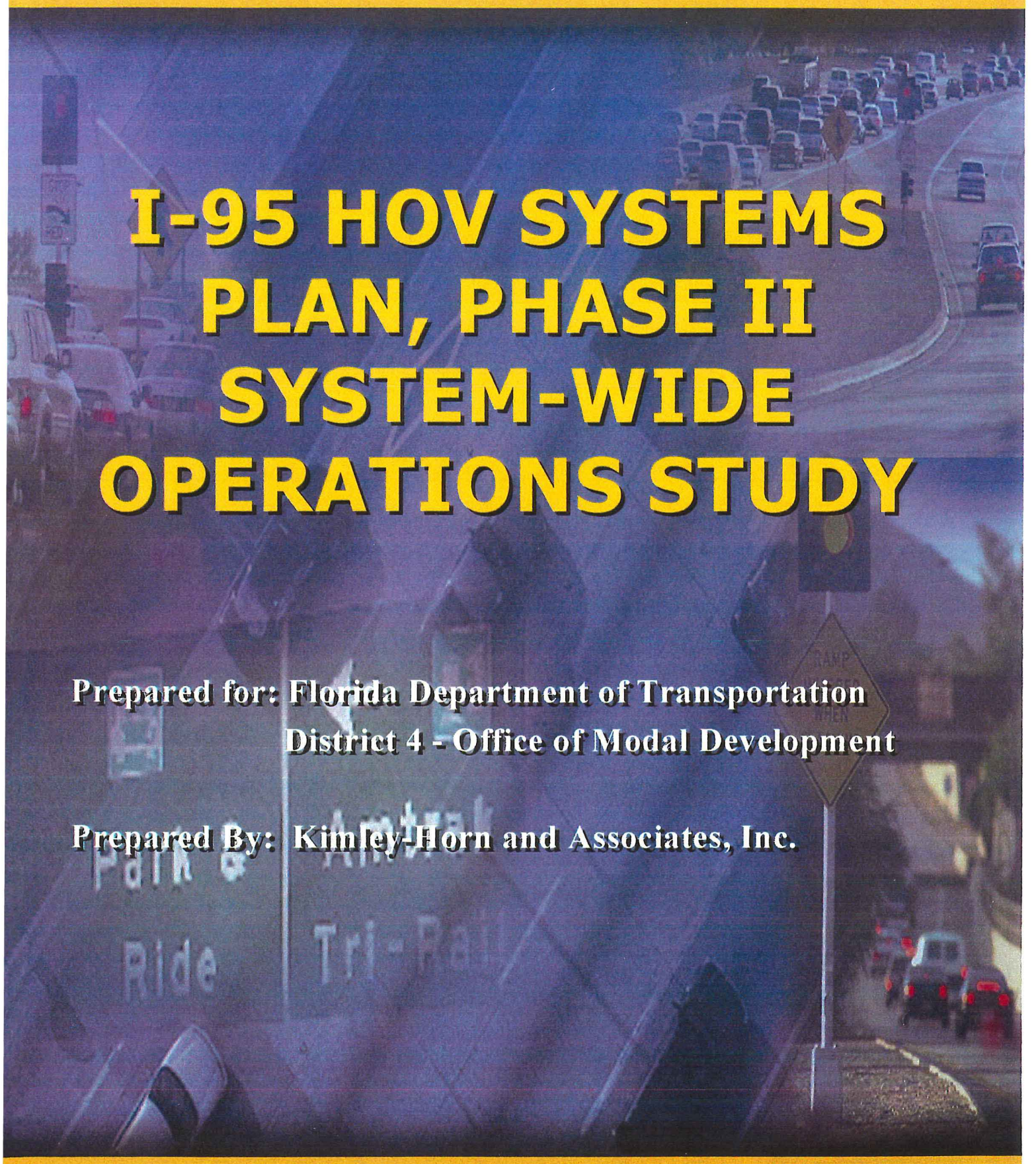


I-95 HOV SYSTEMS PLAN, PHASE II SYSTEM-WIDE OPERATIONS STUDY

Prepared for: Florida Department of Transportation
District 4 - Office of Modal Development

Prepared By: Kimley-Horn and Associates, Inc.

Kimley-Horn and Associates, Inc.

DRAFT

I-95 HOV SYSTEMS PLAN, PHASE II

SYSTEM-WIDE OPERATIONS STUDY

TECHNICAL MEMORANDUM #1:

DATA ANALYSIS

Prepared For: Florida Department of Transportation
District 4 – Office of Modal Development

Prepared By: Kimley-Horn and Associates, Inc.

Kimley-Horn
and Associates, Inc.

May 2002

TABLE OF CONTENTS

INTRODUCTION 1

REVIEW OF PREVIOUS/ONGOING STUDIES 5
I-95 HOV Systems Plan, Phase I 5
2000 I-95 HOV Lane Monitoring Report 6
I-95 / I-595 Master Plan Study 7
I-95 Multimodal Transportation Study 8
Golden Glades Multimodal Transportation Facility 10
Tri-Rail Master Plan 11
South Florida Regional Transit Analysis Study 12
MPO TIPs and FDOT's Five-Year Work Program 12
Miami-Dade County 13
Broward County 13
Palm Beach County 14
Transit Development Plans 14
Miami-Dade County 16
Broward County 16
Palm Beach County 17
Long Range Transportation Plans 17
Miami-Dade County 17
Broward County 18
Palm Beach County 19
Summary 20

EXISTING OPERATING CONDITIONS 22
Traffic Volumes 23
Directional Flow 26
Truck Volumes 28
Ramp Volumes 29
Travel Speeds 30
Inaccuracies in Travel Speed Data 30
Travel Time and Delay Runs 30
Level of Service 33
Vehicle Occupancy 36
Person Throughput 38
Violation Rates 40
Summary 42

SYSTEM ACCESSIBILITY 44
Ramp Analysis 44
"Tier I" Ramp Analysis 44
"Tier II" Ramp Analysis 49
Weaving Sections 51
"Tier I" HOV Weaving Analysis 51
"Tier II" HOV Weaving Analysis 54
Summary 56

EXISTING TRANSIT SERVICE AND SUPPORT FACILITIES 57
Bus Service in the I-95 HOV Lanes 58
Tri-County Commuter Rail Authority 60
Transit Service Connecting to Supporting Facilities in the I-95 HOV Corridor 62
Connecting County Bus Service 62
Connecting Tri-Rail Shuttles 64
Park-n-Ride Lots and Intermodal Facilities 65
Parking Utilization 67
Park-n-Ride Lot Accessibility 71
Park-n-Ride Lot Condition and Maintenance 74
Summary 77

NEXT STEPS 78

LIST OF FIGURES

Figure 1 - 1: Existing I-95 HOV System 2
Figure 1 - 2: Status of I-95 Corridor Improvements in Palm Beach County 15
Figure 1 - 3: I-95 Corridor Long Range Plan 20
Figure 1 - 4: I-95 Average Annual Daily Traffic 24
Figure 1 - 5: AM and PM Peak Period Level of Service 34
Figure 1 - 6: AM Peak Period Average Vehicle Occupancy 37
Figure 1 - 7: PM Peak Period Average Vehicle Occupancy 37
Figure 1 - 8: AM Peak Hour Person Throughput 39
Figure 1 - 9: PM Peak Hour Person Throughput 39
Figure 1 - 10: AM Peak Period HOV Lane Violation Rates 41
Figure 1 - 11: PM Peak Period HOV Lane Violation Rates 41
Figure 1 - 12: Person Movement Capacity of Buses 57
Figure 1 - 13: Transit Service and Support Facilities 66
Figure 1 - 14: Park-n-Ride Lots Total Spaces and Usage 69

