Metropolitan Planning Organization

Miami-Dade County

Reversible Flow Lane Study

SR 5 / US 1 / South Dixie Highway
From SW 40th Street/SR 976/Bird Road to
Interstate 95 (I-95)




Submitted by:
The Corradino Group, Inc.

GPC III-07
Miami-Dade County, Florida

December 3, 2007

METROPOLITAN PLANNING ORGANIZATION
Miami-Dade County

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Miami, Florida 33128

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PREPARED BY:
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PROFESSIONAL ENGINEER CERTIFICATE

I hereby certify that I am a registered professional engineer in the State of Florida practicing with The Corradino Group, a Florida Corporation, authorized to operate as an engineering business, P.E. #7665, by the State of Florida Department of Professional Regulation, Board of Engineers, and that I have prepared or approved the evaluation, findings, opinions, conclusions or technical advice hereby reported for:

Work Order Number:	**GPC III-07**
Project:	**US 1 Reversible Flow Lane Study**
County:	**Miami-Dade County**
MPO Project Manager:	**Larry Foutz**
Public Works Project Manager:	**Joan Shen, P.E.**

I acknowledge that the procedures and references used to develop the results contained in this report are standard to the professional practice of transportation engineering as applied through professional judgment and experience.

SIGNATURE: ______________________

NAME: Ryan Solis-Rios, P.E.
FIRM: The Corradino Group
P.E. No.: 63345
DATE: December 3, 2007

US 1 REVERSIBLE FLOW LANE STUDY
FINAL PROJECT REPORT

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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.

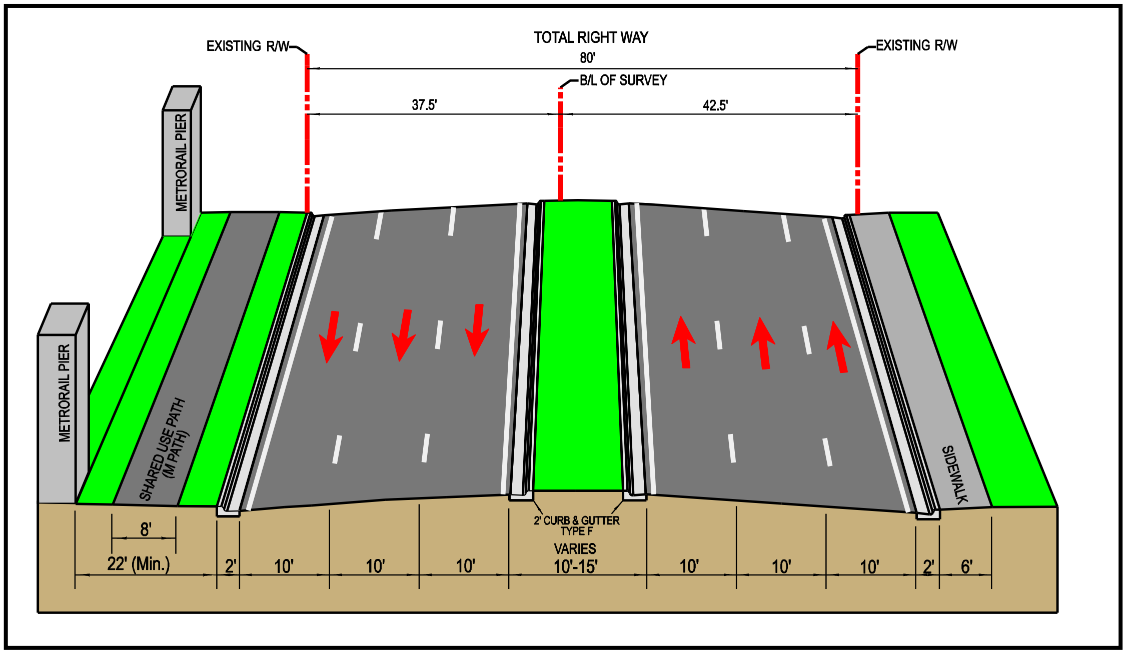


Figure S-2 – Existing Typical Section

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 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-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-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.

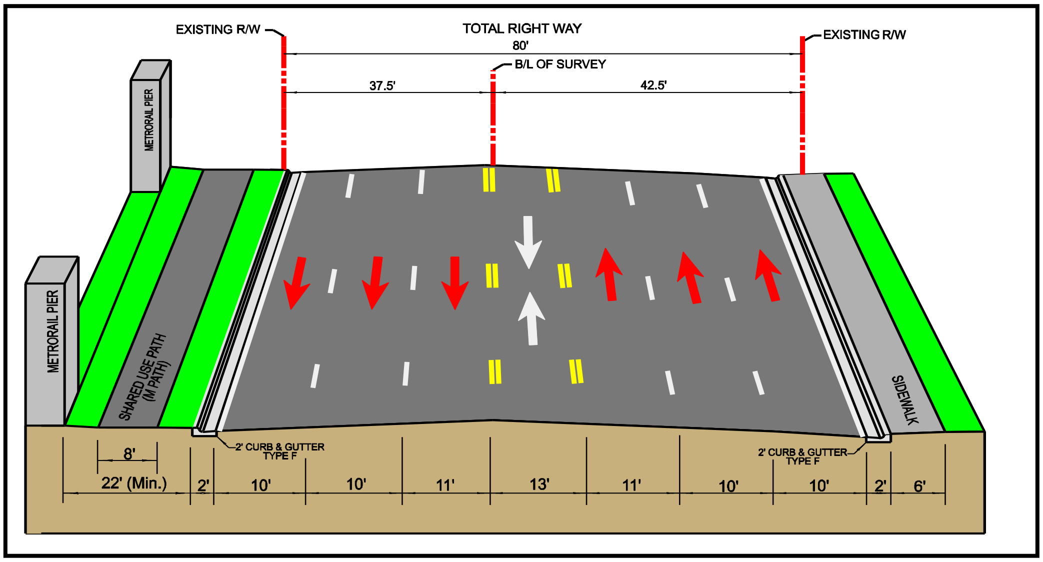


Figure S-3 – Proposed Alternative 2 Typical Section

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.

I. INTRODUCTION

The Miami-Dade County Metropolitan Planning Organization (MPO) is evaluating the feasibility for the addition of a reversible lane system along the US 1 corridor between SW 40th Street (Bird Road) and Interstate 95 (I-95). The study area extends approximately 2.6 miles south of the intersection of I-95 with US 1 within Miami-Dade County, Florida. The proposed project is in the planning phase in which preliminary engineering studies are conducted (*See Figure S.1-Project Location Map*).

A reversible lane is a lane in which vehicular traffic may travel in either direction, depending on certain conditions. Typically, it is meant to improve traffic flow during peak hours, by having overhead traffic signal indicate which lanes are open or closed to driving or turning. Reversible lanes are a commonly implemented traffic control strategy that enhances traffic flow and increases capacity. Used throughout the United States, reversible lanes control traffic flow on congested arterials by allocating roadway lanes to one direction or another according to the time of day. This strategy is particularly effective when peak period traffic volumes are directional in nature and right of way is insufficient to construct additional lanes.

The purpose of the study is to examine the existing safety and operations along the corridor and determine the impact on safety and corridor Level of Service (LOS) resulting from the potential addition of a reversible lane system. Currently US 1 is experiencing operational concerns mainly due to low speeds, long vehicular delays and their associated impacts to travel time. Specific alternatives were identified by modifying the roadway typical section with the removal of the existing raised median. These alternatives were analyzed with regards to traffic operations and safety conditions with the reversible lanes in place. Project goals and objectives considered during the study were to improve roadway operations, to increase capacity during the peak periods, to mitigate existing traffic congestion and to accommodate future traffic demand.

This report documents the existing conditions along the project corridor, literature research, data collection and provides a planning level analysis. The existing conditions analysis provides the pertinent background information, along with the existing and projected facility traffic LOS, which was utilized to develop and evaluate project alternatives. The planning level analysis includes the development of conceptual alternatives by performing typical section evaluations, traffic analyses and cost estimates. The corridor analysis considers the need to accommodate the traffic demands along US 1 by adding one or two reversible lanes during the morning and afternoon peak periods.

The US 1 corridor within the study limits runs diagonally in a northeast to southwest direction. For the purpose of this study, the report will refer to the northbound as the direction towards Downtown Miami. The southbound will refer to the direction towards the area of Kendall. The same relationship will occur with the crosstreets. The eastbound direction will be towards the Bay and the westbound direction towards Coral Gables.

1.1 Project History

The US 1 corridor has been under extensive study and discussion since the mid 1970's. The past three decades are full of many controversial issues that included transportation studies, public meetings, public hearings, amendments and meetings between the public, government agencies and other interested parties.

During the 1970's prior to the implementation of the Metrorail, US 1/South Dixie Highway was the subject of a Bus/HOV Priority demonstration project. This US 1 demonstration project, also known as the "Blue Dash", covered the limits between the beginnings of I-95 to the north all the way to Sunset Drive in the south. The project consisted of providing a contra flow bus lane as well as a High-Occupancy-Vehicle (HOV) lane during peak direction and hour traffic volumes along US 1.

Specifically, during peak traffic period, two general purpose traffic lanes operated in both directions along US 1. In the peak direction of travel the inside lane (the one immediately next to the median) was reserved exclusively for HOVs, while the remaining two lanes in the peak direction remained available for other vehicles. The inside lane in the off-peak direction was designated as the contra flow lane for the buses. For example, during the AM peak period, two northbound (NB) lanes will be for general purpose traffic, the inside NB lane will be for HOVs and the southbound (SB) inside lane along US 1 would be designated for the NB contra flow buses. During the PM peak period, the reverse of the above operations would occur.

The set up of the contra flow bus lane entailed the daily installation and removal of traffic cones to mark the lane, as well as overhead traffic devices to properly identify the contra flow lane during each period of operation. Buses did not stop within the contra flow lane and vehicular left turns were prohibited along US 1 during the operation of the contra flow lane.

The contra flow operations were abandoned during the later part of the demonstration project and the buses were allowed to travel in the concurrent flow lane along with the HOVs. Operations continued until before the opening of the Metrorail. Issues and concerns were encountered during this demonstration project. The most prominent ones were the manpower effort and expenses associated with the daily installation and removal of the safety delineator cones; left turn prohibitions along US 1; and the extensive use of police officers to enforce turning restrictions and safety issues with regards to the buses operating against the expected traffic flow.

There were however, positive aspects as the result of this US 1 "Blue Dash" demonstration project such as a significant increase in the number of peak period bus trips. In fact, it induced many formerly automobile drivers to switch to transit, thus resulting in a significant increase in transit rider ship along the US 1 corridor.

1.2 Literature Research

A reversible lane is a lane in which traffic may travel in either direction depending on certain conditions. Reversible lanes have regularly been used in construction work zones, during major events, urban congestion management and more recently, for the evacuation of major metropolitan regions threatened by hurricanes. Some of the reasons, benefits and downfalls of having a reversible lane system are listed below:

Reasons:
- 65% or more of traffic moves in one direction during peak hours
- Limited lane availability for additional traffic capacity
- Limited funding
- Social and environmental concerns from major roadway widening projects
- Move traffic more efficiently in congested areas
- No other acceptable alternative exist

Benefits:
- Maximize existing capacity
- Manage demand
- Offers a drivers the usual route instead of a detour due to congestion

Downfalls:
- Possible head on crashes due to driver confusion
- Left turns are prohibited at peak hours
- Added traffic flow turbulence
- Cannot use center lane as way to make a safe merge into traffic

Transitions and Capacity:
- Effective traffic flow has to be maintained beyond the terminus or end of the reversible lanes and congestion points to ensure that the lane reduction at the end of the reversible lanes does not cause a bottleneck.
- Transition periods occur when traffic is switched from one direction to the other and are necessary to clear the segment and prevent opposing vehicles from conflicting after the conversion. The transition needs to include the time required for the last vehicle entering the section to exit; typically these vehicles will be police or service vehicles to ensure the full and safe clearance of opposing traffic. Technology as we know today can provide the use of overhead lane designation signs that practically eliminates the need to do this.
- The transition period typically may last from 30-60 min.

Signing and Marking:

- Reversible lane marking is typically a dashed or broken double yellow line on both sides.
- Yellow clearance intervals uses yellow signals to inform drivers that they need to change lanes or make other adjustments.
- An optional, although strongly recommended red clearance interval, follows the yellow with a red signal, and is a period of emphasis and safety in case some motorists are tardy responding to the yellow signal in heavy traffic. The red signal indicates that a driver cannot use the lane.
- A green signal indicates that a driver may use the lane.
- Turn arrow signals indicate to drivers what turns are allowed in the reversible lanes.
- The Overhead Lane Control Signal is used to maintain efficient traffic flow. These signals are used to indicate whether the reversible lanes are open or closed. They are available with an option yellow triangle phase for caution to warn vehicles of “lane closing soon” or “lane closing ahead” (also similar or directional regulatory mounted signs can be used).
- The Red “X” sign is approximately 11.1”.
- The Green Arrow sign is approximately 5” x 7”.
- The Lens is twelve inches (12”) in diameter
- Light Emitting Diode (LED)
- Weight is approx. seven pounds (7 lbs).
- Reversible sign must be mounted over the center of the lane that is being reversed and shall be perpendicular to the roadway alignment.
- Overhead signs should be located at intervals not greater than 0.25 miles.
- The bottom of the overhead sign should not be more than nineteen feet (19’) above the pavement.

Standard Sample of a Lane Addition and Lane Drop:

Figure 2.1 shows segments of a divided highway with two northbound traffic lanes and two southbound traffic lanes. A fifth center lane, is shown between them, beginning from a taper at the bottom of the page, expanding to form a lane, and then tapering away at the top of the page. Another roadway labeled "Northern Avenue" is shown intersecting the subject highway near the top of the page. A series of signs are shown for both directions of travel along the vertical lanes from the bottom to the top of the figure.

The first sign shown at the bottom of the figure is known as ***R3-9h*** and is shown located over the left northbound lane and facing south. It is shown as a horizontal rectangular white sign with a black border. The words "BEGIN REVERSE LANE 400 FEET" in black are shown on two lines.

Beyond this sign, the highway is shown to expand on the left and right, and the dividing lines between the northbound and southbound lanes separate to form a "V" shape to accommodate a fifth, center lane between the dividing lines. At this point, a directional arrow known as ***R3-9d*** is shown indicating a sign over the center lane and facing south. A sign known as ***R3-9g*** is shown mounted back-to-back with the ***R3-9d*** sign and facing north. It is shown as a horizontal rectangular white sign

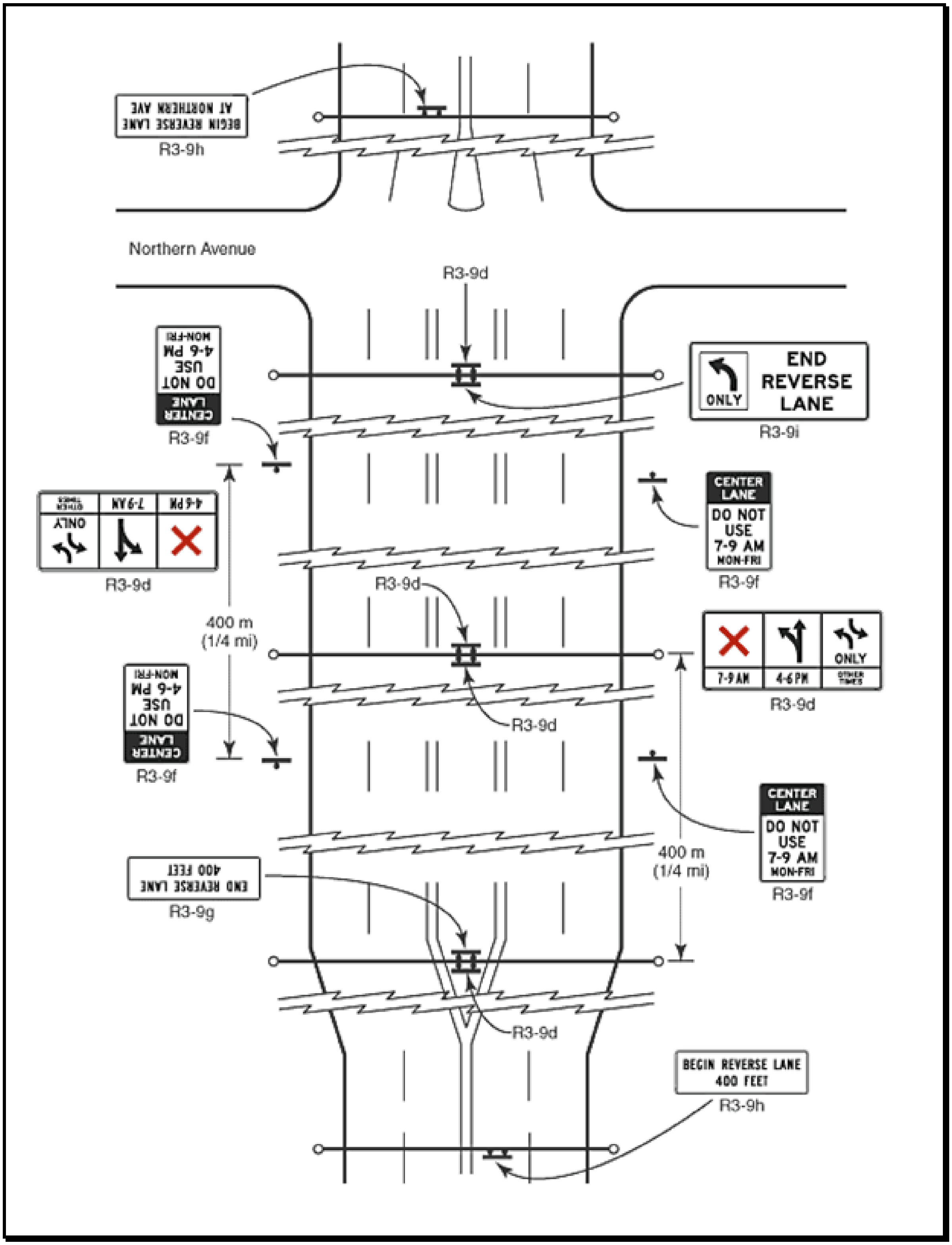
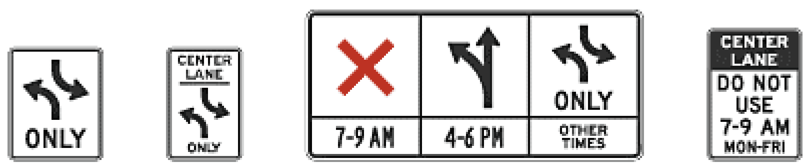


Figure 2.1 – Standard Location of Reversible Two-Way Left-Turn Signs

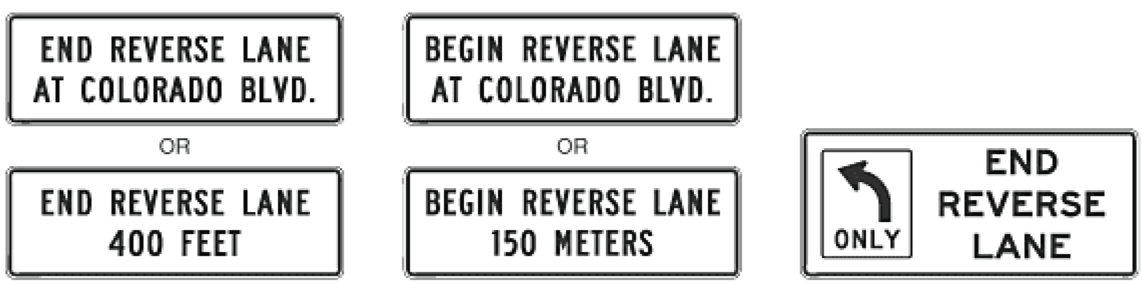
with a black border. The words "END REVERSE LANE 400 FEET" in black are shown on two lines.

