. It is a centralized repository for data generated by Florida's regional TMCs. This research project was created to provide an archive that will support the development of performance measures and promote further research into traffic flow and congestion modeling. Currently it houses data from TMCs in FDOT Districts Two, Four, Five and Six. Data from District Seven is expected to come on-line in the last quarter of calendar 2010. The STEWARD database contains daily summaries of traffic volumes, speeds, occupancies and travel times obtained from SunGuide TMCs in Florida and aggregated by 5, 15 and 60 minute periods. The data can be compiled at the facility, section or station levels for any time period specified by the user.

Information on STEWARD is available at: http://cdwserver.ce.ufl.edu/steward/index.html

Ultimately, STEWARD will be migrated to FDOT's Traffic Engineering Research Laboratory (TERL). A sample report is included in **Appendix A**.

Major Arterial System

City of Tampa / Tampa-Hillsborough Expressway Authority Traffic Management Center

Data Coverage

The City of Tampa operates this TMC and the Expressway Authority's Reversible Express Lanes on the Selmon Crosstown Expressway. Live video is available for the Expressway but it is not continuously monitored nor is it recorded.

Video cameras are used mainly for traffic management, e.g. to determine the presence of a malfunctioning traffic light or a stalled vehicle. If TMC staff happens to observe a crash, then a Road Ranger and/or other emergency service may be dispatched. The TMC does not have readily available performance or operational reports or data.

Congestion and Safety Data from Other THEA and City of Tampa Sources

The Expressway Authority periodically conducts traffic and revenue studies. The most recent study is the *2009 Traffic and Revenue Update*, prepared by Wilbur Smith Associates. As part of this update, traffic data was collected, including hourly traffic and vehicle classification counts on the Selmon Expressway, as well as speed and delay studies on the Expressway and other major roads in the same travel shed. The data shows that traveling on the Expressway between US 301 and downtown Tampa yields a time savings of 15 minutes in the morning compared to parallel roads such as Adamo Drive, and 13 ½ minutes longer than traveling west on I-4. In the afternoon, the travel time savings from downtown to US 301 is 5 minutes. Excerpts from the Update are included in **Appendix B**.

The City's Transportation Division periodically collects 24-hour traffic count data and compiles an inventory of roadway conditions within the city. The inventory is included in **Appendix C**; most of counts are from 2008. The City intends to update their count data beginning in October 2010.

Table 3 shows the 50 most congested roads in the City's inventory, based on automobile Level of Service (LOS) and Volume to Capacity (V/C) ratio. Capacities in this table reflect generalized thresholds used by the City and may differ from actual capacities and maximum flow rates as obtained from field studies or more detailed analysis tools.

The City's Transportation Division is also responsible for the traffic signals on city-maintained roads and therefore collects 14-hour intersection turning movement counts as well as signal timing records.

The City also maintains crash records for roads within the city limits. This information was used to identify the top 40 crash locations in the City for the last two years, shown in **Tables 4 and 5**.

Table 3: 50 Most Congested Roads in Tampa

ON	From - To (S to N or W to E)	Date of Count (mm/dd/yr)	Existing Daily Volume	Existing LOS D Capacity	Existing v/c (vol/ los D cap)	Existing LOS	Existing PM Peak Volume
Cross Creek Blvd	Kinnan St to Morris Bridge Road	01/20/08	29,715	10,300	2.75	F	2,995
I-275	City Limits to Kennedy Blvd	06/01/07	155,500	68,900	2.15	F	10,514
I-275	City Limits to Kennedy Blvd	06/01/07	147,000	68,900	2.03	F	9,981
I-275	Armenia/Howard to Ashley Dr	06/01/07	204,000	103,400	1.88	F	12,500
I-275	Ashley/Scott Ex to Ash. NBOnRamp	06/01/07	201,000	103,400	1.85	F	12,100
I-4	22th St to 40th St	06/01/07	131,500	68,900	1.82	F	9,950
CR 581	I-75 to (Dona Michelle)Hunter's Green Dr	01/20/08	64,827	34,200	1.81	F	5,196
Westshore Blvd	Gandy Blvd(El Prado) to Bay to Bay Blvd	02/10/08	22,039	11,680	1.80	F	1,671
I-275	Himes Ave to Armenia/Howard	06/01/07	191,500	103,400	1.76	F	11,887
I-275	Kennedy Blvd to Memorial Hwy	06/01/06	125,399	68,900	1.73	F	10,543
I-275	Dale Mabry Hwy to Himes Ave	06/01/07	187,000	103,400	1.72	F	10,480
I-275	Lois Ave to Dale Mabry Hwy	06/01/07	175,500	103,400	1.62	F	9,772
I-4	40th St to 50th St	06/01/07	116,500	68,900	1.61	F	10,800
I-275	Sligh Ave to Bird St	06/01/07	172,500	103,400	1.59	F	11,600
I-275	Westshore Blvd to Lois Ave	06/01/07	169,500	103,400	1.56	F	9,261
Himes Ave	Hillsborough Ave to Henry (City Limits)	12/11/07	16,623	10,300	1.54	F	1,431
Kennedy Blvd	Henderson Blvd to MacDill Ave	08/17/08	46,912	29,400	1.52	F	3,962
I-275	I-4 to M.L.K.Jr Blvd	06/01/07	164,500	103,400	1.52	F	11,100
Florida Ave	Bougainvillea Ave to Country Club Dr	07/06/08	25,480	16,100	1.51	F	2,166
I-275	Hillsborough Ave to Sligh Ave	06/01/07	163,000	103,400	1.50	F	11,000
I-275	M.L.K.Jr Blvd to Hillsborough Ave	06/01/07	162,500	103,400	1.50	F	10,900
CR 581	City Limits to Amberly Dr	01/20/08	53,666	34,200	1.49	F	4,237
I-4	50th St to City Limits	06/01/06	107,000	68,900	1.48	F	8,239
I-275	Bird St to Busch Blvd	06/01/07	156,500	103,400	1.44	F	10,553
Howard Ave	Bayshore Blvd(Morrison Ave) to Swann Ave	06/10/08	15,332	10,300	1.42	F	1,239
Memorial Hwy	Kennedy Blvd to I-275	08/05/07	72,520	49,214	1.40	F	5,329
NW X-Way FRT E	Courtney Campbell to Hillsborough Ave	04/08/02	33,500	22,800	1.37	F	512
Maritime Blvd	Hookers Point to 22nd St	02/17/08	14,787	10,300	1.37	F	1,224
I-275	Memorial Hwy to Westshore Blvd	06/01/07	147,000	103,400	1.35	F	9,018
CR 581	Amberly Dr to Tampa Palms	01/20/08	53,626	37,800	1.35	F	4,483
Franklin St	Garrison Channel to Ice Palace Dr(East)	01/07/08	14,610	10,300	1.35	F	1,323
Westshore Blvd	Bay to Bay Blvd(Swann) to Azeele St	02/10/08	16,480	11,680	1.34	F	1,424
Swann Ave	MacDill Ave to Howard Ave	06/19/08	14,185	10,300	1.31	F	1,240
M.L.K.Jr Blvd	Central Ave to Marguerite St	07/27/08	34,644	25,500	1.29	F	3,102
Lois Ave	Azeele St to Kennedy Blvd	06/24/08	13,893	10,300	1.28	F	1,503
CR 581	Hunter's Green Dr to New Tampa Blvd/ Cross (	01/20/08	46,034	34,200	1.28	F	3,777
7th Ave	21st St to 22nd St	07/15/08	13,858	10,300	1.28	F	1,155
Westshore Blvd	M.L.K.Jr Blvd to Hillsborough Ave	02/10/08	15,675	11,680	1.28	F	1,560
Dale Mabry Hwy	Swann Ave to Azeele St	06/01/08	45,293	34,200	1.26	F	3,483
Westshore Blvd	I-275 to Cypress St	02/10/08	40,605	31,100	1.24	F	3,452
I-4	I-275 to 22nd St	06/01/07	134,500	103,400	1.24	F	9,100
Dale Mabry Hwy	Bay to Bay Blvd(Neptune St) to Henderson Blv	06/08/08	38,196	29,400	1.24	F	3,031
Columbus Dr	50th St to Broadway Ave	05/04/08	13,375	10,300	1.24	F	1,048
NW X-Way (Toll Rd)	Courtney Campbell to Memorial Hwy	01/01/96	136,000	103,400	1.23	F	8,370
Kennedy Blvd	Lois Ave to Dale Mabry Hwy	08/03/08	37,556	29,400	1.22	F	3,102
I-275	Orange/Jefferson Ramp to I-4	04/08/02	134,500	103,400	1.22	F	9,278
M.L.K.Jr Blvd	Himes Ave to MacDill Ave	07/27/08	32,452	25,500	1.21	F	2,803
I-275	Kennedy Blvd to Memorial Hwy	06/01/07	86,500	68,900	1.20	E	6,633
Lois Ave	M.L.K.Jr Blvd to Hillsborough Ave	06/24/08	12,827	10,300	1.19	E	1,197
Howard Ave	Swann Ave to Azeele St	06/10/08	12,811	10,300	1.18	E	940

