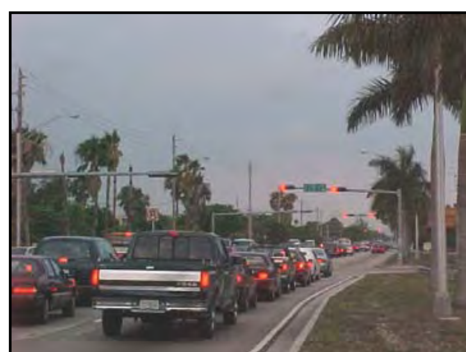
Miami-Dade MPO

Metropolitan Planning Organization

Congestion Management System (CMS) Update

Review and Evaluation of Potential Congested Corridors



Miami-Dade MPO Metropolitan Planning Organization

November 2004

Kimley-Horn and Associates, Inc.

CONGESTION MANAGEMENT SYSTEM (CMS) UPDATE

REVIEW AND EVALUATION OF POTENTIAL CONGESTED CORRIDORS

Prepared For:

MIAMI-DADE COUNTY MPO

Prepared By:

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PURPOSE OF THE STUDY

The objective of this study is to update the Congestion Management System / Mobility Management Program (CMS/MMP) that was developed for Miami-Dade County in 1996. To effectively update the program, it is necessary to develop an accurate and concise methodology based on previous work to analyze the current congested corridors within Miami-Dade County.

I-95 Crossing the Miami River in Downtown Miami

The steps included in this study utilize current available data on the County's roadways and project the current demand into the future to determine locations where traffic congestion is impacting the mobility of goods and people. The methodology implemented in the update of the CMS/MMP includes the following steps.

- A literature review gathered nationwide information on projects completed in other cities to mitigate congestion considering methodologies used, CMS components, and strategies identified. In addition, federal, state, and local regulations for CMS procedures are examined.
- Modifications to the current CMS/MMP are recommended to enhance the implementation of CMS strategies developed under this process.
- Data needed to analyze where congestion problems exist in the County are identified and collected.
- The data collected are evaluated to determine congested corridors within the County.
- Strategies are identified to improve mobility for two selected congested corridors.
- Specific projects are identified to include in the Transportation Improvement Program (TIP) to address mobility along the most severely congested corridors.

BACKGROUND

The initial requirement to develop a Congestion Management System (CMS) came about as a result of the federal Intermodal Surface Transportation Efficiency Act (ISTEA) of 1991. ISTEA required that all urban areas with a population over 200,000 (referred to as Transportation Management Areas or TMAs) develop a CMS. ISTEA also required all states to develop a CMS. While non-TMAs were not required to develop a CMS, they were required to consider congestion management strategies developed by the state CMS during their planning process. Subsequent Florida Statutes were passed requiring that all MPOs develop a CMS (including those that were not TMAs) and consider the results during the development of their individual Long Range Transportation Plan (LRTP) and Transportation Improvement Program (TIP).

In January 1998, the federal Transportation Equity Act for the 21st Century (TEA-21) was passed. TEA-21 modified some of the requirements identified in ISTEA, including the elimination of the requirement that non-TMA MPOs must consider the results of the state CMS. TEA-21 also removed the requirement that all states must develop and implement their own CMS. However, Florida Statutes have continued to require all MPOs to have a CMS. The Florida requirements are identified in Title XXVI, Chapter 339.177. Additional requirements for each MPO to apply its CMS are provided in Title XVI, Chapter 339.175. Florida Statutes also require that each MPO must prepare and consider the results of a CMS for the purpose of making recommendations for transportation improvements.

Federal Regulations

Federal CMS regulations provide insight to the rationale behind the development of the current CMS. The federal regulations for the development and implementation of CMS plans were provided in 23 Code of Federal Regulations (CFR) Parts 599 and 626, Management and Monitoring Systems, Subpart E – Traffic Congestion Management System, published December 1, 1993. Federal regulations define a CMS as a systematic process that provides information on transportation system performance and alternative strategies to alleviate congestion and enhance the mobility of persons and goods.

The general requirements of a CMS are described below:

- Each state shall develop, establish, and implement, on a continuing basis, a CMS resulting in the identification and implementation of strategies that provide the most efficient use of existing and future transportation facilities in all areas of a state, including metropolitan and non-metropolitan areas, where congestion is occurring or is expected to occur.
- In both metropolitan and non-metropolitan areas, consideration shall be given to strategies that reduce single-occupant-vehicle (SOV) travel and improve existing transportation system efficiency. Where the addition of general purpose lanes is determined to be an appropriate strategy, explicit consideration shall be given to the incorporation of appropriate features into the SOV project to facilitate future demand management and operational improvement strategies to maintain the functional integrity of those lanes.
- All transportation corridors or facilities with existing or potential recurring congestion shall be identified and an assessment of the level of the current or potential congestion shall be made on a continuing basis.
- In all TMAs, the CMS shall be part of the metropolitan planning process.
- In a TMA designated as non-attainment for carbon monoxide and/or ozone, the CMS shall provide an appropriate analysis of all reasonable (including multimodal) travel demand reduction and operational management strategies for the corridor in which a project that will result in a significant increase in capacity for SOVs (adding general purpose lanes to an existing highway or constructing a new highway) is proposed. If the analysis demonstrates that travel demand reduction and operational management strategies cannot fully satisfy the need for additional capacity in the corridor and additional SOV capacity is warranted, then the CMS shall identify all reasonable strategies to manage the SOV facility effectively (or to facilitate its management in the future). Other travel demand reduction and operational management strategies appropriate for the corridor, but not appropriate for incorporation into the SOV facility itself shall also be identified through the CMS. All identified reasonable travel demand reduction and operational management strategies shall be incorporated into the SOV project or committed to by the state and MPO for implementation.

The federal regulations define the CMS components as:

- **Performance measures.** Parameters shall be defined that will provide a measure of the extent of congestion and permit the evaluation of the effectiveness of congestion reduction and mobility enhancement strategies for the movement of people and goods.
- **Data collection and system monitoring.** A continuous program of data collection and system monitoring shall be established to determine and monitor the duration and magnitude of congestion and to evaluate the effectiveness of implemented actions.
- **Identification and evaluation of proposed strategies.** The anticipated performance and expected benefits of traditional and nontraditional strategies that will contribute to the more efficient use of existing and future transportation systems shall be identified and evaluated based on the established performance measures. Strategies, or combinations of strategies, to be appropriately considered include, but are not limited to:
  - Transportation demand management measures, such as carpooling, vanpooling, alternative work hours, telecommuting, and parking management
  - Traffic operational improvements, such as intersection and roadway widening, channelization, traffic surveillance and control systems, motorist information systems, ramp metering, traffic control centers, and computerized signal systems
  - Measures to encourage high occupancy vehicle (HOV) use, such as HOV lanes, HOV ramp bypass lanes, guaranteed ride home programs, and employer trip reduction ordinances
  - Public transit capital improvements, such as exclusive rights-of-way (rail, busways, bus lanes), bus bypass ramps, park and ride and mode change facilities, and paratransit services
  - Public transit operational improvements, such as service enhancement or expansion, traffic signal preemption, fare reductions, and transit information systems
  - Measures to encourage the use of nontraditional modes such as bicycle facilities, pedestrian facilities, and ferry service
  - Congestion pricing
  - Growth management and activity center strategies
  - Access management techniques
  - Incident management
  - Intelligent vehicle highway system and advanced public transportation system technology
  - The addition of general purpose lanes

- **Implementation of strategies.** For each strategy (or combination of strategies) proposed for implementation, an implementation schedule, implementation responsibilities, and possible funding sources shall be identified.
- **Evaluation of the effectiveness of implemented strategies.** A process for periodic assessment of the effectiveness of implemented strategies, in terms of the area's established performance measures, shall be implemented. The results of this evaluation shall be provided to decision makers to provide guidance on selection of effective strategies for future implementation.

These regulations have been presented in this document to help explain the rationale behind the current Miami-Dade County MPO CMS.

State Regulations

Relevant portions of the applicable Florida Statutes are provided below. These requirements should guide the development and application of the Miami-Dade County CMS.

Florida Statutes, Title XXVI, Chapter 339.175 (2002), Metropolitan Planning Organization – This statute requires each MPO to prepare a CMS for the metropolitan area. The purpose of the CMS is to provide recommendations to the Department of Transportation and local governmental entities regarding transportation plans and programs.

Florida Statutes, Title XXVI, Chapter 339.177 (2002), Transportation Management Programs – This statute requires each metropolitan planning organization within the state to develop and implement a CMS. The CMS is to be developed and implemented to provide the information needed to make informed decisions regarding the proper allocation of transportation resources. The CMS must use appropriate data gathered at the state or local level to define problems, identify needs, analyze alternatives, and measure effectiveness.

Local Regulations

Resolution MPO #33-93 (7/15/93) – The Miami-Dade County Congestion Management Plan was approved by the local MPO Governing Board.

Resolution TPC # 26-94 (7/11/94) – The Transportation Planning Council (TPC) approved the creation of the Congestion Management System Steering Committee, a sub-committee of the Transportation Planning Technical Advisory Committee (TPTAC). Other stakeholders involved with the TPTAC include:

- Miami-Dade County Planning Department
- Miami-Dade County Development Impact Committee
- Miami-Dade County Public Works Department
- Metro-Dade Transit Agency
- Florida DOT Planning Division
- Florida DOT Public Transit Office
- Regional Commuter Assistance Program (RCAP)
- Department of Environmental Resources Management (DERM)
- MPO Pedestrian/Bicycle Coordinator
- MPO Congestion Management Coordinator
- Citizens Transportation Advisory Committee
- City of Miami
- The general public

LITERATURE REVIEW

As part of the update to the Miami-Dade County CMS/MMP that was developed in 1996, a literature review was conducted of other CMS/MMP studies completed in Florida and metropolitan planning areas nationwide. Based on the extensive review of CMS programs, several areas were selected for a more in-depth examination including three from the State of Florida and two from out of the state. Two matrices including performance measures (shown in Table 1) and management strategies (shown in Table 2) were developed for each of the selected CMS programs. In addition to the information provided in the matrix, current CMS procedures, plans, and programs were reviewed for these locations and are summarized next.

Table 1. Performance Measures

Transportation Mode	Category	Subcategory	Broward County CMS	Indian River County CMS	Palm Beach County CMS	Atlanta Regional CMS	St. Louis Regional CMS	Total
Highways	Congestion	V/C Ratios > 1	X	X	X	X	X	5
		LOS	X	X	X	X	X	5
		Peak Season, Hour & Direction LOS			X		X	2
		ART_PLAN	X					1
		Travel Times	X	X			X	3
		Number of Incidents		X			X	2
		Intersection Critical Sum			X			1
		Annual Average Vehicle Occupancy			X			1
		Roadway User Survey			X			1
		% Congested Miles by Facility Type			X	X		2
		Annual Estimate of Congested Periods			X	X		2
		Average Duration				X		1
		Maximum Duration				X		1
		Capacity	X	X	X	X	X	5
		Functional Classification				X	X	2
		Activity Center Density Index				X		1
		TDM Measures					X	1
		Vehicle Density	X			X	X	3
		Person Throughput					X	1
	System Efficiency	ADT	X	X	X	X	X	5
		VMT		X		X	X	3
		VHT		X				1
		Crash Rates		X		X		2

Table 1. Performance Measures (cont.)

Transportation Mode	Category	Subcategory	Broward County CMS	Indian River County CMS	Palm Beach County CMS	Atlanta Regional CMS	St. Louis Regional CMS	Total
Transit	**Mobility**	Load Factor	X		X	X	X	4
		On-Time Performance			X	X	X	3
		Travel Rates	X	X		X	X	4
		Congested links	X	X	X	X	X	5
	Accessibility	Number of Bike/Ped. Miles		X				1
		Service Areas		X		X		2
		Transit Route Miles		X				1
		Reserved ROW for Future Mass Transit		X			X	2
		Monitor Park-and-Ride Lots					X	1
		Intermodal Connectivity				X		1
Point Based Ranking System				X		X		2

Table 2. Mobility Management Strategies

Transportation Mode	Subcategory	Broward County CMS	Indian River County CMS	Palm Beach County CMS	Atlanta Regional CMS	St. Louis Regional CMS	Total
Intersections	Signals	X	X		X	X	4
	Traffic Control	X	X		X	X	4
	Geometrics	X	X		X	X	4
Roadway	Geometrics	X			X	X	3
	General Purpose Lanes	X	X		X	X	4
	Access Management	X	X		X	X	4
	Parking Management	X	X		X	X	4
	Alternate Facilities	X			X	X	3
	Ramp Metering					X	1
TDM	Flexible Work Hours	X			X	X	3
	Vanpool	X			X	X	3
	Rideshare	X			X	X	3
	Telecommunicating	X			X	X	3
	Congestion Pricing	X	X		X	X	4
	Trip Reduction	X			X	X	3
	Guaranteed Ride Home Programs					X	1
	Compressed Work Week	X			X	X	3
	Financial Incentives	X			X	X	3
	Parking Management	X			X	X	3
	HOV Lanes	X			X	X	3
	Park and Ride Lots	X			X	X	3

Table 2. Mobility Management Strategies (cont.)

Transportation Mode	Subcategory	Broward County CMS	Indian River County CMS	Palm Beach County CMS	Atlanta Regional CMS	St. Louis Regional CMS	Total
Transit	Service/Fares	X	X		X	X	4
	Operations		X		X	X	3
	Intersection	X			X	X	3
	ITS		X		X	X	3
	Safety	X			X	X	3
	Connections	X			X	X	3
	Reserved ROW for Future Mass Transit	X				X	2
	Paratransit		X		X	X	3
	Marketing		X		X	X	3
	Light/Commuter Rail	X			X		2
	Transit Information Systems	X	X		X	X	4
Pedestrian / Bicycle	Facility Improvements	X	X		X	X	4
Other	Growth Management/Land Use/Zoning	X	X		X	X	4
	Design Standards		X		X	X	3
	Forming TMAs	X				X	2
	Goods Movement Management	X			X		2
	Incident Management	X	X		X	X	4
	Traveler Information System	X				X	2
	Construction Management					X	1
	Auto Restricted Zones	X					1
	Intermodal Facilities	X			X	X	3
	Information Systems	X			X	X	3
	Alternative Fuel Vehicles	X			X	X	3
	Economic Empowerment Zones	X			X		2

Broward County CMS

The CMS in Broward County was created to coordinate and evaluate potential transportation improvement projects and prioritize them for future funding. The CMS is designed to locate transportation corridors or facilities with congestion problems and develop mitigation strategies to increase mobility. The CMS coordinates with management agencies in the county including the Metropolitan Planning Organization (MPO), county planning, traffic engineering, Tri-Rail, safety, transit, and South Florida Commuter Services to aid in the development of the 5-year Transportation Improvement Program (TIP). The CMS also encourages community involvement through the Technical Coordinating Committee (TCC) by providing a community roundtable and newsletter.

Identification of congested corridors is achieved through performance measures separated into two Tiers. Tier 1 includes determining the level of service (LOS) for corridors by using volume to capacity ratios (V/C) during peak periods of the day based on generalized level of service tables developed by the Florida Department of Transportation (FDOT). Tier 1 also includes defining the Transit Load Factor, which is the total number of passengers using transit divided by the number of available seats during the peak periods of the day. Corridors that exhibit congestion as a result of the Tier 1 analysis are then subjected to further evaluation under the Tier 2 analysis to confirm the deficiencies. Tier 2 involves the use of FDOT's ART_PLAN program, which provides a more detailed analysis of the LOS of a corridor that takes all system variables into account. The ART_PLAN is used to define the LOS of roadways in Broward County with respect to measured delays along each defined corridor. With respect to alternative modes of transportation, the Tier 2 analysis examines the transit travel rates and speeds along overcapacity roadways.

The county management agencies have joined together to create a "strategies subcommittee" to identify specific cost-effective solutions to reduce congestion once overcapacity roadways are identified. The strategies are organized into categories and include: transportation systems management (TSM), transportation demand management (TDM), transit, bicycle, pedestrian, and other. Within each category there are specific strategies outlined to reduce congestion. The defined corridors that are selected are then individually studied guided by a technical advisory committee (TAC) to determine what strategies could be effective in reducing congestion. Current or planned improvement projects are also considered when selecting suitable corridors where congestion management strategies could be implemented. The final list of congested corridors with potential management strategies are then prioritized and become Broward County's Congestion Management Plan.

Indian River County CMS

The CMS for the Indian River County MPO was developed to fit into the overall planning process in order to meet federal, state, and local regulations. Similar to Broward County, the Indian River County CMS coordinates with management agencies in the county to aid in the development of the 5-year Transportation Improvement Program (TIP) and the first 10 years of the Long-Range Transportation Plan (LRTP). The CMS is designed to identify corridors or facilities with congestion and develop strategies to reduce congestion.

The CMS process is integrally linked to the MPO process for Indian River County. The CMS process includes system performance, identifying priority corridors, strategy screening, and strategy monitoring. Once the transportation performance is evaluated, priority corridors with high congestion are identified and then are filtered out based on the transportation plan provided by the MPO. After a list of filtered priority projects is created, an improvement project is then included in the TIP as congestion strategy implementation by means of the MPO planning process. The strategies are then monitored by the CMS process to measure strategy performance for future updates to the Indian River County CMS.

Selection of priority corridors is achieved through a ranking system developed to outline mobility dysfunctions. The ranking system assigns weights, ranges, and scores to each prioritization criteria depending on their effects on mobility. The criteria include: ADT, V/C ratios, crash rates, regional connectivity, port and industrial access, intermodal connections, recreational/commercial access, and hurricane evacuation routes. By multiplying weights for each criterion by each criterion score, a weighted score is obtained. The priority score for each corridor is then obtained by summing up all the weighted scores. The higher the priority score, the greater need there is to identify strategies to reduce congestion along the corridor.

