US 1 Reversible Flow Lane Study

Executive Summary

A Planning Study was initiated to examine the existing safety and operations along the US 1 corridor, between SW 40th Street (Bird Road) and Interstate 95 (I-95), in order to determine the impact on safety and corridor Level of Service (LOS), resulting from the potential addition of a reversible lane system. The Miami-Dade County Metropolitan Planning Organization (MPO) is currently evaluating the feasibility for the addition of a reversible lanes system which have successfully been completed and implemented in areas such as Charlotte, NC on Tyvola Road, Washington DC on Connecticut Avenue, Louisville, Kentucky on Bardstown Road and Covington, Kentucky on the Clay Wade Bailey Bridge. The study area extends approximately 2.6 miles south of the intersection of I-95 with US 1 within Miami-Dade County, Florida (*See Figure S-1 Project Location Map*).

Figure S-1 – Project Location Map

Existing Roadway Characteristics: FDOT's Straight Line Diagrams for Miami-Dade County indicate that the section of US 1 between SW 40th Street (Bird Road) (MP 5.674) and Interstate 95 (I-95) (MP 8.275) is classified as an Urban Principal Arterial and is part of the National Highway System (NHS). It is an important north/south arterial within Miami-Dade County as well as one of the only four (4) evacuation routes serving the Florida Keys and South Miami-Dade County.

The northern portion of the corridor is predominantly residential with the majority of the properties backing onto the US 1 corridor. Other designated uses along the corridor include business/office and institutional/public facilities. South of SW 22nd Avenue the business/office and commercial retail properties emerge along the frontage parcels of US 1 in the northbound direction. High density residential areas are located behind the frontage parcels throughout the rest of the corridor. Most of the commercial retail properties are located at the signalized intersections.

The southbound direction has very few curb cuts unlike the northbound side where every block intersects US 1. Metrorail, a Miami-Dade County Transit facility, is located parallel to US 1 along the southbound direction. The Metrorail corridor is located along a 70-foot wide right of way easement that runs parallel to the US 1 right of way. Two Metrorail stations are located within the project limits; 1) Vizcaya and 2) Coconut Grove Stations.

Existing Typical Section: The existing roadway typical section along US 1 from SW 40th Street (Bird Road) to I-95 varies slightly, primarily consisting of the following roadway elements (*See Figure S-2 Existing Typical Section*).

- Six ten-foot (10') wide travel lanes
- Eleven-foot (11') wide turn lanes
- Fifteen-foot (15') wide raised median with Type "F" curb and gutter
- Outside Type "F" curb and gutter
- Sidewalk along the northbound direction at specific locations. The width varies between five and six feet (5'-6') wide
- Posted speed is 45 mph.

Traffic: Currently US 1 traffic is experiencing long delays as the result of low travel speeds and operational concerns along the corridor. The Synchro traffic software was used to compute the roadway Level of Service (LOS), based on the Highway Capacity Manual 2000 edition (HCM). As the Synchro Outputs results indicate, most intersections along the study limits of US 1 currently operate at a LOS F during the peak hour periods with very high volume over capacity (v/c) ratios along the side street approaches.