Beyond these signs at an undimensioned distance, a sign known as ***R3-9f*** is shown located to the outside of both the northbound and southbound lanes. It is shown as a vertical rectangular white sign with a black border. A black panel is shown on the top third of the sign, with the words "CENTER LANE" in white shown on two lines. Below this, words in black are shown on four lines. On the sign facing south, the words "DO NOT USE 7-9 AM MON-FRI" are shown. On the sign facing north, the words "DO NOT USE 4-6 PM MON-FRI" are shown.

It is important to note that if left turns are prohibited as part of the reversible lane operations, then the left turn pointing arrow will be eliminated from the center panel in sign ***R3-9d*** below. In this case, the center panel will only show a straight pointing arrow.



R3-9a R3-9b R3-9d R3-9f



R3-9g R3-9h R3-9i

Another set of signs shown over the center lane is shown located 0.25 miles (¼ mi) beyond the first set of overhead signs. These signs are shown as two back-to-back ***R3-9d*** signs, one facing south and one facing north. The sign facing south is shown as a horizontal rectangular white sign with a black border. The sign is shown divided horizontally into thirds by two vertical black lines that extend from the upper to lower border. The sign is also divided vertically into two sections by a horizontal black line one-fourth of the way from the bottom border. On the left third of the sign, a large red "X" is shown above the horizontal black line and the legend "7-9 AM" in black is shown below the line. On the middle third of the sign, a vertical black arrow is shown above the line with two arrowheads: one pointing upward and one on the left curving up and to the left. The legend "4-6 PM" in black is shown below the line. On the right third of the sign, two opposing curving arrows are shown above the line, one pointing upward and to the left, and one pointing downward and to the right. The bases of the shafts of the two arrows are directly in line with each other in the vertical axis. The word "ONLY" in black is shown centered below the arrows. The words "OTHER TIMES" in black are shown on two lines below the horizontal line. On the sign facing north, the left third of the sign is shown with a large red "X" above the horizontal black line, and the legend "4-6 PM" in black is shown below the line. On the middle third of the sign, a vertical black arrow is shown above the horizontal black line with two arrowheads: one pointing upward and one on the left curving up and to the left. The legend "7-9 AM" in black is shown below the line. On the right third of the sign, two opposing curving arrows are shown above the line, one pointing upward and to the left, and one pointing downward and to the right. The bases of the shafts of the two arrows are directly in line with each other in the vertical axis. The word "ONLY" in black is shown centered below the arrows. The words "OTHER TIMES" in black are shown on two lines below the horizontal line.

Beyond these signs, another set of signs known as ***R3-9f*** is shown located to the outside of both the northbound and southbound lanes with the same information as on the first set of signs. For the southbound lane, the sign is shown at a dimensioned distance of 0.25 miles (¼ mi) in advance of the other ***R3-9f*** sign.

Beyond these signs, another set of signs are shown over the center lane in advance of the intersection with the horizontal road, Northern Avenue. A sign known as ***R3-9i*** is shown as located over the center lane and facing south. It is shown as a horizontal rectangular white sign with a black border and legend. On the left, a smaller vertical rectangular white sign is shown with a black border and black legend. A vertical black arrow is shown curving up and to the left above the word "ONLY." To the right of this sign, the words "END REVERSE LANE" in black are shown on three lines. A directional arrow known as ***R3-9d*** is shown mounted back-to-back with the ***R3-9i*** sign and facing north.

The center lane is not shown continuing beyond the intersection with Northern Avenue. On the far side of the intersection, an island is shown between the dividing lines of the opposing lanes, which is shown tapering to a point where the dividing lines become a double line straight ahead. At this point, a sign known as ***R3-9h*** is shown located over the left southbound lane, facing north. The words "BEGIN REVERSE LANE AT NORTHERN AVENUE" in black are shown on two lines.

Reversible Flow Lanes Successfully Completed:

- **Charlotte, NC on Tyvola Road:**
  The reversible lanes system was implemented prior to the Charlotte Coliseum opening in 1987 but was rebuilt in 1998 and is used to accommodate the traffic demand associated with special events. A five-lane road was constructed with three (3) reversible lanes so that four lanes (4) could be used before and after events. It uses overhead signals in order to direct traffic at the coliseum in order for traffic to flow more smoothly. It is considered one of the most technologically sophisticated systems in the United States.

- **Washington DC on Connecticut Avenue:**
  The reversible lanes were developed in order to allow traffic to flow more freely during peak periods. The system operates Monday through Friday from 7:00am to 9:30am and from 4:00pm to 6:30pm. There is currently side street parking but during the reversible lane period, the spaces are used as a through lane resulting in a six-lane facility with four lanes in the major direction of flow. The system is controlled by overhead signage and road side signage. The departments of transportation officials are very pleased with the operation and have stated that noncompliance is not a significant problem.

- **Louisville, Kentucky on Bardstown Road:**
  Bardstown Road is a major arterial feeding Downtown Louisville that has reversible lanes for 2½ miles. Southbound traffic leaving Downtown Louisville is restricted to one lane during the morning rush hour with northbound traffic having the same restriction during the evening rush hour. Electronic signs over the roadway alert motorists to the traffic flow dedication of each lane.

- **Covington, Kentucky on the Clay Wade Bailey Bridge:**
  The Clay Wade Bailey Bridge is a cantilever bridge that carries US Route 42 and 127 across the Ohio River which connects Cincinnati, Ohio to Covington, Kentucky. It is 675 feet wide and has three lanes which use the center lane as a reversible lane to be used during heavy traffic flow in the appropriate direction of flow.

- **Tampa, Florida on the Lee Roy Selmon Cross-town Expressway:**
  The cross-town expressway is a fifteen mile (15) limited access toll road. It connects Brandon, Florida with downtown Tampa, Florida and the southern peninsula of Tampa. It has an elevated section aimed at increasing the capacity along the expressway during peak traffic hours by operating are reversible lanes. Hours of operation are westbound ramps from 6:00am to10:00 am, Eastbound Brandon ramp opens at 10:30am after a 30-minute transition. The downtown direction will be closed from 1:30 pm to 3:00pm allowing the downtown Brandon ramps to open at 3:00pm to allow traffic to flow eastbound. On the weekends the traffic will flow in the eastbound direction to Brandon only from 11:00am to 4:00am. This new network link has resulted in a low traffic volume along the reversible lanes system.

- **Miami, Florida Dolphin Stadium Reversible Land System:**
  The reversible lane system is located on NW 199th Street between 2nd and 27th Avenues to increase the flow of peak direction traffic into the Dolphin stadium before and after sporting and special events. Currently major upgrades are scheduled to replace aging, failure-prone hardware and increase the efficiency of how the system handles left turn movements (*See Photos below*).

II. METHODOLOGY

The methodology for examining the US 1 corridor included an evaluation and analysis of safety conditions and traffic operations. In addition to safety, maximizing operational efficiency is an important goal included in this analysis. Through improving efficiency, delay can be reduced and effective roadway capacity maximized.

2.1 Safety Analysis

As part of the overall study, a crash data analysis was performed using the last three (3) years of crash history from the Florida Department of Transportation (FDOT) Crash Analysis Reporting System database. Each major intersection and road segment within the study limits was examined to identify existing and potential future traffic safety concerns with respect to the implementation of a reversible flow lane system. A conclusion should be reached regarding the effect the proposed improvements will have on the safety of the facility. Details on the safety analysis are provided in *Section IV* of the report.

2.2 Traffic Operations Analysis

The traffic operations along the corridor were evaluated using a combination of field observation, review of traffic data, capacity/LOS analysis, and corridor simulation to determine the advantages and disadvantages of various alternatives. The field observation included the following elements:

- An inventory of physical roadway and intersection characteristics including lane configuration, storage and geometry.
- Observations of AM peak hour and PM peak hour traffic conditions through the corridor.

A review of traffic operations data was performed including:

- Current year and historic traffic volume data from the FDOT count stations.
- Supplemental traffic volume data and turning movement counts at all signalized intersections.
- Signal optimization and intersection phasing.
- Turning restrictions.

Growth trends were examined based on historic count data and traffic growth projections using the Miami-Dade Planning Area Travel Demand Model. The Miami-Dade model is based on the Florida Standard Urban Transportation Model Structure (FSUTMS). The model is recognized by FDOT and the Metropolitan Planning Organization (MPO) as one of the accepted travel demand modeling tools for the Miami-Dade region. This model is the same tool used for the South Link study efforts during the South Miami-Dade Corridor Study in April 2006.

A capacity/LOS analysis of the signalized intersections along the corridor was performed using the Synchro Software. This software uses the methodology of the Highway Capacity Manual 2000 Edition to determine intersection capacity and LOS. This analysis was performed for the existing conditions and each of the alternatives considered. In addition, simulation was performed using the SimTraffic software to provide a detailed look at the simulated traffic flow and queue distances.

Further examination of typical sections were performed on aerial photography provided by FDOT along with supplemental photography obtained by the Corradino Group (TCG). These typical sections were sketched on the aerials to determine relative impacts to surrounding properties and identify potential alternatives. Based on these conceptual layouts, preliminary cost estimates were performed during the alternative analysis.

2.3 Coordination

TCG coordinated with the following agencies throughout the alternative analysis phase of the study to ensure that the alternatives considered were consistent with goals and objectives with regards to the corridor.

- Miami-Dade County Public Works
- Miami-Dade County Transit
- Florida Department of Transportation

III. EXISTING CONDITIONS

The methodology utilized for evaluating existing conditions along US 1 consists of data gathering in the areas of (1) roadway characteristics, (2) traffic operations characteristics, and (3) safety characteristics. This includes the collection and review of all data pertaining to the existing facility through review of existing documents, on-site inventories and collection of pertinent data that would serve as a basis for evaluation.

3.1 Existing Roadway Characteristics

3.1.1 Functional Classification

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. In general, arterial roadways provide direct service between cities and larger towns, which generate and attract a large proportion of the relatively longer trips (emphasize a high level of mobility). The existing speed limit is posted at 45 mph along the project corridor. The access management classification within the study limit is Class 5 Restrictive where medians physically prevent vehicle crossing between intersections.

US 1 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.

3.1.2 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 Figures 3.1-3.3-Existing Typical Sections*):

- 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.

The median measured 15' which included the curb and gutter. The only location where the median did not measure 15' was at the Bird Road intersection. The smallest measurement was 10' and it gradually opened up to the full 15' as you continued northbound from Bird Road. The existing right of way varies from 80 to 90 feet wide (*See Appendix A-Base Maps*).

The existing condition outside the right of way lines varies (Metrorail, sidewalks, property walls) as seen on *Figures 3.1-3.3*. Aerial photography and existing survey conditions show that the sidewalk along the northbound direction lies outside the existing right of way limits.

Some sidewalks are provided along the US 1 northbound direction that vary between 5'-6' wide. A concrete wall lies just behind the back of curb north of SW 17th Avenue along the eastside (northbound) of US 1.

The Metrorail piers are located approximately twenty two feet (22') behind the US 1 southbound curb. These piers are six feet (6') long by three feet (3') wide with a twelve-foot (12') wide opening between each pair of piers. The Coconut Grove Metrorail Station is located south of SW 27th Avenue and continues to SW 29th Ave. Within the area of the station, there is an eleven-foot (11') wide buffer behind the curb and a seven-foot (7') wide sidewalk. After the intersection, the eight-foot (8') M-Path begins again.