LIST OF TABLES

Table 1 - 1: GGC Program Requirements....10
Table 1 - 2: I-95 Improvements in Miami-Dade County's 2025 Transportation Plan....18
Table 1 - 3: I-95 Improvements in Broward County's 2025 Transportation Plan....18
Table 1 - 4: I-95 Improvements in Palm Beach County's 2025 Transportation Plan....19
Table 1 - 5: I-95 Mainline Traffic Volumes....25
Table 1 - 6: Peak Period Directional Distribution of Traffic....27
Table 1 - 7: I-95 Truck Volumes....28
Table 1 - 8: Peak-to-Daily Traffic Ratios....29
Table 1 - 9: Peak Period Travel Speeds....32
Table 1 - 10: Peak Period Level of Service....35
Table 1 - 11: HOV Lane Violation Citations....42
Table 1 - 12: Most Congested Ramps Based on v/c Ratio....46
Table 1 - 13: Most Congested Ramps Based on Volume-to-Ramp Length Ratio....47
Table 1 - 14: Most Congested Ramps Based on Traffic Density....47
Table 1 - 15: Most Congested Interchanges Based on the "Tier I" Ramp Analysis....48
Table 1 - 16: Ranked List of Congested Interchange Ramps with Conceptual Improvements....50
Table 1 - 17: "Tier I" List of Deficient HOV Weaving Locations....53
Table 1 - 18: "Tier II" Ranked List of Deficient HOV Weaving Locations....55
Table 1 - 19: Metrobus 95X Express Service Ridership Data....60
Table 1 - 20: Transit Connections at Supporting Facilities in the I-95 HOV Corridor....63
Table 1 - 21: Daily Boardings and Alightings for BCT at Supporting Facilities....64
Table 1 - 22: Ridership on Tri-Rail Shuttles at Connecting Facilities....65
Table 1 - 23: Park-n-Ride Lot Capacity and Utilization in 2001....68
Table 1 - 24: Park-n-Ride Lot Historical Utilization....70
Table 1 - 25: Overall Usage of Park-n-Ride Lots in Broward and Palm Beach Counties....71
Table 1 - 26: Park-n-Ride Lot Accessibility Rating....73
Table 1 - 27: Recommendations from Biannual Park-n-Ride Maintenance Report....75
Table 1 - 28: Recommendations from Biannual Park-n-Ride Comments and Suggestions Report....76

EXPLANATION OF ACRONYMS

AADT	average annual daily traffic
ATIS	advanced traveler information system
AVO	average vehicle occupancy
BCT	Broward County Transit
CBD	central business district
CMEA	conceptual mobility enhancement alternative
EB	eastbound
FDOT	Florida Department of Transportation
FEC	Florida East Coast
FSUTMS	Florida Standard Urban Transportation Model Structure
FY	fiscal year
GGC	Golden Glades Center
GIS	geographic information system
GP	general purpose
HCS 2000	Highway Capacity Software 2000
HEFT	Homestead Extension of Florida's Turnpike
HOV	high occupancy vehicle
HOT	high occupancy toll
HPT	high performance transit
ICS	intelligent corridor system
IMR	Interchange Modification Report
ITS	intelligent transportation system
LOS	level of service
LPA	locally preferred alternative
LRTP	Long Range Transportation Plan
MDT	Miami-Dade Transit
MDX	Miami-Dade Expressway Authority
MIC	Miami Intermodal Center
MOE	measures of effectiveness
mph	miles per hour
MPO	Metropolitan Planning Organization
NB	northbound
NW	Northwest
PD&E	Project Development & Environment
RTO	Regional Transportation Organization
SB	southbound
SFRC	South Florida Rail Corridor
SOV	single occupant vehicle
SB	southbound
SR	state road
SW	Southwest
TAC	technical advisory committee
TDP	Transit Development Program
TIP	Transportation Improvement Program
VA	Veteran Affairs
v/c	volume-to-capacity ratio
vpd	vehicles per day
WB	westbound

INTRODUCTION

High occupancy vehicle (HOV) facilities are intended to address traffic congestion by maximizing the person-carrying capacity of a roadway or corridor. The definition of an HOV can include buses, vanpools, and carpools. HOV facilities can increase person movement capacity by carrying more people in fewer vehicles.

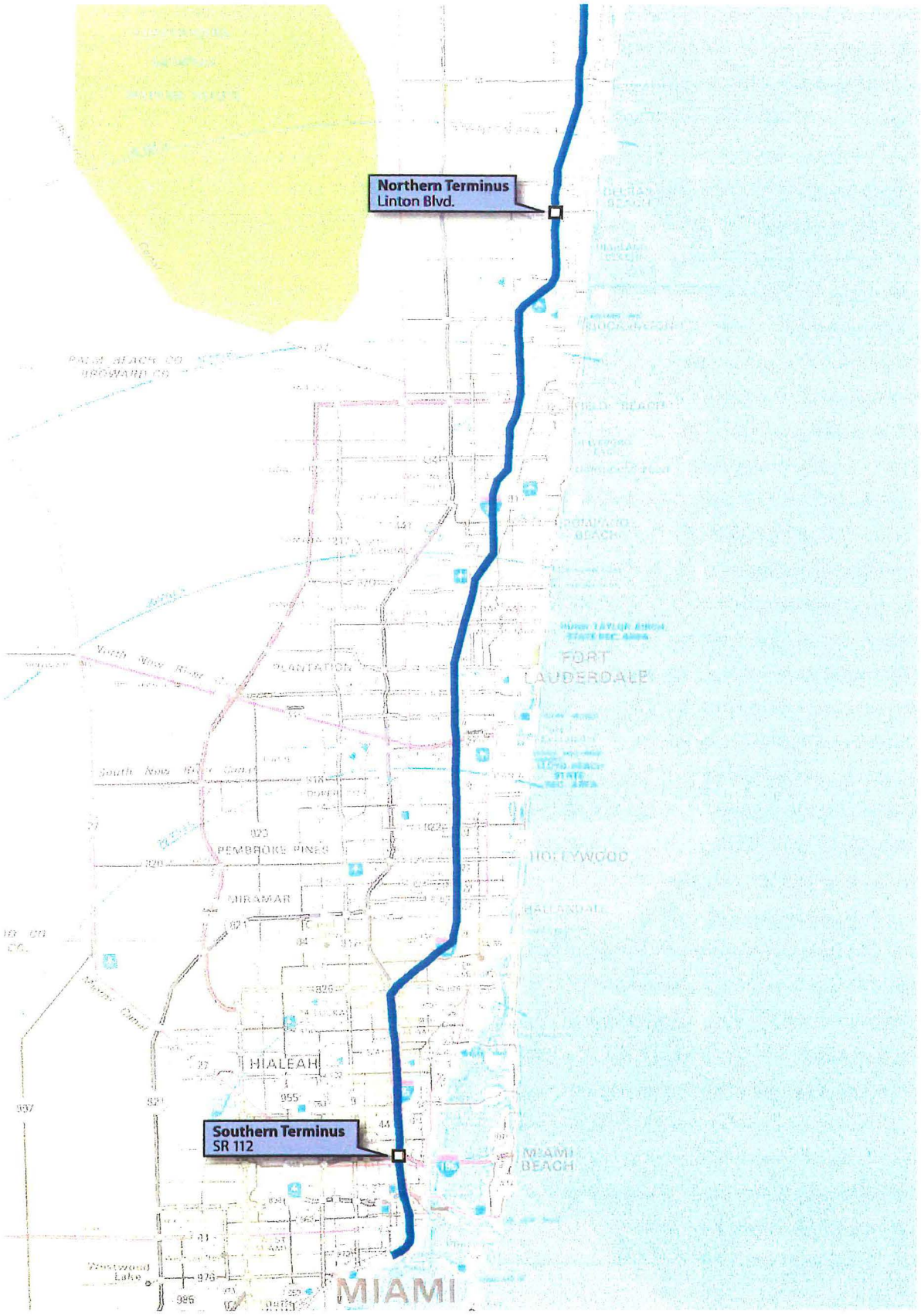
The intent of HOV facilities is to provide a travel alternative that a significant volume of commuters will find attractive enough to change from driving alone to using a higher occupancy mode. A primary concept behind HOV facilities is to provide both travel time savings and more predictable travel times for HOVs. These two benefits serve as incentives to choose a higher occupancy mode over driving alone.