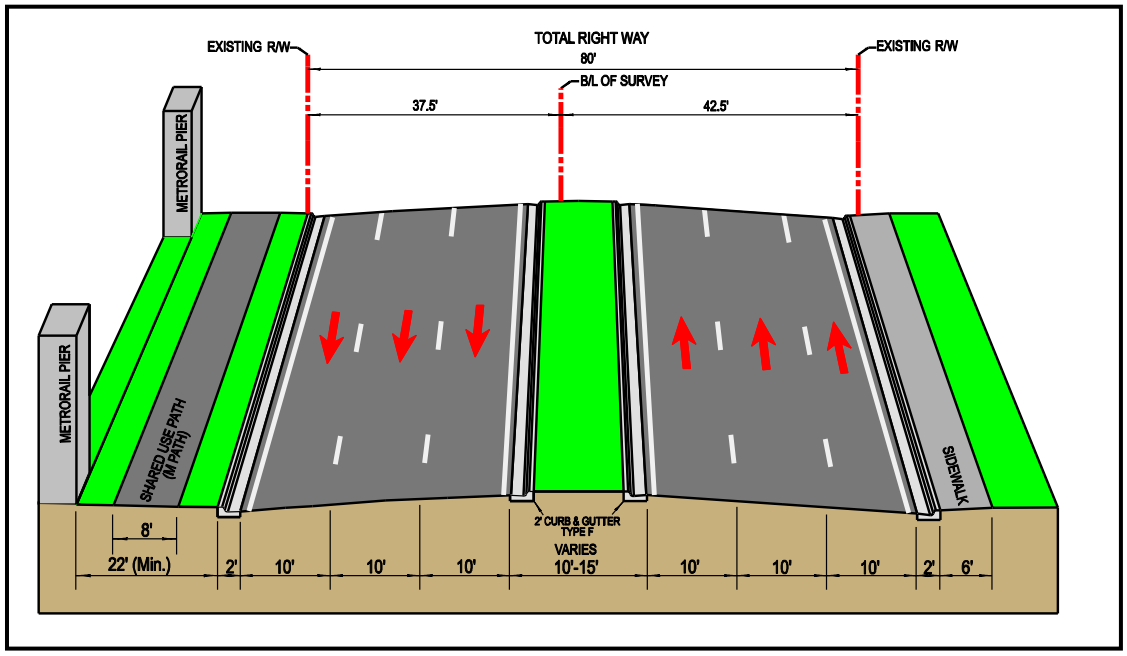

Figure S-2 – Existing Typical Section

Crash Analysis

As part of the overall study, a crash data analysis was performed using the last three (3) years of crash history. Each major intersection and roadway segment within the study limits was examined to identify existing traffic safety concerns with respect to the implementation of a reversible flow lane system.

Table S-1
Crash Data by Severity

Year	Number of Crashes	Number of Injury Crashes	Number of Injuries	Number of Fatal Crashes	Number of Fatalities
2003	383	121	182	4	5
2004	440	130	181	4	4
2005	398	108	168	2	2
Total	1221	359	531	10	11
Average/ Year	**407**	**120**	**177**	**4**	**4**

Table S-1 shows that the number of fatalities has remained relatively the same between the years 2003-2005 with a slight decrease in the year 2005. The same can be said with regards to the number of injury crashes. The average number of accidents per year over the 3-year period is 407 with 4 fatalities and 177 injuries. *Table S-2* shows the types of crashes at these intersections.

Table S-2 Signalized Intersections Crash Types				
Intersection		Mile Post	Type of Crash	
SW 40th Street		5.674		
17	(2003)		Rear-End (4)	Sideswipe (4)
18	(2004)		Rear-End (6)	Sideswipe (2)
15	(2005)		Rear-End (3)	Coll w/ MV on Other Roadway (2)
SW 32nd Avenue		5.986		
25	(2003)		Left-Turn (3)	Rear-End (6)
24	(2004)		Angle (3)	Rear-End (8)
37	(2005)		Left-Turn (8)	Rear-End (5)
SW 27th Avenue		6.534		
17	(2003)		Rear-End (2)	Left-Turn (2)
30	(2004)		Rear-End (7)	Sideswipe(3)
41	(2005)		Left-Turn (8)	Rear-End (5)
SW 24th Avenue		6.804		
14	(2003)		Angle (3)	Rear-End (3)
14	(2004)		Left-Turn (2)	Rear-End (3)
14	(2005)		Left-Turn (5)	Right-Turn (1)
SW 22nd Avenue		7.074		
23	(2003)		Rear-End (4)	Coll. W/ Pedestrian (2)
27	(2004)		Rear-End (7)	Coll. W/ Pedestrian (2)
23	(2005)		Angle (6)	Rear-End (4)
SW 17th Avenue		7.62		
38	(2003)		Angle (5)	Rear-End (7)
38	(2004)		Angle (11)	Rear-End (9)
36	(2005)		Angle (6)	Rear-End (4)
SW 16th Avenue		7.748		
16	(2003)		Left-Turn (4)	Angle (2)
26	(2004)		Rear-End (7)	Sideswipe (4)
12	(2005)		Angle (3)	Rear-End (2)

In summary, rear end collisions are the most common crashes and account for an average of 23.42% of the crashes along US 1. Angle collisions are the second most common with an average of 9.75% of the crashes and sideswipe collisions are the third most common with an average of 7.21% of the crashes. The high percentage of rear end and sideswipe collisions are typical of roadways experiencing heavy traffic congestion similar to US 1; whereas angle collisions are typical of roadways having poor intersection geometry and traffic signal timing.

Table S-3 Arterial Roadway – Level of Service (US 1)						
Roadway Segment	Year	Direction	Average Travel Speed (mph)		LOS	
			AM	PM	AM	PM
Overall within the Study Limits	2007	NB	12.2	25.8	F	C
		SB	22.6	12.8	C	F
	2030	NB	7.9	21.1	F	D
		SB	15.6	7.2	E	F
	Alt #2	NB	12.4	26.5	F	C
		SB	15.6	13.6	E	E