Source: City of Tampa Inventory of Roadway Conditions (August 2010)

Table 4: Top 40 Tampa Crash Locations – 2008

Rank	Intersection Location	Total Crashes
1	Gandy Blvd & Manhattan Ave	59
2	Dale Mabry Hwy & Hillsborough Ave	57
3	40th St & Hillsborough Ave	50
4	Hillsborough Ave & Himes Ave	47
5	Florida Ave & Waters Ave	39
6	Columbus Dr & Dale Mabry Hwy	39
7	50th St & Adamo Dr	39
8	Dale Mabry Hwy & Kennedy Blvd	38
9	Dale Mabry Hwy & Gandy Blvd	38
10	22nd St & Hillsborough Ave	38
11	Bruce B Downs Blvd & Highwoods Preserve Pkwy	37
12	50th St & Broadway Ave	37
13	30th St & Fowler Ave	37
14	Fowler Ave & Nebraska Ave	36
15	Armenia Ave & Waters Ave	36
16	Hillsborough Ave & Nebraska Ave	34
17	Hillsborough Ave & Lois Ave	33
18	Armenia Ave & Hillsborough Ave	33
19	Busch Blvd & Florida Ave	32
20	Bruce B Downs Blvd & Tampa Palms Blvd	32
21	Bruce B Downs Blvd & Interstate 75	32
22	Amberly Dr & Bruce B Downs Blvd	31
23	Habana Ave & Hillsborough Ave	30
24	Gandy Blvd & West Shore Blvd	30
25	Armenia Ave & Sligh Ave	30
26	50th St & Fowler Ave	30
27	15th St & Fowler Ave	30
28	Kennedy Blvd & Tampa St	28
29	Florida Ave & Hillsborough Ave	28
30	Dale Mabry Hwy & Dr Martin Luther King Jr Blvd	28
31	Cypress St & Dale Mabry Hwy	28
32	22nd St & Busch Blvd	28
33	Florida Ave & Linebaugh Ave	27
34	Columbus Dr & I-4	27
35	Busch Blvd & Nebraska Ave	27
36	50th St & Columbus Dr	27
37	30th St & Hillsborough Ave	27
38	Dale Mabry Hwy & Spruce St	26
39	Bruce B Downs Blvd & Regents Park Dr (north)	25
40	Dr Martin Luther King Jr Blvd & Habana Ave	25

Source: City of Tampa, Transportation Division (Ron Phillips e-mail, August 26, 2010)

Table 5: Top 40 Tampa Crash Locations – 2009

Rank	Intersection Location	Total Crashes
1	40th St & Hillsborough Ave	37
2	Armenia Ave & Hillsborough Ave	23
3	22nd St & Hillsborough Ave	21
4	Hillsborough Ave & Himes Ave	21
5	Florida Ave & Waters Ave	20
6	Columbus Dr & Dale Mabry Hwy	20
7	Florida Ave & Hillsborough Ave	19
8	34th St & Hillsborough Ave	19
9	Busch Blvd & Nebraska Ave	18
10	Habana Ave & Hillsborough Ave	18
11	Ashley Dr & Kennedy Blvd	18
12	Hillsborough Ave & Lois Ave	17
13	Gandy Blvd & Manhattan Ave	17
14	50th St & Adamo Dr	16
15	Hillsborough Ave & Nebraska Ave	15
16	Cypress St & Dale Mabry Hwy	15
17	Rome Ave & Waters Ave	15
18	Fowler Ave & Nebraska Ave	15
19	Dr Martin Luther King Jr Blvd & Marguerite St	15
20	Dale Mabry Hwy & Hillsborough Ave	15
21	Armenia Ave & Waters Ave	15
22	30th St & Busch Blvd	15
23	Busch Blvd & Florida Ave	14
24	15th St & Fowler Ave	14
25	Busch Blvd & Interstate 275	13
26	Kennedy Blvd & West Shore Blvd	13
27	Dale Mabry Hwy & Kennedy Blvd	13
28	Dale Mabry Hwy & Gandy Blvd	13
29	Dr Martin Luther King Jr Blvd & Nebraska Ave	12
30	Armenia Ave & Sligh Ave	12
31	50th St & Broadway Ave	12
32	Hillsborough Ave & Interstate 275	11
33	Interstate 275 & Sligh Ave	11
34	Dr Martin Luther King Jr Blvd & Habana Ave	11
35	Cherokee Ave & Hillsborough Ave	11
36	Boulevard & Dr Martin Luther King Jr Blvd	11
37	Boulevard & Cleveland St	10
38	Hillsborough Ave & Macdill Ave	10
39	Nebraska Ave & Sligh Ave	10
40	Dale Mabry Hwy & Euclid Ave	10

Source: City of Tampa, Transportation Division (Ron Phillips e-mail, August 26, 2010)

Hillsborough County Traffic Management Center

Data Coverage

The County's TMC, operated by the Traffic Services Division of the Public Works Department, serves as the hub for the county's intelligent traffic system. Cameras provide real-time images of intersections on county-maintained collectors and arterials. The TMC uses the information from video cameras and sensors in the ground to change the timing of traffic signals when necessary, as for example, in clearing traffic after an accident has occurred.

Currently, the TMC does not have readily available performance and operational data or reports. However, the County is currently in the process of developing and implementing an Advanced Traffic Management System (ATMS) system, funded through Transportation Task Force funding. It represents a multi-year upgrade program for communications, cabinets, and system detection. The end state of this effort will have new TS2 cabinets with integrated UPS, running on ATMS.now with certain corridors operating under Traffic Responsive Pattern Selection mode of operation. The first corridor is still under construction, but the schedule has prioritized corridors coming on-line over the next couple of years. Concepts such as corridor performance monitoring, incident detection and active traffic management are envisioned as part of this program. Recurring and non-recurring sources of congestion will be monitored and presumably captured as data for compilation into reports.

Congestion and Safety Data from Other County Sources

Hillsborough County routinely collects 24 and 72-hour traffic counts and the Planning and Growth Management Department produces an annual Level of Service Report for concurrency purposes. Traffic volume data comes from permanent or portable counting devices at designated stations on roads maintained by the County in the unincorporated area. The most recent published document is the 2008 Level of Service report, the data for which is included in **Appendix D**. A companion map showing deficient roadways as of 2008 is also included in Appendix D. "Deficient" is defined to mean a road whose automobile LOS is less than its adopted LOS standard.

Based on the Level of Service Report, **Table 6** identifies the 50 most congested roadways in unincorporated Hillsborough County for both county and state roads, based on their automobile LOS and V/C ratio.