The I-95 HOV system in South Florida presently extends approximately 46 miles from SR 112 (Airport Expressway) in Miami-Dade County through Broward County to just south of Linton Boulevard in Palm Beach County. Figure 1-1 illustrates the limits of the existing I-95 HOV system. Ongoing and future construction projects will extend the I-95 HOV System north through Palm Beach County to Indiantown Road near the Martin County Line and make the system the longest continuous HOV facility (84 miles) in the United States.

This study will examine the I-95 HOV system in a system-wide manner as part of the regional alternative mode network. Previous studies will be built upon to develop performance measures and assess the level of service, hours of HOV designation, vehicle occupancy, vehicle eligibility, and other operational issues. Based on the results of the performance evaluation, short-term strategies will be developed to maximize the performance of the system.

The following tasks will be addressed in the development of the overall study:

- Intergovernmental Coordination
- Statewide HOV Workshop
- Data Analysis
- Develop an Enhanced Evaluation Program
- Evaluate System Performance and Recommend Improvements



System-Wide Operations Study
Existing I-95 HOV System

Figure 1-1

A technical advisory committee (TAC) including representatives of the local metropolitan planning organizations (MPOs) and transit agencies, FDOT District 4, and FDOT District 6 will perform the dual role of facilitating intergovernmental coordination and representing the interests of the general public. The TAC will meet periodically to guide the overall efforts of the study.

A statewide HOV workshop will bring together transportation professionals and agency representatives with a panel of national HOV experts to discuss options for maximizing the performance of the I-95 HOV system as part of the regional alternative mode system. The workshop will include interactive group sessions seeking to identify specific strategies and policy direction.

Previous and ongoing transportation studies will be reviewed and their findings and conclusions will be identified as related to the I-95 HOV system so that short-term strategies which may be developed are consistent with long-term system improvements already identified in other plans. Existing traffic data will be assessed including traffic counts, ramp volumes, travel times, vehicle occupancy, and HOV lane violation rates. Accessibility to and from the I-95 HOV system will be evaluated including the identification of congested ramps and interchanges and deficient weaving sections. Existing transit service on the I-95 HOV system will be inventoried, and planned and programmed expansions of transit service will be identified. Existing data will be compiled for park-n-ride lots and these facilities will be grouped based upon their use and location.

HOV monitoring and evaluation programs will be researched and creative ideas and innovative techniques may be considered for application to the I-95 HOV system. Additional goals and objectives may be formulated for the system including moving people, transit benefits, and improving overall roadway efficiency. Evaluation criteria or measures of effectiveness (MOEs) will be developed to the new objectives and threshold levels will be established to determine if the system is attaining its objectives. An enhanced evaluation process will be established to facilitate the assessment of the overall system.

The performance of the I-95 HOV system will be evaluated and short-term strategies will be developed to maximize the utilization, operation, and maintenance of the system. The short-term strategies will focus on actions to more effectively integrate the I-95 HOV system into the regional alternative mode system.

This technical memorandum presents the results of the data analysis and is divided into the following sections:

- Review of Previous/Ongoing Studies
- Summary of Existing Operating Conditions
- System Accessibility
- Multimodal Service and Facilities

Additional technical memoranda will be prepared summarizing the development of an enhanced evaluation program, and performance evaluation and recommended improvements. At the conclusion of the study these technical memoranda will be merged into a final report.

REVIEW OF PREVIOUS/ONGOING STUDIES

Previous and ongoing studies applicable to the I-95 HOV system were reviewed to gather information for this study. Key conclusions were identified and the applicability of the prior study conclusions was assessed. This review of the findings of previous and ongoing studies will assist in the development of short-term strategies to enhance the operation of the I-95 HOV system. Additionally, these short-term strategies will be developed consistent with long-term system improvements that have been identified in other plans. The review undertaken for this project included the following studies:

- I-95 HOV Systems Plan, Phase I
- 2000 I-95 HOV Lane Monitoring Report
- I-95 / I-595 Master Plan Study
- I-95 Multimodal Transportation Study
- Golden Glades Multimodal Transportation Facility
- Tri-Rail Master Plan
- South Florida Regional Transit Analysis Study
- Miami-Dade, Broward, and Palm Beach Metropolitan Planning Organization (MPO) Transportation Improvement Programs (TIPs)
- FDOT Five-Year Work Programs for Miami-Dade, Broward, and Palm Beach Counties
- Miami-Dade, Broward, and Palm Beach County Transit Development Programs (TDPs)
- Miami-Dade, Broward, and Palm Beach MPO Long Range Transportation Plans (LRTPs)

Findings are summarized below.

I-95 HOV Systems Plan, Phase I

The *I-95 HOV Systems Plan* was completed in July 2000 by Vanasse Hangen Brustlin, Inc. The study examines all portions of the existing I-95 HOV system in Broward and Palm Beach Counties, as well as the portion in Miami-Dade County from the Broward County Line to the Golden Glades Interchange. The study's report contains three sections: "Recommended

Actions," "Review of National Practices," and "System Overview." One general conclusion of this study was that the I-95 HOV System has been designed and operated in a consistent manner with national practice. A series of smaller actions were recommended to provide improvements to the facilities. The actions were organized into eight specific areas:

- HOV Facility Signs and Markings
- I-95 HOV Operations
- Park-and-Ride Lots
- Transit Services
- Marketing/Ridesharing
- Enforcement
- Evaluation
- Facility Policies and Program Management

This *System-Wide Operations Study* will address several of these recommended actions.

2000 I-95 HOV Lane Monitoring Report

The *2000 I-95 HOV Lane Monitoring Report* was completed in May 2001 by Reynolds, Smith & Hills, Inc. A large amount of data were collected including traffic counts, speeds, travel time runs, vehicle occupancy, and the number of citations issued. The I-95 HOV System was evaluated against several mobility performance measures including level of service, travel time, person throughput, reliability, and violation enforcement. This approach was consistent with prior monitoring reports and allows the results to be compared to previous years.

According to this report, morning peak congestion extends from approximately 6:30 AM to 9:00 AM and afternoon congestion extends from approximately 3:30 PM to 7:00 PM throughout the I-95 HOV corridor. Average annual daily traffic (AADT) is as high as 268,000 vehicles per day (vpd) in Miami-Dade County, 281,000 vpd in Broward County, and 188,000 vpd in Palm Beach County.