Table S-4 Signalized Intersections – Level of Service					
Intersection	Year	Delay (sec)		LOS	
		AM	PM	AM	PM
1) SW 37th Avenue	2007	37.6	69.5	D	E
	2030	49.6	131.7	D	F
	Alt # 2	73.8	141.1	E	F
2) SW 40th Street	2007	138.7	100.5	F	F
	2030	324.4	207.7	F	F
	Alt # 2	340.3	101.2	F	F
3) SW 32nd Avenue	2007	38.8	47.1	D	D
	2030	44.0	120.4	D	F
	Alt # 2	22.7	21.3	C	C
4) SW 27th Avenue	2007	54.9	97.9	D	F
	2030	72.8	98.2	E	F
	Alt # 2	21.9	40.5	C	D
5) SW 22nd Avenue	2007	98.4	67.1	F	E
	2030	123.9	62.1	F	E
	Alt # 2	49.5	23.5	D	C
6) SW 17th Avenue	2007	97.9	98.8	F	F
	2030	119.7	124.0	F	F
	Alt # 2	54.3	47.3	D	D
7) SW 16th Avenue	2007	46.5	149.6	D	F
	2030	102.2	103.5	F	F
	Alt # 2	26.9	112.4	C	F

Feasibility Review

While a reversible traffic operation is considered one of the most cost efficient methods of increasing peak direction capacity of an existing roadway; there are several characteristics or conditions that a corridor should have in order to be considered for this type of operation. These characteristics or conditions are as follows:

- **A.** Traffic congestion problem in peak direction of traffic
- **B.** Traffic congestion should be periodic and predictable
- **C.** No adequate parallel street available to accommodate demand
- **D.** Proportion of traffic is high for through and low for turning vehicles
- **E.** Peak direction traffic has at least a split of 60/40 two-way traffic demand
- **F.** Transitions and terminal locations should have adequate capacity
- **G.** Off peak direction should have adequate capacity
- **H.** Cost of implementation should be low and/or offset by the improvements

Conditions A & B: The US 1 section between SW 40th Street (Bird Road) and Interstate 95 (I-95) in Miami Dade County, must be designed to adequately serve the peak hour traffic volume in the peak direction of flow. Since traffic going one way during the morning peak is going the opposite way during the evening peak, both sides of the facility must generally be designed to accommodate the peak directional flow during the peak hour. Daily traffic numbers on this roadway range between 25,000 and 52,000 according to the FDOT 2003–2005 traffic counts. This is the typical daily operation which is both periodic and predictable. Therefore, conditions A and B are met.

Condition C: US 1 operates as a collector roadway running east to west just south of I-95. All traffic from roadways running north to south including the Florida's Turnpike, access US 1 to travel north to I-95 or south to various areas including the Keys in which US 1 is the only major roadway in and out of this area. There are no major roads that run parallel to US 1.

Condition D: The percentage of through traffic along US 1 within the study limits range between 86% - 98% while the turning percentages range between 0 - 15%. The overall proportion of traffic is high for through and low for turning vehicles and therefore meets condition D.

Condition E: A comparison was made of the directional traffic demand and the data shows that the corridor has an average of a 60/40 split within the study limits. A split of 60/40 or less is categorized as a significant directional disparity; the concept of reversible lanes is at times practical for this type of scenario.

Condition F: The north end of US 1 merges with I-95 which is a major interstate that services the east side of Miami-Dade county. The southern end of US 1 has very few curb cuts which limit the number of intersections within the area thereby limiting the amount of traffic that can access the roadway. These conditions provide adequate capacity at the transition and terminal locations for a reversible lane system.

Condition G: The off peak direction will maintain the existing number of through lanes with an acceptable LOS study corridor.

Condition H: The cost of construction will be offset once the project is completed and travel time savings begin to accrue.

Alternative Analysis

Four (4) alternatives were developed based on a realistic assessment of the type of facility that would be required to meet the goals of the study. The No Build Alternative proposes to keep the existing roadway layout and make no improvements; Alternative 2, (total cost $13,500,000) *(See Figure S-3 Proposed Alternative 2)* primarily consist of one reversible flow lane allowing through traffic in the respective direction during peak hours; Alternative 3, (total cost $20,000,000) consists of two reversible flow lanes allowing through traffic in the respective direction during peak hours and Alternative 4, (total cost $20,000,000) consists of two reversible flow lanes allowing through traffic in the respective direction during peak hours and a center Two-Way Left Turn (TWLT) lane. The proposed conditions pertaining to each alternative indicates that in general Alternative 2 provides a better LOS in comparison with the other alternatives.