Following identification of all priority corridors, strategies can then be implemented to increase mobility and reduce congestion. Indian River County has developed five tiers of strategies to alleviate congestion. Each individual tier bases strategies on the following:

- Tier 1 – Elimination of Vehicle Trips
- Tier 2 – Shift Automobile Trips to Other Modes
- Tier 3 – Attempt to Increase HOV Trips and Reduce SOV Trips
- Tier 4 – Optimization of Existing Highway Operation Including Operational Improvements, Incident and Access Management, and ITS Systems
- Tier 5 – Providing Additional Travel Lanes

Once strategies are implemented, they are monitored by the CMS to determine how effective the strategies were with respect to reducing congestion.

Palm Beach County CMS

The Palm Beach County CMS was designed as a tool to assist in the transportation planning decision making process by providing a systematic process for managing congestion. The Palm Beach County MPO coordinates a CMS Task Force and maintains the network database. The CMS Task Force evaluates performance measures on an annual basis and provides recommendations to the Technical Advisory Committee (TAC) on behalf of the MPO. The TAC then makes recommendations to the MPO for final implementation. Public involvement through public meetings is a continually increasing priority in the CMS for Palm Beach County. Other contributing organizations include: Citizens Advisory Committee (CAC), Bicycle and Pedestrian Advisory Committee (BPAC), and Americans with Disabilities Act (ADA) representatives.

The CMS in Palm Beach County follows a cyclic order of evaluation including: choosing appropriate performance measures, monitoring network performance, defining congested locations, selection of potential strategies to reduce congestion within the TIP where applicable, and evaluation of implemented strategies. There are three tiers of analysis within the Palm Beach County CMS. Tier 1 performance measures for roadways used for the Palm Beach County CMS include V/C ratios and intersection critical sum. If the V/C ratio is greater than 1.0, then the corridor is evaluated under Tier 2. Tier 2 examines the significance of the congestion and how long it lasts. The corridor advances to Tier 3 if the peak season, hour or direction V/C ratio is greater than 1.0 or if the Intersection Critical Sum is greater than 1,400 vehicles per hour (vph). Tier 3 defines the most significantly congested corridors, and if both the V/C ratio is greater than 1.0 and the intersection critical sum is greater than 1,400, then the corridor will enter full CMS analysis provided there are no programmed improvements on the corridor in the TIP. Also, included in the selection of congested corridors are transit on-time performance and passengers per available seat using transit.

Once a corridor has been identified as a CMS analysis corridor, a peer review is conducted of how other MPOs (including Broward and Miami-Dade Counties) implement their CMS programs and strategies to reduce congestion. However, no specific potential cost-effective improvements/solutions were listed for Palm Beach County.

Atlanta, Georgia CMS

In accordance with federal regulations, the Atlanta metropolitan area developed a CMS beginning in 1995 with a series of public involvement activities. The Atlanta Regional Commission (ARC) evaluates the CMS biannually to provide information on transportation system performance, alternative strategies for alleviating congestion, providing alternative transportation modes to decrease single occupancy vehicles (SOVs) in the metropolitan area, and increasing the mobility of each transportation method. CMS data collection comes from various sources including: Regional Development Plan (RDP), roadway congestion index (RCI), transit agencies, the census, travel demand models, regional transportation plan (RTP), TIP, and county input.

After data is collected from all sources, the corridors are ranked according to the selection criteria by the RTP through a set of priority measures. Selection criteria include: congestion, goods movement, connectivity, transit, safety, environmental justice, and future projects. In the ranking process, each corridor is evaluated individually with a point-based system similar to the ranking used in Indian River County's CMS. Points are assigned to each priority measure based on a range of values. The scores are then multiplied by the predetermined weight of each measure and summed up. A higher total score, based on points assigned to each priority measure, indicates a high-priority facility.

After the priority corridors have been selected and ranked, the CMS and other regional planning organizations conduct corridor studies to further examine mobility problems. The RTP is then developed based on the results of the corridor studies. The RTP process includes need assessment, prioritization of funding, conformity to the roadway network, and a call for solutions. Once the corridor has been examined through the RTP development process, improvements for the corridor are included in the TIP.

St. Louis, Missouri CMS

The St. Louis CMS was developed to assist the East-West Gateway Coordinating Council (EWGCC) in evaluating and implementing strategies to enhance the mobility of persons and goods to meet state and local needs for the existing and future transportation system. Requirements developed by the CMS include:

- Traditional and non-traditional strategies to reduce congestion
- Alternatives thoroughly analyzed before simply adding general purpose lanes
- TSM/TDM elements to ensure effective facility management in the future
- Evaluation of effectiveness of implemented strategies

The St. Louis CMS process consists of five steps including system monitoring, strategy consideration, project selection, project implementation, and effectiveness evaluation. Performance measures include V/C ratios, vehicle density, speed/travel time, VMT, peak load factors, park-and-ride lot utilization, and person throughput. Data is collected from conducting aerial surveys, travel time runs, ITS activities, state and local traffic counts, loop detectors, travel demand modeling, transit monitoring, park-and-ride lot surveys, Missouri Department of Transportation's (MoDOTs) Enterprise system, and Illinois Department of Transportation's (IDOT) Illinois Roadway Information System (IRIS) system. Data can be obtained from MoDOT, IDOT, local transit agencies, and public surveys.

Selection of priority corridors is obtained through evaluation of each performance measure. The LOS of each corridor is determined using V/C relationships established in the Highway Capacity Manual (HCM) as an initial selection criteria for each transportation facility. Vehicle density is then determined from aerial surveys or roadway surveillance systems. Level of service can then be obtained from the HCM with respect to the maximum passenger cars per lane per mile allowed for each category. Level of service is also calculated from the HCM based on minimum percentages of free-flow speeds obtained from the vehicle speed data. The VMT is used to monitor congestion where the VMT has increased over a period of time without significant improvements to the roadway facility to meet demand. The HCM also provides LOS values for peak-load factors to evaluate transit facilities. Park-and-ride utilization and person throughput is also evaluated to determine the utilization of rideshare programs and efficiency of the transit systems.

Potential strategies utilized by the St. Louis CMS to alleviate congestion on priority corridors include the following categories:

- TDM Strategies
- Traffic Operational Improvements
- HOV Improvements
- Public Transit Capital Improvements
- Public Transit Operational Improvements
- Bicycle and Pedestrian Improvements
- Congestion Pricing
- Growth Management and Activity Center Strategies
- Access Management
- Incident Management
- Intelligent Transportation Systems (ITS)
- Adding General Purpose Lanes

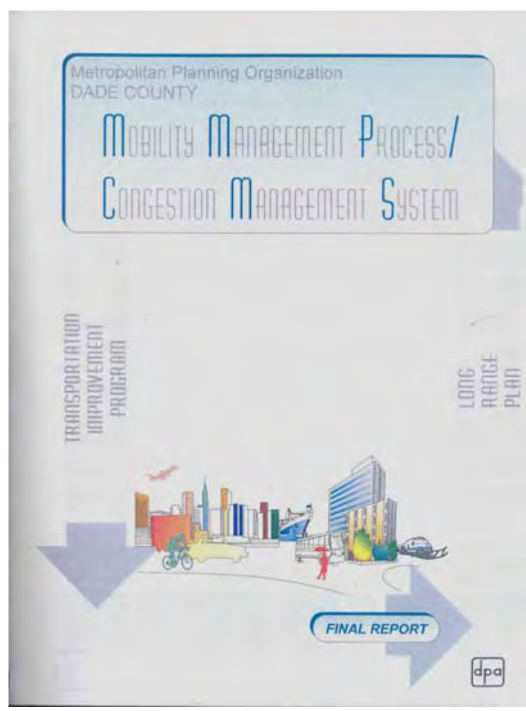
Potential improvement projects are then considered for inclusion in the Regional Transportation Plan (RTP) for future improvement. Once an improvement has been implemented, the effectiveness of each improvement is analyzed and reported for future reference.

EXISTING MIAMI-DADE COUNTY CMS/MMP PROCESS

The process provided in the existing Miami-Dade County CMS/MMP was reviewed in order to provide a basis for an effective updated process in selection of high priority CMS corridors. The existing Miami-Dade CMS/MMP provides an excellent background through research, in-depth analysis, and recommendations for improving the mobility of goods and people. The existing Miami-Dade County CMS/MMP process is divided into 10 sections including system requirements, data collection, measuring congestion, moving toward mobility, locating congestion, potential strategies, evaluation of corridors and strategies, evaluation of selected corridors, funding, and recommendations. Each section provides a comprehensive approach that clearly defines the CMS/MMP process.

This chapter of the report describes the process of developing the existing Miami-Dade County CMS/MMP.

Data Collection



Data collection is the preliminary step in developing the Miami-Dade CMS/MMP. Extensive data were collected from State, County, and municipal agencies for development of the existing CMS. The main sources of data from the State were FDOT, South Florida Commuter Services (SFCS), and the Department of Environmental Planning (DEP). The main sources of data from Miami-Dade County were the Miami-Dade County Planning Department, Miami-Dade County Department of Public Works, Miami-Dade County Development Impact Committee (DIC), Metro-Dade Transit Agency, and the Metropolitan Planning Organization (MPO). The main source of data from the municipal level was the City of Miami. A complete listing of data obtained from each source is shown in Table 3.

Table 3. Existing CMS Data Summary

Source/Data Obtained	Physical	Operational	Performance	Standards	Improvements	Jurisdiction	Land Use	Demand Reduction	Policy
	Data Type								
FDOT									
Access Management	X			X					
Traffic Counts			X						
Existing Roadway LOS		X	X						
HPMS	X								
RCI/TCI	X								
SHS Map						X			
FIHS Map				X		X			
Fed. Func. Class. Map						X			
Work Prog.Cap. Impr. Map					X				
Constrained Corridors	X					X			X
South Florida Commuter Service									
Carpools/Vanpools								X	
TMAs								X	
Employees/Student O/D								X	
FDEP									
Air Quality Baseline			X						
M-D County Planning Department									
Land Use							X		
M-D County Public Works									
Traffic Counts/Signals	X	X	X						
Maintenance Responsibility						X			
M-D County Concurrency Info. Office									
Road Concurrency LOS		X	X						
Miami-Dade Transit Agency									
Section 15 Data	X	X	X						
Miami Urbanized Area MPO									
Transportation Model	X	X	X				X		X
Bicycle Facilities	X		X		X				
M-D County Information Tech. Dept.									
GIS Database	X		X			X	X		
City of Miami									
Average Travel Speed		X	X						
GIS Database	X								

Identifying Congestion

Identifying congestion is the next major step in the existing Miami-Dade CMS/MMP process. The first step in identifying congestion is to define the CMS networks which are selected from the entire metropolitan area under the MPO's jurisdiction and connecting roadways from other jurisdictions.

Recurring Congestion is a Significant Concern within Miami-Dade County

The second step in identifying congestion was to determine volume to capacity (V/C) ratios for the entire highway network. V/C ratios were obtained through use of the Miami-Dade County transportation model prepared by the MPO. Existing V/C ratios were determined from the travel demand model from traffic volume and capacity data.

The next step was to use the existing methodology used by FDOT to determine the levels of service (LOS) for roadways within the network. FDOT utilizes several methods of determining the level of service including: generalized level of service tables, ART_PLAN computer model, ART_TAB computer model, FREE_TAB computer model, RMUL_TAB computer model, UMUL_TAB computer model, R2LN_TAB computer model, U2LN_TAB computer model, and SIG_TAB computer model. The Miami-Dade County level of service methodology includes the same methodology as FDOT's. However, since the county roadway system falls under the jurisdiction of the Comprehensive Development Master Plan (CDMP), other level of service standards must be considered. The CDMP calls for one level of service standard for Florida Intrastate Highway System (FIHS) roadway segments and one for non-FIHS roadway segments. The difference between the CDMP standards and FDOT standards are that FDOT uses Average Annual Daily Traffic (AADT) to calculate LOS and the CDMP uses Average Weekday Daily Traffic (AWDT). Therefore, it was recommended that the level of service be used to compare to the existing V/C ratio to determine the roadway segments that were exceeding or near the allowed V/C ratio.

Since congestion is a relative term, a new concept was introduced in the existing Miami-Dade CMS/MMP called the Relative Congestion Ratio (RCR). The RCR complies with both state and federal regulations and is calculated by dividing the existing V/C ratio by the maximum V/C ratio allowed in the CDMP according to local conditions. The existing V/C ratios were then compared to the level of service standards. Every roadway segment exceeding or close to the allowed V/C ratio was identified and the RCR was calculated for each segment. Road segments with RCR values of 0.9 or greater were considered to be roadway segments that were congested or nearly congested according to the following ranking categories.

- Nearly Congested (0.90 < RCR <= 1.00)
- Moderately Congested (1.00 < RCR <= 1.20)
- Highly Congested (RCR >= 1.20)

This ranking system identifies roadway segments that are currently experiencing congestion as well as segments that may experience congestion in the future. The Steering Committee of the Miami-Dade County MPO approved the criteria that a corridor should be at least 2 miles in length to be considered a CMS corridor. Roadway segments less than 2 miles in length that had RCR values greater than 0.90 were considered to be congested spots. Roadways with programmed improvements and freeways were not included in the evaluation of corridors. The congested corridors in 1996 were outlined in the existing Miami-Dade County CMS/MMP and are presented in Table 4.

Congestion on Arterial Roadways Limits Mobility and Accessibility

Table 4. Miami-Dade County CMS/MMP Congested Corridors in 1996

Congested Corridors	From	To	RCR
NW 25th Street	H.E.F.T.	NW 72nd Avenue	> 1.20
NW 20th Street	NW 27th Avenue	NW 7th Avenue	> 1.20
SR 826 (Palmetto Expressway)	US-1 (South Dixie Highway)	Golden Glades Interchange	> 1.20
SW 67th Avenue (Ludlam Road)	SW 136th Street	SW 8th Street	> 1.20
W. 27th Avenue	US-1 (South Dixie Highway)	NW 79th Street	> 1.20
NW 7th Avenue	I-95	SR 826 (Palmetto Expressway)	> 1.20
I-95	Broward County Line	US-1 (South Dixie Highway)	> 1.20
SW 88th Street (Kendall Drive)	SW 137th Avenue	SR 874	> 1.20
SR 874	SW 88th Street (Kendall Drive)	Snapper Creek Expressway	> 1.20
Snapper Creek Expressway	SR 874	US-1 (South Dixie Highway)	> 1.20
US-1 (South Dixie Highway)	SW 112th Street	I-95	> 1.20
NW 103rd Street	SR 826 (Palmetto Expressway)	NW 7th Avenue	> 1.20
SR 836	SR 826 (Palmetto Expressway)	I-95	> 1.20
Florida Turnpike	SW 88th Street (Kendall Drive)	NW 17th Avenue	1.01 - 1.20
SW 117th Avenue	SW 200th Street	SW 152nd Street (Coral Reef Drive)	1.01 - 1.20
W. 107th Avenue	SR 874	SR 836	1.01 - 1.20
W. 87th Avenue	SW 88th Street (Kendall Drive)	SR 836	1.01 - 1.20
NW 72nd Avenue	SW 72nd Street (Sunset Drive)	NW 36th Street	1.01 - 1.20
SW 57th Avenue (Red Road)	Old Cutler Road	SR 836	1.01 - 1.20
Ingraham/Main Highway	SW 72nd Street	NW 36th Street	1.01 - 1.20
McFarlane/Bayshore Drive	Grand Avenue	SW 12th Avenue	1.01 - 1.20
Old Cutler Road	SW 200th Street	SW 72nd Street	1.01 - 1.20
W. Dixie Highway	NE 125th Street	NE 215th Street	1.01 - 1.20
NE 125th Street	I-95	West Dixie Highway	1.01 - 1.20
Miami Gardens Drive	NW 2nd Avenue	US-1 (Biscayne Boulevard)	1.01 - 1.20
Okeechobee Road	SR 826 (Palmetto Expressway)	SR 112	1.01 - 1.20
N. 74th/79th Street	SR 826 (Palmetto Expressway)	US-1 (Biscayne Boulevard)	1.01 - 1.20
SR 112	Okeechobee Road	NW 7th Avenue	1.01 - 1.20
SR 836	H.E.F.T.	SR 826	1.01 - 1.20
I-395	I-95	Collins Avenue	1.01 - 1.20
SW 40th Street (Bird Road)	SW 147th Avenue	SW 57th Avenue (Red Road)	1.01 - 1.20
SW 56th Street (Miller Drive)	SW 137th Avenue	SW 57th Avenue (Red Road)	1.01 - 1.20
Quail Roost/Carribean Boulevard	SW 137th Avenue	Old Cutler Road	1.01 - 1.20
SR 91 (Turnpike Connection)	Golden Glades	Florida Turnpike	0.91 - 1.00
SW 127th Avenue	SW 88th Street (Kendall Drive)	SW 40th Street (Bird Road)	0.91 - 1.00

The existing Miami-Dade CMS/MMP reflects the actual congestion levels along the congested corridors as well as all the congested spots. The degree of congestion was summarized for all roadways in Miami-Dade County. A summary of the findings provided the following results:

- Nearly Congested – 45 miles
- Moderately Congested – 141 miles
- Highly Congested – 54 miles

Note: These results represent 15-20 percent of the arterial and collector system in Miami-Dade County.

Duration of congestion was the next procedure in identifying congestion for the existing Miami-Dade CMS/MMP. The method developed by FDOT for calculating duration of congestion compares hourly volumes, in 15-minute increments, against hourly capacity or maximum allowed service volumes. This method, through use of 24-hour counts available for State facilities, would establish the duration of congestion during the day that a segment of roadway was congested. Since this method is very effort and data intensive, the existing study developed a method to estimate congestion duration from readily available data. A straight-line model was developed using the FDOT data where readily available based on V/C ratios and measured hours of congestion. Therefore, only the V/C ratio is required to determine the congestion duration by using this method. Congestion duration as a function of the V/C ratio is approximated by the following equation:

Congestion Duration (hours) = (10.05 X V/C Ratio) – 7.66

Congestion delay was the final procedure in identifying congestion for the existing Miami-Dade CMS/MMP. Congestion delay is measured in vehicle-mile-hours and is the product of the traffic volume during the peak hour, roadway segment lengths in miles, and congestion duration in hours. The peak hour traffic volume was approximated as 7 percent of the average daily traffic. Congestion delay is approximated by the following equation:

Congestion Delay (veh-mi-hrs) = (ADT x 0.07) x (roadway length) x (Congestion Duration)

Total congestion delay is approximated by summing the congestion delay on all congested roadway segments.