Table 6: Most Congested Roads in Unincorporated Hillsborough County

(County Roads)

Roadway (From/To)	LOS Std.	AADT	Peak Hr Dir Vol	Peak Hr Dir Cap	V/C Ratio	LOS
BELL SHOALS RD: (BLOOMINGDALE AVE-to-BOYETTE RD)	D	29,233	1,450	817	1.78	F
BRUCE B DOWNS BLVD: (BEARSS AVE -to-TAMPA PALMS BLVD)	D	69,962	3,747	2,180	1.72	F
PROGRESS BLVD: (78TH ST -to-US 301)	E	20,524	1,397	846	1.65	F
MEMORIAL HWY: (VETERANS EXPWY -to-HILLSBOROUGH AVE)	D	50,328	2,580	1,625	1.59	F
MT CARMEL/FRONT ST: (SEFFNER VALRICO-to-SR 60)	D	12,106	813	515	1.58	F
GUNN HWY: (DALE MABRY HWY -to-LINEBAUGH AVE)	E	42,177	2,630	1,710	1.54	F
BOYETTE RD: (MCMULLEN DR -to-BELL SHOALS RD)	D	22,506	1,176	817	1.44	F
BENJAMIN RD: (SLIGH AVE-to-WATERS AVE)	D	15,321	1,112	817	1.36	F
FORBES RD: (M L KING BLVD -to-I-4)	C	15,253	891	656	1.36	F
HENDERSON RD: (WATERS AVE-to-LINEBAUGH AVE)	D	12,422	1,090	800	1.36	F
GUNN HWY: (LINEBAUGH AVE -to-ANDERSON RD)	E	36,445	2,272	1,710	1.33	F
HOOVER BLVD: (HILLSBOROUGH AVE -to-ANDERSON RD)	D	18,487	1,243	950	1.31	F
LAKEWOOD DR: (M L KING BLVD-to-BROADWAY AVE)	E	20,232	1,001	770	1.3	F
LAKEWOOD DR: (BROADWAY AVE-to-SR 60)	D	20,232	1,001	770	1.3	F
BROADWAY AVE: (FALKENBURG -to-WILLIAMS RD)	D	10,190	984	770	1.28	F
LINEBAUGH AVE: (COUNTRY WAY BLVD -to-RACE TRACK RD)	D	18,844	1,048	817	1.28	F
WHEELER RD: (PARSONS RD -to-VALRICO RD)	D	9,864	625	490	1.28	F
HANLEY: (HILLSBOROUGH AVE -to-WILSKY BLVD)	E	38,826	2,131	1,710	1.25	F
BROADWAY AVE: (WILLIAMS RD-to-LAKEWOOD)	E	10,190	984	808	1.22	F
GIBSONTON DR: (I-75 -to-US HWY 301)	D	33,920	1,806	1,490	1.21	F
FLETCHER AVE: (56TH ST -to-I-75)	D	37,329	1,926	1,625	1.19	F
46TH ST: (FLETCHER AVE -to-SKIPPER RD)	D	18,124	965	817	1.18	F
CROSS CREEK BLVD: (KINNAN ST -to-MORRIS BRIDGE RD)	D	12,652	950	817	1.16	F
LITHIA PINECREST RD: (LUMSDEN RD-to-BLOOMINGDALE AVE)	D	19,605	1,217	1,050	1.16	F
BLOOMINGDALE AVE: (KINGS AVE-to-BELL SHOALS RD)	D	47,162	2,720	2,360	1.15	F
BRUCE B DOWNS BLVD: (FLETCHER-to-BEARSS AVE)	E	47,050	2,618	2,310	1.13	F
CR 579: (I-4-to-M L KING BLVD)	D	14,399	792	700	1.13	F
S MOBLEY RD: (RACE TRACK RD -to-GUNN HWY)	C	9,179	496	440	1.13	F
BELL SHOALS RD: (LITHIA PINECREST-to-BLOOMINGDALE AVE)	D	10,604	593	530	1.12	F
FLETCHER AVE: (FLORIDA AVE-to-ORANGE GROVE RD)	D	36,931	1,819	1,625	1.12	F
BLOOMINGDALE AVE: (US HWY 301 -to-PROVIDANCE RD)	E	38,580	2,258	2,030	1.11	F
BLOOMINGDALE AVE: (PROVIDANCE RD-to-KINGS AVE)	D	38,580	2,258	2,030	1.11	F
LITHIA PINECREST RD: (SR 60 -to-LUMSDEN RD)	D	15,009	797	730	1.09	F
TEMPLE TERRACE HWY: (56TH ST -to-HARNEY RD)	D	30,534	1,755	1,625	1.08	F
GUNN HWY: (CITRUS PARK DR -to-EHRLICH RD)	D	14,851	864	810	1.07	F
HENDERSON RD: (LINEBAUGH AVE-to-GUNN HWY)	E	15,605	1,041	970	1.07	F
ANDERSON RD: (WATERS AVE-to-LINEBAUGH AVE)	E	30,824	1,818	1,710	1.06	F
FLETCHER AVE: (BRUCE B DOWNS-to-46TH ST)	E	40,196	1,711	1,634	1.05	F
FLETCHER AVE: (46TH ST-to-56TH ST)	D	40,196	1,711	1,625	1.05	F
78TH ST: (CAUSEWAY BLVD-to-MADISON AVE)	E	16,765	882	846	1.04	F
GUNN HWY: (S MOBLEY-to-VAN DYKE RD)	E	21,016	1,115	1,090	1.02	F
KINGS AVE: (LUMSDEN RD -to-BLOOMINGDALE AVE)	D	20,058	1,166	1,150	1.01	F
ANDERSON RD: (SLIGH AVE-to-WATERS AVE)	E	28,394	1,717	1,710	1	F
MCINTOSH RD: (US 92 -to-I-4)	C	16,922	935	656	1.43	E
MORRIS BRIDGE RD: (I-75 -to-CROSS CREEK BLVD)	D	14,007	1,321	1,000	1.32	E
CR 579: (I-4-to-US 301)	C	12,850	845	656	1.29	E
BIG BEND RD: (SUMMERFIELD BLVD -to-BALM RIVERVIEW)	D	11,258	723	620	1.17	E
FALKENBURG RD: (US HWY 92-to-M L KING BLVD)	D	10,159	771	690	1.12	E
GEORGE RD: (MEMORIAL HWY -to-HILLSBOROUGH AVE)	D	10,118	670	620	1.08	E
FISH HAWK BLVD: (BELL SHOALS RD -to-LITHIA PINECREST)	D	15,734	829	779	1.06	E

Source: Hillsborough County 2008 Level of Service Report

Table 6 (cont'd): 50 Most Congested Roads in Unincorporated Hillsborough County

(State Roads)