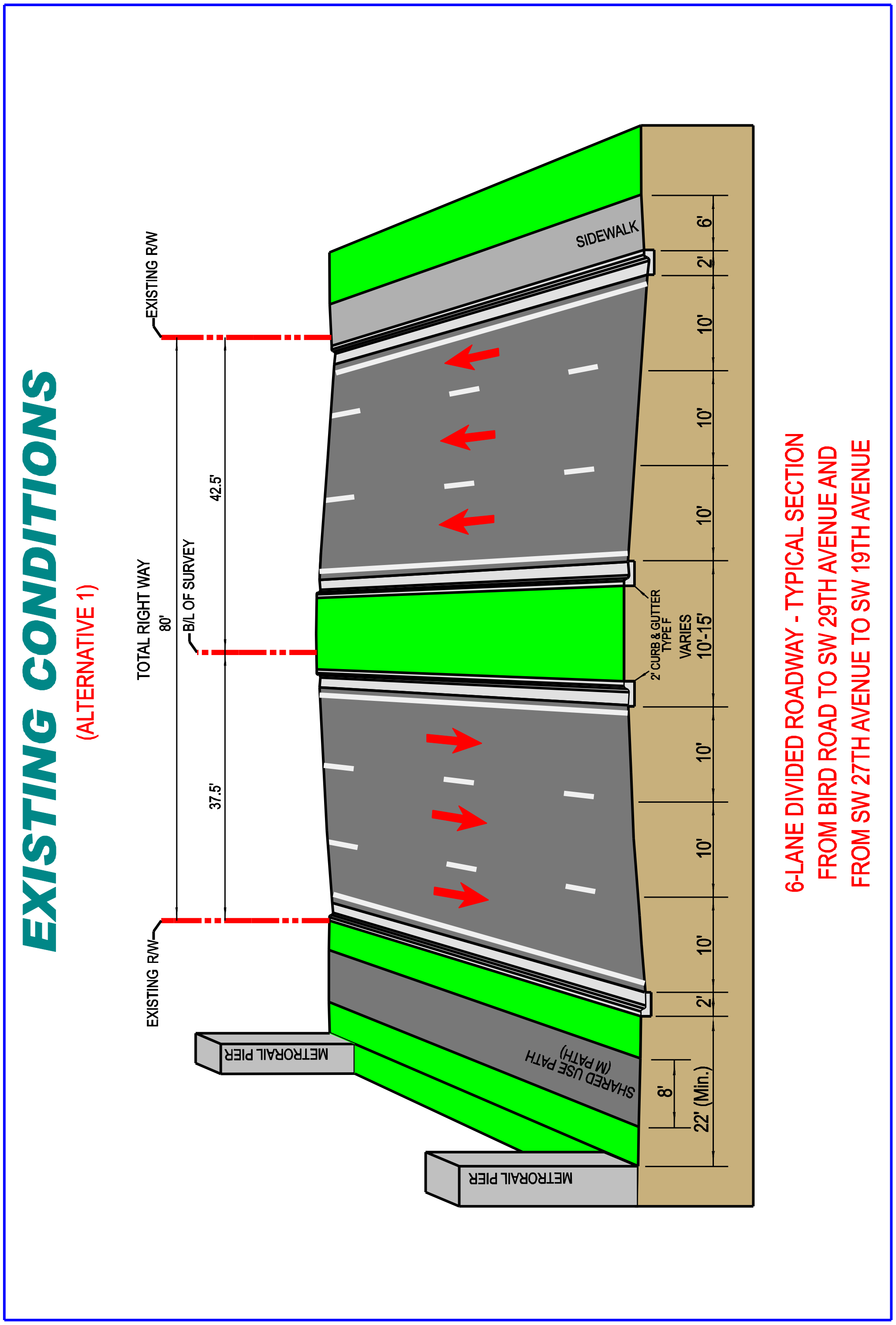


Figure 3.1 – Existing Four-Lane Divided Urban Typical Roadway Section I

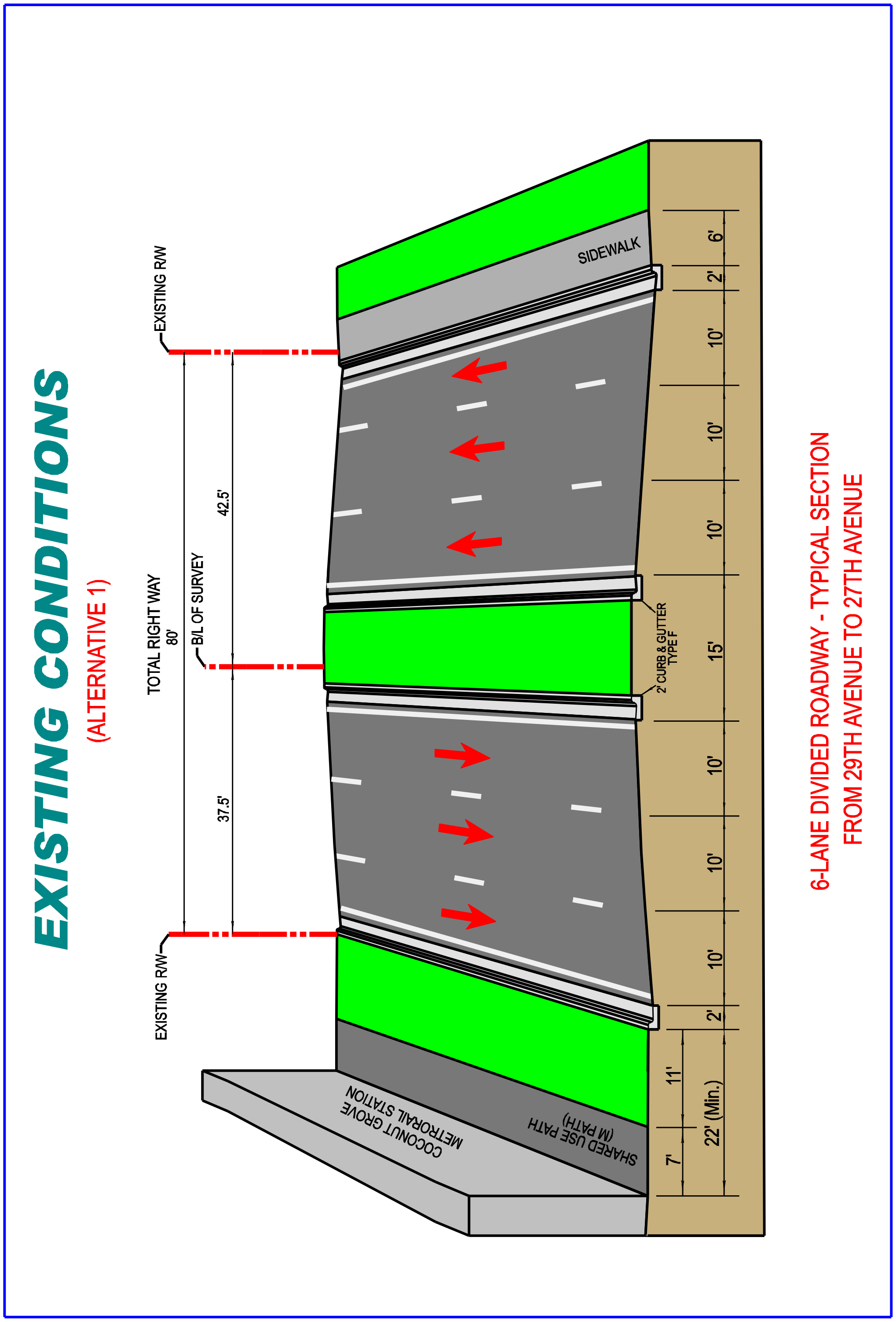


Figure 3.2 – Existing Four-Lane Divided Urban Typical Roadway Section II

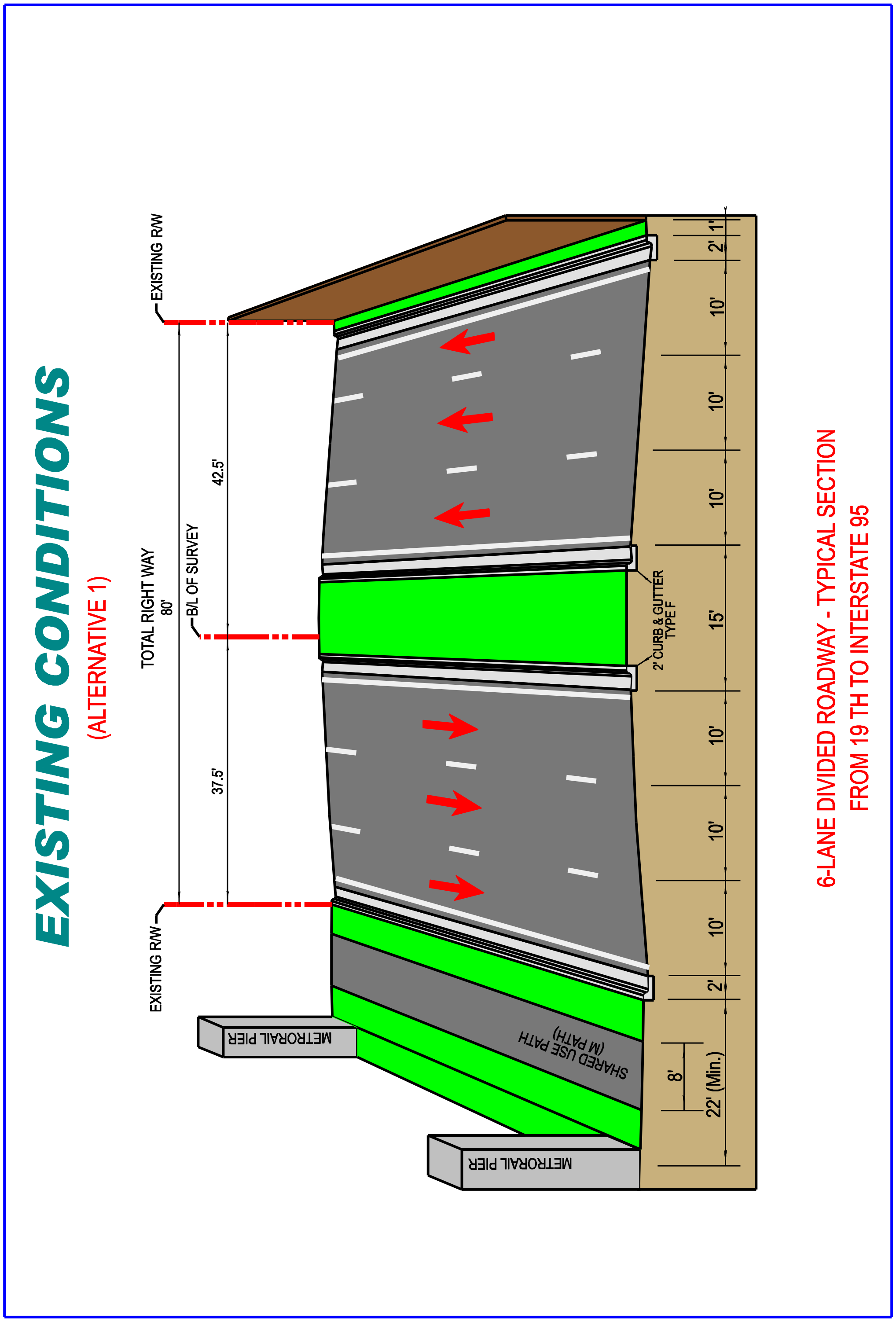


Figure 3.3 – Existing Four-Lane Divided Urban Typical Roadway Section III

3.1.3 Land Use

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.

3.1.4 Pedestrian and Bicycle Facilities

As well as serving through traffic, the US 1 corridor also serves traffic movements between neighborhoods and from neighborhoods to nearby parks and school facilities. Some sidewalks are provided along the US 1 northbound direction. The sidewalk along the US 1 southbound direction varies between 5'-6' wide and begins just south of SW 17th Avenue with a four-foot (4') wide buffer continuing south to SW 27th Avenue, at that point the buffer ends and the side walk becomes six feet (6') wide. The sidewalk stops for just one block between SW 26th Avenue and SW 27th Avenue, due to a small parking lot. These existing sidewalks were recorded based on field observation of the corridor. To the north of SW 17th Avenue along the eastside (northbound) there is a concrete wall that sits just behind the back of curb.

Pedestrian travel demand as measured in existing traffic counts are summarized below.

Table 3.1
Pedestrian Movement

Intersection	AM Peak Period	PM Peak Period	Total Count (pedestrian)
SW 37th Avenue	0	8	8
SW 40th Street	11	10	21
SW 32nd Avenue	20	20	40
SW 27th Avenue	72	52	124
SW 22nd Avenue	0	12	12
SW 17th Avenue	4	0	4
SW 16th Avenue	0	12	12

As these figures indicate, pedestrian traffic is primarily concentrated between the SW 32^{nd} Avenue and SW 27^{th} Avenue intersections adjacent to the Metrorail Coconut Grove Station. Pedestrians use these intersections to access the station, which is the corridor's primary pedestrian traffic generator.

Metrorail Path (M-Path) Greenway

A shared use path/greenway runs along the southbound side of US 1 between the Metrorail and the US 1 existing right of way. The path is eight-foot (8') wide and is located inside the Metrorail right of way typically running along the backside of Metrorail. There are occasional meandering sections /jogs throughout the study limits. Some sections of the path are as close as eight feet (8') behind the US 1 southbound curb. The shared use path/greenway is referred to as the Metrorail Path (M-Path) and its limits are from SW 7^{th} Avenue to SW 67^{th} Avenue. The M-Path was ranked highest of the corridors included in the Miami-Dade greenway network plan in the 2030 Long Range Transportation Plan update. The prioritization was based on proximity to transit facilities, schools, parks, higher-density housing and employment.

Bicycle facilities which are located away from the roadways are identified as greenways. There are very few situations where they are located adjacent to the roadways. Greenways are two-way facilities except for when they are located next to vehicular traffic. The purpose of a greenway is to provide people with access to open spaces close to where they live, and to link together rural and urban spaces.

The original M-Path was designed before current standards for paved shared use paths were developed and as a result now has operational and safety deficiencies that have handicapped its full use. A master plan has been developed to repair the surface and crosswalks, straighten out the path and extend the M-Path from SW 67^{th} Avenue to the Miami River or South Dade Trail. Other enhancements along US 1 could possibly include crossing signals, route signs, warning signs to drivers and bollards. Funding will be provided from the Miami Dade Transit and the Florida Department of Transportation. Planning of this project has already been initiated by the Metropolitan Planning Organization and its consultant Kimley-Horn with the support of other Miami-Dade city agencies. Once the ultimate greenway project is implemented this would likely increase the overall number of pedestrians and cyclists along the corridor.

3.1.5 Intersections and Signalization

There are a total of thirteen (13) intersections with full median openings and two (2) directional median openings within the study limits. The locations and types of intersections are listed below. *Figure 3.4-Intersection Schematic Map* graphically shows the existing intersections and *Figure 3.5-Existing Lane Geometry* shows the existing lane configurations.

• SW 40th Street (Bird Road)	Signalized Intersection
• SW 32nd Avenue (McDonald Avenue)	Signalized Intersection
• SW 31st Avenue (Bridgeport Avenue)	Unsignalized Intersection
• SW 30th Court	Unsignalized Intersection
• Virginia Street	Unsignalized Intersection
• SW 28th Terrace	Directional Median Opening
• SW 27th Avenue (Unity Boulevard)	Signalized Intersection
• SW 27th Terrace	Unsignalized Intersection
• SW 26th Avenue	Directional Median Opening
• SW 24th Avenue (Pedestrian Crosswalk)	Signalized Intersection
• SW 23rd Avenue	Unsignalized Intersection
• SW 22nd Avenue	Signalized Intersection
• SW 19th Avenue	Unsignalized Intersection
• SW 17th Avenue	Signalized Intersection
• SW 16th Avenue	Signalized Intersection

Existing US 1 turning restrictions exist at some intersections within the study limits.

- SW 40th Street (Bird Road)
  - ✓ Left turn movements are prohibited at this intersection.
  - ✓ No right turn on red from US 1 (northbound and southbound)
- SW 32nd Avenue
  - ✓ No U-turns
- SW 27th Avenue
  - ✓ No U-turns
- SW 17th Avenue
  - ✓ Southbound left turn movement is prohibited at this intersection.
  - ✓ No right turn on red from US 1
  - ✓ SW 16th Avenue
  - ✓ No U-turns

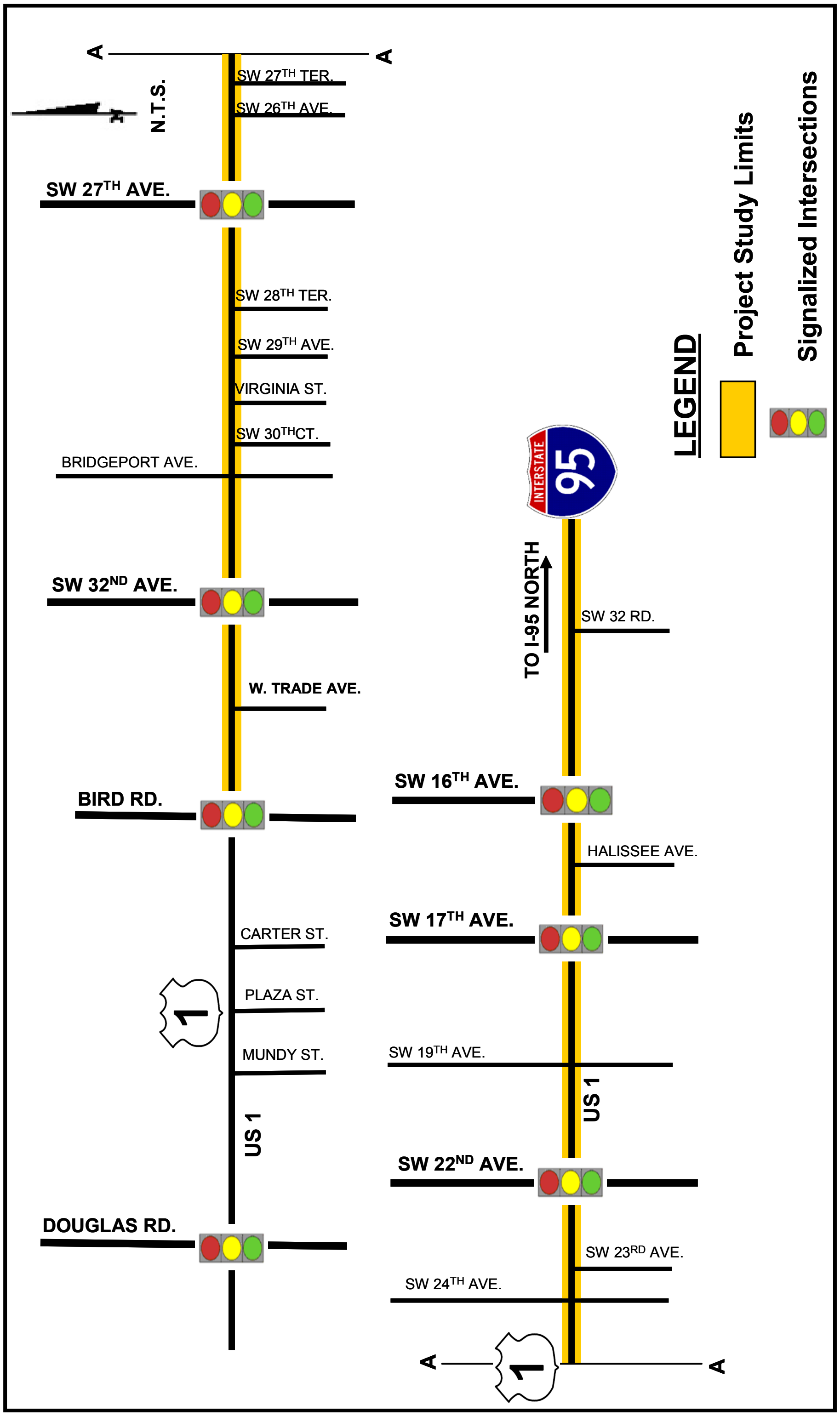


Figure 3.4 – US 1 Intersections Schematic Map

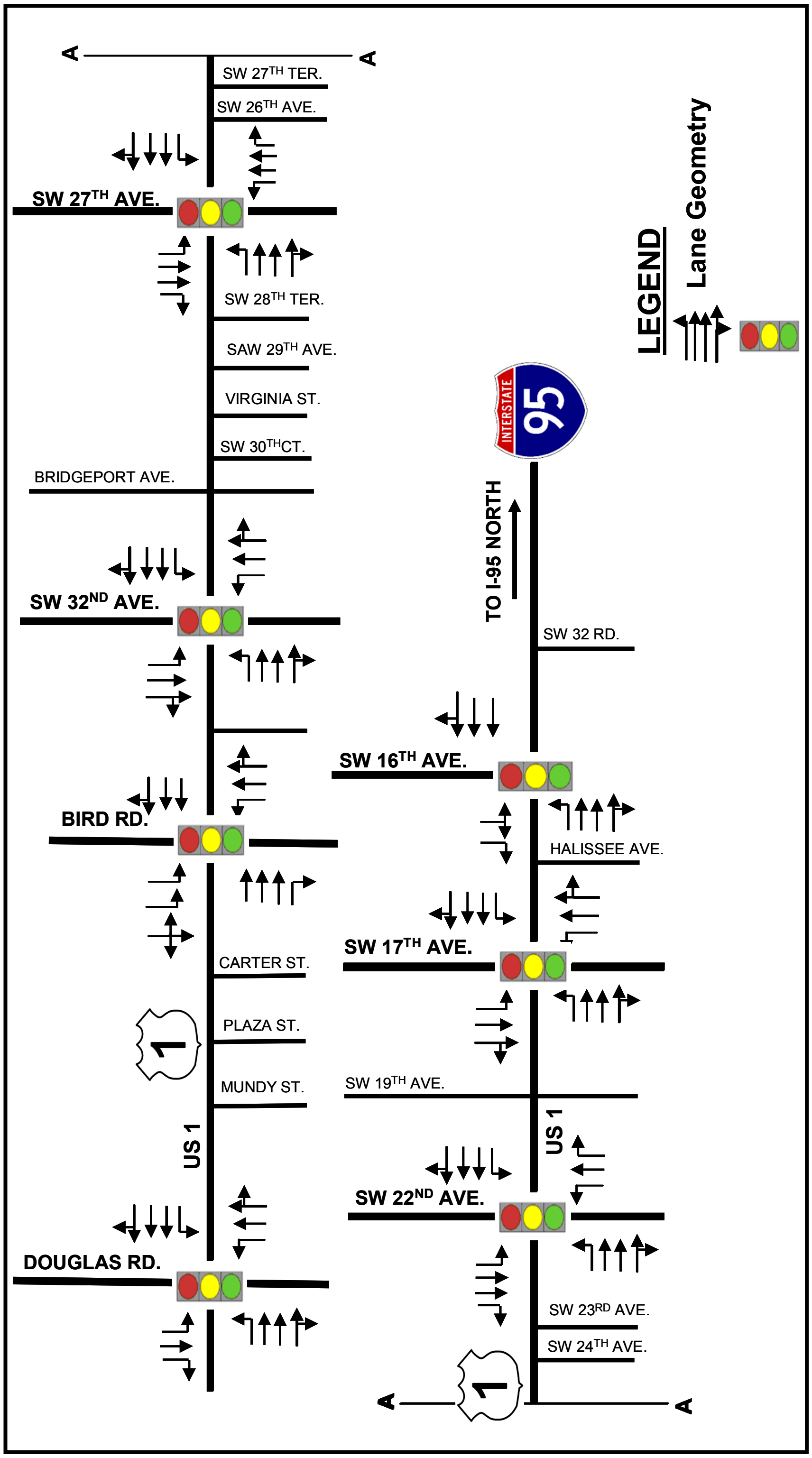


Figure 3.5 – Existing Lane Geometry

3.1.6 Lighting

Conventional street lighting exists along the entire project limits. The poles are located along the median between Bird Road and SW 27th Avenue and between SW 22nd Avenue and I-95. The poles are located behind the sidewalk along the northbound direction between SW 27th Avenue and SW 22nd Avenue. These poles are maintained by Miami-Dade Public Works. The existing lighting will need to be relocated to either along the existing sidewalks and/or the Metrorail right of way. The relocation will depend on the recommended alternative and may require right of way acquisition.

3.1.7 Utilities

The following utility companies and governmental utility departments have facilities located near or inside the project vicinity.

- Miami-Dade County Public Works
  - ✓ Conventional lighting along the median
  - ✓ Traffic signal interconnections along the median and along the Metrorail right of way.
- Florida Department of Transportation
  - ✓ Intelligent Transportation System (ITS) sign on the median north of SW 17th Avenue.
  - ✓ ITS camera on the median between SW 17th Avenue and SW 19th Avenue.
- Florida Power and Light Fiber Net
  - ✓ Underground facilities on the north side of US 1 from SW 22nd Avenue to SW 24th Avenue and a new project in permitting to tie existing facilities from SW 24th Avenue to SW 28th Terrace with three crossings on US 1. The facilities consists of 4-1 ½" HDPE conduit and associate hand holes.
- Comcast Cable
  - ✓ Active aerial plant attached to the existing utility poles.
- Bellsouth/AT&T Telecommunications
  - ✓ Traffic controller/AT&T buried traffic cables/conduits exists at the intersections of Bird Road, SW 32nd Avenue, SW 27th Avenue, SW 24th Avenue, SW 19th Avenue, SW 17th Avenue and SW 16th Avenue.
  - ✓ An AT&T aerial cable runs along the south side of the existing US 1 right of way from SW 19th Avenue to SW 17th Avenue and from north of SW 16th Avenue to the Viscaya Metrorail Station.
- Miami-Dade Water and Sewer
  - ✓ An underground 16" water main line exists along US 1 north of SW 32nd Avenue.
  - ✓ An underground 10" sanitary sewer line exists along US 1 north of SW 32nd Avenue.