SUMMARY OF LITERATURE REVIEW

Upon reviewing several of the CMS/MMP studies completed in Florida and select metropolitan planning areas nationwide, it was necessary to develop a summary of the procedures and compare them to the recommended procedure to update the existing Miami-Dade CMS/MMP. The procedures analyzed include data collection, data analysis, and selection of corridors for each CMS/MMP study reviewed.

Data Collection

Concurrency tables have been used in Indian River County and Palm Beach County for each CMS/MMP study to identify congested corridors to be further analyzed as potential CMS corridors. The data is collected internally from county traffic count stations that are used to track concurrency. The Broward County CMS/MMP utilizes traffic count data from the County and FDOT. An extensive data collection effort is utilized for each biannual CMS update for the Atlanta, Georgia CMS/MMP, which is a time consuming and expensive effort. The St. Louis, Missouri CMS process also employs extensive data collection through MoDOT, IDOT, local transit agencies, and public surveys.

The existing Miami-Dade CMS data collection process is also extensive and time consuming. Data were collected from State, County, and municipal agencies for development of the existing Miami-Dade CMS. The main sources of data from the State were FDOT, South Florida Commuter Services (SFCS), and the Department of Environmental Planning (DEP). The main sources of data from Miami-Dade County were the Miami-Dade County Planning Department, Miami-Dade County Department of Public Works, Miami-Dade County Development Impact Committee (DIC), Metro-Dade Transit Agency, and the Metropolitan Planning Organization (MPO).

It is recommended that a method of data collection should be implemented based on concurrency tables similar to those used in Indian River and Palm Beach Counties. This would provide for a much less extensive data collection effort by only needing to collect concurrency data from one source, while maintaining accurate results. A further recommendation is to gather vested trip data to take into account the future congestion of each roadway. Vested trips are trips expected to be generated by development that has already been approved but not yet constructed.

Determination of Congested Corridors

As mentioned in the previous section, several performance measures are used to identify congested corridors and locations. All of the CMS/MMP studies reviewed used V/C ratios, level of service, and congested transit mobility as performance measures for identifying congested roadways. Broward County utilizes the generalized level of service tables developed by the Florida Department of Transportation (FDOT) and ART_PLAN to identify congested roadways. Palm Beach and Indian River Counties utilize concurrency tables to determine the V/C ratios, which also provide a measure of congestion. The Atlanta, Georgia CMS examines intersection level of service to locate congested roadways with respect to delay in seconds per vehicle. The St. Louis, Missouri CMS examines the level of service of each corridor using V/C relationships established in the Highway Capacity Manual (HCM) as an initial selection criteria for each transportation facility.

The current Miami-Dade CMS/MMP has utilized the Relative Congestion Ratio (RCR) to identify congested locations based on calculated V/C ratios. However, it is recommended that a weighted RCR be developed to take into account the future traffic conditions considering the vested trips as well as the current congestion of each roadway. By looking at the future RCR values of a roadway, more effective alternatives may be developed that address future congestion along a corridor.

Selection Criteria

Indian River County, Atlanta Georgia, and the existing Miami-Dade CMS utilize a point-based ranking system to further evaluate the congested corridors. Each of the CMS studies utilized a long list of criteria to rank the corridors by assigning a range of points to each criterion and totaling the points. The corridors with the lowest or highest total number of points, depending on the point system, is the highest ranked corridor. This is an effective way to quickly generate a list of corridors where improvements are needed to reduce congestion.

The existing Miami-Dade CMS/MMP utilizes a long list of criteria with the same amount of possible points given to each criterion. It is recommended that in the updated CMS for Miami-Dade County, the criteria should be assigned varying points based on their impact on congestion.

The Indian River County and Atlanta, Georgia, CMS methodologies follow a similar approach by assigning a weight to each criterion. It is also recommended that the Miami-Dade CMS/MMP's list of criteria be shortened to contain only the most important criteria to rank each corridor.

Corridor Ranking Criteria

The existing CMS/MMP utilizes a methodology to rank the corridors depending on their compliance with a list of 16 factors. A scale of 1 to 5 is used, where 1 is the lowest value and 5 is the highest. The points were added up for each potential CMS corridor, and the corridors were ranked based on the lowest number of total points. The existing CMS/MMP utilizes the following list of corridor ranking criteria to evaluate each corridor.

1. Efficient use of existing transportation facilities
2. Consistency with energy conservation programs
3. Actions taken to relieve/prevent congestion
4. Mobility of people and goods
5. Operational strategies and Transportation Demand Management (TDM)
6. Balancing transportation and land use
7. Programming of transportation enhancement facilities
8. Project's cost effectiveness
9. Intermodal facilities
10. Connectivity between areas
11. Consideration in LRTP and TIP
12. Availability of right-of-way
13. Efficient movement of freight
14. Life cycle costs
15. Overall social, economic, energy, and environmental effects
16. Investment in developing projects

UPDATED MIAMI-DADE COUNTY CMS/MMP PROCESS

The predominant focus of the updating process was to gather research from other CMS/MMP processes, obtain traffic and capacity data, locate high priority congested corridors, and to provide solutions to improve the mobility of goods and people along each high priority corridor while minimizing the excessive effort required to complete the analysis. The process proposed by the update focuses on the most important processes to easily and quickly identify highly congested corridors and solutions to improve them.

Recommendations

The following are recommended improvements to the existing Miami-Dade CMS/MMP process:

- Obtain and utilize traffic counts/concurrency data from the Traffic Analysis Review Unit of the Miami-Dade County Public Works Department, as well as from Florida Department of Transportation (FDOT) count stations.
- Calculate the existing and future Relative Congestion Ratios (RCR) for each traffic count station.
- Develop a weighted RCR value for each count station based on a weighted average of existing (60 percent) and future (40 percent) RCR values.
- Sort out the count stations having weighted RCR values of 0.90 or greater.
- Develop a list of potential CMS corridors based on roadway segments of at least one mile having multiple count stations with weighted RCR values of 0.90 or greater.
- Eliminate the corridors that are categorized as freeways as well as roadways with programmed capacity improvements.
- Use the selection criteria, given in the next section of this report, to rank each potential CMS corridor.

The following sections of this report implement the changes recommended in the identification of congested corridors.

Data Collection / Identification

Traffic count station and concurrency data were obtained from the Traffic Analysis Review Unit of the Miami-Dade County Public Works Department, as well as from Florida Department of Transportation (FDOT) count stations. This data were used to identify congested corridors within the County. The most recent data provided (September 2003) by Miami-Dade County and FDOT included: station number, roadway name, location, functional classification, maximum capacity, current traffic count, vested trips, available trips, maximum allowed level of service, and when the data was last updated. The most pertinent data needed to determine the congested corridors in Miami-Dade County includes roadway names, locations, maximum capacities, traffic counts, and vested trips.

Determination of Congested Corridors

The first step in the determination of congested corridors was to compile the state and county traffic counting stations data into one database. This was done to analyze the maximum number of count stations in the county. Because congestion is a relative term, the next step was to use the relative congestion ratio (RCR) equation to identify congested locations around the county. The RCR was used in the previous Miami-Dade CMS/MMP and follows both state and local standards. The RCR is defined as the existing V/C Ratio divided by the maximum allowed V/C ratio for the count location.

Similarly, the future RCR was determined for each count location by adding the vested trips to the existing traffic count and dividing by the maximum capacity allowed. The vested trips are expected to occur within a reasonable amount of time (Approximately 5 years), and are calculated based on approved but not yet constructed developments within the area of each traffic count station.

The next step was to take the existing RCR and future RCR, and develop a weighted RCR to take into account the existing and future conditions at each count station. The weighted RCR was calculated by multiplying the existing RCR by 60 percent and future RCR by 40 percent and summing the results. By using 60 percent on the existing conditions and 40 percent on the future, adequate consideration could be given to both the existing and future conditions of the roadways in Miami-Dade County. Identifying the currently congested corridors is important, but it was also deemed necessary to look at the future conditions of the corridors as well, which is an important update to the current CMS procedure. Due to increased development in the western portion of the County, this methodology provides insight to future congestion expected from vested trips.

The next step in determining the congested corridors was to sort the weighted RCR values that were greater than or equal to 0.9. RCR values greater than or equal to 0.9 were also used in the previous Miami-Dade MMP/CMS study to identify congested corridors. By sorting the locations according to roadway name, a list of roadways with multiple count stations having weighted RCR values 0.9 or higher was identified. A map showing these congested corridors is presented as Figure 1.

Count stations then were filtered to locate continuous sections of roadway with high weighted RCR values. The original database was then reduced to show only the roadways that have multiple count stations with weighted RCR values of 0.9 or higher.

The list of corridors was then further refined by filtering out the corridors that have capacity enhancing projects planned or underway, and the remaining corridors are presented in Table 5. FDOT manages the freeway facilities and related improvement projects in the County, the current freeway segments excluded from the analysis are presented in Table 6. A map showing all segments removed due to planned improvement projects and segments that are freeways or interstates is presented as Figure 2.

High Traffic Volume on Arterial Roadways Often Causes Long Queues on Side Street Approaches

FIGURE 1.

CONGESTED ROADWAYS IN MIAMI-DADE COUNTY

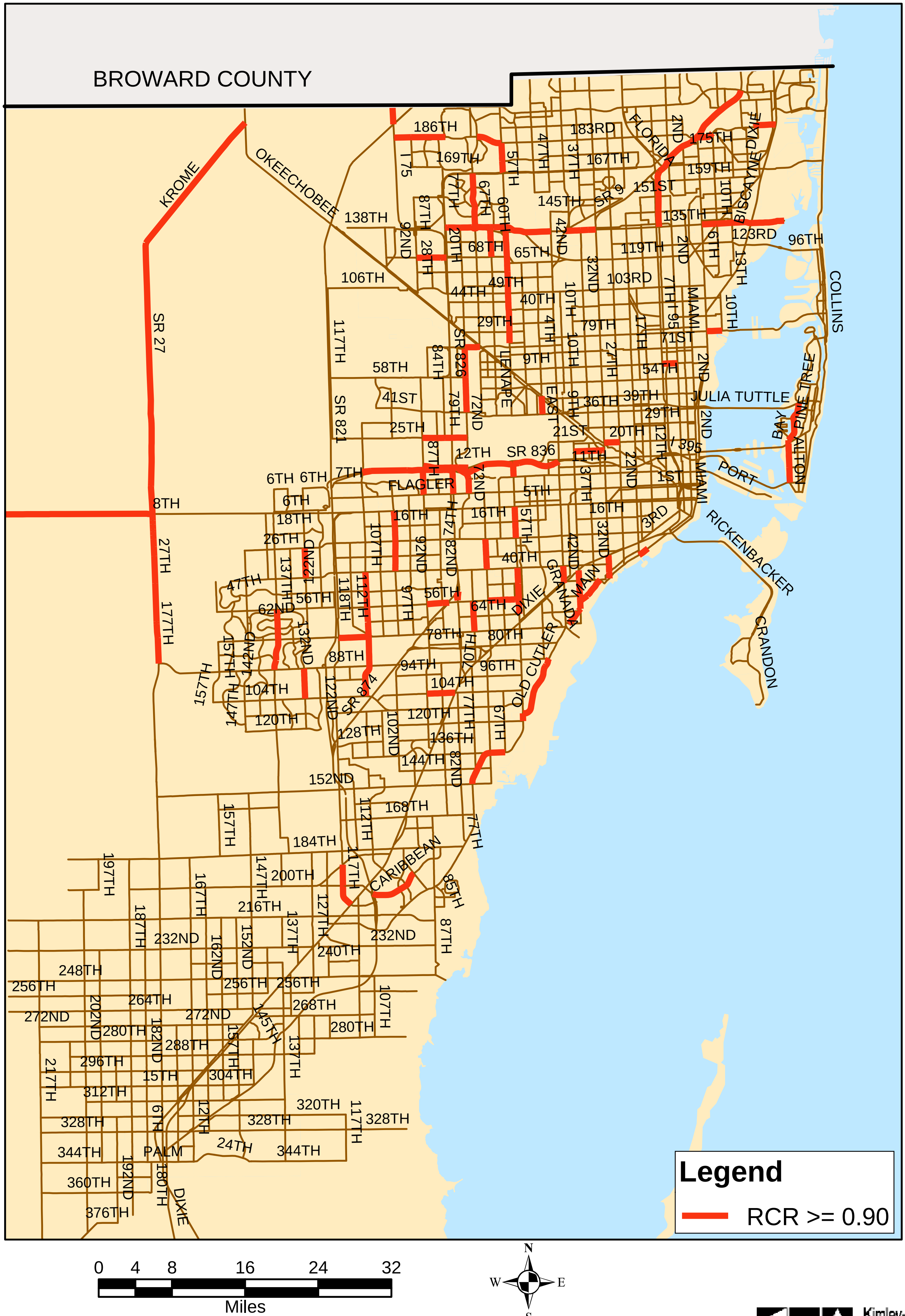


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FIGURE 2.

FREEWAYS AND PROGRAMMED IMPROVEMENT PROJECTS

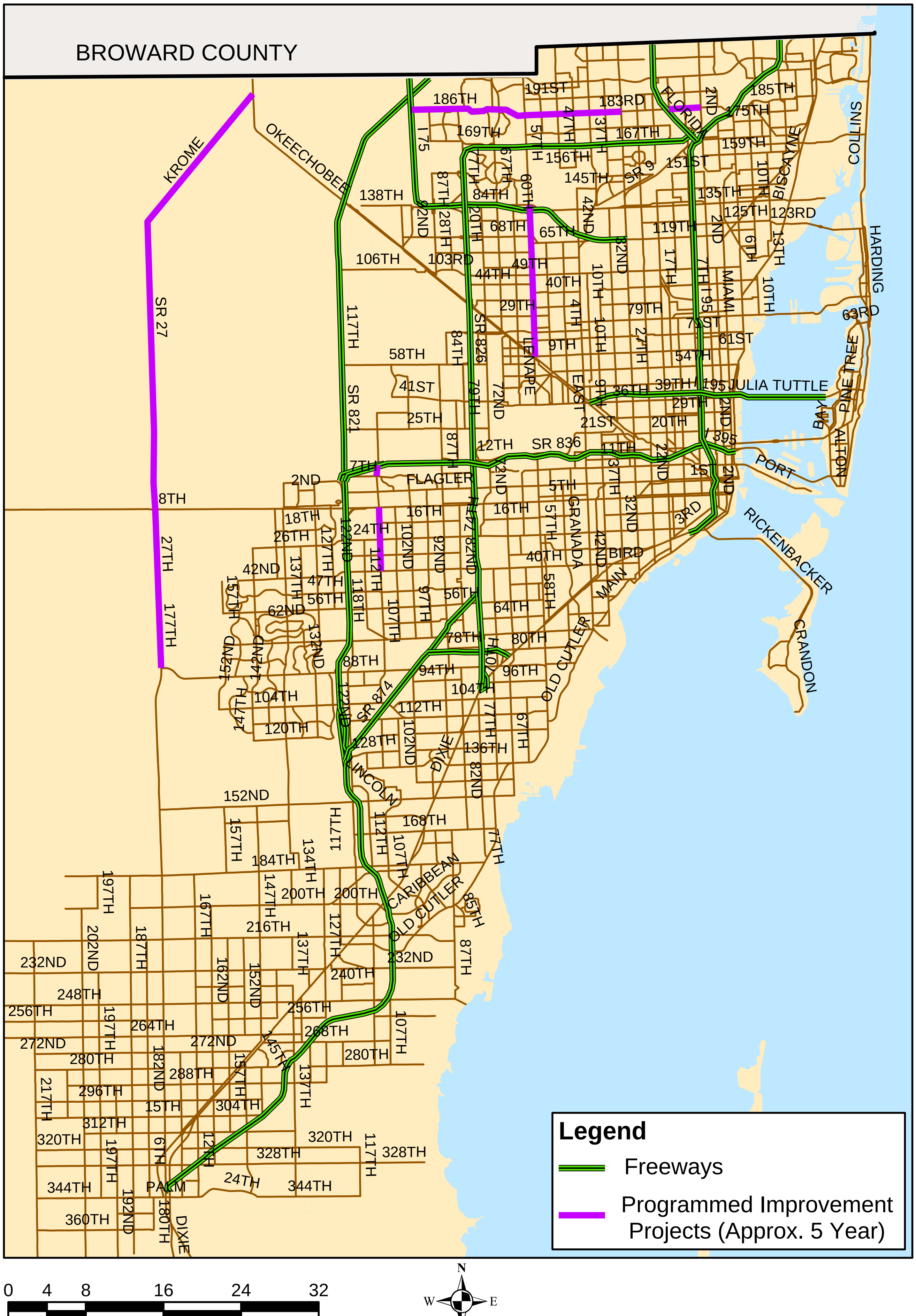

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Table 5. Corridors with Capacity Enhancing Projects Planned or Underway

Roadway	Segment Description	Planned Project
Miami Gardens Drive (NW 183rd St.)	NW 77th Avenue to NW 57th Avenue	PD&E/EMO STUDY
Miami Gardens Drive (NW 183rd St.)	NW 57th Avenue to NE 18th Avenue	ADD LANES
Krome Avenue (SR 997)	SW 295th Street to Okeechobee Road (US-27)	PD&E/EMO STUDY
SW 97th Ave	South of SW 8th Street to SW 40th Street	ADD LANES
Gratigny Drive (NW 122nd St.)	West of SR 826 to NW 87th Avenue	ADD LANES
NW 62nd Avenue	NW 122nd Street to NW 138th Street	ADD LANES
SW 127th Avenue	SW 120th Street to SW 88th Street	ADD LANES