State Road (from and to)	LOS Std	AADT	Peak Hr Dir Vol	Peak Hr Dir Cap	V/C Ratio	LOS
US HWY 301: (GIBSONTON-to-BIG BEND RD)	D	29,000	1,700	860	1.98	F
BUSCH BLVD: (ARMENIA AVE-to-DALE MABRY)	E	54,500	2,900	1,710	1.7	F
BEARSS AVE: (NEBRASKA AVE -to-FLORIDA AVE)	E	53,000	2,900	1,720	1.69	F
FLETCHER AVE: (NEBRASKA AVE -to-FLORIDA AVE)	E	47,000	2,600	1,720	1.51	F
DALE MABRY HWY: (WATERS AVE-to-FLETCHER AVE)	E	76,500	4,000	2,710	1.48	F
I-75: (I-4-to-ML KING JR BLVD)	D	155,000	8,000	5,410	1.48	F
M L KING BLVD: (40TH ST-to-I-4)	E	23,500	1,300	890	1.46	F
DALE MABRY HWY: (HILLSBOROUGH AVE-to-WATERS AVE)	E	76,500	4,000	2,790	1.43	F
I-4: (I-75 -to-CR 579)	D	147,000	7,600	5,410	1.41	F
56TH ST: (HILLSBOROUGH AVE-to-RIVERHILLS DRIVE)	E	48,000	2,600	1,860	1.4	F
DALE MABRY HWY: (BEARSS/EHRLICH-to-VAN DYKE)	D	67,000	3,600	2,570	1.4	F
I-75: (FLETCHER AVE -to-BRUCE B DOWNS BLVD)	D	92,500	5,000	3,580	1.4	F
HILLSBOROUGH AVE: (ANDERSON-to-VETERANS EXPWY)	E	70,000	3,700	2,710	1.37	F
I-4: (US HWY 301 -to-I-75)	D	144,000	7,400	5,410	1.37	F
FOWLER AVE: (BRUCE B DOWNS-to-56TH ST)	D	66,500	3,500	2,570	1.36	F
DALE MABRY HWY: (VAN DYKE-to-LUTZ LAKE FERN)	D	47,000	2,500	1,860	1.34	F
HILLSBOROUGH AVE: (50TH ST -to-US HWY 301)	E	47,500	2,500	1,860	1.34	F
I-4: (MCINTOSH RD -to-BRANCH FORBES RD)	D	138,000	7,400	5,530	1.34	F
I-75: (ML KING JR BLVD -to-SR 60)	D	138,000	7,400	5,530	1.34	F
DALE MABRY HWY: (FLETCHER AVE-to-BEARSS/EHRLICH)	E	66,500	3,500	2,710	1.29	F
I-4: (US 41/50TH-to-ML KING JR BLVD)	D	135,000	7,000	5,410	1.29	F
M L KING BLVD: (PARSONS AVE-to-MCINTOSH RD)	D	19,800	1,100	860	1.28	F
SR 60 / BRANDON BLVD: (LAKEWOOD DR-to-LITHIA PINECREST)	D	75,500	4,000	3,130	1.28	F
HILLSBOROUGH AVE: (VETERANS EXPWY -to-SHELDON RD)	E	63,500	3,400	2,710	1.26	F
I-4: (CR 579 -to-MCINTOSH RD)	D	129,000	6,900	5,530	1.25	F
SR 60 / ADAMO DR: (US HWY 41-to-US 301)	D	44,000	2,300	1,860	1.24	F
US HWY 301: (MLK BLVD/ SR 574-to-SR 60/ADAMO DR)	D	44,000	2,300	1,860	1.24	F
I-75: (I-4-to-FOWLER AVE)	D	127,000	6,800	5,530	1.23	F
FOWLER AVE: (56TH ST-to-I-75)	D	58,500	3,100	2,570	1.21	F
M L KING BLVD: (CR 579-to-PARSONS AVE)	D	28,000	1,500	1,240	1.21	F
I-75: (FOWLER AVE -to-FLETCHER AVE)	D	124,000	6,400	5,410	1.18	F
SR 60 / BRANDON BLVD: (US 301-to-FALKENBURG)	D	50,500	2,900	2,450	1.18	F
56TH ST: (RIVERHILLS DR -to-FOWLER AVE)	E	39,500	2,100	1,800	1.17	F
I-4: (SR 39-to-COUNTY LINE RD)	D	118,000	6,300	5,410	1.17	F
US HWY 301: (SR 60/ ADAMO-to-CAUSEWAY)	D	38,000	2,000	1,710	1.17	F
I-4: (BRANCH FORBES RD-to-THONOTOSASSA)	D	119,000	6,400	5,530	1.16	F
I-4: (THONOTOSASSA-to-SR 39)	D	119,000	6,400	5,530	1.16	F
SR 60 / BRANDON BLVD: (FALKENBURG-to-LAKEWOOD)	D	85,500	4,500	3,900	1.15	F
US HWY 92: (WILLIAMS RD-to-CR 579)	D	15,100	980	860	1.14	F
I-75: (SR 674-to-MANATEE COUNTY)	B	59,500	3,500	3,110	1.13	F
M L KING BLVD: (FALKENBURG-to-WILLIAMS RD)	E	38,500	2,100	1,860	1.13	F
US HWY 301: (BLOOMINGDALE-to-GIBSONTON DR)	D	46,500	2,900	2,650	1.09	F
DALE MABRY HWY: (LUTZ LAKE FERN-to-COUNTYLINE RD)	D	36,500	2,000	1,860	1.08	F
HILLSBOROUGH AVE: (SHELDON RD -to-COUNTRYWAY BLVD)	D	59,000	3,000	2,790	1.08	F
US HWY 92: (US HWY 301-to-WILLIAMS RD)	D	14,300	930	860	1.08	F
US HWY 301: (I-4 NORTH-to-MLK BLVD/ SR 574)	D	37,500	2,000	1,860	1.08	F
US HWY 41: (CAUSEWAY-to-MADISON)	D	36,000	1,900	1,860	1.02	F
SR 674: (US HWY 301-to-CR 579)	D	22,000	1,200	870	1.38	E
US HWY 301: (HARNEY RD -to-FOWLER AVE)	D	20,500	1,200	950	1.26	E
I-4: (ML KING JR BLVD -to-US HWY 301)	D	117,000	6,000	5,410	1.11	E

Source: Hillsborough County 2008 Level of Service Report

From field observations and monitoring by the TMC, the Traffic Services Division conducts signal timing studies that consider bottlenecks and their causes, as well as safety problems. Such studies typically recommend signal timing and phases, as well as intersection improvements such as turn lanes and lengths, and pedestrian signals and crosswalks. Importantly, traffic conditions are evaluated before and after improvements are made.

The County and FDOT are in the process of carrying out a Signalized Intersection Timing Update Program on key corridors throughout the unincorporated area. **Appendix D** includes a map identifying these corridors, the type of signal update being conducted, and the responsible agency.

A sample signal timing report prepared in 2009 by Albeck Gerken, Inc. is also provided in **Appendix D**. The before and after evaluation suggests that such improvements have a high benefit to cost ratio. For instance, based on before and after travel time runs on S.R. 60 between Falkenberg and Kingsway Roads, signal timing improvements resulted in overall travel time savings ranging from 14.9% to 42.8% and delay reductions ranging from 43.4% to 96.3%. Translating these into direct user benefits, the benefit to cost ratio of the signal timing improvement was 114:1.

Additional benefits are likely to result from recommended non-motorized safety features, turn lanes and improvements to intersection geometry, although such modifications may require more ROW and typically result in a higher cost.

The Hillsborough County Public Works Department and FDOT maintain a Crash Data Management System that compiles data from long form crash reports filed by all law enforcement agencies. Historical crash data is available but must be requested through FDOT in order to meet privacy concerns. The Hillsborough County Sheriff's Office also tracks traffic crashes by location and posts them to its website. The website features interactive mapping of the top 25, 50, 100 or 200 crash locations (i.e., intersections with the highest number of crashes) in the unincorporated county for any given month. An example is provided in **Appendix D**.

Congestion and Safety Analysis in the *2035 Plan*

Congestion Data

The MPO maintains the long range transportation plan for Hillsborough County. It has a time horizon of at least 20 years and was recently updated to 2035. Congestion is considered both in terms of current and future conditions. For example, the Plan illustrates deficient roads as they existed in 2006, as well as congestion in 2035. **Table 7** ranks the most congested corridors in 2006 as measured by Vehicle Hours of Delay (VHD) per mile. This data is from the Tampa Bay Regional Planning Model, and is based on the difference between original (uncongested) speeds and congested speeds as calculated by the model for a specific roadway. Measuring congestion in this manner shows that although the limited access highways carry more traffic, some of the worst congestion occurs on major arterials such as Bruce B. Downs Blvd., Hillsborough Ave. and SR 60. (It is also worth noting that this information is from 2006, before the completion of major reconstruction projects on I-275 NB lanes between downtown Tampa and Westshore and Memorial Highway between Westshore and the Courtney Campbell Causeway.)

The forecast of future congestion shown in **Map 2** is based on traffic volumes and capacities taken from the TBRPM that predicts travel generated by future population and growth. This scenario assumes no improvements will be made to the transportation system other than those that are funded over the next several years. As might be expected under this scenario, most of the limited access roads such as I-275, I-4, and I-75, and Veteran's Expressway, and a substantial number of major surface arterials such as Hillsborough Avenue, US 92, SR 60, and Bruce B. Downs Boulevard would exceed their capacity by 50% or more.

Table 8 ranks these roads in terms of the most vehicle hours of delay per mile in 2035, again taken from the TBRPM and assuming no improvements beyond the existing plus committed system. Under this scenario, vehicle hours of delay increase dramatically (as much as by a factor of four). Arterials such as Bruce B. Downs Boulevard, US 41, US 301 in northern Hillsborough County would become severely congested with development in this part of the county as well as growth in regional traffic. In addition, east/west corridors such as I-275, and SR 60 would be among the top five arterials with the most delay.