During the HOV enforcement periods, travel speeds were significantly higher in the HOV lanes than the general-purpose lanes. In Miami-Dade County the HOV lane traveled up to 12 miles per hour (mph) faster during the AM peak and 10 mph during the PM peak. Travel speeds were 14

mph faster during both peak periods in Broward County. In Palm Beach County the southbound HOV lane recorded speeds 17 mph faster during the PM peak period.

The average vehicle occupancy (AVO) for the I-95 HOV lanes was 1.77 persons per vehicle during the enforcement period, which compares favorably to the 1.60 persons per vehicle reported in 1995. The AVO for the HOV lanes was highest in Miami-Dade County. South of the Golden Glades Interchange, the HOV lane carried approximately 2,020 and 1,335 more persons than the average general-purpose lane during the AM and PM peak hours, respectively.

The vehicle occupancy surveys also recorded the number of single occupant vehicles (SOVs) that use the HOV lanes during the enforcement period. Violation rates range from 8% to 31% in Miami-Dade County. In Broward County violation rates range from 39% to 78%. Palm Beach County violation rates range from 38% to 56%.

Recommendations made in this report include (1) considering HOV enforcement in both directions with extended time periods in Miami-Dade County and (2) additional enforcement or increased fines for HOV citations may decrease violations by SOVs. The data presented in the *2000 I-95 HOV Lane Monitoring Report* is evaluated in more detail in the "Existing Operating Conditions" section of this report.

I-95 / I-595 Master Plan Study

The *I-95 / I-595 Master Plan Study* focuses on two corridors: (1) I-95 from the Miami-Dade/Broward County Line to Indiantown Road in Palm Beach County and (2) I-595 from SW 136th Avenue to U.S. 1 in Broward County. The master planning process consisted of three phases or "Tiers." In "Tier I," the study corridors were assessed and eleven Conceptual Mobility Enhancement Alternatives (CMEAs) were examined. Five of these alternatives were selected for additional analyses in "Tier II":

- No-Build Conditions
- As-Planned Alternative
- As-Planned Plus Alternative
- System Alternative
- Transit Alternative

The MPO adopted a preliminary Locally Preferred Alternative (LPA), which is a combination of the System and Transit Alternatives, for advancement into the Tier III process. The LPA incorporates the improvements adopted by the Broward and Palm Beach County MPOs in their LRTPs for the I-95 corridor. The Broward and Palm Beach County LRTPs include the widening of I-95 from Commercial Boulevard north to PGA Boulevard so that its entire mainline from SR 112 to PGA Boulevard is ten lanes (eight general-purpose lanes and two HOV lanes). The section of I-95 between PGA Boulevard and Indiantown Road would be widened to eight lanes (six general-purpose lanes and two HOV lanes). Interchange improvements to implement the ten-lane mainline section have been identified at the many locations and a new interchange is identified at SR 710 (Beeline Highway) in Palm Beach County.

ITS improvements recommended for the corridor include implementation of an intelligent corridor system (ICS). The ICS consists of a master plan to design and operate an intelligent transportation system (ITS) operations facility. The ITS operations facility will house monitoring and control capabilities for a dynamic message sign system, a video monitoring system, and an advanced traveler information system (ATIS). Other ITS improvements that are part of the ICS include the creation of a freeway incident management team and the continuation of the currently operating SunGuide Road Rangers Service Patrol.

In "Tier III" of the study process, the LPA was refined and traffic impact analysis was performed to determine the feasibility of meeting future travel demand. The widening of I-95 in Broward County to eight general-purpose lanes and two HOV lanes is expected to meet future travel for the next twenty years in the improved segments north of Copans Road. However, the segments south of Copans Road will continue to be congested, particularly in the vicinity of the I-595 interchange. In Palm Beach County the improvements identified in the LPA satisfy travel demand throughout the corridor.

Preliminary construction cost estimates for the I-95 corridor improvements are $143.9 million for Broward County and $1.028 billion for Palm Beach County.

I-95 Multimodal Transportation Study

The *I-95 Multimodal Transportation Corridor Study* was completed in February 2001 by Kimley-Horn and Associates, Inc. The purpose of the study was to develop and evaluate transportation

improvements to meet the long-range needs of the I-95 corridor in Miami-Dade County. In order to maximize the capacity of the corridor with minimal impacts to the surrounding communities, a reversible HOV lane concept was developed. The reversible lane concept may be implemented under two potential configurations:

- Two-lane limited access facility built within the existing right-of-way by removing the existing concrete barrier in the center of I-95. Fixed concrete barriers would be used to separate the general purpose through lanes from the existing HOV lanes.
- Utilization of moveable barriers that can be relocated based on the traffic demand. The movable barrier option "borrows" a lane from the off-peak direction and "loans" it to the peak direction during peak periods. During off-peak times the lanes can be evenly distributed, similar to today's operation.

The limits of the reversible lane system would extend from I-395 to south of Ives Dairy Road. The existing bridge that carries the HOV lanes to and from SR 112 (Airport Expressway) would be modified to allow the reversible lane to continue uninterrupted past the SR 112/I-195 interchange. The existing flyover structure at the Golden Glades Interchange would also be retrofitted to be part of this system. An intermodal center was recommended just south of I-395, adjacent to the Metromover, to provide commuters a destination parking facility with enhanced access to the existing transit system.

The conceptual mobility enhancement alternative (CMEA) also includes five smaller projects:

- Northbound auxiliary lane between NW 135th Street (Opa-Locka Boulevard) and NW 151st Street
- Additional southbound through lane from NW 125th Street to NW 135th Street
- Collector/distributor roads between NW 95th Street and NW 103rd Street
- Ramps connecting I-95 and NW 14th Street
- Ramp from NW 3rd Avenue to southbound I-95

Opinion of probable cost for the total project is in the range of $550 to $650 million, based on the fixed barrier reversible lane concept.

Golden Glades Multimodal Transportation Facility

The *Golden Glades Multimodal Facility Implementation Plan* was completed in October 2001 by DMJM+Harris. The purpose of the study was to develop a staged implementation plan to transition the *Golden Glades Multimodal Facility Feasibility Study*, which was completed in 1994, to the implementation phase.

A master plan for the Golden Glades Center (GGC) was developed to provide potential joint developers an understanding of the specific public sector requirements associated with the multimodal transportation facility. The multimodal facility would consist of a 1,300-space parking garage with bus bays located on the ground floor level. The facility would include: passenger waiting areas and amenities; areas for transit supportive (retail) joint development; an enclosed pedestrian bridge to connect the Tri-Rail station with the garage; and office space within the terminal to accommodate administrative and operations staff as well as ITS equipment. The specific program requirements for the GGC are summarized in Table 1-1.

Table 1 - 1: GGC Program Requirements

GGC Program Element	Quantity
Local Bus (MDT and BCT)	8 Bus Bays
Express Bus	4 Bus Bays
Additional Bus Bays	2 Bus Bays
Tri Rail Jitney	Drop-off/Pick-up at Kiss&Ride
Inter-City Bus	6 Bus Bays
Terminal	3,773 Square Feet
Transit Supportive Development	2,000 Square Feet
Pedestrian Plaza	17,267 Square Feet
Elevated Walkway	3,267 Square Feet
Structure Parking	1,300 Vehicles

The recommended master plan was developed based on a restructuring of the access road system. The proposed improvements envision the complete realignment of SR 9 following the southern and eastern edges of the existing park-n-ride lot, which opens up the property to be developed as one parcel. Southbound access to the GGC from SR 826 (Palmetto Expressway) and Florida's Turnpike would be provided via a new ramp connection. Northbound access from the GCC to I-95, SR 826, and Florida's Turnpike would also be provided by a new ramp. One of the primary

vehicle circulation features approaching the GGC facility is a roundabout connecting the various arterial roads to the main GGC entrances and exits.