Table 6. Freeway Segments Excluded

Roadway	Segment Description
SR 826 (Palmetto Expressway)	SW 56th Street (Miller Drive) to SR 874
SR 826 (Palmetto Expressway)	SW 24th Street (Coral Way) to SR 836
I-95	NW 62nd Street TO NW 119th Street
I-95	NW 135th Street to NE 203rd Street
I-75 (SR 93)	North of H.E.F.T. to Broward County Line
Dolphin Expressway (SR 836)	NW 72nd Avenue to NW 42nd Avenue
Dolphin Expressway (SR 836)	NW 107th Avenue to SR 826

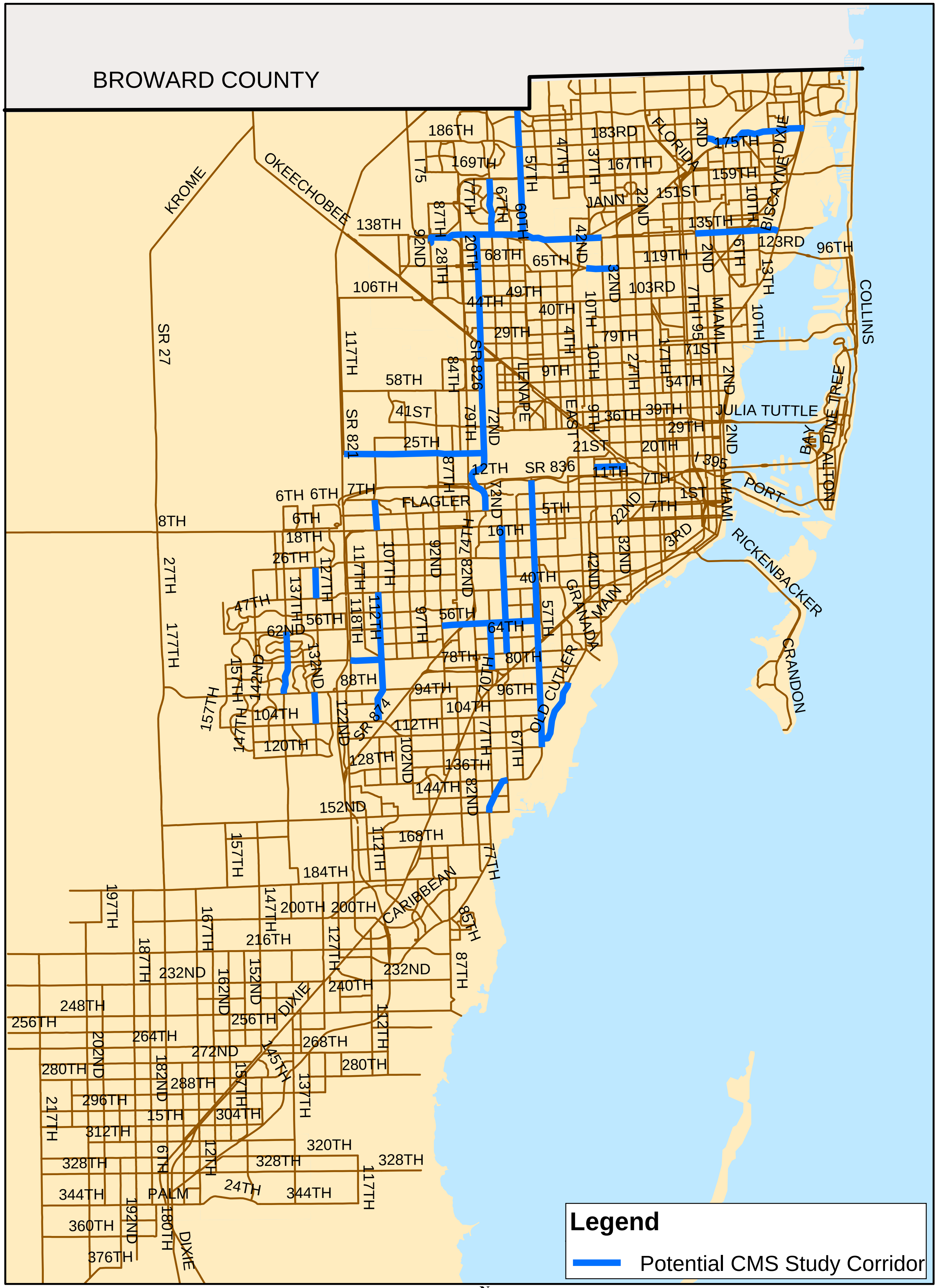
After removal of the freeway segments and corridors with planned or underway capacity enhancing projects, a complete listing of possible corridors was developed. A map showing each potential corridor is presented as Figure 3. The potential corridors were then ranked based on the following criteria:

- Congestion
- Length of the Corridor
- Safety
- Hurricane Evacuation Routes
- Port/Industrial/Intermodal Access

A matrix showing the above ranking criteria and each corridor is presented in Table 7. Each corridor was ranked according to the criteria to produce a list of potential corridors. The potential corridors include:

- NW 57th Avenue (Red Road) from south of SW 120th Street to State Road 836
- NW 72nd Avenue (Milam Dairy Road) from north of Flagler Street to NW 138th Street
- NW 25th Street from NW 117th Avenue to NW 72nd Avenue
- State Road 916 from NW 87th Avenue to NW 32nd Avenue
- State Road 916 from NW 2nd Avenue to NE 30th Avenue
- NW 17th Street from NW 27th Avenue to NW 37th Avenue
- NW 119th Street (Gratigny Road) from NW 27th Avenue to NW 37th Avenue
- SW 67th Avenue (Ludlam Road) from SW 8th Street to SW 72nd Street
- Red Road from Okeechobee Road to NW 215th Street (County line)
- SW 127th Avenue from SW 26th Street to SW 42nd Street
- SW 127th Avenue from SW 88th Street to SW 104th Street
- SW 56th Street (Miller Road) from SW 57th Avenue to SW 87th Avenue
- Old Cutler Road from SW 57th Avenue to SW 88th Street
- SW 72nd Avenue from SW 56th Street to SW 80th Street
- Old Cutler Road from SW 136th Street to SW 152nd Street
- State Road 985 (SW 107th Avenue) from SW 104th Street to SW 40th Street
- SW 137th Avenue from SW 56th Street to SW 88th Street
- NW 67th Avenue (Ludlam Road) from State Road 826 to NW 138th Street
- SW 72nd Street (Sunset Drive) from SW 107th Avenue to SW 117th Avenue

FIGURE 3.
POTENTIAL CMS CORRIDORS



0 4 8 16 24 32

Miles

N
W E
S

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Table 7. Corridor Ranking Criteria

Corridor	Corridor Description	Magnitude of Congestion (Avg RCR)	Length of Corridor (mi)	Predominate Number of Lanes	Median Type	Average Crash Rates	Functional Classification	Congestion Points	Length of Corridor Points	Safety Points	Hurricane Evacuation Routes Points	Airport / Seaport / Intermodal Points	Overall Points
RED ROAD 57TH AVE (SR 859)	From South of SW 120th Street to SR 836	1.03	8.3	2	Undivided	4.222	Urban Minor Arterial	7.50	15.00	10	5	5	42.5
NW 25 ST	From NW 117th Avenue to NW 72nd Avenue	1.34	4.5	4	Paved	4.036	Urban Minor Arterial	11.25	7.50	7.5	0	5	31.3
NW 72 AVE/MILAM DAIRY RD	From North of Flagler Street to NW 74th Street	0.93	5.0	6	Raised	3.752	Urban Minor Arterial	3.75	11.25	5	5	5	30.0
NW 17 ST	From NW 27th Avenue to NW 37th Avenue	1.85	1.0	2	Undivided	4.222	Urban Collector	15.00	3.75	10	0	0	28.8
SR 916 (135TH ST/138TH ST)	From NW 2nd Avenue to US-1	0.95	2.5	4	Paved	2.891	Urban Minor Arterial	3.75	7.50	7.5	5	2.5	26.3
LUDLAM RD (SW 67 AVE)	From SW 8th Street to SW 72nd Street	1.31	4.0	4	Paved	4.036	Urban Minor Arterial	7.50	7.50	7.5	0	2.5	25.0
GRATIGNY RD (NW 119 ST)	From NW 27th Avenue to NW 37th Avenue	1.33	1.0	4	Raised	2.891	Urban Principal Arterial	11.25	3.75	2.5	5	2.5	25.0
SW 127 AVE	From SW 88th Street to SW 104th Street	1.19	1.0	2	Undivided	4.222	Urban Collector	7.50	3.75	10	2.5	0	23.8
SW 127 AVE	From SW 26th Street to SW 42nd Street	1.03	1.0	2	Undivided	4.222	Urban Collector	7.50	3.75	10	2.5	0	23.8
RED ROAD (NW 57 AVE)	From NW 138th Street to NW 215th Street	0.75	4.8	6	Raised	3.752	Urban Principal Arterial	3.75	7.50	5	5	2.5	23.8
MILLER RD (SW 56 ST)	From SW 57th Avenue to SW 87th Avenue	1.07	3.0	4	Raised	2.891	Urban Minor Arterial	7.50	7.50	2.5	2.5	2.5	22.5
OLD CUTLER RD	From SW 57th Avenue to SW 88th Street	1.15	1.9	2	Undivided	4.222	Urban Minor Arterial	7.50	3.75	10	0	0	21.3
SW 72 AVE	From SW 56th Street to SW 80th Street	0.88	1.5	2	Undivided	4.222	Urban Collector	3.75	3.75	10	2.5	0	20.0
OLD CUTLER RD	From SW 136th Street to SW 152nd Street	0.94	1.0	2	Undivided	4.222	Urban Minor Arterial	3.75	3.75	10	0	0	17.5
SW 137 AVE	From SW 56th Street to SW 88th Street	1.01	2.0	4	Raised	2.891	Urban Minor Arterial	3.75	7.50	2.5	2.5	0	16.3
SW 107 AVE(SR 985)	From SW 104th Street to SW 40th Street	0.90	4.0	4	Raised	2.891	Urban Minor Arterial	3.75	7.50	2.5	2.5	0	16.3
LUDLAM RD (NW 67 AVE)	From SR 826 to NW 138th Street	0.92	1.8	4	Raised	2.891	Urban Minor Arterial	3.75	3.75	2.5	5	0	15.0
SW 72 ST (SUNSET DR)	From SW 107 Avenue to SW 117 Avenue	0.93	1.0	4	Raised	2.891	Urban Minor Arterial	3.75	3.75	2.5	0	2.5	12.5

DESCRIPTION OF SELECTION CRITERIA

A point system was developed in order to rank the corridors based on congestion, length of corridor, safety, access to hurricane evacuation routes, and access to port/industrial/intermodal facilities. The point system is based on a weighted number of maximum points given to each selection criteria, which provides a total of 50 possible points. The two corridors with the highest point value were selected as the highest priority corridors.

The point breakdown by selection criterion is as follows:

- Congestion – 15 points
- Length of the Corridor – 15 points
- Safety – 10 Points
- Hurricane Evacuation Routes – 5 Points
- Port/Industrial/Intermodal Access – 5 Points

The ranking criteria for congestion were established by setting ranges for the RCR. Table 8 outlines the total points for each range.

Table 8. Congestion Criteria

Congestion	
Ranking Criteria (Average RCR)	Points
1.58 to 1.85	15
1.30 to 1.57	11.25
1.03 to 1.29	7.5
0.75 to 1.02	3.75

The ranking criteria for the total length of each segment were established by providing maximum points to corridors that are 8 miles or more in length and minimum points to segments that are 2 miles or less in length. Table 9 outlines the total points for each ranking criterion.

Table 9. Length of Segment Criteria

Length of Segment	
Ranking Criteria (Miles)	Points
>= 8	15
5 to 7.99	11.25
2 to 4.99	7.5
1 to 1.9	3.75

The ranking criteria for the safety category were established by determining the predominant number of lanes, the functional classification, and whether the segment of roadway was divided or undivided. Statewide segment crash data were collected from FDOT for the year 2001, which provides average crash rates per million vehicle miles traveled (MVMT) for segments of roadways by type. Four categories of roadway segments describe each potential corridor including:

- Urban, 2-3 Lanes, Two-Way, Undivided Roadway (4.222 crashes/MVM)
- Urban, 4-5 Lanes, Two-Way, Divided Roadway, Paved Median (4.036 crashes/MVM)
- Urban, 6+ Lanes, Two-Way, Divided Roadway, Raised Median (3.752 crashes/MVM)
- Urban, 4-5 Lanes, Two-Way, Divided Roadway, Raised Median (2.891 crashes/MVM)

Points were established for each roadway type in increments of 2.5 points up to 10 points, as shown in Table 10.

Table 10. Safety Criteria

Safety	
Ranking Criteria (Crash Rate)	Points
4.222	10
4.036	7.5
3.752	5
2.891	2.5

The hurricane evacuation route ranking criteria were developed by determining whether the roadway segment provides a direct connection to an evacuation route, indirect access to an evacuation route, or no access to an evacuation route. Primary hurricane evacuation routes in Miami-Dade County include all interstates and freeways. Direct connection or access to an interstate or freeway was evaluated. A maximum of five points were available for providing connections to hurricane evacuation routes. The point breakdown for hurricane evacuation routes is shown in Table 11.

Table 11. Hurricane Evacuation Route Criteria

Hurricane Evacuation Routes	
Ranking Criteria (Distance)	Points
Directly Connected	5
Provides Access to Connection	2.5
No Access to Connection	0

The airport/seaport/intermodal ranking criteria were developed by determining whether the roadway segment provides a direct connection to an airport, seaport, or intermodal facility; access to an airport, seaport, or intermodal facility; or no access to an airport, seaport, or intermodal facility. Airport/seaport/intermodal locations that were considered in this analysis include Miami International Airport (MIA), Port of Miami, Tri-Rail, Metrorail, Metromover, and the South Dade Busway. A maximum of five points were available for each segment with respect to airport/seaport/intermodal access and the point breakdown is shown in Table 12.

Table 12. Airport/Seaport/Intermodal Criteria

Airport/Seaport/Intermodal	
Ranking Criteria (Distance)	Points
Directly Connected	5
Provides Access to Connection	2.5
No Access to Connection	0

Points were assigned to each corridor with respect to the evaluation criteria and were totaled to provide an overall score. The corridors were then ranked to determine the priority corridors that would be used for further evaluation. A complete list of potential corridors ranked in order of priority is provided in Table 7.

SELECTION OF PRIORITY CORRIDORS

As part of the update to the existing Miami-Dade CMS/MMP, two congested corridors were selected for further analysis. These analyses will serve as a pilot for future corridor evaluation procedures in Miami-Dade County. The analysis is based on readily available data and abbreviated data collection efforts. By utilizing readily available data, the data collection effort is minimized and therefore the cost of corridor analysis will be reduced.

After ranking each of the corridors, it was necessary to select two priority corridors for further analysis. It was recommended that one of the roadways be a state maintained roadway and the other to be a county maintained roadway.

Red Road (SW 57th Avenue) demonstrated the highest number of overall points (42.5). The limits of designation are from SW 120th Street to SR 836. Red Road is designated as a historic highway. As a result, it would be difficult to widen the corridor or add new turn lanes to improve congestion. In order to widen or add turn lanes to a designated historic highway the public must concur on the proposed changes presented at public hearings and meetings. This process has proven difficult in the past. Therefore, SW 57th Avenue (Red Road) was eliminated as a priority corridor.

NW 25th Street exhibited the next highest overall points (31.3). It has been discovered that improvements are programmed for NW 25th Street. Therefore NW 25th Street was eliminated as a priority corridor.

Milam Dairy Road (SR 916) from Flagler Street to NW 74th Street was the next highest ranked corridor. The facility is classified in the concurrency tables as being primarily a four-lane facility. However, upon field review it was determined that the facility is predominately six lanes. Therefore, problems are expected with widening or adding turn lanes along the facility and the facility was eliminated as a priority corridor.

The next highest ranked corridor was determined to be NW 17th Street. Although the weighted RCR is high for the corridor, the length of the corridor is only one mile. Therefore, NW 17th Street was eliminated as a priority corridor.

The following corridors were selected as the two priority corridors to be used for further analysis.

Selected Corridors

SR 916 (NW/NE 135th Street)

NW/NE 135th Street from NW 2nd Avenue to US-1 (Biscayne Boulevard) has 26.3 total ranking points. This corridor along NW/NE 135th Street is a 2.5 mile, four-lane, divided state urban minor arterial with an average weighted RCR value of 0.95. A two-way left turn lane exists along the entire length of the corridor. Although the weighted RCR for the corridor is 0.95, the level of service of the roadway between NW 2nd Avenue and Dixie Highway was listed as LOS F in the *2003 Florida Department of Transportation (FDOT) District 6 Level of Service Inventory*.

SW 67th Avenue (Ludlam Road)

SW 67th Avenue from SW 8th Street (Tamiami Trail) to SW 72nd Street (Sunset Drive) has 25.0 total ranking points and was chosen as the priority corridor maintained by the county for further analysis. This corridor along SW 67th Avenue is a 4.0 mile, divided county urban minor arterial with an average weighted RCR value of 1.31. Between SW 8th Street and SW 40th Street the corridor has four lanes. The corridor transitions to a two-lane roadway at SW 40th Street and continues as a two-lane roadway southbound to SW 72nd Street with a two-way left turn lane.

Comparison of Results

Differences in the methodologies used in this report compared to the existing Miami-Dade CMS/MMP are based on the objective of updating the existing CMS/MMP to reduce the amount of effort required while producing similar and accurate results. This section of the report outlines the differences between the existing and updated CMS/MMP.