The long range plan also takes into account "constrained roads", shown on **Map 3**. These roads cannot be widened with more lanes because of their impacts to the environment or surrounding communities, excessive right-of-way costs, or due to policies established by the adopted comprehensive plans. Some of these, such as Fowler Avenue, Hillsborough Avenue, North Dale Mabry Highway, and Bearss Avenue are also congested, which further reinforces the need to shift trips to alternative modes, off-peak periods, or parallel routes.

Table 7: Vehicle Hours of Delay on Congested Major Roads in 2006

Rank	Congested Major Corridors	Segment Length (Miles)	Daily VHD (2006)	VHD per Mile
1	Bearss Ave / Bruce B Downs Blvd from 30th St to Cross Creek Rd	6.5	17,681	2,720
2	SR 580 / Hillsborough Ave from Pinellas / Hillsborough Co Line to Memorial Hwy	4.8	11,725	2,443
3	I-275 from Pinellas / Hillsborough Co Line to I-4	7.4	14,580	1,970
4	SR 60 / Adamo Dr from US 301 to I-75	1.5	2,456	1,637
5	SR 60 / Courtney Campbell Cswy (Hillsborough Co from Pinellas / Hillsborough Co Line to Eisenhower Blvd	6.5	10,049	1,546
6	SR 580 / Hillsborough Ave from Memorial Hwy to Dale Mabry Hwy	5	7,555	1,511
7	SR 60 / Adamo Dr from 50th St to US 301	3	4,342	1,447
8	Bearss Ave / Bruce B Downs Blvd from Florida Ave to 30th St	2.4	3,283	1,368
9	US 41 from Bearss to Hillsborough / Pasco Co Line	6	7,397	1,233
10	Dale Mabry Hwy from Hillsborough Ave to US 41	13	13,497	1,038
11	Gunn Hwy from Veterans Expy to Hillsborough / Pasco Co Line	8.6	8,653	1,006
12	Kennedy Blvd from I-275 to Dale Mabry Hwy S	2.1	2,011	958
13	I-275 from I-4 to Bearss	8.5	7,867	926
14	I-75 from I-4 to I-275	13	10,465	818
15	Dale Mabry Hwy / US 92 from Kennedy Blvd to Hillsborough Ave	3.6	2,493	693
16	Fowler Ave from I-275 to I-75	7	4,508	644
17	US 301 from Fowler Ave to Hillsborough / Pasco Co Line	11	6,973	634
18	US 301 from Leroy Selmon Crosstown Expwy / SR 618 to I-4	4.5	2,813	625
19	SR 60 / Kennedy Blvd / Memorial Hwy from Westshore Blvd to Courtney Campbell Cswy	2.5	1,562	625
20	SR 60 from I-75 to Turkey Creek Rd	10	6,227	623
21	Boy Scout Blvd / Spruce St from Memorial Highway to Dale Mabry Hwy	2.5	1,467	587
22	SR 574 / MLK Jr Blvd from Dale Mabry Hwy to I-275	3	1,733	578
23	I-4 from I-275 to I-75	8	4,575	572
24	I-4 from I-75 to Hillsborough / Polk County Line	18	8,613	479
25	Westshore Blvd from Gandy Blvd to Kennedy Blvd	3.6	1,653	459
26	US 41 from Big Bend Rd to Selmon Crosstown Expwy	10	4,243	424
27	Dale Mabry Hwy / US 92 from Interbay Blvd to Kennedy Blvd	5	2,063	413
28	Sheldon Rd from Hillsborough Ave to Ehrlich Rd	5.8	2,384	411
29	I-75 from Leroy Selmon Crosstown Expwy / SR 618 to I-4	5	2,018	404
30	US 92 / SR 574 / MLK Jr Blvd from I-4 to I-75	3.5	1,300	371
31	Gunn Hwy from Dale Mabry Hwy to Veterans Expy	4.5	1,578	351
32	US 301 from Big Bend Road to Leroy Selmon Crosstown Expwy / SR 618	11	3,443	313
33	US 92 / Gandy Blvd from Pinellas / Hillsborough Co Line to Dale Mabry Hwy	9	2,789	310
34	I-75 from Big Bend Rd to Leroy Selmon Crosstown Expwy / SR 618	10	2,882	288
35	I-275 from Bearss to I-75 N	7	2,008	287
36	SR 60 / Adamo Dr from Channelside Dr to 50th St	3	856	285
	Countywide Average - All Corridors		*355,637*	*267*
37	Veterans Expwy from Hillsborough Ave to Dale Mabry Hwy N	13.2	3,093	234
38	Lee Roy Selmon Crosstown Expwy from Willow Ave to I-75	10	2,312	231
39	Westshore Blvd from Kennedy Blvd to Spruce St / Boy Scout Blvd	1	179	179
40	US 92 / SR 574 / MLK Jr Blvd from I-75 to Alexander St	12	2,106	176
41	N Suncoast Expwy (Hills /Pasco /Hernando from SR 589 / Vets Expwy to US 98 / Ponce De Leon Blvd	54	9,003	167
42	US 301 from I-4 to Fowler Ave	4.7	758	161
43	I-75 from Manatee / Hillsborough Co Line to Big Bend Rd	12	1,635	136
44	Lee Roy Selmon Crosstown Expwy from Gandy Blvd to Willow Ave	1	114	114
45	Brandon Prkwy from I-75 to CR 676 / Lumsden Rd	2.4	271	113
46	US 301 from Manatee / Hillsborough Co Line to Big Bend Road	11.5	1,197	104
47	US 92 / SR 574 / MLK Jr Blvd from I-275 to I-4	4.2	404	96
48	US 92 from Alexander St to Hillsborough / Polk Co Line	5	337	67
49	US 41 from Busch Blvd to Bearss	4	258	65
50	CR 39 from SR 674 to SR 60	16.5	790	48
51	US 41 from Manatee / Hillsborough Co Line to Big Bend Rd	14	376	27
52	Branch Forbes Rd from SR 574 to Thonotosassa Rd	3	45	15
53	Gibsonton Rd from US 41 to I-75	2.1	11	5