Challenges to the Project's Implementation: Implementing a project of this magnitude will face many challenges such as:

- General public acceptance
- Acceptance by residents along the corridor
- Acceptance by elected officials
- Acceptance by governmental agencies such as FDOT, MDT, Miami-Dade Public Works, City of Miami, and any other interested parties.
- Construction related impacts

First, the general public and affected residents along the corridor need to be convinced that the proposed reversible lanes will be of benefit to them. One concern to overcome is the elimination of left turns during the reversible lanes hours of operation and additional traffic and delays to intersecting streets. This is a valid concern that if not explained adequately may render the project undesirable. The public and other interested parties will need to be able to understand that the relatively small inconvenience of eliminating left turns is far outweighed by the savings in travel time on US 1 during periods of heaviest congestion. Another concern that the public would have is the elimination of the median and the opportunities for landscaping. This concern should be addressed by proposing additional landscaping along the Metrorail right of way, which will compensate for the loss of the median on US 1.

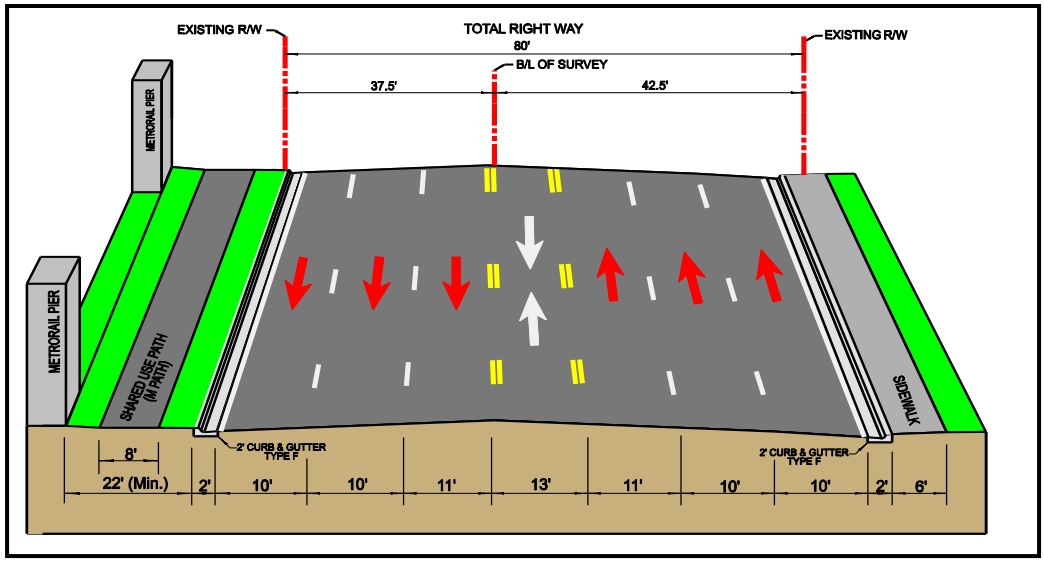

Figure S-3 – Proposed Alternative 2 Typical Section

Recommendations

Based on the analysis conducted and documented in this report, it is clear that Alternatives 2 and 3 are the only ones that would realistically meet the overall objectives in the US 1 corridor. These objectives are:

1. Improve roadway operations
2. Increase capacity during the peak periods to mitigate existing traffic congestion
3. Accommodate future demand

Based on this final draft report and preliminary evaluation, Alternative 2 appears to be the alternative which best fits the needed improvements along this section of US 1. The following are some of the reasons:

- Minimal Right of Way Acquisition
  - → Alternative 2 will keep FDOT from buying right of way reducing impacts to the adjacent properties;
  - → This alternative will not have significant Miami-Dade Transit (Metrorail) impacts and no impacts to the Metrorail Shared Use Path.

- Lower Total Construction Cost
  - → Alternative 2 will save approximately $6.5 million on construction costs versus Alternative 3.

Construction Cost		**$7,624,938**
Landscape	2%	$152,499
Maintenance of Traffic	15%	$1,143,741
Mobilization	15%	$1,143,741
Contingency	15%	$1,143,741
CEI	15%	$1,143,741
Design	15%	$1,143,741
Total Estimated Construction Cost		**$13,496,142**

- Traffic Level of Service
  - → Alternative 2 shows an overall improvement of approximately 5-6 mph in vehicular speeds along US 1 and an intersection delay decrease of approximately 67 seconds per cycle when compared to the No Build Alternative;
  - → This alternative enhances the north/south and east/west intersection operations.

- Traffic Safety
  - → Rear-end collisions are the most common type of crash along the study limits. Rear-end collisions are typical for a roadway with a congested corridor and intersections. Increasing capacity during the peak hours will decrease rear-end collisions.

- Maintenance of Traffic (MOT)
  - → Alternative 2 will require less number of MOT phases during construction saving time and money to the state.

Based on the information developed in this study, the implementation of a reversible flow lane system is feasible and presents a balance in providing the needed improvements. However, we recommend that additional studies be performed to extend the reversible lane system limits further south possibly to Kendall Drive.