The existing CMS/MMP recommended that a corridor should be at least 2 miles in length to be considered a CMS corridor. Although the 2-mile minimum is not consistent with the State Task Force recommendations, the criteria provided a representation of the congested corridors in Miami-Dade County. Roadway segments less than 2 miles in length that had RCR values greater than 0.90 were considered to be congested spots. However, some of the corridors listed in the existing CMS/MMP were found to be less than 2 miles upon further examination. Roadways with programmed improvements and freeways were not segregated in the evaluation of corridors in the existing CMS/MMP. It was also established that there were some gaps in the corridor data for the CMS/MMP update, which has prevented identifying some of the same corridors outlined in the existing CMS/MMP. With a more complete data set, it is likely that many of the same corridors outlined in the existing CMS/MMP would be identified. Approximately 89 percent of the corridors identified in the existing CMS/MMP were also identified in the updated CMS/MMP, disregarding the gaps in the data for some of the corridors.

EXISTING CONDITIONS ANALYSIS OF SELECTED CORRIDORS

This study has established an updated Miami-Dade CMS/MMP evaluation process by examining governmental regulations, incorporating positive elements from a literature review of other CMS/MMP programs, and reviewing the data collection and congestion identification process from the existing Miami-Dade CMS/MMP process. A list of potential CMS/MMP corridors was produced utilizing the updated process. A point system was developed in order to rank the corridors based on congestion, length of corridor, safety, access to hurricane evacuation routes, and access to port/industrial/intermodal facilities. Two congested corridors were selected for further analysis that will serve as a pilot for future corridor evaluation procedures in Miami-Dade County – SR 916 (NW/NE 135th Street) and SW 67th Avenue (Ludlam Road). This section of the report provides further analysis of the existing transportation conditions along the selected CMS corridors. The existing conditions analysis provides the basis for developing recommendations for improving the mobility of the corridors.

Existing conditions were analyzed for four modes of travel.

- Pedestrian
- Bicycle
- Transit
- Roadway

Pedestrian conditions are largely affected by surrounding land uses and existing pedestrian infrastructure. Residential land uses often produce employment, shopping, and recreational trips. Other land uses that tend to be associated with increased pedestrian activity include commercial activity centers, schools, and parks. The primary forms of pedestrian infrastructure include sidewalks, crosswalks, pedestrian signals, and pedestrian signage. Lighting is also an important element of pedestrian infrastructure that improves pedestrian mobility, safety, and security at night. In order for walking to provide a viable transportation alternative, conditions need to be favorable for pedestrian accessibility and mobility. Providing quality pedestrian facilities is important for encouraging short trips to be made on foot instead of by driving.

Bicycling offers longer distance mobility than walking and is therefore less dependent upon the land uses adjacent to the corridor. However, surrounding land uses can still have a large impact upon bicycling activity. Residential areas often produce various types of bicycling trips including employment, shopping, school, and recreational. The primary forms of bicycle infrastructure include bike lanes, dedicated bike paths, shared use paths, wide curb lanes, and paved shoulders. Bike lanes form a portion of the roadway and have been designated for exclusive use by bicycles. Bike lanes are not physically separated from traffic, but are marked by pavement markings, striping and signage. Bike paths and shared use paths are physically separated by an open space or a barrier and typically attract additional recreational riders. Shared use paths may be used by pedestrians as well as bicyclists. Wide curb lanes are similar to bike lanes but are not designated by striping or pavement markings. Paved shoulders are separated from travel lanes by the striping representing the outside edge of the outermost travel lane. Paved shoulders are meant to provide space for vehicle breakdowns and correction for driver error. Bicyclists may use the paved shoulder for travel, although the pavement surface is often not smooth and is sometimes littered with debris.

Bicycle infrastructure can include bicycle parking racks, bicycle transport racks, lockers, and even workplace showers. Bicycle racks and lockers are used for end-of-trip bicycle parking and are typically available at schools, libraries, government buildings, and public transit terminals. Traditional bike racks provide little security; bicycle storage lockers provide additional security from theft and protection from the elements. Bicycle transport racks are facilities provided on public transit vehicles that allow transit patrons to bring their bicycle along with them from trip origin to trip destination. In addition, the availability of showers and lockers at a workplace encourages bicycle commuting by providing facilities that allow employees to maintain a professional appearance.

Public fixed-route transit offers mobility along certain travel paths, or routes. Transit is typically utilized for longer distance trips than walking or bicycling; however, patrons must travel according to the transit operating schedule. Since transit routes operate on fixed paths, transfers are often necessary to complete trips from origin to destination. Common types of transit in urban settings include commuter rail, heavy rail, automated people movers, regional buses, and community shuttles. Important transit characteristics include route alignments, destinations served, hours of operation, headways (service frequencies), fare structure, bus stop locations and infrastructure, and ridership data.

For purposes of this study, the roadway mode of travel refers to traffic mobility and accessibility. Traffic on roadways in most urban settings is primarily composed of private automobiles, which account for the majority of travel mode choice for common trip purposes such as employment and shopping. Since the mobility of this travel mode is high, roadway infrastructure affects traffic conditions more than adjacent land uses. In fact, roadway infrastructure must be carefully designed to complement the surrounding land uses. Important roadway infrastructure includes functional classification, number of travel lanes, intersection control, and intersection lane assignments. Important roadway data and characteristics include traffic counts, average vehicle delay at intersections, and level of service.

SR 916 (NW/NE 135th Street)

Figure 4 depicts the SR 916 (NW/NE 135th Street) study corridor between NW 2nd Avenue and US 1 (Biscayne Boulevard).

Pedestrian

Sidewalks exist along both sides of NW/NE 135th Street between NW 2nd Avenue and US 1 (Biscayne Boulevard). Existing sidewalks along NW/NE 135th Street are typically located on the back of the curb, which provides little separation between pedestrians and vehicular traffic. This condition degrades the pedestrian environment along the corridor and could introduce pedestrian safety concerns.

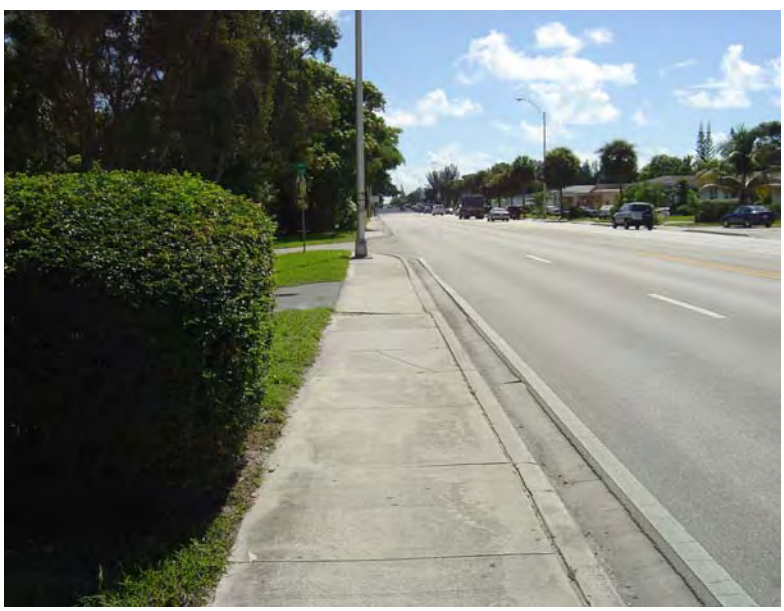


Exhibit 1. Typical Sidewalk Conditions along NW/NE 135th Street

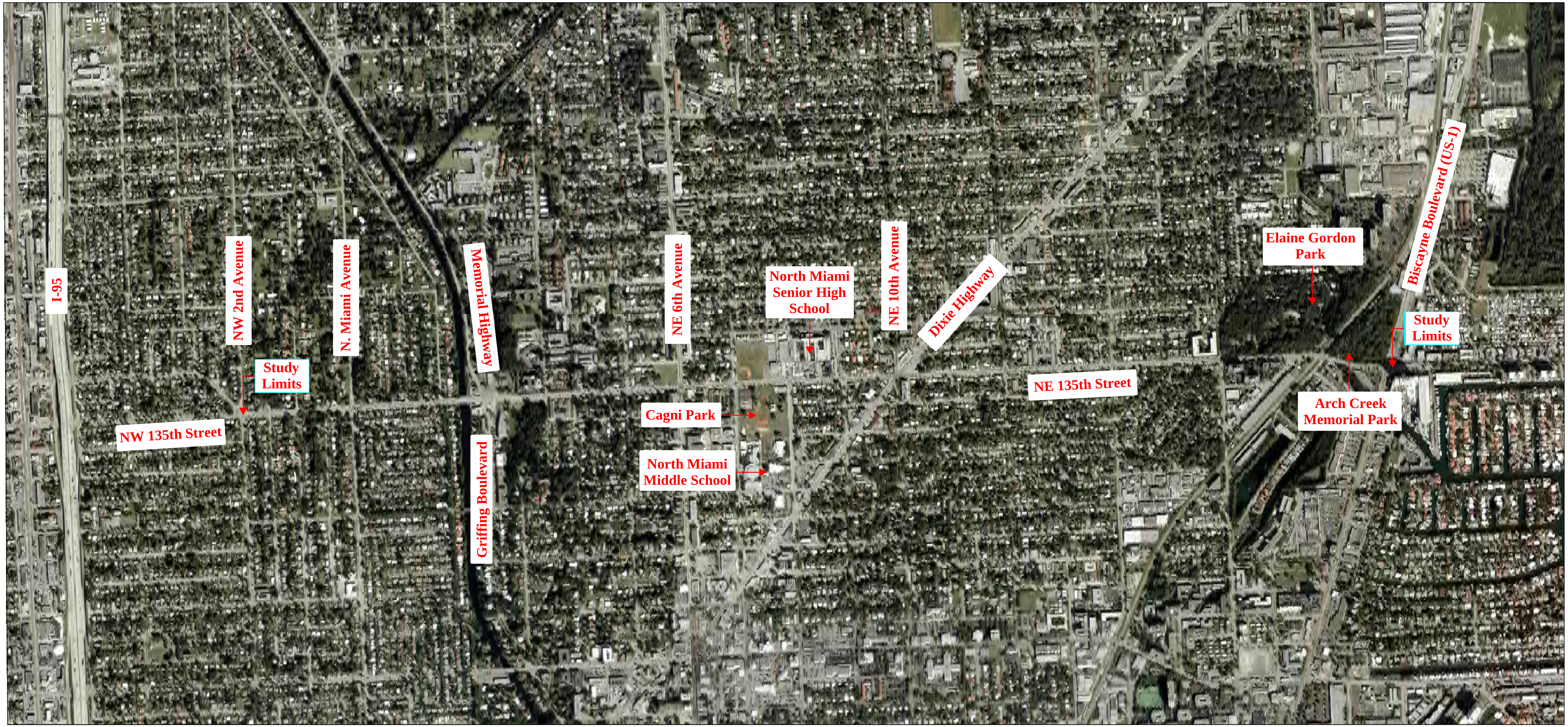


FIGURE 4
SR 916 (NW/NE 135TH STREET)
CORRIDOR OVERVIEW

Kimley-Horn and Associates, Inc.

Sidewalks along intersecting cross-streets are found for most major intersections along the corridor, with the exception of North Miami Avenue. In addition, Memorial Highway/Griffing Boulevard only has short segments of existing sidewalks that connect to NE 135th Street. Pedestrian crosswalks exist at the signalized intersections along the corridor. However, there may be cases where the crosswalk pavement markings have faded due to extended wear. Particularly, the crosswalks across Dixie Highway seem to be faded to the point that they may soon become unrecognizable.

Lighting along NW/NE 135th Street appears adequate to support the existing levels of pedestrian activity along this corridor.

Roadway speed limits are 30 miles per hour (mph) west of North Miami Avenue and 40 mph between North Miami Avenue and Biscayne Boulevard. Lower speed limits may encourage pedestrian activity by improving the environment for pedestrians.

Adjacent land use along most portions of the NW/NE 135th Street study corridor is residential with some commercial land use at intersections. Three parks exist along the corridor east of NE 6th Avenue – Cagni Park, Elaine Gordon Park (Enchanted Forest), and Arch Creek Memorial Park. Two schools exist along the corridor – North Miami Senior High School (NMSHS) and North Miami Middle School (NMMS). A school zone exists along NW/NE 135th Street between NE 6th Avenue and Dixie Highway associated with NMSHS and NMMS. Heightened pedestrian activity associated with these two schools exists during school commencement and dismissal within the study corridor. Enhanced crosswalk pavement markings are provided at three (3) intersections near NMSHS – NE 7th Avenue, NE 8th Avenue, and NE 9th Avenue.

Bicycle

Bike lanes are not provided along the NW/NE 135th Street study corridor and little bicycle activity appears evident in the study corridor, with the possible exception of pockets of activity associated with the schools. Recreational bicycling is common on local streets in the surrounding residential neighborhoods. Many recreational bicyclists are children or novice bicyclists who may feel uncomfortable riding on an arterial such as NW/NE 135th Street, even if bicycle facilities such as bike lanes were provided. Limited right-of-way availability and the density of driveway access may restrict the feasibility of implementing bike paths or bike lanes.

Transit

Transit service in the NW/NE 135th Street study corridor is provided by Miami-Dade Metrobus Route 28, which operates on 30-minute headways during both peak and off-peak periods. Route 28 is the SR 916 trunk line between LeJeune Road and Biscayne Boulevard. Route 28 also serves the Hialeah Metrorail Station, Opa-Locka, and the Florida International University (FIU) North Campus. Transfers are provided at the following intersections:

- North Miami Avenue (Route 2)
- NE 6th Avenue (Route 9)
- Dixie Highway (Route 75)
- NE 12th Avenue (Route 10)
- NE 16th Avenue (Route 16)
- Biscayne Boulevard (Routes 3 and Biscayne Max)

A total of 23 bus stops are provided on NW/NE 135th Street within the study limits between NW 2nd Avenue and Biscayne Boulevard: 12 eastbound bus stops and 11 westbound bus stops. Benches are provided at 10 of the 23 bus stops (43 percent) within the study corridor. No shelters are provided at bus stops within the study corridor; the presence of shelters could encourage transit ridership in the corridor by enhancing transit patron comfort.

Exhibit 2. Passengers Waiting at a Transfer Stop Without a Shelter

Peak period ridership surveys were obtained from Miami-Dade Transit to estimate bus ridership during weekday peak travel periods. Ridership surveys conducted after January 1, 2002, were considered recent enough for purposes of this study. Surveys conducted for both eastbound and westbound trips were used in this analysis. Table 13 summarizes the results of the bus ridership surveys conducted for Route 28 within the study corridor. Although transit serves critical transportation needs within the corridor, current ridership levels do not appear to significantly reduce travel congestion within the corridor.

Table 13. Route 28 Average Ridership and Capacity per Bus within Study Corridor

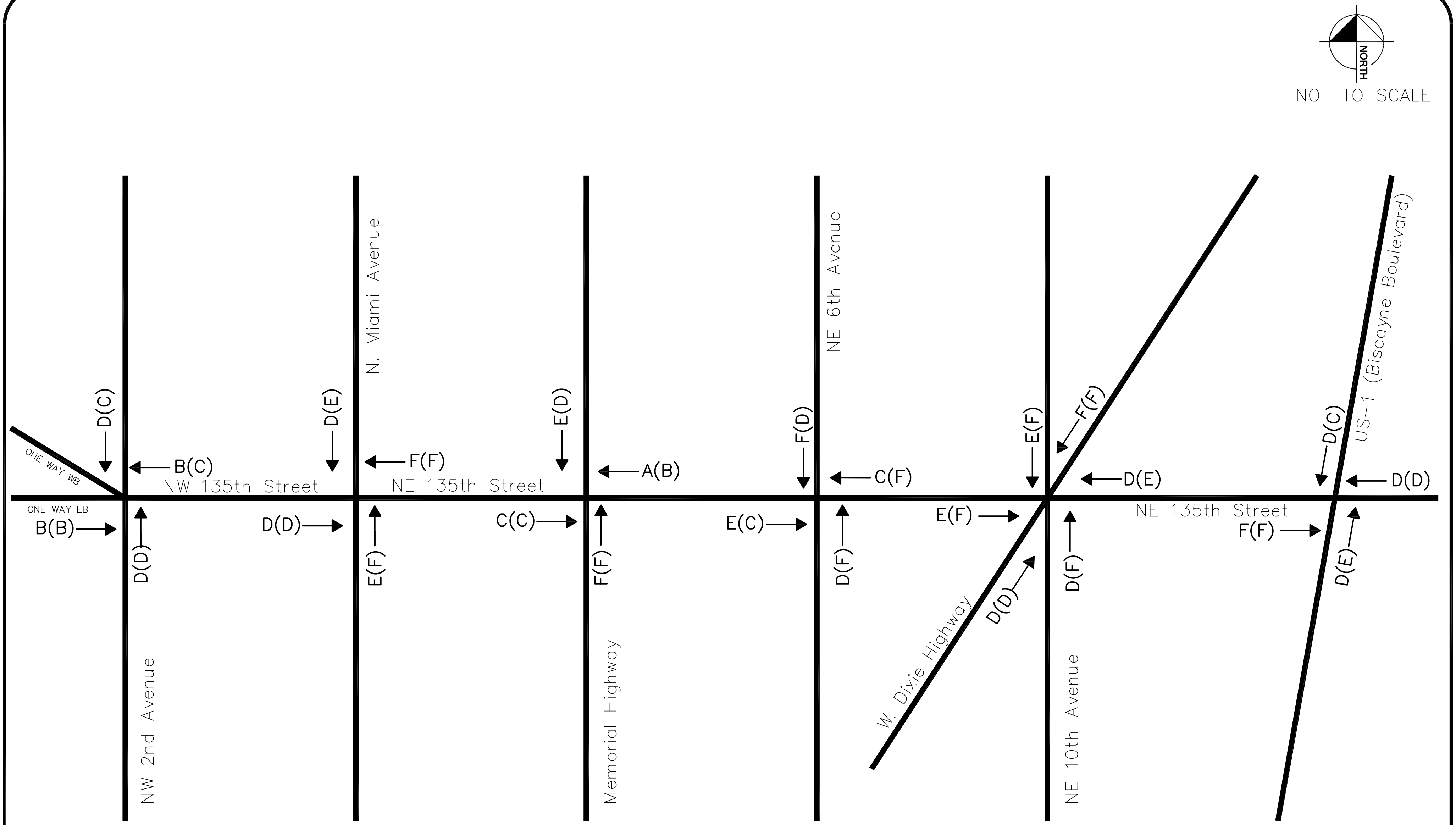
	Direction	Ridership	Capacity
AM Peak	Eastbound	13	60
	Westbound	9	60
PM Peak	Eastbound	7	57
	Westbound	15	60

Roadway

SR. 916 (NW/NE 135th Street) is a state minor arterial roadway within the limits of this analysis (NW 2nd Avenue to Biscayne Boulevard). Biscayne Boulevard is the eastern terminus of SR 916. NW/NE 135th Street is a 5-lane roadway (2 eastbound lanes, 2 westbound lanes, one center 2-way left-turn [TWLT] lane). Within the study limits west of North Miami Avenue, the speed limit is 30 miles per hour (mph). Between North Miami Avenue and Biscayne Boulevard, the speed limit is 40 mph. NW/NE 135th Street provides access to Interstate 95 west of the study limits. Most of the study corridor is contained within the City of North Miami, although a small portion on the western end of the corridor is within unincorporated Miami-Dade County.