Tri-Rail Master Plan

Tri-Rail, the only commuter rail system in Florida, operates trains in the South Florida Rail Corridor (SFRC) parallel to I-95 in Miami-Dade, Broward, and Palm Beach Counties. The line extends from the Miami International Airport to Mangonia Park in Palm Beach County. Tri-Rail service was initiated in January 1989 as part of a major traffic mitigation effort during construction and expansion of I-95. Tri-Rail provides access to the region's three international airports: Miami International Airport, Ft. Lauderdale-Hollywood International Airport, and Palm Beach International Airport. Connecting bus service is available from all 18 Tri-Rail stations and a connection to Miami-Dade's Metrorail is provided at Tri-Rail's Metrorail Transfer Station.

The SFRC is operating at capacity, serving Tri-Rail, Amtrak, and freight trains. To address this restraint, Tri-Rail has undertaken a program of projects to improve the corridor. This program, known as the "Double Track Corridor Improvement Program," consists of laying a second mainline track, upgrading grade crossing and signal systems, and modifying stations to accommodate the double track. The project is scheduled for completion by March 2005. The double-tracking and related improvements will (1) improve Tri-Rail's schedule reliability, (2) reduce Tri-Rail's peak period peak period headways to 20 minutes, and (3) improve the safety of train operations along the SFRC.

As part of its ongoing master planning process, Tri-Rail is considering the following projects:

- Establishing commuter rail service in Miami-Dade and Broward Counties in the FEC rail corridor, which is north-south rail corridor line generally located about 1 to 2 miles east of I-95.
- Extending service approximately 15.7 miles north to Jupiter in the Florida East Coast (FEC) rail right-of-way.
- Establishing a new route parallel to SR 836 (Dolphin Expressway) from the Miami Intermodal Center (MIC) west approximately 8.8 miles to the Dolphin Mall along an existing CSX rail alignment.

- Establishing a new route southwest from the MIC to the Kendall area. This route would follow SR 874 (Don Shula Expressway) to a terminus at Coral Reef Drive along an existing CSX rail alignment.
- Establishing an east-west rail line between the National Car Rental Center in Sunrise and Downtown Fort Lauderdale. The proposed alignment would operate along Broward Boulevard and continue south to the Fort Lauderdale-Hollywood International Airport.

South Florida Regional Transit Analysis Study

The South Florida Regional Transportation Organization (RTO) is conducting the ongoing *South Florida Regional Transit Analysis Study*, which seeks to enhance the efficiency and coordination of all transit elements in South Florida (Miami-Dade, Broward, and Palm Beach Counties). The study is emphasizing regionally significant transit projects that may have a direct impact on Tri-Rail service and/or provide services across a county boundary. The study is addressing the following aspects:

- Conducting a comprehensive review of each transit mode in the South Florida area and its relationship to other modes.
- Evaluating the capacity of the current transit modes to meet regional project needs.
- Identifying cost-effective regionally significant transit enhancements that may be implemented within the next ten years (2010).
- Identifying long-term (2011 and later) regionally significant transit corridor projects that are critical to the economic competitiveness and future mobility of South Florida.

Transit corridors that are being assessed in the analysis include freeways (including I-95), arterials, and public transit routes such as I-95 and the SFRC.

MPO TIPs and FDOT's Five-Year Work Program

Metropolitan Planning Organization (MPO) Transportation Improvement Programs (TIPs) and FDOT's Five-Year Work Programs were both reviewed for Miami-Dade, Broward, and Palm Beach Counties. The MPO TIPs specify funded transportation improvements programmed for

implementation over the next five years and FDOT's Five-Year Work Program lists transportation improvements and allocates funds. The MPO TIPs and FDOT's Five-Year Work Program are coordinated for consistency and accuracy.

Miami-Dade County

The Miami-Dade MPO's TIP for Fiscal Years (FYs) 2001/2002 to 2005/2006 and FDOT's Five-Year Work Program list several projects for the I-95 corridor including several of the smaller projects identified in the *I-95 Multimodal Transportation Corridor Study*. The funded projects for the I-95 corridor include:

- ITS Freeway Management Service Patrols
- Add Northbound Auxiliary Lane from NW 135th Street (Opa-Locka Boulevard) to NW 151st Street
- Add Southbound Through Lane from NW 125th Street to NW 135th Street
- Add Southbound On-Ramp and Northbound On-Ramp at NW 14th Street (PD&E Ongoing)
- Port of Miami Truck Access Ramps at NW 8th Street
- ITS Package B (18 Variable Message Signs, 22 Ramp Meters, 28 Trailblazers, Detectors)
- Golden Glades Multimodal Terminal

Broward County

The Broward MPO's TIP for FYs 2001/2002 to 2005/2006 and FDOT's Five-Year Work Program contain a small number of projects for the I-95 corridor. The funded projects for the I-95 corridor, which are primarily ITS projects, include:

- Rangers Service Patrol
- Video Monitoring System Cameras
- Advanced Incident Information System

Palm Beach County

The most significant improvements to the I-95 corridor over the next several years will occur in Palm Beach County. Widening projects will add two additional general use lanes and two HOV lanes to I-95 between Linton Boulevard and PGA Boulevard, extending the limits of the I-95 HOV system in South Florida approximately 29 miles. Construction is already ongoing for the section of I-95 between Linton Boulevard and Gateway Boulevard, and a new interchange at Palm Beach International Airport is also presently under construction.

The Palm Beach MPO's TIP for FYs 2002 to 2006 and FDOT's Five-Year Work Program list a number of projects for the I-95 corridor including several projects associated with the widening of I-95 and extension of the HOV system. Additionally, major reconstruction is programmed for the SR 80 (Southern Boulevard) interchange. Figure 1-2 presents the status of the ongoing and programmed improvements to the I-95 corridor in Palm Beach County.