Denotes limited access facility

Source: Tampa Bay Regional Planning Model

Map 2: Congestion in 2035, Assuming Committed Improvements are Built

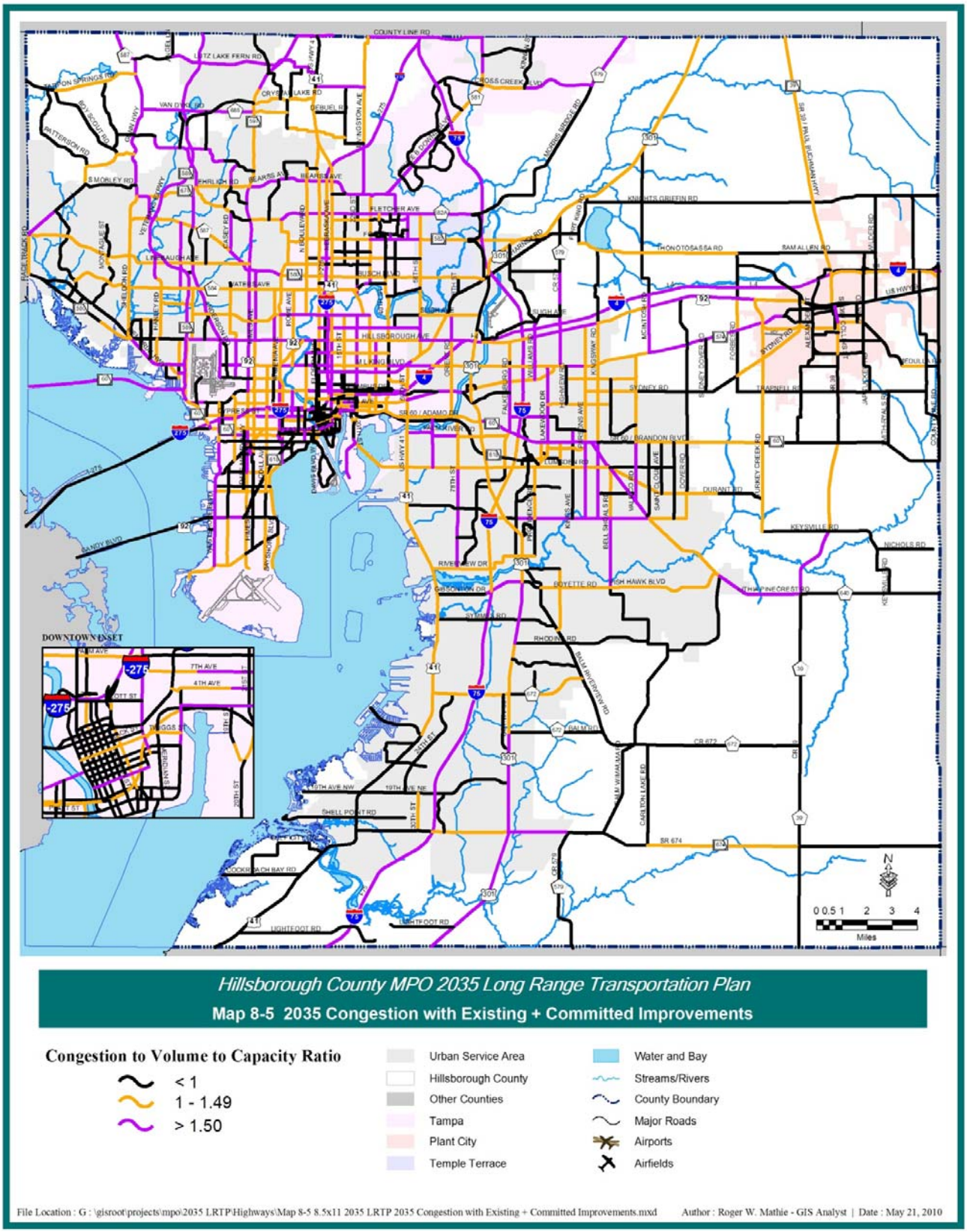


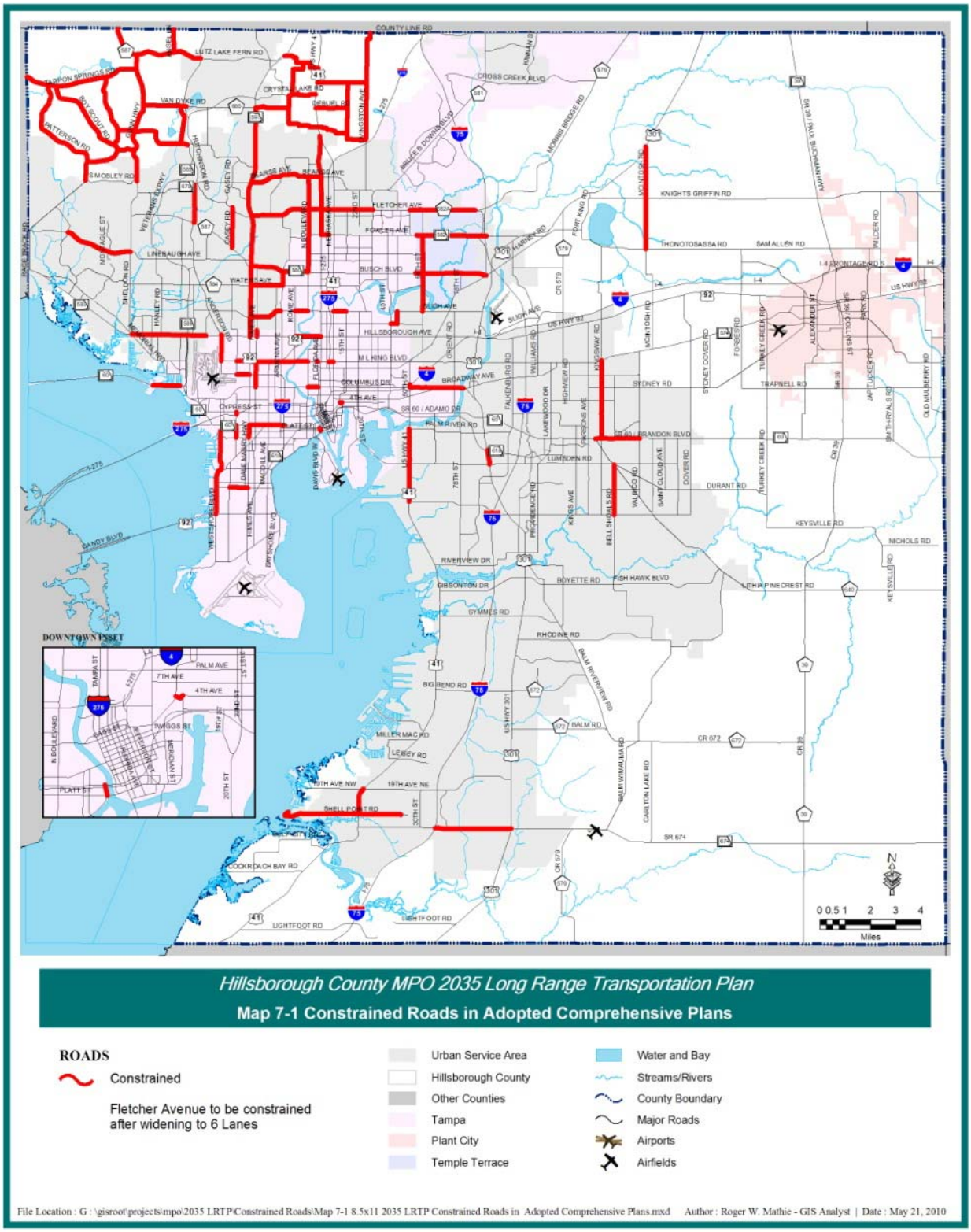
Table 8: Vehicle Hours of Delay in 2035, Assuming Committed Improvements are Built