- Florida Power and Light Company
  - ✓ An underground transmission line exists along the US 1 median from SW 32nd Avenue to north of SW 16th Avenue.
  - ✓ An underground 9-5" P Ducts line in 30" casing exists crossing US 1 at SW 37th Avenue.
  - ✓ An underground 4-4" P Ducts line exists along the south side of the existing US 1 right of way from SW 32nd Avenue to SW 22nd Avenue..
  - ✓ An underground 6-5" F Ducts line exists crossing US 1 at SW 32nd Avenue.
  - ✓ An underground 2-5" P Ducts line exits along the north side of the existing Metrorail right of way from SW 31st Avenue to north of SW 16th Avenue.
- People Gas
  - ✓ An underground 8" diameter steel casing gas pipeline runs north-south crossing US 1 at the SW 16th Avenue intersection approximately 18 feet west of the edge of pavement.
- City of Coral Gables – *(No response as of December 3, 2007).*
- MCI Communications – *(No response as of December 3, 2007).*

IV. SAFETY ANALYSIS

4.1 Crash Data

Traffic crash data along the US 1 corridor was obtained from the FDOT Crash Analysis Reporting System database for the latest three (3) years of information (2003 through 2005). The crash data included information on:

- Number of accidents
- Type of accident
- Severity (injury, fatality)

Tables 4.1-4.5 summarize the crash data for the years 2003 through 2005. A detailed graphical crash data analysis is shown in *Appendix B-Crash Data Analysis*.

Table 4.1
Crash Data Summary

Year	Number of Accidents	Safety Ratio
2003	383	0.98
2004	440	1.04
2005	398	1.01
Average / Year	**407**	**1.01**

The safety ratio is used to determine if a roadway segment may potentially be considered a high accident segment location. If the safety ratio is greater than 1.0, then it is considered a high accident segment location. The safety ratio on *Table 4.1* shows the overall safety ratio along the study limits. The safety ratio was calculated for the entire corridor as a whole. The two major factors in the safety ratio calculation are traffic volumes and number of crashes. The average year safety ratio of ***1.01*** means that there are sections within the study limits that already reach the high accident segment location thresholds.

Table 4.2 shows the crash statistics summary within the study limits. *Figure 4.1-Intersection Crash Rates* depicts the number of crashes that occurred at the signalized intersections and *Table 4.3* shows the types of crashes at these intersections.

Table 4.2
Crash Statistics Summary
US 1 from SW 40th Street (Bird Road) to Interstate 95

CHARACTERISTICS	TYPE OF CRASH	NUMBER OF CRASHES			3-YEAR TOTAL CRASHES	PERCENT OF TOTAL	MEAN CRASHES PER YEAR
		YEAR					
		2003	2004	2005			
CRASH TYPE	Rear End	87	119	80	286	23.42%	95
	Head On	2	7	10	19	1.56%	6
	Angle	31	37	51	119	9.75%	40
	Left Turn	22	25	25	72	5.90%	24
	Right Turn	2	8	2	12	0.98%	4
	Sideswipe	28	34	26	88	7.21%	29
	Pedestrian/Bicycle	8	6	8	22	1.80%	7
	Fixed Obj. above ground	2	1	2	5	0.41%	2
	Sign (Post)	0	1	0	1	0.08%	0
	Guard Rail	0	2	0	2	0.16%	1
	Concrete Barrier wall	2	3	1	6	0.49%	2
	Bridge /Pier /Abutment	1	0	0	1	0.08%	0
	Tree/Shrub	9	3	7	19	1.56%	6
	Traffic Gate	0	0	0	0	0.00%	0
	Crash Attenuators	0	0	0	0	0.00%	0
	Other Fixed Object	2	1	2	5	0.41%	2
	Ran into Ditch/Culvert	0	0	0	0	0.00%	0
	Overturned	1	0	1	2	0.16%	1
	Ran off Road into water	0	0	0	0	0.00%	0
	Construction Barricade sign	0	0	0	0	0.00%	0
	Utility/Light Pole	4	2	1	7	0.57%	2
	Fence	0	0	1	1	0.08%	0
	Other	182	191	181	554	45.37%	185
	TOTAL CRASHES	383	440	398	1221	100.00%	407
WEATHER CONDITIONS	Sunny	281	356	288	925	75.76%	308
	Cloudy	43	37	39	119	9.75%	40
	Rain	44	30	47	121	9.91%	40
	Fog	0	0	0	0	0.00%	0
	Others	14	17	24	55	4.50%	18
	Unknown	1	0	0	1	0.08%	0
SURFACE CONDITIONS	Dry	301	373	313	987	80.84%	329
	Wet	72	56	61	189	15.48%	63
	Others	10	11	24	45	3.69%	15
	Unknown	0	0	0	0	0.00%	0
MONTH OF YEAR	January	30	31	32	93	7.62%	31
	February	20	44	17	81	6.63%	27
	March	50	42	39	131	10.73%	44
	April	32	41	32	105	8.60%	35
	May	28	42	40	110	9.01%	37
	June	37	43	46	126	10.32%	42
	July	32	37	43	112	9.17%	37
	August	33	34	45	112	9.17%	37
	September	36	35	32	103	8.44%	34
	October	29	41	27	97	7.94%	32
	November	31	22	29	82	6.72%	27
	December	25	28	16	69	5.65%	23
DAY OF WEEK	Sunday	63	65	61	189	15.48%	63
	Monday	65	78	53	196	16.05%	65
	Tuesday	74	83	52	209	17.12%	70
	Wednesday	55	73	71	199	16.30%	66
	Thursday	36	45	47	128	10.48%	43
	Friday	39	43	52	134	10.97%	45
	Saturday	51	53	62	166	13.60%	55
HOUR OF DAY	00:00-03:00	28	33	40	101	8.27%	34
	03:00-06:00	18	26	25	69	5.65%	23
	06:00-09:00	43	50	36	129	10.57%	43
	09:00-12:00	69	67	51	187	15.32%	62
	12:00-15:00	64	74	51	189	15.48%	63
	15:00-18:00	87	99	84	270	22.11%	90
	18:00-21:00	41	51	61	153	12.53%	51
	21:00-24:00	33	40	48	121	9.91%	40

Table 4.3 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)

During a further crash data analysis research, high crash segment locations were found within the study limits. *Table 4.4* lists these locations.

Table 4.4
High Crash Segments and Spots

* Rank	Mile Post	Year	Location
# 183 # 363	5.4-5.7	2004 2005	Douglas Road to Bird Road
# 209 # 183	5.9-6.0	2003 2005	West Trade Avenue to SW 32nd Avenue
# 412 # 426	6.4-6.8	2003 2004	SW 28th Terrace to SW 24th Avenue
# 526 # 393 # 454	6.9-7.1	2003 2004 2005	SW 23rd Avenue to SW 22nd Avenue
# 265 # 232 # 294	7.5-7.9	2003 2004 2005	South of SW 17th Avenue to North of SW 16th Avenue

* Based on FDOT ranking statewide

Table 4.5 summarizes the information on the severity of the accidents in terms of injuries and fatalities.

Table 4.5
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 4.5 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.

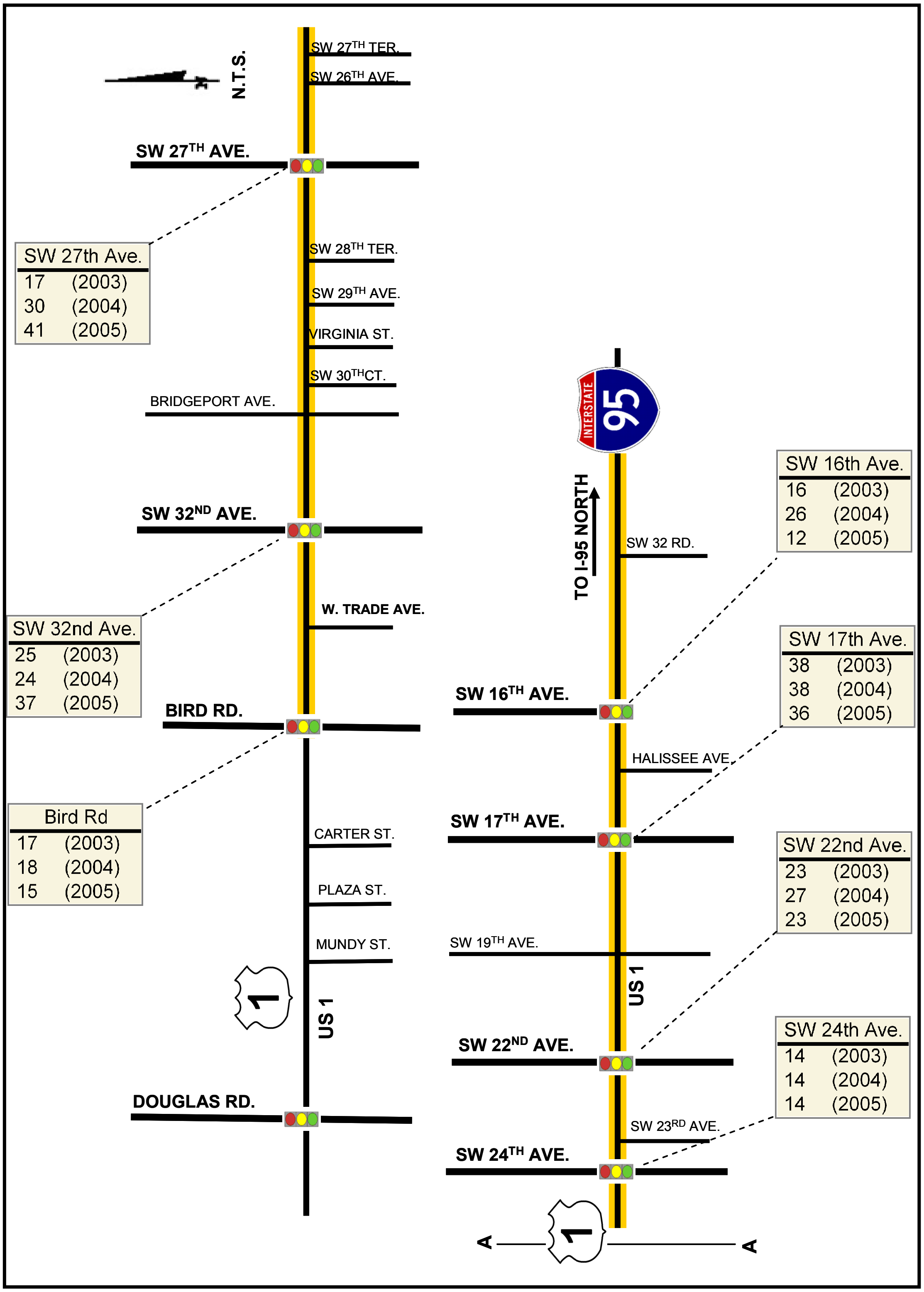


Figure 4.1 – Intersection Crash Rates

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.

Our results also indicate that a high percentage of other types of crashes have occurred along this section of US 1 and account for an average of 45.37% of the crashes. To be able to understand the sources and reasons for this unknown figure, it is recommended to investigate this with a special Crash and Traffic Operations Study.

Finally, approximately 36% of all collisions occurred at night. This may be an indication of poor or insufficient roadway lighting conditions. It is recommended that existing roadway lighting along US 1 be evaluated.

V. NO-BUILD TRAFFIC

5.1 Traffic Volumes

Traffic volumes along the US 1 corridor were examined to determine traffic flow patterns and fluctuations in traffic volume by time of day. Existing daily traffic volume count data was obtained from FDOT count stations (2003-2005). This data was supplemented by four (4) hour Turning Movement Counts (TMC) at seven (7) locations during the hours of 7-9 AM and 4-6 PM.

- SW 37th Avenue (Douglas Road)
- SW 40th Street (Bird Road)
- SW 32nd Avenue (McDonald Avenue)
- SW 27th Avenue (Unity Boulevard)
- SW 22nd Avenue
- SW 17th Avenue
- SW 16th Avenue

All existing and estimated Annual Average Daily Traffic (AADT), Directional Design Hour Volume (DDHV), TMC and FDOT 24-hour total volumes are shown in *Appendices C-G*. *Figure 5.1* shows the location of the FDOT count stations and the 24-hour total volumes per direction along the corridor.

The primary purpose of collecting existing traffic data and examining roadway characteristics is to verify the Florida Standard Urban Transportation Modeling Structure (FSUTMS) model vehicular volumes as well as to provide field information for the analysis of existing conditions. The traffic data collection and traffic analyses were performed in accordance with FDOT procedures.

Based on the FDOT procedures outlined in the Project Traffic Forecasting Handbook, the Average Annual Daily Traffic (AADT) volumes can be determined from short-term TMC data by applying a Weekly Seasonal Correction Factor (SF). The SF of 0.99 was obtained from the FDOT Transportation Statistics Office Database and applied to the collected traffic count data.

The Miami-Dade Planning Area Model was the travel demand model used to develop future travel projections. The Miami-Dade model is based on the FSUTMS. The evaluation of future traffic operating conditions requires the use of directional design hourly volumes (DDHV). DDHVs are obtained by applying the design hour factor (K_{30}) and the directional factor (D_{30}) to the future AADT volumes. Additional factors required for the analysis includes the 24-hour truck factor (T_{24}), the design hour truck factor (DHT) and the existing turning movement percentages obtained from the data collection.

A review of the FDOT Florida Traffic Information (FTI) database along with 2003-2005 traffic counts was conducted to obtain the design hour volumes. *Table 5.1* presents a summary of the project traffic factors.

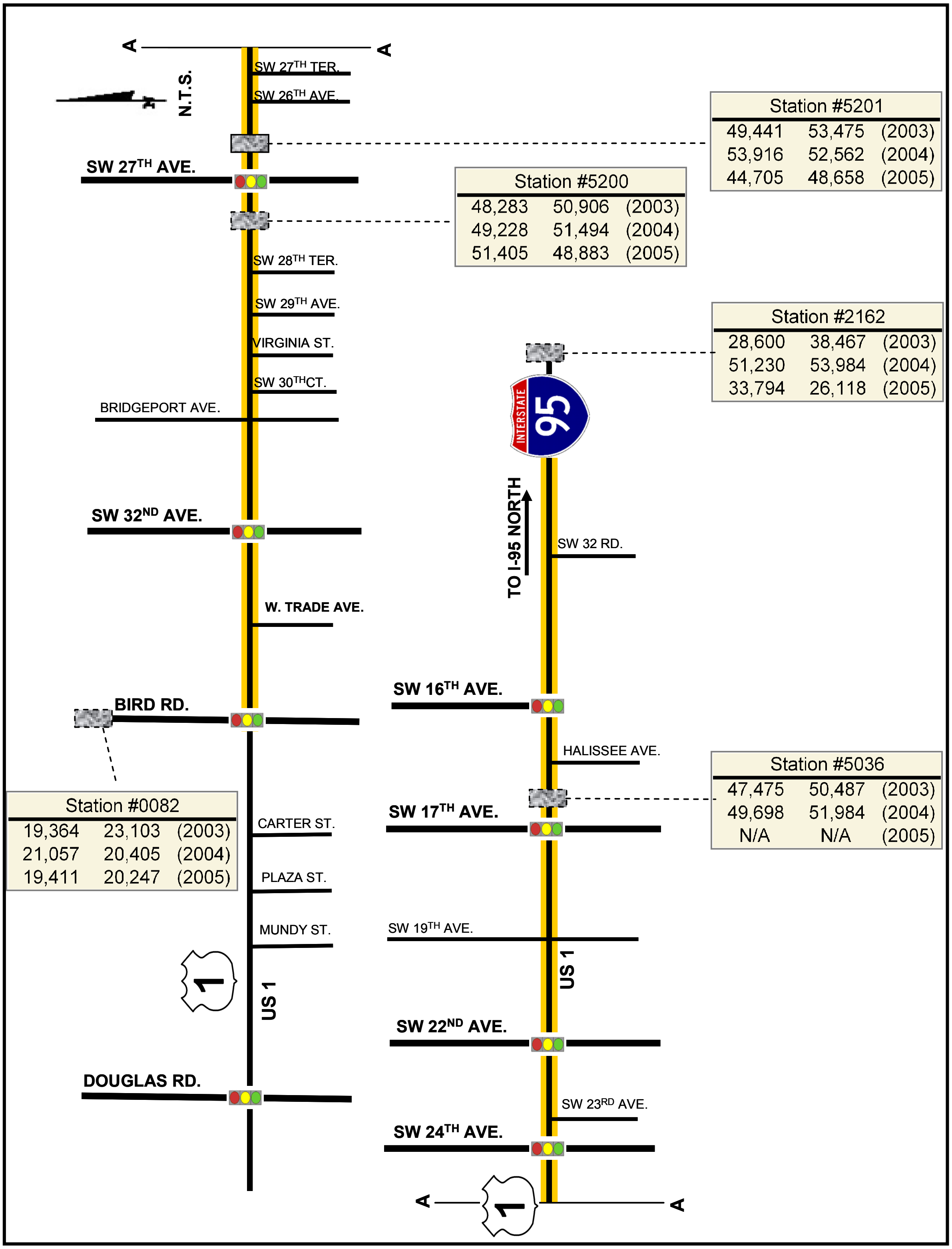


Figure 5.1 – FDOT Count Stations and 24-hour Total Volumes

Table 5.1 DDHV Conversion Factors	
Factors	**Value**
Design Hour Factor (K_{30})	9.2%
Directional Factor (D_{30})	56.62%
Daily Truck Factor (T_{24})	6%

5.1.1 US 1 Directional Splits

Daily volumes, while useful for planning purposes, can not be used alone for design or operational analysis purposes. Volumes along US 1 vary considerably over the 24 hours of the day, with periods of maximum flow occurring during the morning and evening commuter "rush hours." The single hour of the day that has the highest hourly volume is referred to as the peak hour. The peak hour volume is generally stated as a directional volume (i.e. each direction of flow is counted separately).

Table 5.2 shows the 2007 calculated directional volume splits between every signalized intersection.

Table 5.2
US 1 Directional Volume Splits

Roadway Segment	Year	Direction	Percent Split (%)	
			AM	PM
1) SW 37th Avenue to SW 40th Street	2007	NB	55	42
		SB	45	58
2) SW 40th Street to SW 32nd Avenue	2007	NB	57	44
		SB	43	56
3) SW 32nd Avenue to SW 27th Avenue	2007	NB	60	43
		SB	40	57
4) SW 27th Avenue to SW 22nd Avenue	2007	NB	61	37
		SB	39	63
5) SW 22nd Avenue to SW 17th Avenue	2007	NB	59	38
		SB	41	62
6) SW 17th Avenue to SW 16th Avenue	2007	NB	58	39
		SB	42	61

US 1 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. The 2007 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.