Eleven (11) traffic signals are provided within the 2.7-mile limits of this study corridor, or approximately 4.1 traffic signals per mile. This moderately high level of traffic signal density could be a contributing cause of traffic congestion within the NW/NE 135th Street corridor. Throughout the study corridor, numerous residential and commercial driveways connect to NW/NE 135th Street. This condition may increase delay along the corridor as slow moving vehicles turn into and out of these driveways.

Turning movement count (TMC) data were collected at selected signalized intersections along the study corridor during both the AM peak (7:00 AM – 9:00 AM) and the PM peak (4:00 PM – 6:00 PM). The TMC data were used to determine a peak hour for each studied intersection and peak hour intersection capacity analysis was performed for each studied intersection. Results of the intersection capacity analysis are presented in Figure 5.



LEGEND

A(A)⟶ APPROACH LEVEL OF SERVICE AM(PM)

FIGURE 5
EXISTING 2004
LEVEL OF SERVICE
NW/NE 135TH STREET

Kimley-Horn and Associates, Inc.

Table 14 presents the delay and level of service by approach for the studied intersections.

Table 14. Delay and Level of Service by Approach – NW/NE 135th Street

Intersection	Peak Hour Delay AM(PM)				Peak Hour LOS AM(PM)			
	EB	WB	NB	SB	EB	WB	NB	SB
NW 2nd Avenue	11.6 (12.9)	11.2 (23.7)	35.7 (37.0)	35.8 (32.4)	B (B)	B (C)	D (D)	D (C)
N. Miami Avenue	46.8 (37.8)	83.2 (83.0)	66.8 (276.6)	40.4 (68.5)	D (D)	F (F)	E (F)	D (E)
Griffing Boulevard/ Memorial Highway	26.5 (24.7)	7.0 (19.1)	815.8[(A)] (117.1)	60.7 (43.4)	C (C)	A (B)	F (F)	E (D)
NE 6th Avenue	66.3 (32.0)	35.0 (90.7)	41.3 (135.8)	106.3 (53.4)	E (C)	C (F)	D (F)	F (D)
NE 10th Avenue	59.4 (167.3)	45.3 (55.4)	53.0 (83.9)	75.9 (84.8)	E (F)	D (E)	D (F)	E (F)
Dixie Highway	59.4 (167.3)	45.3 (55.4)	52.2 (52.3)	148.9 (122.1)	E (F)	D (E)	D (D)	F (F)
Biscayne Boulevard	194.4 (339.6)	43.3 (41.2)	37.9 (68.2)	37.6 (31.9)	F (F)	D (D)	D (E)	D (C)

Note: (A) – Actual vehicle delay may be less than the Highway Capacity Manual (HCM) reported result for the northbound Griffing Boulevard movement as vehicles making through movements were observed to deviate around vehicles waiting to execute a permissive left turn.

According to the intersection capacity analysis performed for this study, LOS F conditions are present for at least one approach at five of the six intersections identified for analysis in this study (NE 10th Avenue and Dixie Highway cross NE 135th Street at the same location and were thus analyzed as one intersection). Eastbound and westbound delay tends to be more severe during the PM peak period, although this is not the case for all approaches. Vehicle delays are particularly severe at the NE 135th Street intersections of North Miami Avenue, NE 6th Avenue, Dixie Highway/NE 10th Avenue, and Biscayne Boulevard. This intersection capacity analysis demonstrates the existence of detrimental traffic congestion in the NW/NE 135th Street corridor.

SW 67th Avenue (Ludlam Road)

Figure 6 depicts the SW 67th Avenue (Ludlam Road) study corridor between Sunset Drive and Tamiami Trail.

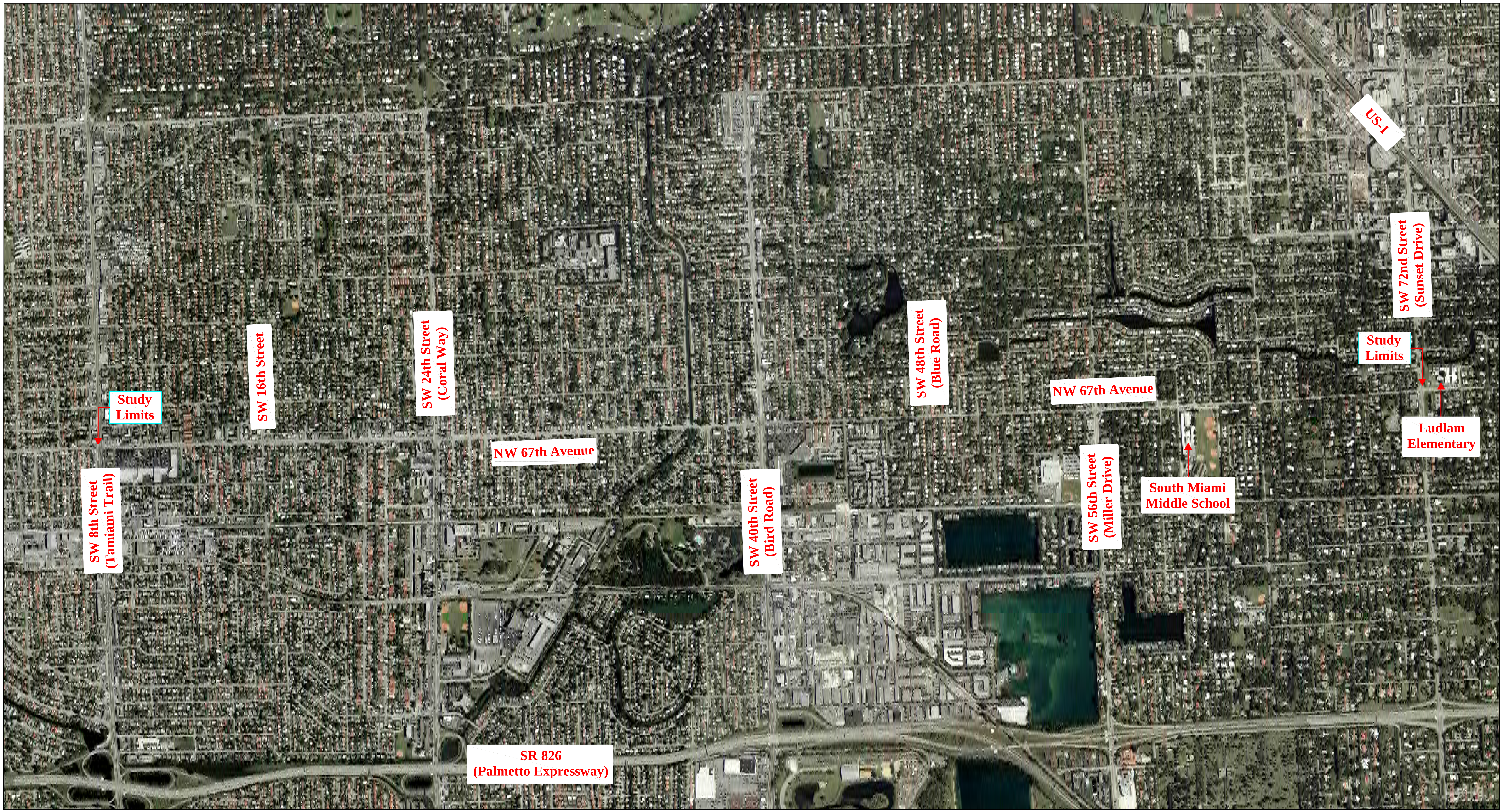


FIGURE 6
SW 67th Avenue (Ludlam Road)
CORRIDOR OVERVIEW

Kimley-Horn and Associates, Inc.

Pedestrian

Sidewalks exist along both sides of SW 67th Avenue between SW 40th Street (Bird Road) and SW 8th Street (Tamiami Trail). Between SW 40th Street and SW 72nd Street (Sunset Drive), sidewalks are discontinuous along both sides of the study corridor.

Existing sidewalks along Ludlam Road between Bird Road and Tamiami Trail are typically located on the back of the curb, which provides little separation between pedestrians and vehicular traffic. Furthermore, from south of Coral Way to Tamiami Trail, continuous access from commercial parking areas to Ludlam Road compromises pedestrian mobility and safety. This condition degrades the pedestrian environment along the corridor and discourages pedestrian activity.

Exhibit 3. Typical Sidewalk Conditions along Ludlam Road near Coral Way

Between Sunset Drive and Bird Road, sidewalks are discontinuous; however, the sections of sidewalk that are provided are typically separated from the roadway by green space. This separation facilitates a positive pedestrian environment, although the discontinuous nature of sidewalks in the area reduces pedestrian mobility.

Exhibit 4. Discontinuous Sidewalk along Ludlam Road between Sunset Drive and Miller Drive

Sidewalks along intersecting section line and half-section line roadways are found along the corridor. Pedestrian crosswalks exist at major signalized intersections along the corridor and pedestrian signal heads are provided for crosswalks at the section line roadways. Other signalized intersections within the study corridor exhibit pedestrian buttons without pedestrian signal heads, except the signalized intersection at SW 64th Street (Hardee Drive), which has no pedestrian features.

Lighting is blocked in some portions of the corridor by the overhanging tree canopy, especially between Sunset Drive and Bird Road. In addition, few streets lights are provided between Miller Drive and Bird Road. Between Bird Road and Tamiami Trail, standard roadway lights are provided along the east side of Ludlam Road.

Adjacent land use along the corridor is residential between Sunset Drive and Coral Way except for some commercial activity around the Bird Road and Coral Way intersections. From just south of Coral Way to Tamiami Trail, adjacent land use is commercial. The residential portion of the corridor south of Coral Way is likely to produce more recreational pedestrian trips, especially in the two-lane section south of Bird Road.

Two schools exist along the southern portion of the study corridor. School zones with overhead flashers are provided along Ludlam Road between the 5900 Block and the 6100 Block (South Miami Middle School) and along Ludlam Road between the 7100 Block and the 7400 Block (Ludlam Elementary School). In addition, Palmer Park is located near South Miami Middle School. Heightened pedestrian activity during school commencement and dismissal is found in the southern portion of the corridor.

In general, greater pedestrian continuity is provided along Ludlam Road in the section north of Bird Road. Between Sunset Drive and Bird Road, some sections of missing sidewalk restrict mobility and inconsistent lighting may discourage pedestrian activity at night.

Bicycle

Bike lanes are not provided along the SW 67th Avenue study corridor, although moderate bicycle activity was observed in the study corridor during field reviews. The Dadeland area approximately one mile south of the study limits is a large employment and shopping activity center for which some bicycle trip demand may exist, which could be met if proper bike facilities were provided. The SW 67th Avenue corridor appears to provide right-of-way for implementing bicycle facilities south of Bird Road. In addition, fewer travel lanes and more green space south of Bird Road generally provides a more pleasant experience for bicyclists than north of Bird Road.

Transit

Transit service in the SW 67th Avenue study corridor is provided by Miami-Dade Metrobus Route 73, which operates on 30-minute peak period headways and 60-minute off-peak headways. Funding from the People's Transportation Plan (PTP) is expected to be used to reduce off-peak headways on Route 73 from 60 to 30 minutes in November 2004. Increasing transit service frequency is consistent with the objectives of the Congestion Management System (CMS).

Route 73 is the SW 67th Avenue trunk line between Flagler Street and Kendall Drive. Route 73 also serves the Dadeland South Metrorail Station, the Okeechobee Metrorail Station, and the Miami Lakes Technical Education Center. Peak-period only trips are made to Miami Children's Hospital along SW 62nd Avenue south of Coral Way. Transfers are provided at the following intersections:

- Sunset Drive (Route 72)

- Miller Drive (Route 56)
- Bird Road (Route 40)
- Coral Way (Routes 24 and Coral Way Max)
- Tamiami Trail (Routes 8 and Flagami Connection)

A total of 55 bus stops are provided within the study limits between Sunset Drive and Tamiami Trail: 26 northbound bus stops and 29 southbound bus stops. Benches are provided at 23 of the 55 bus stops (42 percent) within the study corridor. Shelters are provided at only 3 of the 55 bus stops (5 percent) within the study corridor, although several other bus stops are located under a natural canopy of trees.

Exhibit 5. Typical Bus Stop along Ludlam Road with no Seating or Trash Receptacle

Peak period ridership surveys were obtained from Miami-Dade Transit to estimate bus ridership during weekday peak travel periods. Ridership surveys conducted after January 1, 2002, were considered recent enough for purposes of this study. Surveys conducted for both northbound and southbound trips were used in this analysis. Table 15 summarizes the results of the bus ridership surveys conducted for Route 73 within the study corridor. Although transit serves critical transportation needs within the corridor, current ridership levels do not appear to significantly reduce travel congestion within the corridor.

Table 15. Route 73 Average Ridership and Capacity per Bus within Study Corridor

	Direction	Ridership	Capacity
AM Peak	Northbound	13	64
	Southbound	12	64
PM Peak	Northbound	21	58
	Southbound	13	58

Roadway

SW 67th Avenue (Ludlam Road) is a county minor arterial roadway within the limits of this analysis (Sunset Drive to Tamiami Trail). Ludlam Road is a 5-lane roadway (2 northbound lanes, 2 southbound lanes, one center 2-way left-turn [TWLT] lane) between Bird Road and Tamiami Trail. Ludlam Road is a 2-lane roadway (1 northbound lane, 1 southbound lane) between Bird Road and Sunset Drive. Within the study limits, the speed limit is 35 miles per hour (mph). The study corridor passes through the City of South Miami, unincorporated Miami-Dade County, and the City of West Miami. Ludlam Road provides connections to US 1 south of the study limits.

Eight (8) traffic signals are provided within the 4.0-mile limits of this study corridor, or approximately 2.0 traffic signals per mile. Spacing of traffic signals does not appear to be a contributing cause of traffic congestion within the Ludlam Road corridor.

Turning movement count (TMC) data were collected at select signalized intersections along the study corridor during both the AM Peak (7:00 AM – 9:00 AM) and the PM peak (4:00 PM – 6:00 PM). The TMC data were used to determine a peak hour for each studied intersection. Peak hour intersection capacity analysis was performed for each studied intersection, and results of the intersection capacity analysis are presented in Figure 7.

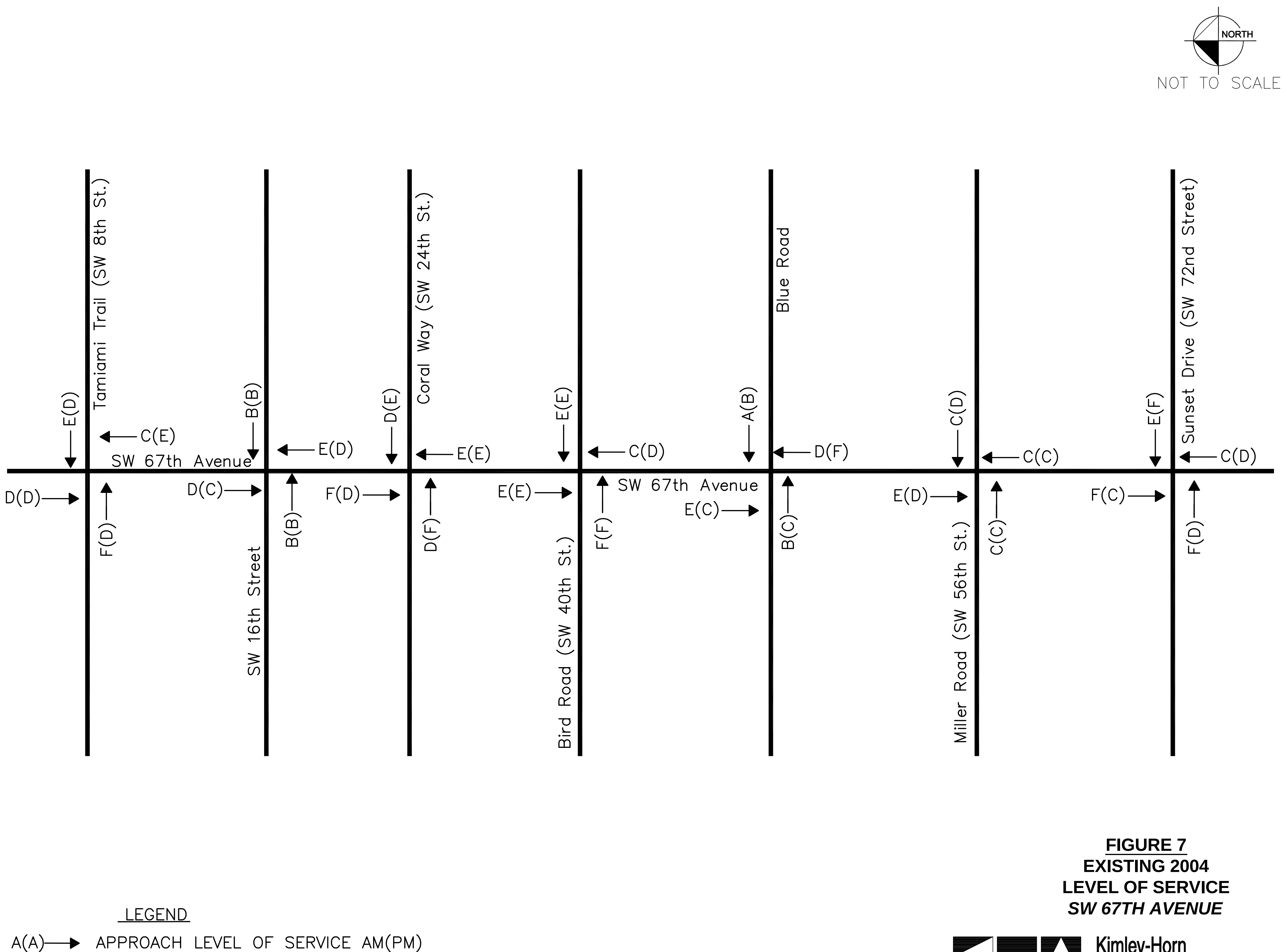


FIGURE 7
EXISTING 2004
LEVEL OF SERVICE
SW 67TH AVENUE

Kimley-Horn and Associates, Inc.