Rank	Congested Major Corridors	Segment Length (Miles)	Daily VHD (2013 E+C)	VHD per Mile
1	Bearss Ave / Bruce B Downs Blvd from 30th St to Cross Creek Rd	6.5	77,934	11,990
2	US 41 from Bearss to Hillsborough / Pasco Co Line	6	44,688	7,448
3	US 301 from Fowler Ave to Hillsborough / Pasco Co Line	11	71,913	6,538
4	SR 60 / Adamo Dr from 50th St to US 301	3	16,840	5,613
5	I-275 from Pinellas / Hillsborough Co Line to I-4	7.4	39,881	5,389
6	SR 60 / Adamo Dr from US 301 to I-75	1.5	7,878	5,252
7	Fowler Ave from I-275 to I-75	7	36,002	5,143
8	Dale Mabry Hwy from Hillsborough Ave to US 41	13	63,084	4,853
9	US 41 from Big Bend Rd to Selmon Crosstown Expwy	10	48,464	4,846
10	I-4 from I-275 to I-75	8	35,676	4,460
11	I-75 from I-4 to I-275	13	56,846	4,441
12	I-4 from I-75 to Hillsborough / Polk County Line	18	79,478	4,415
13	Bearss Ave / Bruce B Downs Blvd from Florida Ave to 30th St	2.4	10,377	4,324
14	SR 580 / Hillsborough Ave from Memorial Hwy to Dale Mabry Hwy	5	21,150	4,230
15	US 92 / SR 574 / MLK Jr Blvd from I-4 to I-75	3.5	14,299	4,085
16	Gunn Hwy from Veterans Expy to Hillsborough / Pasco Co Line	8.6	34,154	3,971
17	I-75 from Big Bend Rd to Leroy Selmon Crosstown Expwy / SR 618	10	35,239	3,524
18	US 301 from Manatee / Hillsborough Co Line to Big Bend Road	11.5	40,203	3,496
19	N Suncoast Expwy (Hills/Pasco/Hernando from SR 589 / Veterans Expwy to US 98 / Ponce De Leon Blvd	54	187,911	3,480
20	Lee Roy Selmon Crosstown Expwy from Willow Ave to I-75	10	34,472	3,447
21	SR 580 / Hillsborough Ave from Pinellas / Hillsborough Co Line to Memorial Hwy	4.8	16,332	3,403
22	US 301 from Big Bend Road to Leroy Selmon Crosstown Expwy / SR 618	11	37,380	3,398
23	SR 60 / Courtney Campbell Causeway (from Pinellas Co Line to Eisenhower Blvd	6.5	21,114	3,248
24	I-275 from I-4 to Bearss	8.5	27,343	3,217
25	SR 60 from I-75 to Turkey Creek Rd	10	31,827	3,183
26	I-75 from Leroy Selmon Crosstown Expwy / SR 618 to I-4	5	14,953	2,991
27	US 301 from Leroy Selmon Crosstown Expwy / SR 618 to I-4	4.5	12,830	2,851
28	Kennedy Blvd from I-275 to Dale Mabry Hwy S	2.1	5,757	2,741
29	Boy Scout Blvd / Spruce St from Memorial Highway to Dale Mabry Hwy	2.5	6,525	2,610
30	SR 574 / MLK Jr Blvd from Dale Mabry Hwy to I-275	3	7,759	2,586
31	Gunn Hwy from Dale Mabry Hwy to Veterans Expy	4.5	11,052	2,456
32	I-275 from Bearss to I-75 N	7	16,054	2,293
33	SR 60 / Kennedy Blvd / Memorial Hwy (from Westshore Blvd to Courtney Campbell Cswy)	2.5	5,450	2,180
34	SR 60 / Adamo Dr from Channelside Dr to 50th St	3	6,159	2,053
35	I-75 from Manatee / Hillsborough Co Line to Big Bend Rd	12	21,981	1,832
36	Dale Mabry Hwy / US 92 from Kennedy Blvd to Hillsborough Ave	3.6	6,400	1,778
37	US 92 / SR 574 / MLK Jr Blvd from I-275 to I-4	4.2	6,895	1,642
	Countywide Average - All Corridors		2,166,080	1,585
37	Veterans Expwy from Hillsborough Ave to Dale Mabry Hwy N	13.2	20,534	1,556
38	US 92 / SR 574 / MLK Jr Blvd from I-75 to Alexander St	12	18,620	1,552
39	Westshore Blvd from Gandy Blvd to Kennedy Blvd	3.6	5,058	1,405
40	Dale Mabry Hwy / US 92 from Interbay Blvd to Kennedy Blvd	5	5,895	1,179
41	Lee Roy Selmon Crosstown Expwy from Gandy Blvd to Willow Ave	1	1,145	1,145
42	US 301 from I-4 to Fowler Ave	4.7	5,280	1,123
43	Sheldon Rd from Hillsborough Ave to Ehrlich Rd	5.8	6,103	1,052
44	US 92 / Gandy Blvd () from Pinellas / Line to Dale Mabry Hwy	9	8,997	1,000
45	Brandon Prkwy from I-75 to CR 676 / Lumsden Rd	2.4	2,371	988
46	Westshore Blvd from Kennedy Blvd to Spruce St / Boy Scout Blvd	1	955	955
47	US 41 from Busch Blvd to Bearss	4	3,359	840
48	US 41 from Manatee / Hillsborough Co Line to Big Bend Rd	14	11,736	838
49	US 92 from Alexander St to Hillsborough / Polk Co Line	5	2,535	507
50	CR 39 from SR 674 to SR 60	16.5	6,818	413
51	Branch Forbes Rd from SR 574 to Thonotosassa Rd	3	796	265
52	Crosstown / I-4 Connector from Leroy Selmon Crosstown Expwy / SR 618 to I-4	0.8	28	35
53	Gibsonton Rd from US 41 to I-75	2.1	57	27

Denotes limited access facility

Source: Tampa Bay Regional Planning Model

Map 3: Constrained Roads



Crash Data

According to FHWA:

> The details of the relationship between congestion and safety are not well understood (with the exception of lower crash severities, which have been documented in a general way for congested conditions, and the associated lower speeds). Based on the limited work that has been performed, a few tentative conclusions may be drawn:
>
> - Crash potential (e.g., crashes per vehicle-mile traveled) probably increases as congestion increases.
> - There is a lower proportion of single vehicle crashes (e.g., run-off-road, rollover, collision with fixed object) during congested conditions and a higher proportion of multiple vehicle crashes.
> - Crash severities (extent and nature of personal injuries) are lower during congested conditions, due to lower vehicle speeds at the moment of crash impact.[1]

The *2035 Plan* includes a safety analysis, based on crash data for 2005 through 2007 derived from Hillsborough County's Crash Data Management System. The analysis identifies high crash intersections and road segments based on their crash rates (crashes per million vehicles). **Table 9** shows the top 50 crash locations for intersections during this period.

Table 10 shows the 50 road segments with the highest crash rates in 2005 through 2007 compared with their volume to capacity ratio from roughly the same period. A statistical measure known as a correlation coefficient was calculated at - 0.1027, which suggests that there is no strong relationship between segment crash rates and congestion. (A correlation coefficient of 1.0 represents a perfect positive relationship between two variables, zero represents no relationship, and -1.0 represents a perfect inverse relationship.) In contrast, a correlation coefficient of 0.6039 was calculated for crashes compared to volume to capacity ratio, suggesting that there is a slight positive correlation between the total number of crashes and congestion. It is also worth noting that in this analysis, many of the high crash locations were in the vicinity of entrance and exit ramps for limited access roads.

[1] FHWA, Freeway Management and Operations Handbook (2003)

Table 9: Top 50 Intersection Crash Locations, 2005 – 2007

Street Name	Intersecting Street	Crash Rate	No. of Crashes
SR 60	BRANDON TOWN CENTER DR	1.82	195
US 301	CAUSEWAY BLVD	1.61	143
US 92	56TH ST	1.60	139
US 41	40TH ST	1.68	137
US 301	GIBSONTON DR	2.31	135
SR 582 (FOWLER)	MORRIS BRIDGE RD	2.39	123
US 41	FLETCHER AVE	1.54	119
CR 676	FALKENBURG RD	1.65	112
SR 580	56TH ST	1.37	109
US 41	BUSCH BLVD	1.33	107
US 41	BEARSS AVE	1.35	100
US 92	ORIENT RD	1.48	84
US 301	BIG BEND RD	4.23	82
SR 39	JAMES L REDMAN PKWY	1.91	72
US 41	CAUSEWAY BLVD	1.57	72
SR 45	COLUMBUS DR	2.01	64
US 301	SUN CITY CENTER BLVD	2.17	53
ARMENIA AVE	SLIGH AVE	1.42	53
US 41	SYMMES RD	2.32	51
US 301	SYMMES RD	2.17	51
US 41 BUSINESS	KENNEDY BLVD	1.50	50
SR 676	78TH ST	1.31	47
US 92	COUNTY ROAD 579	1.76	46
SR 60	TURKEY CREEK RD	1.42	45
SR 585 (N 22nd)	PALM AVE	3.83	43
SR 585 (N 22nd)	7TH AVE	1.33	43
US 92	BRANCH FORBES RD	1.83	41
SR 45	21ST AVE	1.48	41
SR 45	LAKE AVE	1.49	37
SR 574	FORBES RD	1.80	34
SLIGH AVE	ANDERSON RD	1.37	34
US 41	SHELL POINT RD	1.73	33
CR 579A	BELL SHOALS RD	1.38	33
SR 39	SAM ALLEN RD	1.56	32
US 41 BUSINESS	17TH AVE	2.58	30
CR 573	PALM RIVER RD	1.50	30
US 41 BUSINESS	JEFFERSON ST	1.56	29
BIG BEND RD	SUMMERFIELD BLVD	1.36	26
JEFFERSON ST	WHITING ST	1.57	25
PROVIDENCE RD	PROVIDENCE LAKES BLVD	2.77	24
CR 640	MILLER RD	1.66	24
15TH ST	131ST AVE	2.09	23
SR 585 (N 22nd)	COLUMBUS DR	2.04	23
SR 585 (N 22nd)	21ST ST	1.97	18
US 92	WILLIAMS RD	1.60	15
SR 585 (N 22nd)	17TH AVE	1.43	15
US 301	19TH AVE NE	1.38	14
JEFFERSON ST	CASS ST	1.90	8
DURANT RD	SAINT CLOUD AVE	1.38	8
RIVERVIEW DR	KRYCUL AVE	1.47	6

Note: identified by crash rate per million entering vehicles & sorted by number of crashes.