5.1.2 Projected Traffic Growth

The traffic projection for the US 1 section from SW 37th Avenue (Douglas Road) to SW 16th Avenue in Miami Dade County was prepared using the 2000 Miami-Dade FSUTMS model. The future year of the model is 2030, which is the same as the analysis year for this study. The consultant initially assessed the model's performance in the study area prior to it's use for future projections. One of the main measures of model's performance was volume over count ratio. However, there is only one link on this section of US 1 which has traffic count available in the base year. The model performance is good on this particular link. The volume over count ratio on this link is 0.97. Other links around this corridor with available traffic counts showed good relationship between the model volumes and the traffic counts. The model shows a traffic growth of around 5% for this section of US 1 for the next 30 years. The analysis of the model around the study area concurs with confidence about the model results.

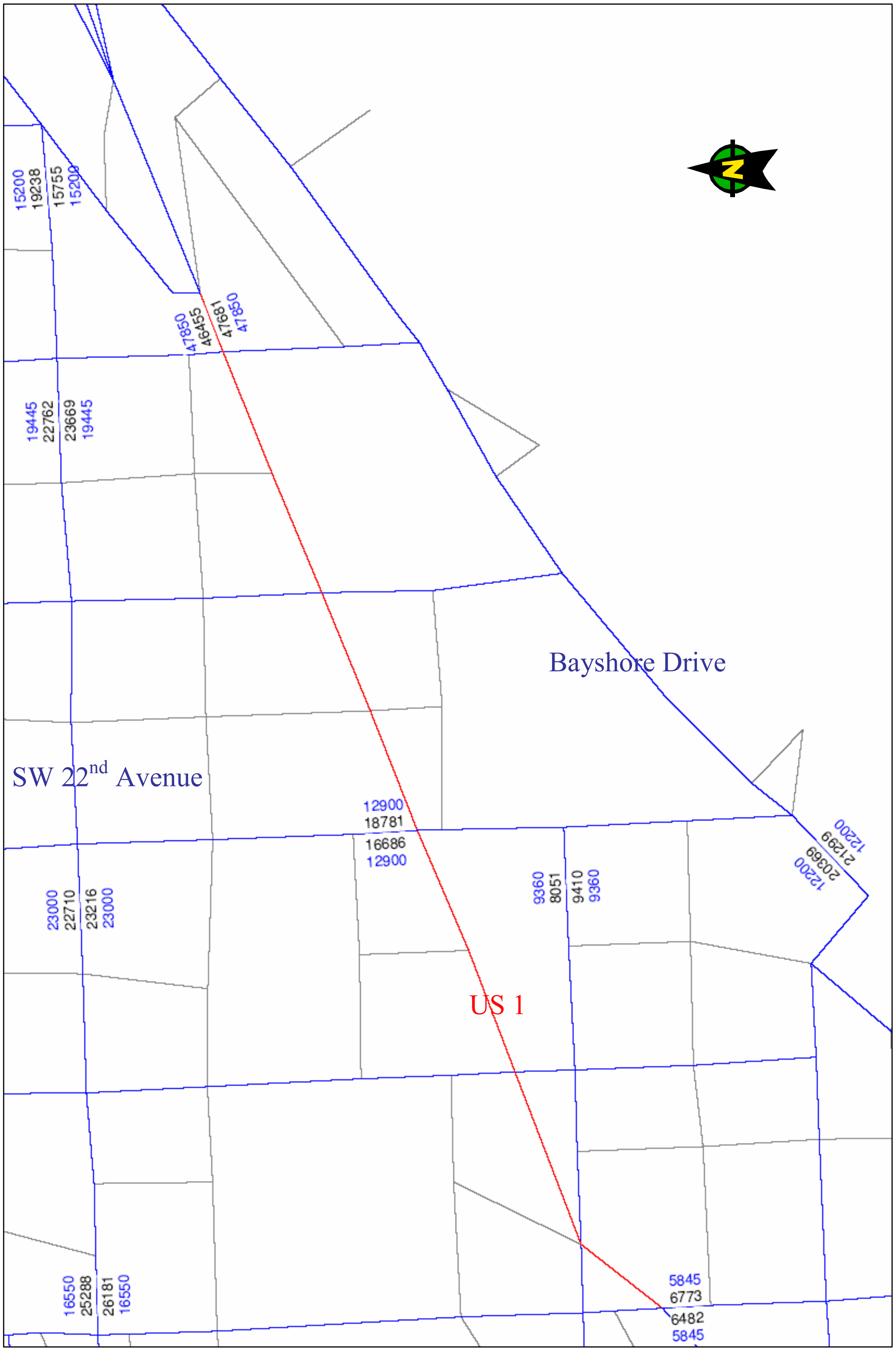


Figure 5.2 – 2000 Base Year Model – Volume (blue) and Counts (black)

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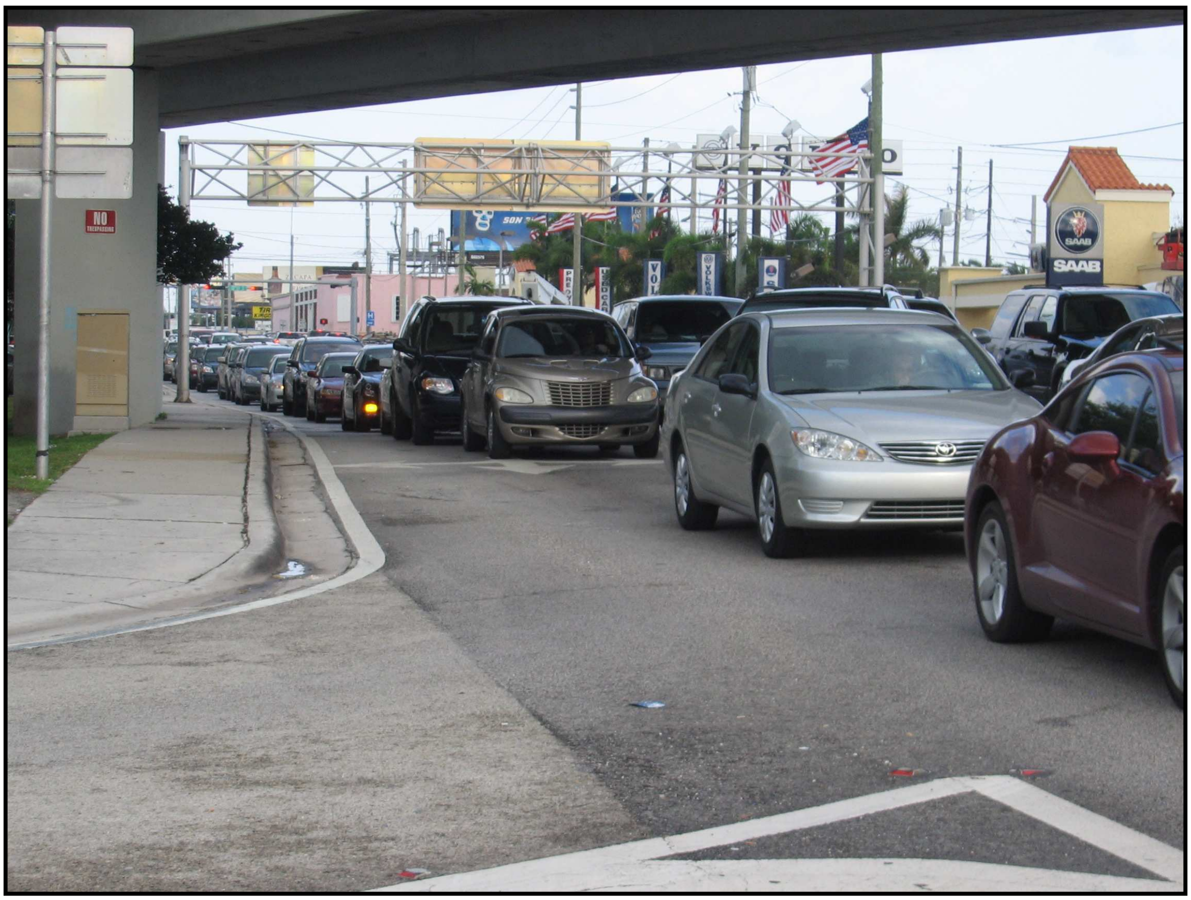
Turning movements traffic counts were collected for all the intersections being analyzed for this study. These counts were only made for the AM peak and PM peak hours. It was assumed that the combined AM and PM counts were true representative of the daily traffic turning patterns. These counts were used to prepare balanced turning movements to be used for estimating the future turning movement volumes.

A 2030 model run was made with the Miami-Dade FSUTMS model. *Figure 5.3* shows the 2030 model volumes.



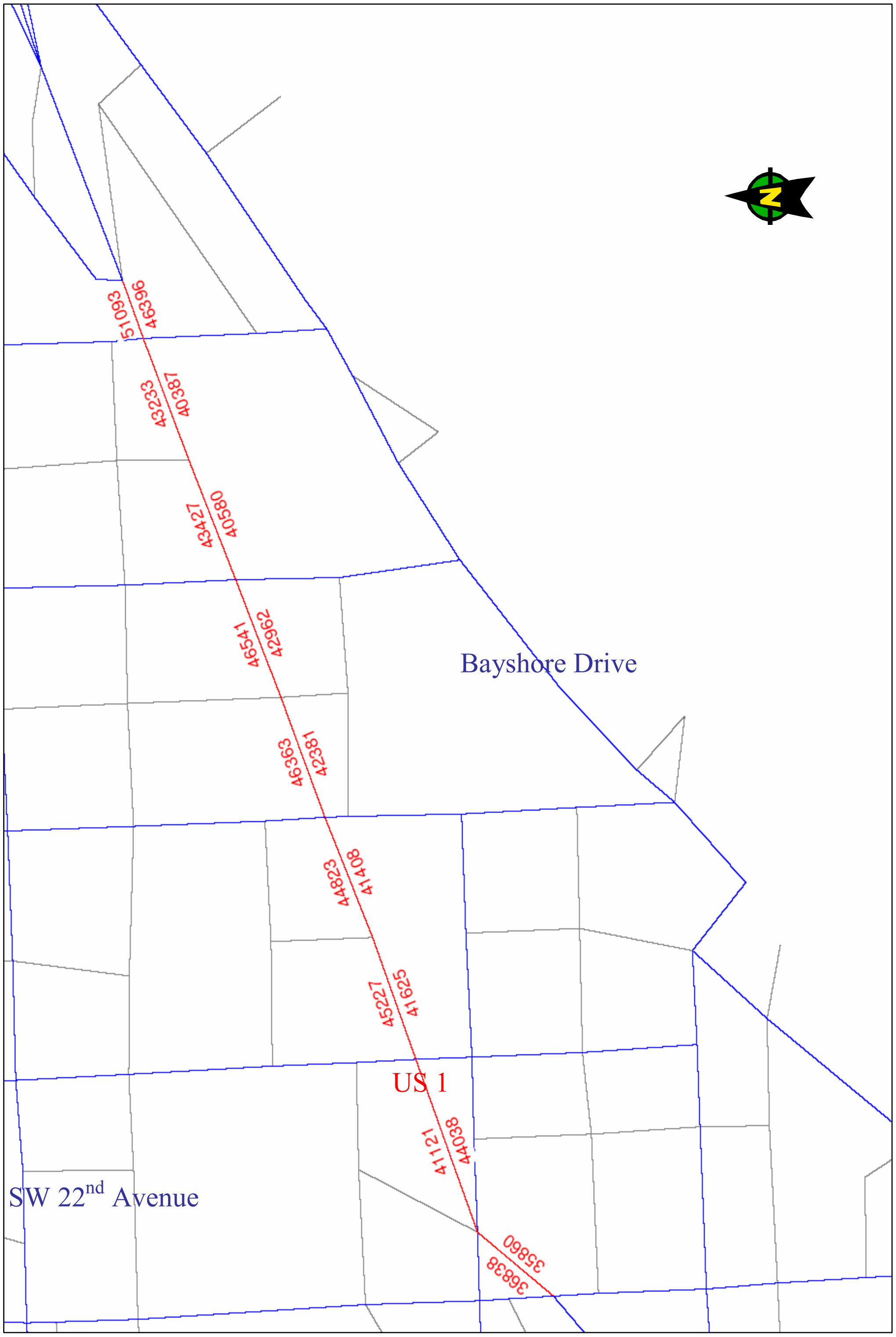


Figure 5.3 – 2030 Year Model

The 2030 daily traffic volumes projected by the model were compared to the base year model volumes. The 2030 model seemed to have under projected the traffic volume on this corridor. Considering the socio-economic growth in the zones around the study corridor and overall Vehicles Miles of Travel (VMT) growth, it was decided that a 10% should be applied to the 2030 model volumes. The comparison of the adjusted 2030 model volumes and the base year model volumes yielded the annual growth factors for individual sections of the study corridor. These growth factors were appropriately applied to the existing condition AM and PM peak traffic counts to estimate the 2030 AM and PM peak volumes for individual roadway sections of US 1. The individual balanced turning movements, developed with the existing condition traffic counts, were used to develop turning movement volumes for respective intersections. The projected traffic volumes were compared to the existing turning movement traffic counts, and the projected traffic was found to be reasonable.

5.1.3 No-Build Traffic Analysis

This section presents the analysis results for the existing (No-Build) lane configuration under existing and projected traffic conditions. The Synchro traffic software was used to compute the roadway Level of Service (LOS), based on the Highway Capacity Manual 2000 (HCM). The HCM classifies road capacity based on LOS A through F, where LOS A represents a road operating below capacity (free-flow conditions with little or no delays) and LOS F suggests a road is operating above design capacity (congested traffic with forced flow conditions at very low operating speeds). The desired LOS for this study area is LOS E or better. This section of US 1 runs parallel to Metrorail, which is an exclusive transit facility.

The US 1 overall LOS depends on the intersection and arterial LOS. Intersection LOS corresponds to the average delay experienced by a vehicle passing through a given intersection. Arterial LOS, in this case a six-lane signalized roadway, is a function of the average travel speed through the project segment.

The US 1 LOS analysis included seven (7) signalized intersections and six (6) arterial segments. The following tables show the LOS for the existing conditions and the design year 2030 traffic volume conditions. The 2007 LOS calculations were based on the exiting timing and phasing configurations along US 1. The existing timing data information was provided by Miami-Dade County Public Works Department (*See Appendix H).*

Simulation was performed using the SimTraffic software to provide a detailed look at the micro-simulation and queue distances. Based on the initial traffic operational analysis and simulation, the data collected (TMC) was not completely representing the existing traffic conditions within the study limits. Flow speeds were adjusted based on existing conditions and field observations at specific links within the study limits. A factor was also applied to some intersections to be able to recreate the existing traffic conditions along US 1. *Appendix I* depicts the Synchro outputs operational analysis results.

Table 5.3 Existing Conditions LOS US 1 Arterial Roadway						
Roadway Segment	**Year**	**Direction**	**Average Travel Speed (mph)**		**LOS**	
			AM	**PM**	**AM**	**PM**
1) SW 37th Avenue to SW 40th Street	2007	NB	17	22.7	D	C
		SB	n/a	n/a	n/a	n/a
	2030	NB	2.9	10	F	F
		SB	n/a	n/a	n/a	n/a
2) SW 40th Street to SW 32nd Avenue	2007	NB	13.8	23	E	C
		SB	17.1	9.6	D	F
	2030	NB	11.9	15.2	F	E
		SB	3.9	3.3	F	F
3) SW 32nd Avenue to SW 27th Avenue	2007	NB	17.1	26.4	D	C
		SB	25.9	20.3	C	D
	2030	NB	12.4	38.6	F	A
		SB	37.6	8.1	A	F
4) SW 27th Avenue to SW 22nd Avenue	2007	NB	9.4	27.6	F	C
		SB	22.3	10.1	C	F
	2030	NB	7.9	32.6	F	B
		SB	31.5	11.3	B	F
5) SW 22nd Avenue to SW 17th Avenue	2007	NB	8.9	26.4	F	C
		SB	21.3	13.8	D	E
	2030	NB	8.5	34	F	B
		SB	22.7	14.2	C	E
6) SW 17th Avenue to SW 16th Avenue	2007	NB	9.8	24.9	F	C
		SB	18.4	4.2	D	F
	2030	NB	5.6	26.7	F	C
		SB	14.8	2.6	E	F
7) SW 16th Avenue to Interstate 95	2007	NB	n/a	n/a	n/a	n/a
		SB	27.4	16.3	C	E
	2030	NB	n/a	n/a	n/a	n/a
		SB	21.6	11.2	D	F
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

As *Table 5.3* indicates, Segments 2, 4, 5 and 6 are currently operating at a LOS F during the peak hour periods. Segment 7 is currently operating at a LOS E during the SB PM peak period.

US 1 experiences severe congestion and LOS F conditions. All segments will have a LOS F by the design year 2030.

Table 5.4 Existing (No-Build) Conditions LOS Signalized Intersections					
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
2) SW 40th Street	2007	138.7	100.5	F	F
	2030	324.4	207.7	F	F
3) SW 32nd Avenue	2007	38.8	47.1	D	D
	2030	44.0	120.4	D	F
4) SW 27th Avenue	2007	54.9	97.9	D	F
	2030	72.8	98.2	E	F
5) SW 22nd Avenue	2007	98.4	67.1	F	E
	2030	123.9	62.1	F	E
6) SW 17th Avenue	2007	97.9	98.8	F	F
	2030	119.7	124.0	F	F
7) SW 16th Avenue	2007	46.5	149.6	D	F
	2030	102.2	103.5	F	F

As *Table 5.4* indicates, most intersections along this section of US 1 currently operate at a LOS F during the peak hour periods with very high v/c ratios along the side street approaches. However, the intersection of SW 37th Avenue and SW 32nd Avenue currently operate at LOS E and LOS D conditions. The intersection of SW 40th Street experiences severe congestions at all times. This intersection has a split phase between the eastbound and westbound direction. Currently, most of the green time (***102 seconds***) is timed for the north/south traffic leaving only ***38 seconds*** to be split between the east/west movements.

US 1 experiences severe intersection delays and LOS F conditions. All segments will have a LOS F by the design year 2030.

VI. CORRIDOR ALTERNATIVES AND ANALYSIS

The purpose of this chapter is to discuss the conceptual alternatives that were identified and developed to assess the feasibility of implementing a Reversible Lane Flow system along US 1 between SW 40th Street (Bird Road) and I-95. All alternatives were developed in general and analyzed in order to select a preferred alternative. The alternatives were developed and refined with the objective of avoidance or minimization of impacts from construction costs. Planning and engineering ideas to achieve this objective are described below.