Table 16 presents the delay and level of service by approach for the studied intersections.

Table 16. Delay and Level of Service by Approach – Ludlam Road

Intersection	Peak Hour Delay AM(PM)				Peak Hour LOS AM(PM)			
	EB	WB	NB	SB	EB	WB	NB	SB
Tamiami Trail	35.3 (39.7)	33.8 (72.5)	141.1 (42.3)	60.5 (36.6)	D (D)	C (E)	F (D)	E (D)
SW 16th Street	41.3 (30.9)	63.3 (39.8)	13.6 (13.5)	11.2 (13.4)	D (C)	E (D)	B (B)	B (B)
Coral Way	101.0 (50.2)	76.9 (79.2)	35.8 (84.4)	49.1 (68.6)	F (D)	E (E)	D (F)	D (E)
Bird Road	75.6 (64.9)	31.4 (41.0)	123.7 (135.5)	65.8 (65.2)	E (E)	C (D)	F (F)	E (E)
Blue Road	75.0 (33.8)	50.9 (80.0)	16.1 (22.2)	7.2 (12.3)	E (C)	D (F)	B (C)	A (B)
Miller Drive	65.4 (48.3)	28.6 (29.6)	25.6 (25.7)	24.5 (35.2)	E (D)	C (C)	C (C)	C (D)
Sunset Drive	120.8 (31.8)	29.5 (41.9)	93.7 (51.1)	60.1 (131.7)	F (C)	C (D)	F (D)	E (F)

According to the intersection capacity analysis performed for this study, LOS E or F conditions are present for all seven intersections selected for capacity analysis on at least one approach. Northbound and southbound vehicle delays are particularly severe at the Ludlam Road intersections of Tamiami Trail, Coral Way, Bird Road, and Sunset Drive. Intersecting corridors also exhibit significant delays at Ludlam Road intersections, particularly: eastbound Coral Way during the AM peak, eastbound Sunset Drive during the AM peak, and westbound Blue Road during the PM peak. This intersection capacity analysis demonstrates the existence of detrimental traffic congestion in the Ludlam Road corridor.

CONGESTION MANAGEMENT STRATEGIES

Congestion management strategies are intended to improve the efficiency of a transportation corridor through improvements that encourage alternatives to the single occupant automobile and promote better use of existing resources. Congestion management strategies can often be implemented at a lower cost than traditional roadway widening and can include technology-based solutions that increase the efficiency of existing roadway systems. This chapter of the report outlines the congestion management strategies developed for the selected congested corridors in this study.

- SR 916 (NW/NE 135th Street) – NW 2nd Avenue to US 1 (Biscayne Boulevard)
- SW 67th Avenue (Ludlam Road) – Sunset Drive to Tamiami Trail

This chapter begins with a summary of the potential strategy list developed for this study. The potential strategies were developed to comply with the goals of the congestion management system (CMS) program. Once the potential CMS strategies were developed, strategies were applied to specific locations along the corridor based on (1) the need for CMS strategies developed in the existing conditions analysis and (2) the appropriateness of a particular strategy at the specific location.

Description of Potential Strategies

The potential strategies list developed for this CMS/MMP update can be utilized as a "toolbox" of CMS strategies that can be applied in congested corridors and spots throughout Miami-Dade County. This "toolbox" is not meant to include all possible CMS strategies; however, common strategies thought to have particular applicability in Miami-Dade County are included.

Pedestrian Strategies

- Provide Appropriate Sidewalks and Pedestrian Paths – Increasing pedestrian mobility by providing sidewalks along travel corridors can encourage short trips to be made on foot and can facilitate connections to other travel modes.
- Construct Missing Sidewalk Links – Greater continuity can be provided for pedestrian trips by ensuring a continuous network of paths that minimizes missing segments.

- Enhance Separation of Pedestrians and Vehicles – Providing a natural barrier of green space between sidewalks and vehicular travel lanes enhances the pedestrian environment.
- Provide Intersecting Pedestrian Connections – Opportunity to serve a greater number of trips can be enhanced by ensuring proper connecting sidewalks along the roadways intersecting a study corridor.
- Install Pedestrian Crossing Infrastructure – Providing pedestrian crosswalks, pedestrian signals, and pedestrian signage at signalized intersections provides guidance for pedestrians and increases motorist awareness of pedestrians.
- Provide Enhanced Connections to Transit Stops – Providing clear, unobstructed pedestrian paths to transit stops is crucial for transit accessibility.
- Install Mid-Block Pedestrian Signals – Where warranted, mid-block pedestrian signals can provide guidance and protection for pedestrians crossing a major roadway and reduce the barrier effect caused by a principal roadway corridor.
- Upgrade Lighting Features – Enhanced lighting can foster a sense of security among pedestrians and may encourage travelers to consider making trips on foot at night as well as during the daylight hours.
- Promote Pedestrian Programs – Develop pedestrian maps, pamphlets, and brochures to educate pedestrians and motorists regarding safety issues and rules.

Bicycle Strategies

- Bicycle Paths – Bike paths are physically separated from vehicular traffic by an open space or a barrier and typically attract recreational riders as well as commuters.
- Bicycle Lanes – Bike lanes are typically provided as the far right lane of a roadway in urban settings and delineated with striping, pavement markings, and signage; bike lanes are not physically separated from motorized traffic.
- Paved Shoulders – Paved shoulders are separated from travel lanes by the striping representing the outside edge of the outermost travel lane and provide space for bicyclists, although the pavement surface is often not as smooth and is sometimes littered with debris.
- Wide Curb Lanes – Wide curb lanes are similar to bike lanes but are not designated by striping or pavement markings.

- Enhanced Bicycle Signage – Enhanced bicycle signage can be provided to serve a variety of functions including alerting motorists to the presence of bicyclists and directing bicyclists to bicycle racks or storage lockers.
- Enhanced Connections to Transit Stops – Ensuring that transit stops are accessible by bicycle lanes encourages travelers to ride a bicycle to the transit stop.
- Bicycle Transport Racks on Transit Vehicles – Bicycle transport racks are features provided on public transit vehicles that allow transit patrons to bring their bicycle along with them and therefore allow the user to bring the bicycle from trip origin to trip destination.
- Greater Continuity for Bicyclists – Constructing missing bicycle facility links along a roadway can provide greater continuity for bicyclists to make longer trips by bicycle along the corridor.
- Enhanced Bicycle Infrastructure – Providing bicycle infrastructure such as bicycle parking racks, bicycle transport racks, lockers, maintenance areas, and even workplace showers can encourage commuters to bicycle by meeting their needs for storage, mobility, and maintaining a professional appearance.
- Promote Bicycle Programs – Develop bicycling maps, pamphlets, and brochures to educate bicyclists, pedestrians, and motorists regarding safety issues and rules.

Transit Strategies

- Provide More Frequent Service – Reducing headways on transit routes can provide more convenient service to transit patrons; convenience of service provides incentive for encouraging travelers to utilize transit.
- Provide Express Bus Service – Express bus service can significantly reduce transit travel times in long corridors with numerous local bus stops.
- Consolidate Bus Stops – Adjacent bus stops located in close proximity where one or both bus stops experience little usage can often be consolidated, which can have positive impacts on travel time, route scheduling, and bus/traffic operations.
- Expand Community Shuttles – Community transit service can often complement regional bus routes by providing connecting bus service to local neighborhoods.
- Far Side Bus Bays – Far side bus bays provide safety benefits by allowing buses to stop without causing other vehicles to stop and potentially block an intersection. Far side bus

bays are typically good locations for timed schedule points to allow buses to dwell if necessary to remain on schedule.

- Near Side Queue Jumpers – Near side queue jumpers are typically provided in right-turn lanes where only public transit vehicles are allowed to execute a through movement. Near side queue jumpers are often provided in conjunction with a far side bus bay. Near side queue jumpers are most effective in locations where right-turn volumes are low.
- Modify Bus Stop Infrastructure to Meet ADA Requirements – The Americans With Disabilities Act (ADA) requires that uninhibited access be provided from the sidewalk to the bus stop.
- Install Bus Stop Infrastructure – Benches and trash receptacles are basic infrastructure for bus stops. Shelters provide a location for patrons to wait for a bus with reduced impact from environmental elements such as sunshine, rain, and wind. A transit system map and informational signage is appropriate in locations frequented by tourists and visitors.
- Implement Lighting Improvements – Enhanced lighting around bus stops can foster a sense of security for transit patrons who travel outside of daylight hours.
- Develop Transit Marketing Techniques – Transit marketing techniques can be developed for residents and employees along a corridor to describe the services that are available and promote the use of public transit.
- Implement Transit ITS Improvements – Intelligent Transportation Systems (ITS) improvements provide capacity or operational enhancements through technological innovations rather than physical capacity enhancements. ITS improvements for transit include strategies such as the "next-bus" technology and signal priority for buses.
- Implement Exclusive Transit Facilities – Although often more capital intensive than other transit strategies, providing exclusive transit facilities, such as bus lanes, busways, and fixed-guideway transit, can often be effective strategies for encouraging modal shift from automobiles to public transit.
- Promote Transit-Oriented Development – Encouraging high-density, mixed-use redevelopment within close proximity to multimodal hubs and transfer stations is a strategy for addressing the relationship between land use and transportation.

Roadway Strategies

- Construct Through Travel Lanes – Although not necessarily consistent with the objectives of congestion management system (CMS) strategies due to capital construction costs and potential right-of-way impacts, constructing through travel lanes is one option for addressing congestion in certain localized cases.

- Construct Turn Lane Improvements – Additional turn lanes or turn lane extensions can provide capacity benefits at intersections, which often represent the most severe capacity restrictions in urban environments.
- Construct Turbo Lanes – Right-turn lanes that are physically separated from other traffic movements can operate as free-flow movements not under signal control. However, these improvements can reduce the walkability of an intersection unless pedestrian provisions are made.
- Construct HOV Lanes – High occupancy vehicle (HOV) lanes attempt to maximize the person carrying capacity of a roadway by allowing exclusive use for vehicles carrying a designated minimum number of passengers.
- Provide Park-n-Ride Lots – Park-n-ride lots associated with major transit stations, multimodal hubs, and HOV lanes, provide opportunities for commuters to rideshare or transfer to public transit services.
- Optimize Signal Timing – Providing signal timing and phasing improvements is a relatively low cost action that can result in immediate traffic flow improvements. Care should be taken to not significantly degrade traffic operations at adjacent intersections that are part of coordinated signal systems.
- Roundabouts – Roundabouts, although not common in most portions of the country, have been shown to effectively provide intersection traffic control in some situations.
- Florida “T” Intersections – Florida “T” intersections channelize movements at a three-leg intersection such that one through movement, or a physically-separated lane(s) of that through movement, is free-flow and traffic does not have to stop at the intersection.
- Turning Movement Restrictions – By eliminating certain movements, increased mobility and safety can often be gained for other traffic movements
- Signing and Marking Enhancements – Proper signage and pavement markings are important throughout a jurisdiction. Improvements to signing and marking can provide important information and channelization for motorists leading to increased awareness and safety.
- Frontage Road Networks – A network of frontage roads is a potential strategy for reducing the number of driveway connections or signalized intersections along an arterial roadway. However, frontage roads often necessitate having adjacent intersections spaced in close proximity where intersecting arterial roadways cross.

- Far Side Bus Bays – As discussed in the Transit Strategies section, far side bus bays can improve traffic flow by removing buses from through travel lanes downstream of an intersection, which can reduce the need for vehicles to stop downstream of the intersection and form a queue that blocks the intersection.
- Traffic Calming Techniques – Traffic calming techniques such as traffic circles, enhanced landscaping, and chicanes are typically more applicable for neighborhood streets rather than arterial roadways. However, if traffic congestion continues to increase, a need may exist for volume management techniques on adjacent local roadways as motorists search for alternate routes to avoid traffic congestion.
- Access Management Strategies – Access management techniques provide traffic operations benefits by reducing the number of signalized intersections, median openings, and driveway connections for arterial roadways.
- Intelligent Transportation Systems (ITS) – ITS improvements incorporate technological solutions for traffic congestion and safety including advanced traffic management systems (ATMS), advanced traveler information systems (ATIS), incident management techniques, motorist information systems, electronic toll collection, and ramp metering.

Transportation Demand Management (TDM) Strategies

- Carpooling – Carpooling is an arrangement in which two or more people share the use and cost of privately-owned vehicles while traveling together to and from prearranged destinations.
- Vanpooling – Vanpooling is typically a more structured form of carpooling that involves more people and thus, higher capacity vehicles. Vanpooling is most practical when a number of employees working in the same office or industrial park have long distance commutes and also live near each other or can meet at a park-n-ride lot. One member of the vanpool volunteers to drive (and typically rides free), while the others share the cost of operating the van. Vanpools can be (1) owned and operated by an individual, (2) owned by an employer, or (3) provided through a third-party leasing arrangement. Sharing the cost of fuel and maintenance can lead to significant cost reductions for commuters.
- Commuter Tax Benefit – Federal tax law stipulates that employers can subsidize their employees' vanpool or transit commutes. An employer can give its employees up to

$100 per month tax-free to commute on transit or in a qualified vanpool. The employer can deduct the cost of this assistance as a business expense.

- Compressed Work Week – A compressed work week is an alternative work schedule in which employees work longer hours each day but fewer days per week. Compressed work weeks typically allow employees to travel to and from work outside of traditional peak hours of travel.
- Flex-Time – Flex-time is an alternative work schedule in which employees choose their own work schedule within a set standard number of hours. Employees can choose a schedule that allows them to travel outside of the traditional peak hours of travel. Organizations with a large number of employees will likely experience a broad range of working hours, thereby reducing the strain on the transportation system caused by many employees arriving and departing within a small window of time.
- Staggered Work Hours – Staggered work hours is an alternative work schedule in which different groups of employees arrive and depart at different times to offset the employment center's congestion impacts on the surrounding roadway network.
- Congestion Pricing – Market-based pricing strategies can be designed to encourage a shift of peak period trips to off-peak periods or to route traffic away from congested facilities during peak demand periods. Congestion pricing can also be used to encourage transit and carpooling by giving preferential treatment to high-occupancy vehicles. For example, on February 17, 2003, the City of London, U.K., began charging a fee for driving an automobile in its central area during weekdays as a way to reduce traffic congestion and raise revenues to fund transportation improvements.
- Parking Management – Parking management strategies utilize a variety of factors to balance the availability of parking with the availability of modal alternatives. Numerous strategies are included in parking management including parking pricing, shared use parking, and time restrictions. One common strategy is preferential parking locations, or discounted parking, provided by employers for carpools/vanpools to encourage ridesharing.
- Park-n-Ride Lots – These parking facilities allow a transfer from low occupancy vehicles to carpools, vanpools, or transit services. These facilities are often located in the vicinity of a transit hub.
- Telecommuting – Telecommuting is a work arrangement in which employees work at home or another location outside of a central facility on one or more days per week.

These off-site employees often use technology-based applications such as e-mail and teleconferencing to communicate with fellow employees.

- Transportation Management Organization/Coordinator – A public or private organization or professional staff can help provide information and guidance for TDM programs to businesses and individuals leading to increased awareness and participation in these programs. FDOT currently operates South Florida Commuter Services (SFCS) to provide commuter assistance in the area.
- Employee Transportation Coordinator (ETC) – Employers can appoint their own employee transportation coordinators who can help coordinate transportation options.
- Transportation Management Association (TMA) – A TMA is formed to help solve transportation issues within a specific area, such as a town, a central business district, or a university campus. A TMA is incorporated to combine business resources and expertise with government efforts to solve local transportation problems. Funding typically comes from both public and private sectors including government grants, dues paid by member companies, and tax deductible in-kind contributions. TMAs often serve as operators for transit circulator systems.

Table 17 presents a summary of the potential CMS strategies developed for this study. Mobility enhancement strategies will be evaluated at specific locations along the selected study corridors based on need and applicability.

Recommended Strategies for the Selected Congested Corridors

The recommended strategies for the two selected corridors were developed from the list of potential mobility strategies presented in the previous section and summarized in Table 17. The potential strategies were evaluated by studying data obtained during the existing conditions analysis for the two selected corridors. Recommended strategies were developed that addressed specific mobility strategies for the selected corridors. Additionally, projects included in the Transportation Improvement Program (TIP) and Long Range Transportation Plan (LRTP) were researched to coordinate with projects being planned or programmed.