Source: Hillsborough County 2035 Long Range Transportation Plan – Safety Technical Report

Table 10: Top 50 Crash Road Segments, 2005 – 2007, Compared to V/C Ratios

Street Name	From	To	Crash Rate per MM	No. of Crashes	V/C Ratio
I-275	I-4 INTERCHANGE	FLORIBRASKA AVE	11.84	616	1.52
I-275	KENNEDY BLVD	MEMORIAL HWY	6.96	571	1.73
VETERANS EXPWY	MEMORIAL HWY	HILLSBOROUGH AVE	5.74	146	0.61
22ND ST	I-4 RAMP NORTH	14TH AVE	19.23	132	0.60
PARK RD	I-4 FRONTAGE RD S	I-4	24.51	131	0.73
US HWY 301	PALM RIVER RD	ADAMO DR	4.29	103	1.17
FALKENBURG RD	ADAMO DR	WOODBERRY RD	5.52	84	0.82
FLORIBRASKA AVE	FLORIDA AVE	NEBRASKA AVE	14.81	80	0.31
COURTNEY CAMPBELL CSWY	BAY HARBOR DR	ROCKY POINT DR	10.28	80	0.91
US HWY 301	CROSSTOWN E RAMP	CROSSTOWN W RAMP	25.82	69	1.17
LEE ROY SELMON EXPWY	FALKENBURG RD	I-75	5.03	64	0.67
39TH ST	12TH AVE	I-4 E RAMP	31.19	42	0.29
ORIENT RD	I-4	HILLSBOROUGH AVE	5.94	41	0.69
MORRIS BRIDGE RD	CROSS CREEK BLVD	COUNTY LINE RD	4.84	39	0.86
HUTCHINSON RD	VETERANS EXPY S RAMP	VETERANS EXPY N RAMP	34.68	38	0.99
VETERANS FRONTAGE S	COURTNEY CAMPBELL RAMP	MEMORIAL HWY	5.38	35	1.37
APOLLO BEACH BLVD	DICKMAN DR	US HWY 41	5.48	29	0.37
VAN DYKE RD	SUNCOAST S RAMP	SUNCOAST N RAMP	9.39	26	0.79
ARMENIA AVE	TAMPA BAY BLVD	M L KING BLVD	6.83	21	0.70
WILLIAMS RD	M L KING BLVD	US 92	14.32	20	0.97
22ND ST	17TH AVE	21ST AVE	9.62	12	0.33
22ND ST	PALM AVE	I-4 RAMP NORTH	4.71	12	0.60
KINGS AVE	ROBERTSON ST	SR 60/BRANDON BLVD	4.50	11	0.88
WATERS AVE	FLORIDA AVE	LAMAR AVE	4.23	10	0.59
TWIGGS ST	JEFFERSON ST	NEBRASKA AVE	7.60	9	0.47
BOY SCOUT RD	RACE TRACK RD	CRAWLEY RD	4.54	9	0.80
ARMENIA AVE	LAUREL ST	I-275	68.85	8	0.51
SHELDON RD	COUNTRYSIDE VILLAGE BLVD	MEADOW PKWY	12.49	8	0.93
WILSKY BLVD	HANLEY RD	MARBELLA CREEK AVE	24.86	6	0.91
ARMENIA AVE	GREEN ST	MAIN ST	20.68	6	0.51
SWANN AVE	SNOW AVE	S BOULEVARD	14.95	6	0.41
LUMSDEN RD	LITHIA PINECREST	DURANT RD	5.54	6	0.95
PARSONS AVE	VICTORIA ST	CLAY AVE	5.89	5	0.68
SWANN AVE	HOWARD AVE	ROME AVE	9.87	4	0.41
KEYSVILLE RD	CEDAR GROVE RD	HENRY GEORGE RD	5.45	4	0.21
RIVERVIEW DR	KRYCUL AVE	US HWY 301	4.58	4	0.42
WILLOW AVE	CYPRESS ST	LAUREL ST	5.48	3	0.40
POLK ST	MORGAN ST	PIERCE ST	68.73	2	0.13
TYLER ST	MARION ST	MORGAN ST	10.52	2	0.16
PALM AVE	15TH ST	21ST ST	10.21	2	0.21
TYLER ST	FLORIDA AVE	MARION ST	6.88	2	0.08
19TH AVE NW	EG SYMMONS PARK	US HWY 41	4.74	2	0.21
VALRICO RD	DIANE AVE	LUMSDEN RD	8.27	1	0.86
SWANN AVE	ROME AVE	SNOW AVE	7.47	1	0.41
WILSKY BLVD	MARBELLA CREEK AVE	LINEBAUGH AVE	6.75	1	0.91
MORGAN ST	ZACK ST	POLK ST	5.65	1	0.07
TYLER ST	TAMPA ST	FRANKLIN ST	4.44	1	0.11

Note: identified by crash rate per million vehicles & sorted by number of crashes.

Source: Hillsborough County 2035 Long Range Transportation Plan – Safety Technical Report

Conclusion and Future Directions

This research has shown that data from ITS sources is beginning to become available and can be adapted to the Congestion Management Process. Currently, raw ITS data from FDOT's Sunguide Center is available and lends itself to detailed analysis of traffic patterns on some of the region's most heavily traveled limited access roads, but such an analysis would consume a considerable amount of the MPO's resources.

Instead, this white paper focused on published reports already or becoming available. The Sunguide Center produces quarterly summaries of incidents and incident durations. Later this year the FDOT District Seven TMC will begin contributing this data to STEWARD, a web-based interactive statewide repository of ITS data, which will relieve users of the burden of having to delve into gigabytes of data to obtain key statistics such as Travel Time Indexes and Buffer Time Indexes. These are potentially valuable additions to the performance measures already being used in the MPO's Congestion Management Process.

These measures could be expanded to arterials in a relatively easy and cost-effective manner using technology offered by private providers such as INRIX. These providers capture and process data from GPS and other mobile devices to develop speed and travel time data without the need for costly infrastructure. Both real time and historical traffic data are available. More information including a cost estimate for Hillsborough County is provided in **Appendix E**.

As local ITS expands and improves, data related to recurring and non-recurring congestion and delays on arterials and collectors will also become more available. Hillsborough County is already pursuing operational strategies such as a county-wide signal timing update program. As measured by before and after changes in delay and travel time, signal re-timings appear to be an effective tool to improve mobility for a relatively modest investment. Where appropriate, consideration should be given to including before-and-after changes in delay and travel time as corridor-level performance measures in the Congestion Management Process.

FDOT's customer surveys indicate that they would like to see timely information on alternative routes that can be posted online and distributed to 511 and Dynamic Message Sign systems. Alternative routes imply the need for strong collaboration between TMCs on route diversion plans. In this regard, the FHWA has observed that the state-of-the-practice is far from the state-of-the-art. In particular,

> *The current state-of-the-practice is highly disaggregated. Freeway and arterial networks are often subject to unrestrained demands significantly greater than available capacity. Capacity is often reduced at bottleneck locations such as major interchanges and bridges. However, the ability to shift travel demands between networks and modes during traffic incidents, roadway work zone activity, adverse weather, or simply unusually large traffic demands is severely hampered by lack of information about current conditions (particularly on the arterial networks), and lack of standardized technical means for sharing that information. There is also*

a lack of institutional collaboration and coordination, and lack of integrated operational strategies and procedures that focus on maximizing the effectiveness of the entire corridor.[2]

To overcome these challenges, FHWA has promoted the concept of "Integrated Corridor Management", defined as "the coordination of individual network operations between parallel facilities that creates an interconnected system capable of cross network travel management." A brief summary and some local examples are included in **Appendix F**.

[2] FHWA Corporate Research and Technology, Integrated Corridor Management Systems Program Plan (http://wwwcf.fhwa.dot.gov/crt/roadmaps/icmprgmplan.cfm)