6.1 Definition of Alternatives

Four (4) alternatives were identified to be considered for the US 1 corridor. Beyond the No-Build alternative, these were based on a realistic assessment of the type of facility that would be required to meet the goals of the study. Each of the following includes a brief description and statement concerning the likelihood of the alternative to satisfy the intent of the study.

Alternative 1 – No-Build

This alternative proposes to keep the existing roadway layout and make no improvements. If no improvements are made, the roadway and its cross roads will experience congestion during peak hours and operate at undesirable level of service. The congestion along the area may cause additional impacts to this roadway. Such impacts may include excessive delays in travel time, large reduction of average travel speeds, excess fuel consumption from idling vehicles and increased air pollutants (particularly hydrocarbons and carbon monoxide) and potential increase in rear end and sideswipe collisions.

Alternative 2 – One Reversible Flow Lane

This alternative (*See Figure 6.1-Alternative 2*) consists of the following elements:

- Remove the existing fifteen-foot (15') wide raised median.
- Remove the existing exclusive left turn lanes along the median.
- Construct one thirteen-foot (13') wide reversible flow lane along the median.
- Widen to the inside the existing lane adjacent to the median on both directions to eleven-foot (11') wide lanes (two lanes total).
- The new reversible flow lane will be designated to flow northbound during the AM peak hour periods.
- The new reversible flow lane will be designated to flow southbound during the PM peak hour periods.
- Left turn movement will be prohibited during the AM and PM peak hour periods.
- The new reversible flow lane will be designated to serve as a center Two-Way Left Turn (TWLT) lane during the non peak hour periods.

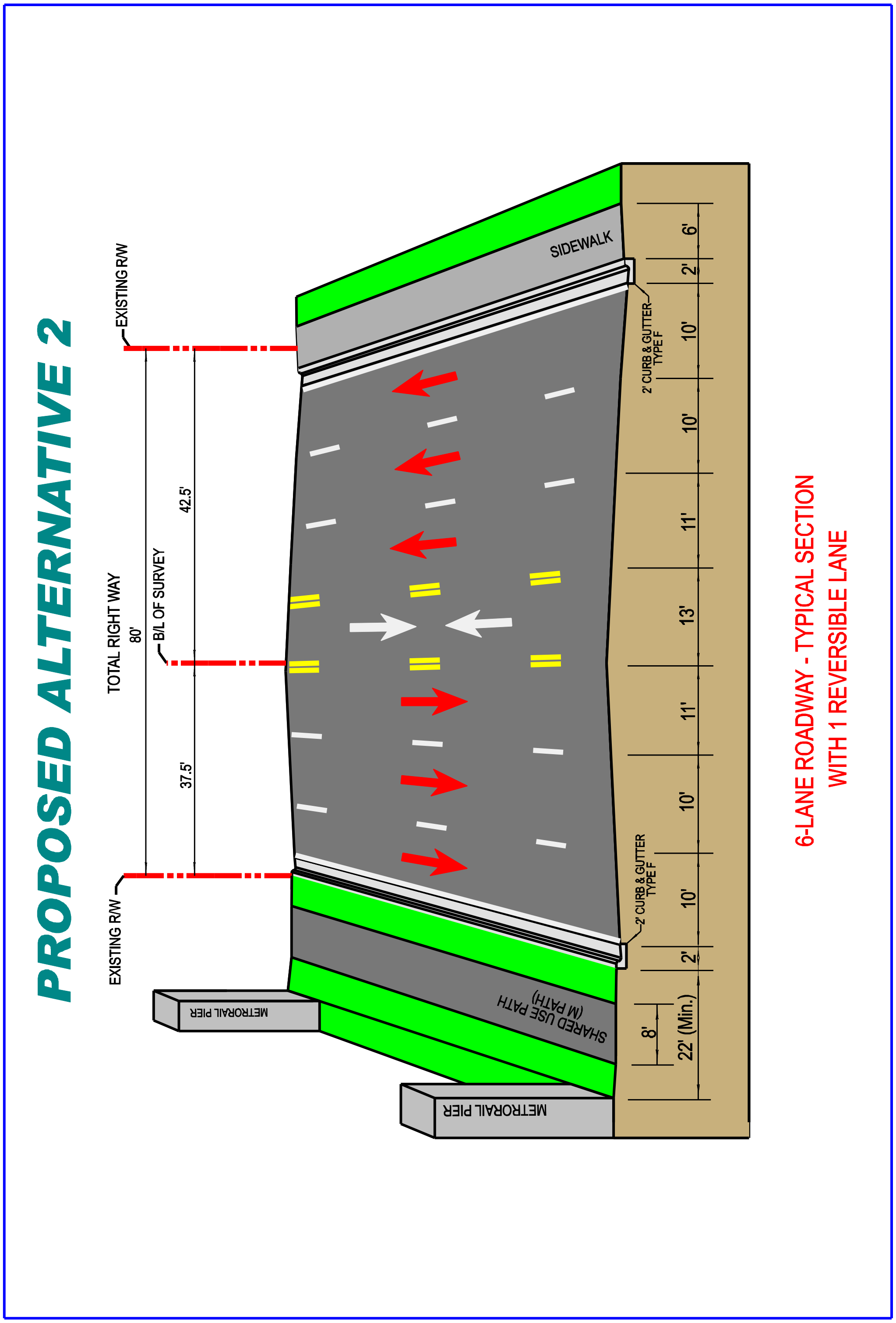


Figure 6.1 – Alternative 2 (One Reversible Flow Lane) Section

The limits for the one reversible lane along US 1 will be from SW 40th Street (Bird Road) to SW 16th Avenue.

Southbound Direction
The one reversible lane will be available for the PM peak hour traffic just after the SW 16th Avenue intersection. The section from I-95 to SW 16th Avenue will maintain the same configuration as today except that the fifteen-foot (15') wide median will become a four-foot (4') wide traffic separator with a possible barrier wall.

The one reversible lane pavement markings will end at SW 40th Street (Bird Road). However, the one lane will simply become a through lane once you cross over the SW 40th Street (Bird Road) intersection. The one lane will continue through the intersection and become what is the existing left turn lane at Douglas Road. All the existing median openings between Bird Road and Douglas Road will be eliminated and traffic will be separated by double yellow striping.

Northbound Direction
The one reversible lane will be available for the AM peak hour traffic just after the SW 40th Street (Bird Road) intersection. The one reversible lane pavement and markings will end at the SW 16th Avenue intersection. However, the one lane will simply become a through lane once you cross over the SW 16th Avenue intersection and will continue to simply merge with the northbound I-95 traffic. Two lanes will merge with the I-95 northbound lanes and the other two will continue US 1 towards Key Biscayne.

Appendix J depicts the beginning, middle and end of the reversible flow lanes.

Alternative 3 – Two Reversible Flow Lanes
This alternative (*See Figures 6.2-6.4-Alternative 3*) consists of the following elements:

- Remove the existing fifteen-foot (15') wide raised median.
- Remove the existing exclusive left turn lanes along the median.
- Construct two eleven-foot (11') wide reversible flow lanes along the median.
- Widen the southbound pavement seven feet (7') to the west to be able to accommodate the two reversible flow lanes.
- The new reversible flow lanes will be designated to flow northbound during the AM peak hour periods.
- The new reversible flow lanes will be designated to flow southbound during the PM peak hour periods.
- Left turn movement will be prohibited during the AM and PM peak hour periods.
- The new reversible flow lanes will be designated to serve as exclusive left turn lanes during the non-peak hour periods. The left turn movement will have a protected-only phasing at all times due to the inadequate left turn sight distance from the stop bar.

- Right of way acquisition will be required from the Miami-Dade County Transit. The right of way west of US 1 belongs to the Metrorail corridor.

The limits for the two reversible lanes along US 1 will be from SW 32nd Avenue to SW 16th Avenue.

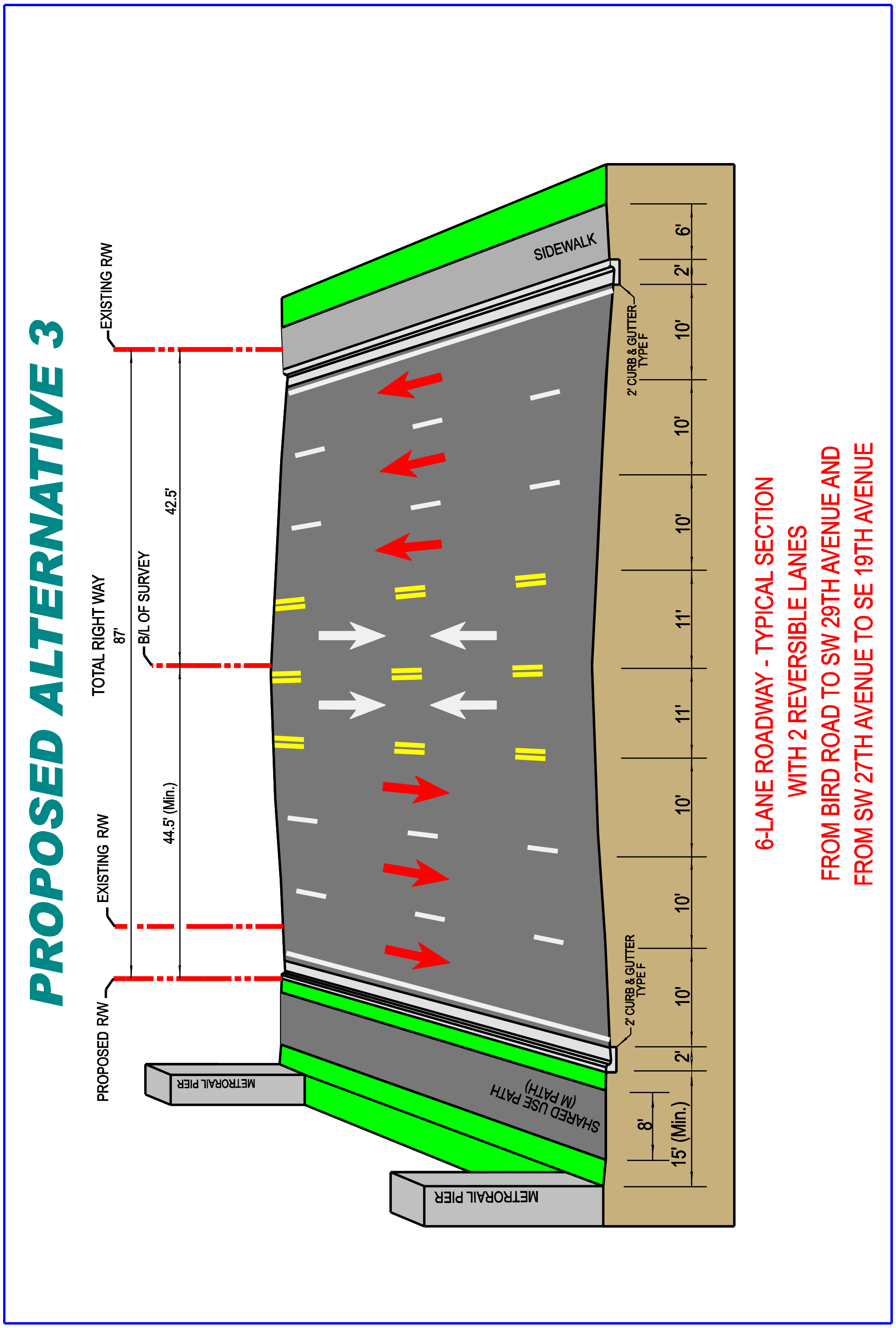


Figure 6.2 – Alternative 3 (Two Reversible Flow Lanes) Section I

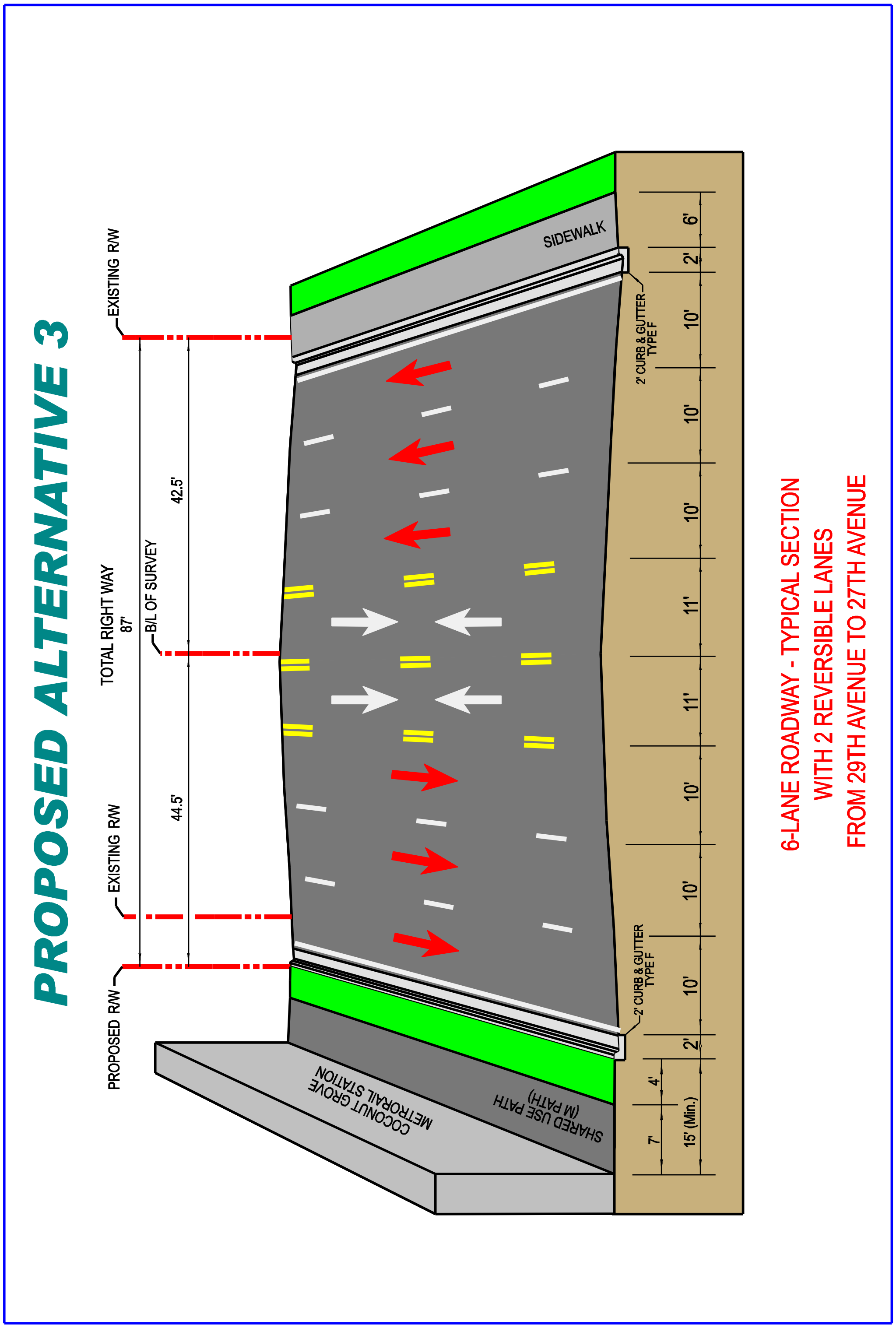


Figure 6.3 – Alternative 3 (Two Reversible Flow Lanes) Section II

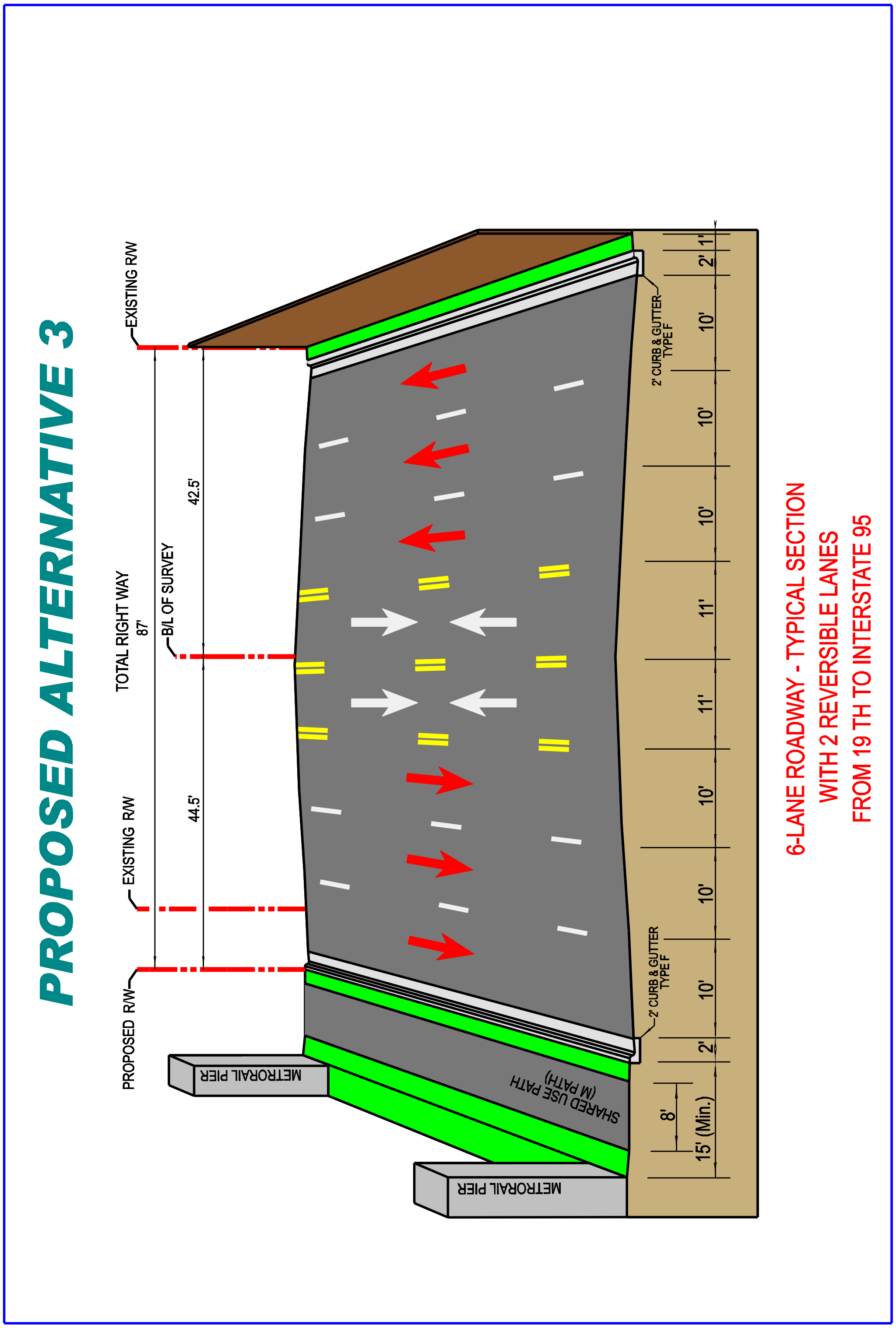


Figure 6.4 – Alternative 3 (Two Reversible Flow Lanes) Section III

Southbound Direction

In order to transition from the off ramps from I-95 to southbound US 1 to accommodate the two additional lanes, a one degree deflection will begin approximately 200 feet south of the Vizcaya Metrorail Station. The deflection will continue for 680 feet until the proposed right of way is seven (7') feet inside the Metrorail right of way. From that point going southbound there will be three through lanes and an eleven-foot (11') wide median. The two reversible lanes will be available for the PM peak hour traffic just after the SW 16th Avenue intersection.