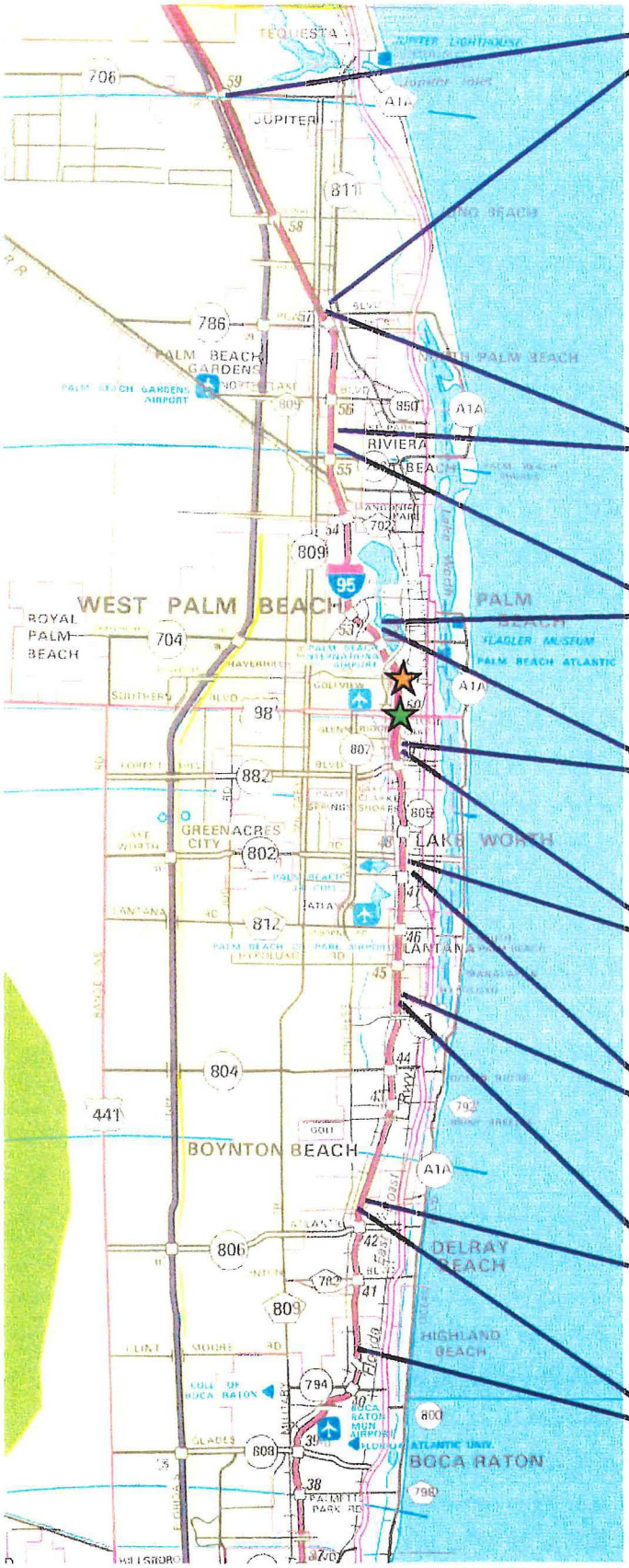
Several ITS projects are also programmed for the I-95 corridor in Palm Beach County. These projects include:

- Rangers Service Patrol
- Video Monitoring System
- Dynamic Message Sign System

Transit Development Plans

The State of Florida statutory requirements mandate that all transit properties receiving Public Transit Block Grants prepare a five-year Transit Development Plan (TDP) and yearly TDP updates. The TDP is a short-range planning tool used to define the community's goals, predict future needs for transit service, identify and state a vision for the near-term direction of the transit agency, provide a clear justification for funding requests, and develop a program of improvements. In particular, the TDP identifies existing service and proposed service improvements, capital and operating costs, existing and proposed sources of funding, and a staged implementation plan.

I-95 Palm Beach County Programmed Improvements



PD&E From: Indiantown Rd.
To: SR 786/PGA Blvd.

Status: Ongoing
Length: 9.07 Miles

PBIA Interchange

Construction Cost	Status	Estimated Completion	Length
$100,138,250	Ongoing	05/05/03	-

SR 80 Interchange

Construction Cost	Letting Date	Estimated Completion	Length
$21,534,000	10/30/02	10/04	-

231921 From: SR 786/PGA Blvd.
To: North of SR 708/Blue Heron Blvd.

Construction Cost	Letting Date	Estimated Completion	Length
$57,122,000	07/04	07/07	2.95 Miles

231920 From: North of SR 708/Blue Heron Blvd.
To: North of Congress Ave.

Construction Cost	Letting Date	Estimated Completion	Length
$55,000,000	02/04	02/07	5.80 Miles

231919 From: North of Congress Ave.
To: North of Forest Hill Blvd.

Construction Cost	Letting Date	Estimated Completion	Length
$38,707,000	07/03	12/06	3.94 Miles

231918 From: North of Forest Hill Blvd.
To: South of 6th Ave.

Construction Cost	Letting Date	Estimated Completion	Length
$93,302,000	12/03	12/06	3.82 Miles

231937 From: South of 6th Ave..
To: North of Gateway Blvd.

Construction Cost	Letting Date	Estimated Completion	Length
$28,899,000	03/03	03/06	3.72 Miles

231917 From: North of Gateway Blvd.
To: South of L30 Canal

Construction Cost	Status	Estimated Completion	Length
$32,992,684	Ongoing	08/04	5.10 Miles

231916 From: South of L30 Canal
To: South Linton Blvd.

Construction Cost	Status	Estimated Completion	Length
$48,978,997	Ongoing	08/03	3.30 Miles

System-Wide Operations Study

Figure 1-2

Miami-Dade County

Miami-Dade Transit's (MDT) *2001 Transit Development Program Update* presents the operating environment, committed improvements, a five-year recommended service plan, and financial analysis of proposed transit improvements for the period ending in 2006. The TDP does not identify expansion of the 95X express bus service which utilizes the I-95 HOV lanes from the Golden Glades interchange to the southern terminus of the HOV system at SR 112 (Airport Expressway). Major transit capital projects listed in the TDP that are relevant to this study include:

- Tri-Rail Double Tracking – This project will allow improved peak period (20-minute headways) commuter passenger rail service in the SFRC.
- Golden Glades Intermodal Center – This project will construct an intermodal transit hub/terminal at the Golden Glades Interchange to serve the Tri-Rail station, express bus routes, local bus routes, and taxis.
- East-West Multimodal Corridor – The Miami-Dade Expressway Authority (MDX) is the lead agency implementing highway elements identified in this project's planning phase including the construction of HOV lanes along SR 836 (Dolphin Expressway) and the SR 112/SR 836 Interconnector. Construction of HOV lanes presents an opportunity for future express transit services.

Broward County

The Broward County Transit Development Plan recommends operations improvements in new service, headways, span of service, and express/limited service. However, none of the existing or recommended express bus routes utilize the I-95 corridor. The TDP references that the feasibility of fixed guideway and High Performance Transit (HPT) will continue to be explored in initial planning and design studies. One of the referenced corridors is the Fort Lauderdale Downtown including a connection to the Broward Boulevard Park-n-Ride Lot, which is adjacent to the I-95 corridor.

Palm Beach County

PalmTran provides fixed-route bus service in Palm Beach County, and coordination with Tri-Rail is provided by linking fixed-route service to the Tri-Rail stations in Palm Beach County. Presently none of the fixed-route service utilizes the I-95 corridor. However, the TDP annual update recommends several projects and strategies that are relevant to this study including:

- Pursuing the financial participation of FDOT and Tri-Rail in the establishment of express bus service in the I-95 corridor.
- Coordinating with FDOT and Tri-Rail to identify an area to be used as a park-n-ride lot in northern Palm Beach County to be served by I-95 or U.S. 1 express bus service or limited stop service.

Long Range Transportation Plans

Federal legislation requires the development of long range transportation plans (LRTPs) to guide transportation investments in metropolitan areas for the next twenty years. Future travel demands are forecasted and regional transportation needs are identified. The federal planning process requires identification of funding sources and adoption of a "Cost Feasible Plan."

Miami-Dade County

Miami-Dade County's *Transportation Plan for the Year 2025* develops a "Minimum Revenue Plan" based on the expectation that only $11.2 billion will be available during the Plan period to fund transportation projects. Improvement to the highway system is an emphasis of the "Minimum Revenue Plan." HOV lanes are proposed along major expressways such as SR 836 (Dolphin Expressway), SR 874 (Don Shula Expressway), and the Homestead Extension of Florida's Turnpike (HEFT). Reversible flow lanes, as identified in the *I-95 Multimodal Transportation Corridor Study*, are planned for I-95 along with ICS projects. Specific projects for I-95 corridor included in the "Minimum Revenue Plan" are listed in Table 1-2.