Table 17. Summary of Potential CMS Strategies

Pedestrian	Bicycle	Transit	Roadway	Transportation Demand Management (TDM)
Provide Appropriate Sidewalks and Pedestrian Paths	Bicycle Paths	Provide More Frequent Service	Construct Through Travel Lanes	Carpooling
Construct Missing Sidewalk Links	Bicycle Lanes	Provide Express Bus Service	Construct Turn Lane Improvements	Vanpooling
Enhance Separation of Pedestrians and Vehicles	Paved Shoulders	Consolidate Bus Stops	Construct Turbo Lanes	Commuter Tax Benefits
Provide Intersecting Pedestrian Connections	Wide Curb Lanes	Expand Community Shuttles	Construct HOV Lanes	Compressed Work Week
Install Pedestrian Crossing Infrastructure	Enhanced Bicycle Signage	Far Side Bus Bays	Optimize Signal Timing	Flex-Time
Provide Enhanced Connections to Transit Stops	Enhanced Connections to Transit Stops	Near Side Queue Jumpers	Roundabouts	Staggered Work Hours
Install Mid-Block Pedestrian Signals	Bicycle Transport Racks on Transit Vehicles	Provide Bus Stops that Meet ADA Requirements	Florida "T" Intersections	Congestion Pricing
Upgrade Lighting Features	Greater Continuity for Bicyclists	Install Bus Stop Infrastructure	Turning Movement Restrictions	Parking Management
Promote Pedestrian Programs	Enhanced Bicycle Infrastructure (bike racks, lockers, shower facilities)	Implement Lighting Improvements	Signing and Marking Enhancements	Park-n-Ride Lots
	Promote Bicycle Programs	Develop Transit Marketing Techniques	Frontage Road Networks	Telecommuting
		Implement Transit ITS Improvements	Far Side Bus Bays	Transportation Management Coordinator
		Implement Exclusive Transit Facilities	Traffic Calming Techniques	Employee Transportation Coordinator (ETC)
		Promote Transit-Oriented Development	Access Management Strategies	Transportation Management Association
			Intelligent Transportation Systems (ITS)	

SR 916 (NW/NE 135th Street)

The following strategies were developed for the SR 916 (NW/NE 135th Street) corridor to address specific travel needs identified within the corridor.

- **Construct sidewalks along North Miami Avenue.**

  Providing sidewalks along connecting corridors can increase the number of destinations accessible by foot in the vicinity of the study corridor.
- **Enhance pedestrian facilities along NE 135th Street between Griffing Boulevard and NE 10th Avenue.**

  A pedestrian facility enhancement is identified along NE 135th Street as a Priority III Pedestrian Facility in the *Miami-Dade County 2025 Long Range Transportation Plan*. This project is in the area of Cagni Park, North Miami Middle School, and North Miami Senior High School.
- **Install bus shelters at bus transfer locations.**

  Within the study corridor, bus stops located adjacent to major intersecting roadways with Metrobus service do not have shelters. During field reviews performed for this study, several passengers were observed standing at these transfer locations trying to avoid the elements. Bus shelters should be provided along NE 135th Street and intersecting roadways at the following bus transfer locations within the corridor to enhance passenger comfort and encourage transit use.
  - North Miami Avenue (Route 2)
  - NE 6th Avenue (Route 9)
  - Dixie Highway (Route 75)
  - NE 12th Avenue (Route 10)
  - NE 16th Avenue (Route 16)
  - Biscayne Boulevard (Routes 3 and Biscayne Max)

  The Appendix of this report depicts examples of bus shelters that could be implemented within the study corridor.
- **Install trash receptacles at bus stops.**

  Trash receptacles are recommended along the corridor at bus stops to encourage tidiness in the area surrounding the bus stops and enhance the overall appearance of the corridor. A total of 23 bus stops are located within the study corridor.

- **Develop a transit marketing campaign within the corridor.**

  Ridership analysis along the portion of Metrobus Route 28 passing through the study area indicates plenty of unused transit capacity is available during peak travel periods. A marketing campaign should be initiated within the North Miami neighborhoods surrounding the NW/NE 135th Street corridor to encourage ridership on Route 28, thereby potentially removing vehicular trips from the study corridor. The transit marketing campaign should be initiated in conjunction with the bus stop infrastructure improvements presented above.

- **Identify median improvements along the corridor.**

  A center two-way left-turn (TWLT) lane exists along the study corridor providing continuous access to many residential driveways. Access management improvements should be developed that incorporate a landscaped median with properly spaced median openings that allow access to adjacent neighborhoods as well as U-turn maneuvers. Meetings with residents and stakeholders should be conducted to ensure public participation in the planning process before decisions are made regarding access points. Prior experience has shown that providing access management improvements typically enhance corridor traffic operations by ten percent.

- **Implement a lag westbound left-turn permissive-protected phase at the North Miami Avenue intersection.**

  The westbound NE 135th Street left-turn movement at the North Miami Avenue intersection experiences significant delay during AM and PM peak travel periods. Implementing a westbound left-turn permissive-protected phase with a lag operation after the eastbound through movement (the lead movement) was found to provide significant improvements to the westbound left-turn movement and an overall reduction in intersection delay of approximately five percent.

- **Implement intersection geometry improvements at the Dixie Highway intersection by removing connections to NE 10th Avenue.**

  NE 10th Avenue is a residential local street that forms two of the six approaches at the signalized intersection of NE 135th Street and Dixie Highway. NE 136th Street and NE 134th Street exist to the north and south, respectively, of the study corridor and provide opportunities for traffic from NE 10th Avenue to access Dixie Highway. Removing NE 10th Avenue can be accomplished by either (1) closing NE 10th Avenue at NE 135th Street through construction of cul-de-sacs or (2) terminating NE 10th Avenue one block to the north and south of NE 135th Street. Intersection capacity analysis indicates a twenty percent reduction in intersection delay can be gained by removing connections to NE 10th Avenue at this intersection.

- **Optimize signal timing and progression within the corridor.**
  Efficient signal timing plans and arterial coordination is paramount given the relatively dense spacing of traffic signals within the NW/NE 135th Street corridor. Miami-Dade County should periodically review signal timing within this corridor, especially if modifications to intersection geometric characteristics are made.

SW 67th Avenue (Ludlam Road)

The following strategies were developed for the SW 67th Avenue (Ludlam Road) corridor to address specific travel needs identified within the corridor.

- **Construct missing sidewalk links south of Bird Road.**
  Sidewalks are discontinuous in the Ludlam Road corridor between Sunset Drive and Bird Road. Providing continuous sidewalks enhances pedestrian mobility and increases transit accessibility. SW 67th Avenue between Sunset Drive and Hardee Drive is identified as a Priority II Pedestrian Facility in the *Miami-Dade County 2025 Long Range Transportation Plan*. However, sidewalk improvements can be implemented relatively quickly when right-of-way is available. This pedestrian enhancement should be implemented as part of the CMS enhancements identified in this study.
- **Construct bike lanes along Ludlam Road from Bird Road to US 1.**
  Right-of-way is available in the Ludlam Road corridor between Sunset Drive and Bird Road to add bike lanes. This portion of the corridor contains only two vehicular travel lanes, which enhances the environment for pedestrians and bicyclists. In addition, a natural canopy of trees is found along much of this section of the corridor, which provides additional natural enhancements for bicyclists. Bike lanes would increase bicycle mobility in this corridor, especially if the bicycle lanes continued south to the US 1 intersection, where connections to the Metrorail Path (M-Path) could be made.
- **Develop a marketing campaign to promote bicycling in the corridor.**
  A marketing campaign for bicycling should be developed and implemented in coordination with bike lane improvements along Ludlam Road and presented to residents and stakeholders along the Ludlam Road corridor. The bicycle campaign should focus on the mobility and health benefits of bicycling. Connections to the M-Path and adjoining Metrorail stations should be advertised in the marketing campaign.

- **Install benches and trash receptacles at bus stops within the corridor.**

  Basic forms of bus stop infrastructure should be provided at bus stops within the Ludlam Road corridor to increase patron comfort and encourage transit usage. Approximately 30 benches would be required to provide benches at locations that currently do not have a bench within the Ludlam Road study corridor.

- **Coordinate with South Florida Commuter Services (SFCS) for TDM marketing campaigns.**

  The resources of the regional commuter assistance agency, South Florida Commuter Services, should be used to promote TDM strategies within the commercial areas along the northern portion of the Ludlam Road corridor, especially between Coral Way and Tamiami Trail.

- **Conduct a school access and traffic circulation plan for South Miami Middle School and Ludlam Elementrary School.**

  Traffic queues from area schools increase congestion during school commencement and dismissal. A school transportation study could determine if improvements to school access and circulation could improve travel conditions along Ludlam Road.

- **Conduct an access management plan for Ludlam Road between Bird Road and Tamiami Trail.**

  This section of Ludlam Road contains a center two-way left-turn (TWLT) lane and numerous commercial driveways. Driveway access should be evaluated including sections of the corridor that adjoin to businesses that force pedestrians to walk across long stretches of continuous driveway access. The need to maintain adequate access for adjoining commercial land uses should be considered when developing any modifications.

- **Provide lead-lag phasing and optimize phase splits at the Tamiami Trail and Coral Way intersections.**

  Intersections in the northern portion of the study corridor are generally more restricted by right-of-way constraints and existing development patterns. Therefore, signal phasing and timing improvements are more appropriate for enhancing capacity. Implementing lead-lag phasing and optimizing phase splits can reduce total intersection delay by seven percent for the Tamiami Trail intersection and six percent for the Coral Way intersection according to intersection capacity analysis performed for this study.

- **Construct shared northbound through+right lane along Ludlam Road at the Bird Road intersection.**

  A partially paved shoulder exists along the northbound approach to the Bird Road intersection that right-turning vehicles sometimes use to bypass queues of through traffic in the northbound travel lane. A full lane could be constructed from approximately the SW 41st Street intersection to Bird Road that could be shared between through vehicles and right-turning vehicles since two northbound receiving lanes exist on the north side of the Bird Road intersection. This improvement is expected to raise the northbound level of service from F to D, and reduce the total intersection delay by fifteen percent.

- **Modify signal timing at the Sunset Drive intersection during the PM peak period.**

  Traffic congestion is quite severe along southbound Ludlam Road approaching the Sunset Drive intersection during the PM peak traffic period. As a result, long queues often form along southbound Ludlam Road from the Sunset Drive intersection. Existing PM peak period capacity analysis indicates the southbound through movement experiences almost three times as much delay as other intersection movements. Slight modifications to the PM peak signal timing at this intersection can positively impact southbound traffic while maintaining similar levels of service along Sunset Drive by switching four seconds of green time from east-west movements to north-south movements. This modification is expected to reduce delay along southbound Ludlam Road by 37 percent while maintaining overall intersection level of service at LOS D.

Opinion of Probable Cost of Recommended Strategies

Tables 18 and 19 present preliminary opinion of probable cost data for the recommended strategies in the SR 916 and SW 67th Avenue corridors, respectively. Final design activities will establish the ultimate specific configuration and cost of the various strategies.

Table 18. Opinion of Probable Costs for NW/NE 135th Street Corridor Recommendations

Recommendation	Estimated Cost
Construction of Sidewalks	$150,000
Enhanced Pedestrian Facility	$150,000
Install Bus Shelters	$240,000
Install Trash Receptacles	$1,200
Develop Transit Marketing Campaign	$25,000
Median Improvements	$1,500,000
Signal Timing Improvement - Miami Avenue	$5,000
Intersection Geometric Improvements - Dixie Highway	$500,000
Optimize Signal Timing and Progression	(A)
Total	$2,571,200

Note: (A) – On an as needed basis.

Table 19. Opinion of Probable Costs for Ludlam Road Corridor Recommendations

Recommendation	Estimated Cost
Construct Missing Sidewalk Links south of Bird Road	$80,000
Construct Bike Lanes south of Bird Road	$500,000
Develop Bicycling Marketing Campaign	$25,000
Install Benches and Trash Recepatcles at Bus Stops	$15,000
Coordinate with SFCS for TDM Improvements	(A)
Conduct a School Access and Traffic Circulation Plan	$15,000
Access Management Improvements	$500,000
Signal Timing Improvement – Tamiami Trail and Coral Way	$1,000
Construct Northbound Lane – Bird Road Intersection	$200,000
PM Peak Signal Timing Improvement – Sunset Drive	$500
Total	$1,336,500

Note: (A) – SFCS staff time.

CONCLUSION

This study provides an update to the Congestion Management System/Mobility Management Program (CMS/MMP) that was developed for Miami-Dade County in 1996. The steps included in this study utilize current available data on the County's roadways and project the current demand into the near future to determine locations where traffic congestion is impacting the mobility of goods and people.

The predominant focus of the updating process was to gather research from other CMS/MMP processes, obtain traffic and capacity data, locate high priority congested corridors, and to provide solutions to improve the mobility of goods and people along each high priority corridor while minimizing the excessive effort required to complete the analysis. The process proposed by the update focuses on the most important processes to easily and quickly identify highly congested corridors and solutions to improve them.

The following are recommended improvements to the existing Miami-Dade CMS/MMP process:

- Obtain and utilize traffic counts/concurrency data from the Traffic Analysis Review Unit of the Miami-Dade County Public Works Department, as well as from Florida Department of Transportation (FDOT) count stations.
- Calculate the existing and future Relative Congestion Ratios (RCR) for each traffic count station.
- Develop a weighted RCR value for each count station based on a weighted average of existing (60 percent) and future (40 percent) RCR values.
- Sort out the count stations having weighted RCR values of 0.90 or greater.
- Develop a list of potential CMS corridors based on roadway segments of at least one mile having multiple count stations with weighted RCR values of 0.90 or greater.
- Eliminate the corridors that are categorized as freeways as well as roadways with programmed capacity improvements.
- Use the selection criteria to rank each potential CMS corridor.

As part of the update to the existing Miami-Dade CMS/MMP, two congested corridors were selected for further analysis – SR 916 (NW/NE 135th Street) and SW 67th Avenue (Ludlam Road).

These analyses serve as a pilot for future corridor evaluation procedures in Miami-Dade County. The analysis is based on readily available data and abbreviated data collection efforts. By utilizing readily available data, the data collection effort is minimized and therefore the cost of corridor analysis will be reduced.

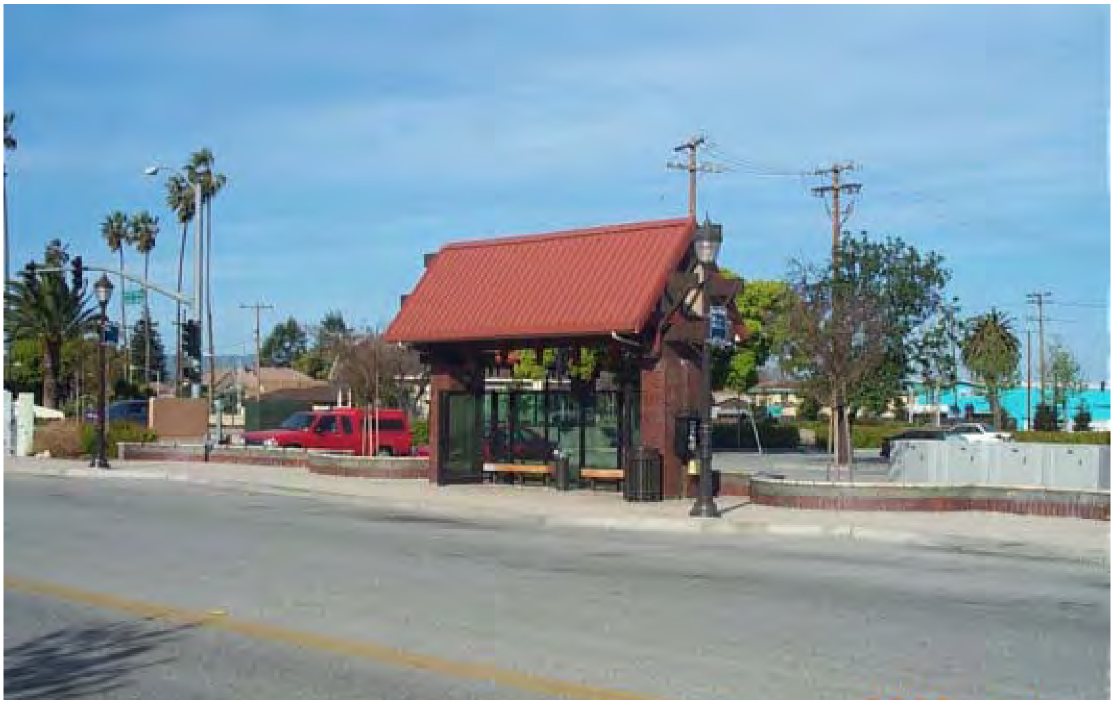
An existing conditions analysis was conducted for the two selected corridors. Both corridors selected through the updated Miami-Dade CMS/MMP proved to be congested corridors with significant vehicular delay. Roadway congestion severely limits peak period mobility in the study corridors and few alternative modal choices exist within the two selected corridors.

A list of potential CMS strategies was developed to serve as a "toolbox" of potential strategies that can be applied in congested corridors and spots throughout Miami-Dade County. Recommended strategies were developed from the list of potential mobility strategies that addressed specific mobility deficiencies for the selected corridors determined during the existing conditions analysis. Projects such as intersection geometric modifications, signal timing enhancements, bus stop infrastructure improvements, sidewalk construction, and bike lanes were developed based on need and applicability within the two corridors.

APPENDIX

Standard Bus Shelter with Bench and Advertising Board

Bus Shelter with Round Seats and Bus Schedule Board to the Left



Bus Shelter Built Consistent with Architecture of Streetscaping Program and Pedestrian Lamps

Bus Shelter Built in a Brick Paver Sidewalk

Bus Shelter with a System Map on the Side Wall

Enhanced Bus Shelter for Transfer Facility Serving Several Routes