The two reversible lanes pavement markings will end at SW 32nd Avenue. However, the two lanes will simply become through lanes once you cross over the SW 32nd Avenue intersection. The first reversible lane to be dropped will be the far left lane. This lane will become a new left turn lane at Bird Road. The second lane will continue through the intersection and become what is the existing left turn lane at Douglas Road. In order to accommodate this configuration, the existing fifteen-foot (15') wide median between Bird Road and Douglas Road will be reduced to a four-foot (4') wide traffic separator all the way to the existing left turn lane at Douglas Road. All the existing median openings between Bird Road and Douglas Road will be eliminated.

Northbound Direction

The two reversible lanes will be available for the AM peak hour traffic just after the SW 32nd Avenue intersection. The two reversible lanes pavement markings will end at SW 16th Avenue intersection. However, the two lanes will simply become through lanes once you cross over the SW 16th Avenue intersection. The first reversible lane to be dropped will be the far left lane. This lane will be extended as a through lane for approximately 1000 feet beyond the SW 16th Avenue intersection. At this point, the lane will merge with the second through lane during a transition of 770' at a 50:1 ratio. Once one of the lanes is dropped the other will continue and simply merge with the northbound I-95 traffic. Two lanes will merge with the I-95 northbound lanes and the other two will continue US 1 towards Key Biscayne.

Appendix J depicts the beginning, middle and end of the reversible flow lanes.

Alternative 4 – Two Reversible Flow Lanes with Left Turns

This alternative (*See Figure 6.5-Alternative 4*) consists of the following elements:

- Remove the existing fifteen-foot (15') wide raised median.
- Remove the existing exclusive left turn lanes along the median.
- Construct two eleven-foot (11') wide reversible flow lanes along the median.
- Widen the southbound pavement seven feet (7') to the west to be able to accommodate the two reversible flow lanes.
- During the hours of 5am-12pm (AM hours) one of the new reversible flow lanes will be designated to flow northbound. The other lane will be designated to serve as a center Two-Way Left Turn (TWLT) lane.

- During the hours of 12pm-5am (PM & evening hours) one of the new reversible flow lanes will be designated to flow southbound. The other lane will be designated to serve as a center Two-Way Left Turn (TWLT) lane.
- Right of way acquisition will be required from the Miami-Dade County Transit. The right of way west of US 1 belongs to the Metrorail corridor. The amount of right of way will be the same as Alternative #3.

The limits for the reversible lanes along US 1 will be from SW 32nd Avenue to SW 16th Avenue.

Southbound Direction

In order to transition from the off ramps from I-95 to southbound US 1 to accommodate the two additional lanes, a one degree deflection will begin approximately 200 feet south of the Vizcaya Metrorail Station. The deflection will continue for 680 feet until the proposed right of way is seven (7') feet inside the Metrorail right of way. From that point going southbound there will be three through lanes and an eleven-foot (11') wide median. The two reversible lanes will be available for the PM peak hour traffic just after the SW 16th Avenue intersection.

The two reversible lanes pavement markings will end at SW 32nd Avenue. However, one lane will simply become a through lane once you cross over the SW 32nd Avenue intersection. The first reversible lane to be dropped will be the far left lane. This lane will taper in to a four-foot (4') wide traffic separator approaching Bird Road. The second lane will continue through the intersection and become what is the existing left turn lane at Douglas Road. In order to accommodate this configuration, the existing fifteen-foot (15') wide median between Bird Road and Douglas Road will be reduced to a four-foot (4') wide traffic separator all the way to the existing left turn lane at Douglas Road. All the existing median openings between Bird Road and Douglas Road will be eliminated.

Northbound Direction

The two reversible lanes will be available for the AM peak hour traffic just after the SW 32nd Avenue intersection. The two reversible lanes pavement and markings will end at SW 16th Avenue intersection. However, one lane will simply become through lane once you cross over the SW 16th Avenue intersection. The first reversible lane to be dropped will be the far left lane as a left turn lane at SW 16th Avenue. Once one of the lanes is dropped the other will continue and simply merge with the northbound I-95 traffic. Two lanes will merge with the I-95 northbound lanes and the other two will continue US 1 towards Key Biscayne.

Appendix J depicts the beginning, middle and end of the reversible flow lanes.

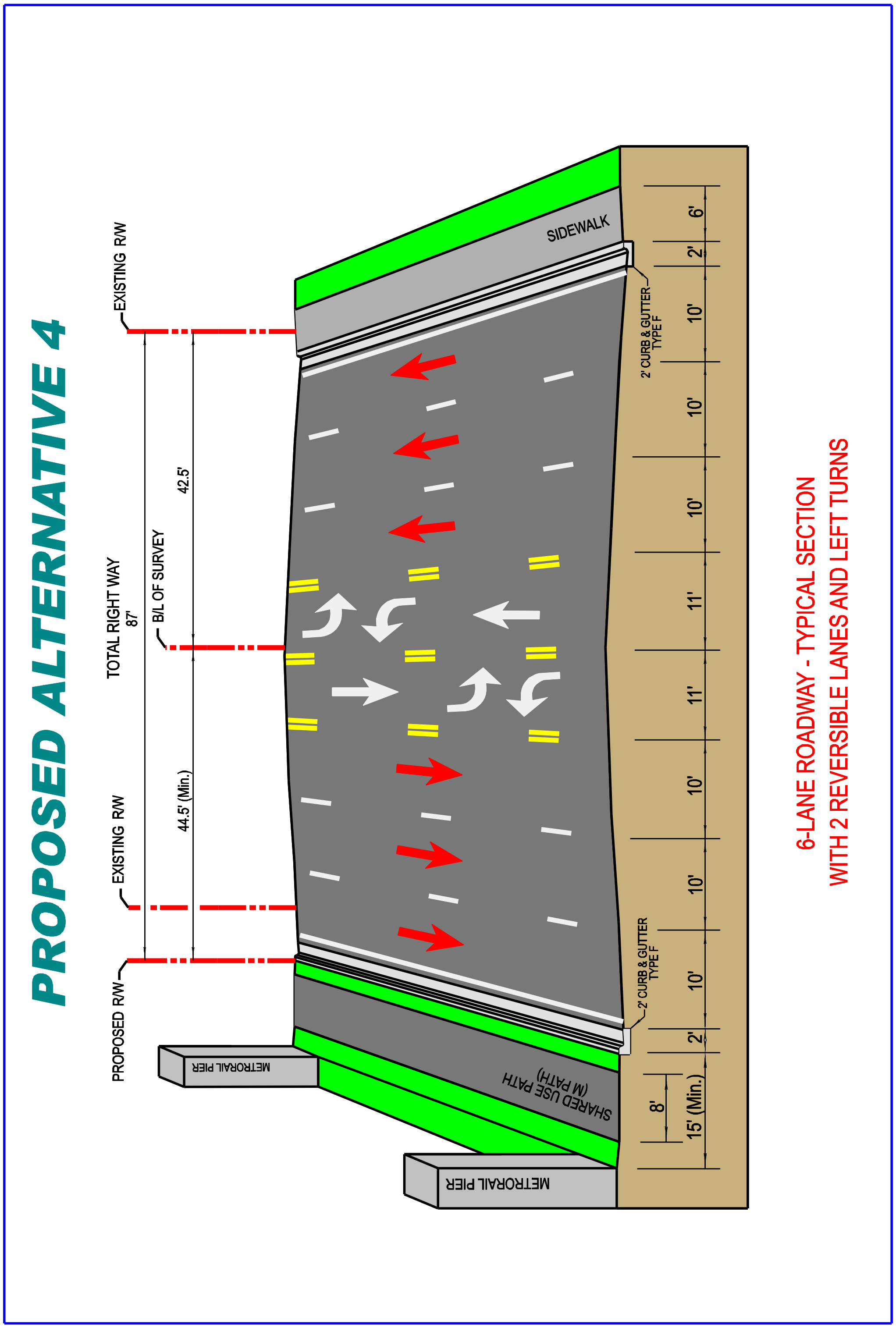


Figure 6.5 – Alternative 4 (Two Reversible Flow Lanes with Left Turns)

6.2 Other Alternatives

During the initial phase of the study, evaluation of other alternatives was conducted. However, they were not selected, as apart of this study effort. Some of these alternatives were identified and assessed for fatal flaws related to constructability, total cost and potential negative impacts to safety and operations. In general terms, some of these alternatives are described below.

Elevated Roadway

This alternative would provide for an elevated roadway along the existing median of US 1. The main advantage is that it would allow for the continuous flow of vehicles without having to stop at signalized intersections with the obvious benefits in travel time savings and expedited flow. However, there are other aspects that would considerably outweigh the benefits. For example, since this will be an elevated roadway it will have to be supported by columns along the entire length as well as all the other required structural components such as beams, girders, slabs, etc. The cost associated with structures is very high when compared with at grade surface roadway construction. For example a typical cost to build a roadway at grade is approximately $7.7 million per mile; whereas the cost of building a structure is about $55.7 million per mile.

As mentioned above in the costs figures, building an elevated structure will be very expensive, which will far outweigh the benefits, and given the very limited amount of available transportation funds, along with the many unfunded transportation improvement needs within Miami-Dade County, it does becomes a very important consideration.

Finally, providing for an elevated roadway next to the existing Metrorail (instead of the other option along the median) will be even more costly to build given the current space restrictions and the potential need for additional structural components that would be required for safety with regards to Metrorail and the existing bike path.

Express Lanes/Managed Lanes adjacent to US 1

This alternative will use the existing available Metrorail right of way on the west side of US 1 to accommodate the expressed/managed lanes. The new lane(s) would have to be built within this right of way in close proximity to the existing pedestrian/bicycle path.

One of the main advantages of this alternative is that the existing US 1 raised median can remain as well as continuing to allow left turns to be made to the intersecting roadway as it is currently done. However, one strong potential safety concern would be its close proximity to the pedestrian/bike path that currently runs underneath Metrorail. Having vehicles traveling at relatively high speeds close to a pedestrian and bicycle facility would not be a desirable condition to have. To provide for adequate safety, physical barriers would have to be constructed between the managed lane and the pedestrian/bike path, thus substantially increasing costs.

There is another potential significant negative impact that would result if this alternative were to be implemented. It pertains to the vehicular access to and from the managed lane at its terminus points with Bird Road on the south and I-95 at the north end. At grade access to and from the managed lanes would have to be done with a new roadway connection. For example High Occupancy Vehicles traveling northbound on US 1 wishing to access the managed lane would have to cross southbound US 1 traffic. In order to do this safely, a new traffic signal or an additional traffic signal indication would have to be installed, thus creating another stopping point along US 1 with additional delays and associated negative impacts to travel time. Any advantage gained in travel time by using the managed lane would be negatively offset by the amount of time having to wait in queue during the red traffic signal indication before you can access the managed lane; and in this case, the southbound US 1 traffic would also need to be stopped.

The above at grade roadway connections to and from the managed lanes can be avoided by building elevated structures, but as indicated above; their construction costs are very high as well as posing additional safety and operational concerns with entering and exiting the managed lanes at the two terminus points.

Reversible Flow Lanes with Moveable Barriers

This alternative is similar to Alternative 3 explained in *Section 6.1* above; with the exception that physical separation using moveable barriers would be provided to separate the reversible flow lanes from opposing traffic. This alternative will provide for increased vehicular` safety, but will result in significant additional costs associated with the daily mechanical moving of the barrier by maintenance vehicles. This will not only increase costs, but may pose new safety and operational concerns during servicing operations resulting from the interaction with vehicles traveling along the narrow right of way of US 1.

Reversible Flow Lanes using the inside through Lane from the Opposite Direction

This alternative proposes two reversible lanes with one being what is now the existing median, the other being one of the inside through lanes from either the northbound or southbound direction. The reversible lanes will operate northbound in the AM peak hours with the inside southbound through lane being used as a northbound reversible lane. In the PM peak hours, the inside northbound lane will be used as a southbound reversible lane. Although this alternative will allow two reversible lanes without a need to buy right of way, it has a fatal flaw that could not be resolved within the study limits.

In order for the reversible lanes to operate properly and at the same time keep the existing lane configurations at Douglas Road, a transition would have to occur between Bird Road and SW 32nd Avenue. Because these intersections are so close, a transition is not possible in this location. Implementing a transition further upstream on US 1 would eliminate a need for the reversible lanes simply because it would not include the main intersections with the highest number of traffic volumes. Forcing the transition could possibly result in head on collisions if drivers are not paying attention to the signing and it would also cause a bottleneck at the Bird Road intersection as opposed to allowing traffic to flow freely which is the purpose for the reversible lanes. This same issue with the transition would also occur between SW 16th Avenue and SW 17th Avenue. This alternative will need to have a maintenance crew and a police officer during the transition periods to be able to clear both directions before the reversible flow lanes change directions. This effort will add an additional cost after construction to be able to maintain the reversible system.

The traffic volumes currently are slowly approaching LOS E and F conditions on the direction opposite to the peak direction. Eliminating a travel lane from the non-peak direction will further deteriorate the non-peak capacity and LOS along US 1.

6.3 Build Alternatives Traffic Analysis

This section presents the analysis results for the proposed build alternatives under projected traffic conditions. The alternatives previously described represent different approaches to improving the operations along this section of the US 1 corridor. To evaluate the effectiveness of these alternatives, they were analyzed using the Synchro and Simtraffic software to compute the roadway LOS. A LOS analysis of the proposed traffic on Alternative 2, 3 and 4 was completed. The purpose of this analysis is to combine the design traffic estimates with the physical roadway characteristics of the planning alternatives to determine the projected LOS. This analysis also helps to define the design details, such as intersection layouts and typical sections.

The following tables show the LOS for the proposed roadway Alternatives 2, 3 and 4. All the tables show the resulting LOS for the design year 2030. *Appendix I* depicts the Synchro outputs operational analysis results.

Table 6.1
2030 Proposed Conditions LOS US 1
Arterial Roadway

Roadway Segment	Alternative	Direction	Average Travel Speed (mph) AM	Average Travel Speed (mph) PM	LOS AM	LOS PM
1) SW 37th Avenue to SW 40th Street	# 2	NB	2.8	16.8	F	E
		SB	n/a	n/a	n/a	n/a
	# 3	NB	2.8	8.6	F	F
		SB	n/a	n/a	n/a	n/a
	# 4	NB	3.7	9.1	F	F
		SB	n/a	n/a	n/a	n/a
2) SW 40th Street to SW 32nd Avenue	# 2	NB	23.7	22.4	C	C
		SB	3.9	11.9	F	F
	# 3	NB	11.9	21.3	F	D
		SB	10.7	5.2	F	F
	# 4	NB	15.4	20.8	E	D
		SB	10.1	5.4	F	F
3) SW 32nd Avenue to SW 27th Avenue	# 2	NB	32.5	33.3	B	B
		SB	26.4	35.8	C	A
	# 3	NB	33.6	27.1	B	C
		SB	34.6	29.6	B	B
	# 4	NB	28.4	33.3	B	B
		SB	34.2	22.5	B	C
4) SW 27th Avenue to SW 22nd Avenue	# 2	NB	20.0	38.8	D	A
		SB	30.1	26.1	B	C
	# 3	NB	32.5	34.2	B	B
		SB	30.9	29.5	B	B
	# 4	NB	26.5	37.1	C	A
		SB	22.2	25.3	C	C
5) SW 22nd Avenue to SW 17th Avenue	# 2	NB	20.9	33.1	D	B
		SB	27.1	24.3	C	C
	# 3	NB	20.6	26.0	D	C
		SB	22.0	32.3	D	B
	# 4	NB	13.4	25.9	E	C
		SB	24.0	37.7	C	A
6) SW 17th Avenue to SW 16th Avenue	# 2	NB	21.8	24.0	D	C
		SB	25.9	15.2	C	E
	# 3	NB	25.8	19.5	C	D
		SB	10.9	14.8	F	E
	# 4	NB	17.7	26.5	D	C
		SB	11.6	8.8	F	F
7) SW 16th Avenue to Interstate 95	# 2	NB	n/a	n/a	n/a	n/a
		SB	25.1	12.7	C	F
	# 3	NB	n/a	n/a	n/a	n/a
		SB	28.3	13.5	B	E
	# 4	NB	n/a	n/a	n/a	n/a
		SB	23	10.3	C	F
Overall within the Study Limits	# 2	NB	12.4	26.5	F	C
		SB	15.6	13.6	E	E
	# 3	NB	12.4	19.9	F	D
		SB	21.1	13.0	D	F
	# 4	NB	13.5	22.0	E	D
		SB	20.1	11.5	D	F

As *Table 6.1* indicates, in general Alternative 2 provides better LOS when compared to Alternative 3 and 4.

Table 6.2
2030 Proposed Conditions LOS US 1
Signalized Intersections

Intersection	Alternative	Delay (sec)		LOS	
		AM	PM	AM	PM
1) SW 37th Avenue	# 2	73.8	141.1	E	F
	# 3	70.3	121.2	E	F
	# 4	55.1	124.8	E	F
2) SW 40th Street	# 2	340.3	101.2	F	F
	# 3	288.1	144.4	F	F
	# 4	294	133.2	F	F
3) SW 32nd Avenue	# 2	22.7	21.3	C	C
	# 3	47	26	D	C
	# 4	35.7	40.9	D	D
4) SW 27th Avenue	# 2	21.9	40.5	C	D
	# 3	18	27.6	B	C
	# 4	40.6	49.7	D	D
5) SW 22nd Avenue	# 2	49.5	23.5	D	C
	# 3	25.3	15.1	C	B
	# 4	37.8	14.9	D	B
6) SW 17th Avenue	# 2	54.3	47.3	D	D
	# 3	50.2	39.8	D	D
	# 4	113.4	80.6	F	F
7) SW 16th Avenue	# 2	26.9	112.4	C	F
	# 3	48.9	95.9	D	F
	# 4	65.2	130.5	E	F

As *Table 6.2* indicates, the 2030 design year signalized intersection analysis shows overall delay improvements to six (6) of the seven (7) analyzed intersections. Two (2) of the intersections analyzed (3 and 7) under Alternative 2, show a lower delay period than Alternatives 3 and 4. Five (5) of the intersections analyzed (1, 2, 4, 5 and 6) show a lower delay period under Alternative 3.