Table 1 - 2: I-95 Improvements in Miami-Dade County's 2025 Transportation Plan

From	To	Project Description	Year Funded
@ NW 8th Street		Port/CBD Truck Access Ramps	2006-2010
Golden Glades Interchange	Ives Dairy Road	Convert HOV to Reversible HOV/HOT Lanes	2016-2020
NW 95th Street	NW 103rd Street	Northbound and Southbound Collector/Distributor Roads	2021-2025
North of SR 112	South of Golden Glades Interchange	Convert HOV to Reversible HOV/HOT Lanes	2021-2025
South of I-395	North of SR 112	Add HOV/HOT Lanes	2021-2025

Broward County

The Broward County Long Range Transportation Plan Year 2025 Update differs from previous plans in attention paid to non-automobile modes of transportation. However, several projects are included in the "Cost Feasible Plan" that will affect the I-95 corridor. These projects are listed below in Table 1-3.

Table 1 - 3: I-95 Improvements in Broward County's 2025 Transportation Plan

From	To	Project Description	Total Cost
Commercial Boulevard	Palm Beach County Line	Widen to 8 General Purpose Lanes and 2 HOV Lanes	$148,600,000
@ Commercial Boulevard		Add Eastbound Left-Turn Lanes	$552,000
Oakland Park Boulevard	Andrews Avenue	Eastbound Left-Turn Lane and Interchange Improvements	$8,792,000
Florida's Turnpike Homestead Extension	I-95	Study 4-Lane Expressway / Frontage Road	$2,000,000
Golden Glades Interchange	I-595	Transit Bridge – High Performance Transit	$37,005,000
@ Atlantic Boulevard		New Tri-Rail Station	$8,000,000
Tri-Rail	Downtown Fort Lauderdale, Fort Lauderdale-Hollywood International Airport	Central Fort Lauderdale Circulator	$10,579,000

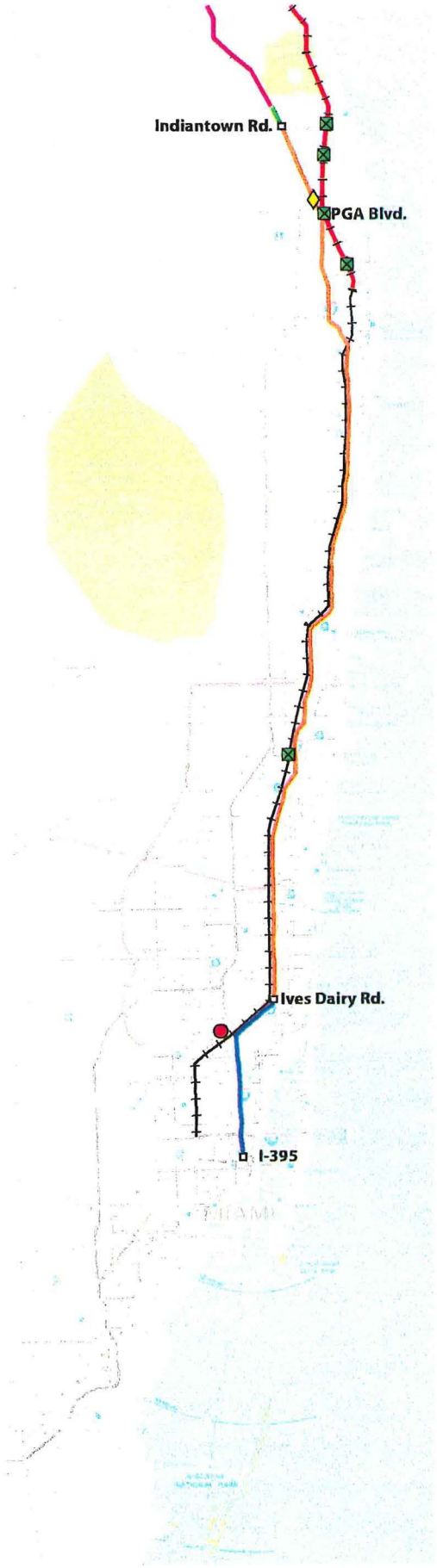
Palm Beach County

The Palm Beach County MPO adopted its *2025 Long Range Transportation Plan* on November 19, 2001. The adopted "Cost Feasible Plan" is based on Alternative #3, which is a mixed combination of Alternative #1 (Highway Focus) and Alternative #2 (Transit Focus). The "cost Feasible Plan" includes extensive roadway enhancements and refined PalmTran service, which concentrates bus service on a "grid system," along with ITS enhancements and the extension of Tri-Rail service into Martin County. Specific projects for I-95 corridor included in the "Cost Feasible Plan" are listed in Table 1-4.

Table 1 - 4: I-95 Improvements in Palm Beach County's 2025 Transportation Plan

From	To	Project Description	Year Funded
@ PGA Boulevard		Park-n-Ride Lot	
PGA Boulevard	Donald Ross Road	Widen to 6 General Purpose Lanes and 2 HOV Lanes	2007-2010
Broward County Line	Linton Boulevard	Widen to 8 General Purpose Lanes and 2 HOV Lanes	2011-2015
Donald Ross Road	Indiantown Road	Widen to 6 General Purpose Lanes and 2 HOV Lanes	2016-2020
Indiantown Road	Martin County Line	Widen to 6 General Purpose Lanes and 2 HOV Lanes	2016-2020
@ Indiantown Road		Park-n-Ride Lot	
@ Central Boulevard		New Interchange	2021-2025
PGA Boulevard	Donald Ross Road	Widen to 8 General Purpose Lanes and 2 HOV Lanes	2021-2025
Donald Ross Road	Indiantown Road	Widen to 8 General Purpose Lanes and 2 HOV Lanes	2021-2025

Figure 1-3 presents the long range plan for the I-95 corridor in South Florida incorporating projects included in the Miami-Dade, Broward, and Palm Beach Counties' Long Range Transportation Plans.



I-95 Corridor Long Range Plan

- **Martin County Line to Indiantown Rd.**
  - Six general purpose lanes/2 HOV lanes
- **Indiantown Rd. to South of Ives Dairy Rd.**
  - Eight general purpose lanes/2 HOV lanes
- **South of Ives Dairy Rd. to I-395**
  - Eight general purpose lanes/2 reversible lanes
- **New Interchanges**
  - Central Boulevard
- **Tri-Rail**
  - Double-track
  - Extension to Martin County, including four new stations at Blue Heron Blvd., PGA Blvd., Frederick Small Rd., North of Indiantown Rd.
  - New station at Atlantic Blvd. (Pompano Beach)
- **Golden Glades Center**
  - Multimodal Transportation Facility

Legend:

- 6 Lanes
- 6 General Purpose/2 HOV
- 8 General Purpose/2 HOV
- 8 General Purpose/2 Reversible
- New Interchanges
- Tri-Rail Extension
- New Tri-Rail Stations
- Golden Glades Center

Kimley-Horn and Associates, Inc.

System-Wide Operations Study

Figure 1-3

Summary

Previous and ongoing studies, work programs, and long range plans were reviewed in order to gather information for the I-95 HOV corridor. A wealth of transportation data for the I-95 HOV system in South Florida was extracted from these studies for analysis of the existing operating conditions. At the same time, long-term system improvements were identified so that consistent short-term strategies may be developed to maximize the utilization, operation, and maintenance of the system.