The above tables present the overall arterial LOS, average travel speed and intersection LOS for the different alternatives and analysis years. The results indicate that all the alternatives provide an improvement in overall arterial average travel speed and LOS over those obtained under the No-Build conditions alternative (Alternative 1). The results also indicate that the LOS obtained under Alternatives 2 and 3 are generally comparable.

The north/south through movements are the movements that control the LOS along this section of US 1. The tables above concentrate on the total LOS as a whole but do not demonstrate the specific results of the critical traffic patterns that the north/south movements play along this section of roadway.

As the Synchro Outputs results indicates (*See Appendix I, Table 6.3 & Table 6.4*), the LOS for the northbound approaches during the AM peak period and the southbound approaches during the PM peak period improves significantly, for the most part, across the study limits. Alternatives 2 and 3 show an improvement along the northbound direction for more than three (3) intersections after comparing them with Alternative 1 and 4. During the southbound PM peak period Alternative 2 shows an improvement in the LOS for five (5) out of the seven (7) intersections analyzed. In general Alternatives 3 and 4 does not provide as much improvement as Alternative 2.

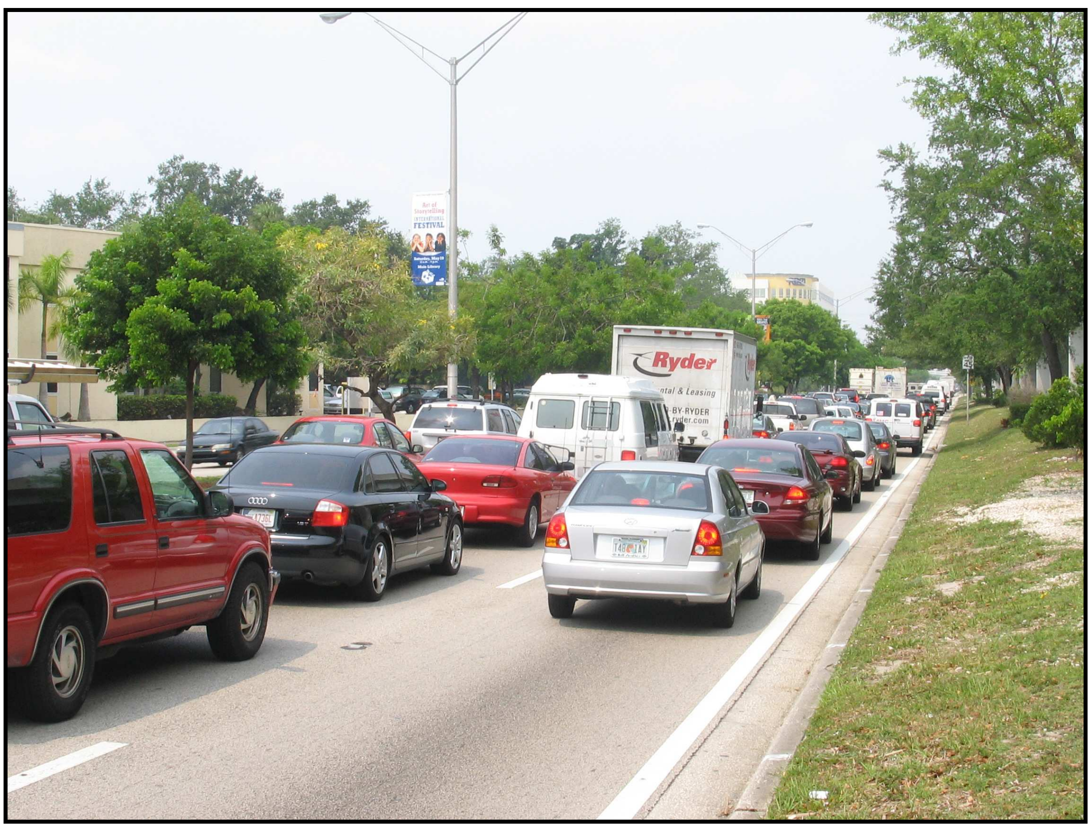


Table 6.3
2030 LOS North/South Approaches
Signalized Intersections

Intersection	Alternative	AM		PM	
		NB	SB	NB	SB
1) SW 37th Avenue	# 1	C	C	E	F
	# 2	F	D	C	F
	# 3	E	D	D	F
	# 4	C	C	D	F
2) SW 40th Street	# 1	F	F	E	F
	# 2	F	F	C	E
	# 3	F	E	E	F
	# 4	F	E	E	F
3) SW 32nd Avenue	# 1	E	A	D	F
	# 2	A	C	B	A
	# 3	E	A	B	B
	# 4	C	A	C	D
4) SW 27th Avenue	# 1	F	A	A	F
	# 2	B	B	A	C
	# 3	A	B	C	B
	# 4	B	C	A	C
5) SW 22nd Avenue	# 1	F	C	B	F
	# 2	D	A	A	C
	# 3	A	C	B	B
	# 4	C	B	A	A
6) SW 17th Avenue	# 1	F	D	A	F
	# 2	C	A	B	C
	# 3	C	E	C	C
	# 4	F	E	C	F
7) SW 16th Avenue	# 1	F	F	A	F
	# 2	B	D	A	F
	# 3	A	F	A	F
	# 4	C	F	A	F

Based on the results from *Table 6.4* it seems that there is not enough demand differentials between the north/south movements to justify two reversible lanes (Alternative 3). One reversible lane provides the needed capacity (v/c = 1.0) within the study limits. The only way that Alternative 3 could work is if the study limits are extended beyond SW 40th Street (Bird Road). It takes approximately two intersections for a transition before two reversible lanes can be fully operational.

Table 6.4 2030 V/C North/South Approaches - Signalized Intersections					
Intersection	**Alternative**	**AM**		**PM**	
		NB	**SB**	**NB**	**SB**
1) South Of SW 37th Avenue	# 1	0.99	1.04	n/a	n/a
	# 2	1.12	1.09	n/a	n/a
	# 3	1.09	1.07	n/a	n/a
	# 4	0.99	1.03	n/a	n/a
2) SW 37th Avenue to SW 40th Street	# 1	1.59	1.48	1.07	1.36
	# 2	1.61	1.49	1.00	1.48
	# 3	1.61	1.07	1.05	1.37
	# 4	1.44	1.06	1.59	1.39
3) SW 40th Street to SW 32nd Avenue	# 1	1.08	0.84	1.05	1.63
	# 2	0.88	0.86	0.89	1.07
	# 3	1.05	0.82	1.10	1.35
	# 4	1.04	0.79	1.08	1.33
4) SW 32nd Avenue to SW 27th Avenue	# 1	1.18	0.95	1.05	1.36
	# 2	0.96	0.88	0.91	0.98
	# 3	0.84	0.95	1.02	0.90
	# 4	0.93	0.97	1.00	1.05
5) SW 27th Avenue to SW 22nd Avenue	# 1	1.38	0.93	0.90	1.22
	# 2	1.03	0.85	0.91	1.03
	# 3	0.94	0.92	0.95	0.92
	# 4	0.98	0.87	0.80	0.99
6) SW 22nd Avenue to SW 17th Avenue	# 1	1.34	0.99	0.83	1.14
	# 2	1.04	0.87	0.80	1.05
	# 3	1.01	0.99	0.82	0.87
	# 4	1.12	0.94	0.78	0.87
7) SW 17th Avenue to SW 16th Avenue	# 1	1.13	1.05	1.32	0.94
	# 2	0.93	1.02	1.00	0.90
	# 3	0.76	0.97	0.92	0.95
	# 4	0.9	1.04	1.05	0.98
8) SW 16th Avenue to Interstate 95	# 1	n/a	n/a	1.31	0.77
	# 2	n/a	n/a	1.26	0.73
	# 3	n/a	n/a	1.23	0.78
	# 4	n/a	n/a	1.36	0.78

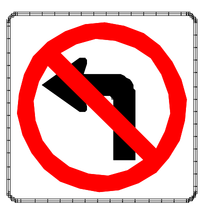
6.4 Lane Use Signalization

In order to reverse traffic flow along a stretch of roadway, proper signing and pavement markings are important to convey the intended message to drivers. However using signing and markings alone are only useful when the following apply:

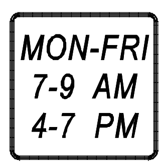
- Only one lane is being reversed
- There are no unusual or complex operations in the reversible lane length
- An engineering study validates that the use of signs alone will result in an acceptable level of safety and efficiency

If conditions of a reversible lane system do not meet the above criteria or the circumstances for the drivers are unpredictable, then lane-use control signals are needed. For the system being proposed in this study; lane-use control signals will be the primary devices for managing traffic during peak hours.

According to the Manual on Uniform Traffic Control Devices (MUTCD), lane-use control signals are typically set every quarter mile or 1,320 feet along the travel way. The signal housing is placed such that the symbol is over the center of each lane that is to be controlled. For reversible lanes, the signals for the opposite direction can be mounted back to back. Supplementary signs are sometimes used to explain their meaning and intent such as turning prohibition. For the proposed reversible lane system, we anticipate that there will be 8 sets of signals which will result in a total of 128 lane signals for Alternative #3 and 112 lane signals for Alternative #2. There will also be 16 - No Left Turn Signs (R3-2) and 16 - time restriction signs (R10-20a) for both alternatives. Begin Reverse Lane and End Reverse Lane signs (R3-9h) should also be installed.



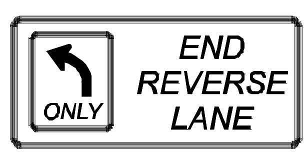
(R3-2)



(R10-20a)

(R3-9h)

(R3-9g)



(R3-9i)

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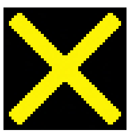
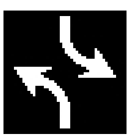
Signals which operate for both the use and non-use of all lanes in a reversible system will be used to inform drivers as to whether or not a lane is available for through traffic or left turns. The lane-use signals function similar to a three ball traffic signal. A red "X" will inform drivers that the lane is closed for use in that direction of travel. A yellow "X" will inform drivers that they will soon lose the privilege of the lane and a green arrow informs drivers that the lane is available for through traffic. A two-way turn symbol may also be used to inform drivers that a lane is available for both directions of travel to execute left turns. Below are examples of signal phases.

Red "X" – Driver may not use lane



Yellow "X" – Driver will soon lose privilege of lane

Green arrow – Drivers may use lane for going straight



"Two-Way" Turn – Drivers may use lanes for left turns only and must watch out for oncoming drivers using the lane for the same purpose.

6.5 Impacts of Left Turns at the Intersections

During the operation of the reversible lanes (Alternatives 2 and 3), left turns from US 1 will be restricted. These vehicles wanting to access these crosstreets will have to use a detour route to allow traffic along US 1 to access the westbound and eastbound roads during peak traffic hours (*See Appendix K*).

The following describes the alternative routes that drivers can take in order to access the roadways at the signalized intersections within the study limits:

Westbound SW 32nd Avenue (Option #1): Vehicles traveling northbound on US 1 would take a right turn onto Bird Road and continue to SW 32nd Avenue where they would then make a left turn and continue through the intersection.

(Option #2): Vehicles traveling northbound on US 1 would take a right turn onto W. Trade Avenue and continue to SW 32nd Avenue where they would then make a left turn and continue through the intersection.

Eastbound SW 32nd Avenue: Vehicles traveling southbound on US 1 would take a right turn onto SW 32nd Avenue and continue to SW 28th Street where they would take a left turn and then another left turn onto SW 33rd Court. Continue to SW 29th Street and make a left turn and then continue to SW 32nd Avenue where the vehicle would take a right turn and continue through the intersection.

Westbound SW 27th Avenue (Option #1): Vehicles traveling northbound on US 1 would take a right turn onto SW 26th Avenue, then another right turn onto SW 28th Street and continue to SW 27th Avenue where the vehicle would then take a right turn and continue through the intersection.

(Option #2): Vehicles traveling northbound on US 1 would take a right turn onto SW 28th Terrace and continue to SW 27th Avenue where the vehicle would then take a left turn and continue through the intersection.

Eastbound SW 27th Avenue (Option #1): Vehicles traveling southbound on US 1 would take a right turn onto SW 27th Avenue and make a u-turn at the first intersection.

(Option #2): Vehicles traveling southbound on US 1 would take a right turn onto SW 24th Avenue and make the first left turn onto SW 28th Lane. Vehicles would continue to SW 27th Avenue where they would make a left turn and continue through the intersection.

Westbound SW 22nd Avenue: Vehicles traveling northbound on US 1 would take a right turn onto SW 23rd Avenue and first left turn onto SW 27th Terrace. Vehicles would continue to SW 22nd Avenue where they would make a left turn and continue through the intersection.

Eastbound SW 22nd Avenue: Vehicles traveling southbound on US 1 would take a right turn onto SW 22nd Avenue and a make a u-turn at the first intersection and then continue through the intersection.

Westbound SW 17th Avenue and SW 16th Avenue: Vehicles traveling northbound on US 1 would take a right turn onto SW 19th Avenue and then the first left turn onto Wa-Kee-Na Drive. Vehicles would continue all the way to SW 17th Avenue and make a left turn and continue through the intersection. For vehicles wanting to access westbound SW 16th Avenue, after coming through the SW 17th Avenue intersection vehicles would make the first right turn onto SW 24 Terrace and continue north to SW 16th Avenue.

Eastbound SW 17th Avenue: Vehicles traveling southbound on US 1 would take a right turn onto SW 16th Avenue and make the first left turn onto SW 24th Terrace. Vehicles would continue to SW 17th Avenue and make a left turn to continue through the intersection.

All the vehicles using these detour routes will significantly add volumes to the intersecting roadways in the east/west direction. The US 1 northbound and southbound directions take most of the green time leaving only the bare minimum to the crosstreets. The crosstreets are currently being impacted by long delays especially vehicles turning left to US 1.

6.6 Construction and Engineering Costs

Tables 6.5-6.6 show the ranges in construction costs estimated for all three alternatives. These are conceptual, in 2007 dollars, and do not include right of way acquisition costs.

Table 6.5
Alternative 2
Preliminary Construction Estimate

Major Pay Items	Quantity	Unit	Unit Price	Estimate
Earthwork				
Clear and Grubing	4.73	ac	$22,300	$105,479
Excavation Regular	15,253.00	cy	$12	$183,036
Excavation Borrow	15,253.00	cy	$23	$350,819
Median Removal	22,880.00	sy	$25	$572,000
Roadway Widening				
Widening to the median	2.60	mi	$877,300	$2,280,980
Utilities Relocations (10 Agencies)	1.00	ea	$1,000,000	$1,000,000
Erosion Control	2.60	mi	$31,540	$82,004
Drainage	2.60	mi	$111,900	$290,940
Signing	2.60	mi	$350,400	$911,040
Lighting	2.60	mi	$285,900	$743,340
Signalization	1.00	ea	$1,105,300	$1,105,300
New Mast Arms	3.00	ea		
Interconnections of Signals	7,000.00	lf		
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				**$13,496,140**

Table 6.6 Alternative 3 and 4 Preliminary Construction Estimate				
Major Pay Items	**Quantity**	**Unit**	**Unit Price**	**Estimate**
Earthwork				
Clear and Grubing	6.93	ac	$22,300	$154,539
Excavation Regular	22,372.00	cy	$12	$268,464
Excavation Borrow	22,372.00	cy	$23	$514,556
Median Removal	22,880.00	sy	$25	$572,000
Roadway Widening				
Widening to the median	2.60	mi	$1,100,000	$2,860,000
Utilities Relocations (10 Agencies)	1.00	ea	$1,000,000	$1,000,000
Retaining Walls	1,350.00	cy	$830	$1,120,500
Shoulder				
Curb and Gutter	13,728.00	lf	$28	$377,520
Sodding	7,627.00	sy	$4	$30,508
Erosion Control	2.60	mi	$31,540	$82,004
Drainage	2.60	mi	$182,500	$474,500
Signing	2.60	mi	$350,400	$911,040
Lighting	2.60	mi	$285,900	$743,340
Signalization	1.00	ea	$2,200,000	$2,200,000
New Mast Arms	7.00	ea		
Interconnections of Signals	13,800.00	lf		
Traffic Monitoring Sites	3.00	ea		
Construction Cost				**$11,308,971**
Landscape	2%			$226,179
Maintenance of Traffic	15%			$1,696,346
Mobilization	15%			$1,696,346
Contingency	15%			$1,696,346
CEI	15%			$1,696,346
Design	15%			$1,696,346
Total Estimated Construction Cost				**$20,016,879**

6.7 Challenges to the Project's Implementation

Implementing a project of this magnitude will face many challenges such:

- 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.

The above concerns and explanations need to be properly conveyed to the elected officials. Elected officials need to be convinced that the costs associated with implementing this project are a wise investment in addressing congestion throughout the corridor and improvements such as this one are very much in line with federal and state initiatives as well as those of the Miami-Dade MPO.

The explanations offered above will also need to be conveyed to the public agencies indicated above. One important aspect of this project is that it follows FDOT and MPO initiatives as outlined on their respective long range transportation plans. One particular challenge will be to convey the above indicated benefits and explanations to the City of Miami, since the residents along the corridor live within the City. The City will obviously be sensitive to their concerns.

Finally, it should be understood that there will be delays and higher levels of noise during construction as well as potential changes in the normal travel patterns due to temporary detours. It should be explained to the residents, the general public, elected officials and governmental agencies that there will always be inconveniences during construction; however, these will be reduced to the maximum extent practical through adequate consultation and exercising extra care when developing maintenance of traffic plans. One important aspect that needs to be conveyed is that all the difficulties experienced during construction will be offset once the project is completed and travel time savings begin to accrue.

Other Projects in the Area

The FDOT currently has two projects within the vicinity of the study limits. One project is under a planning study and the other one is under construction. The planning study is called "Refuge Lanes Study". The purpose of the study is to identify sites and develop conceptual designs for a series of incident management pullouts along US 1 from I-95 to SW 104th Street.

The project under construction is an Intelligent Transportation System (ITS) implementation. The purpose of this project is to provide expansion of the Sun Guide Advanced Traffic Management System between SW 17th Avenue and SW 112th Street. This project includes the installation of fiber optic lines, seventeen (17) cameras and four Variable Messaging Signs (VMS).

VII. 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:

4. Improve roadway operations
5. Increase capacity during the peak periods to mitigate existing traffic congestion
6. 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.

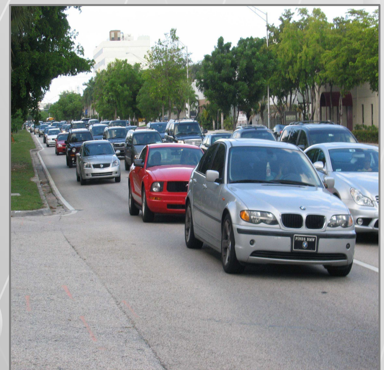
- Lower Total Construction Cost
  - → Alternative 2 will save approximately $6.5 million on construction costs versus Alternative 3.

- 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.



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