EXISTING OPERATING CONDITIONS

The I-95 HOV system in South Florida presently extends approximately 46 miles from SR 112 (Airport Expressway) in Miami-Dade County through Broward County to just south of Linton Boulevard in Palm Beach County. The HOV requirement is in effect only during the peak traffic periods of the morning (7:00 to 9:00 AM) and afternoon (4:00 to 6:00 PM). In Miami-Dade County the HOV requirement is in effect only in the peak direction (southbound in the morning and northbound in the afternoon) during the peak traffic periods; in Broward and Palm Beach Counties the HOV requirement is in effect in both directions during the peak traffic periods.

Existing traffic data for the I-95 HOV system was obtained from FDOT's Transportation Statistics Office. Additional traffic data was obtained from previous studies of the I-95 HOV system in South Florida. In particular, a large quantity of traffic data was extracted from the *I-95 HOV Systems Plan, Phase I,* and the *2000 I-95 HOV Lane Monitoring Report.* Data presently collected as part of the HOV monitoring process includes:

- Traffic volumes
- Travel speeds
- Vehicle occupancy
- Person throughput
- Violation rates

This traffic data was compiled in a geographic information system (GIS) database to facilitate analysis and mapping capabilities. The GIS database was also valuable for screening of data for reasonableness and accuracy. The traffic data were extracted from text files into a Microsoft Access database and mapping was performed using ArcGIS. Since the I-95 HOV system extends into two districts, a basemap was created by merging the FDOT District 4 and District 6 basemaps of state roads. Traffic data was brought into the ArcGIS map using the state roadway section number for I-95 and the mileposts for I-95 determined from FDOT straight-line roadway inventories.

Existing traffic data for the I-95 HOV system are presented and interpreted below.

Traffic Volumes

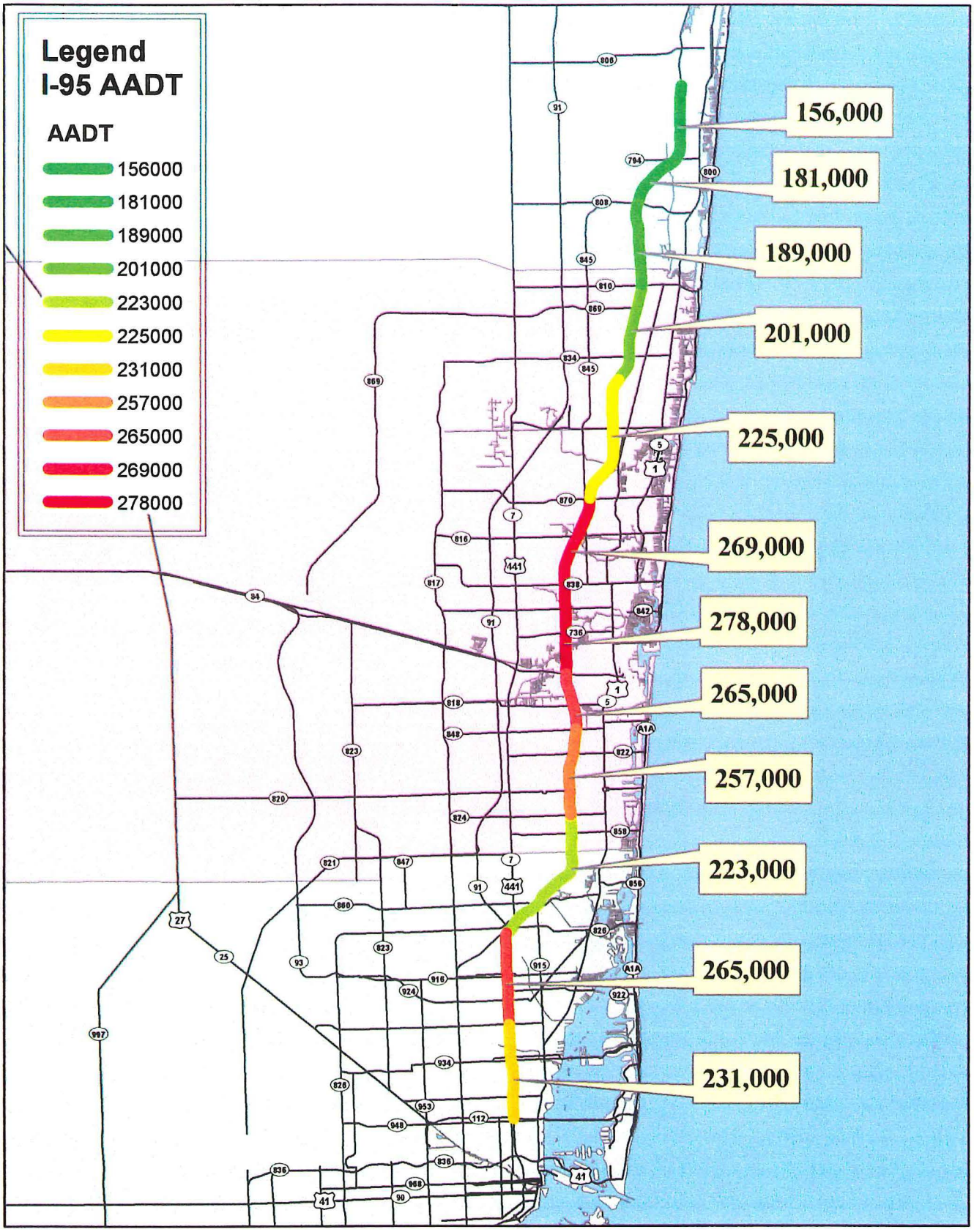
I-95 mainline traffic count data were obtained from the *2000 I-95 HOV Lane Monitoring Report*. Traffic counts were recorded in each lane of I-95 for a continuous 72-hour period between Tuesday through Thursday at twelve locations along the I-95 HOV system. The traffic counts were conducted in Miami-Dade County on October 10, 11, and 12, 2000; the traffic counts were collected in Broward and Palm Beach Counties on January 23, 24, and 25, 2001. In Miami-Dade County, the traffic counts were grouped by HOV lane, the lane adjacent to the HOV lane, and all other general purpose lanes. The traffic counts in Broward and Palm Beach Counties were collected separately for each lane of the I-95 cross section.

The traffic counts were adjusted to reflect annual average daily traffic (AADT) conditions by applying weekly and axle adjustment factors provided by FDOT. These traffic volumes were compared to traffic volumes available from FDOT's Transportation Statistics Office to check for inaccuracies. Based on the comparison of these data, the traffic volumes collected for the *2000 I-95 HOV Lane Monitoring Report* were found to be reasonable.

Figure 1-4 depicts the AADT of the I-95 HOV system by roadway segments, which were based on the twelve traffic count locations from the *2000 I-95 HOV Lane Monitoring Report*. Table 1-5 presents the average annual daily traffic (AADT), along with directional peak hour traffic volumes for the AM and PM peak periods. The directional peak hour volumes in Table 1-5 are grouped by HOV lane and general purpose (GP) lanes.

Figure 1-4 and Table 1-5 both illustrate that the highest daily traffic volumes occur near downtown Fort Lauderdale, where the AADT approaches 280,000. This segment of I-95 also has the widest cross section of the study corridor. Traffic volumes in northern Broward County and Palm Beach County, where the cross section narrows from ten lanes to eight lanes, are lower than volumes for the rest of the study corridor. For example, between SR 816 (Oakland Park Boulevard) and SR 814 (Atlantic Boulevard) the AADT drops from 269,000 to 225,000.

Traffic volumes in Miami-Dade County are highest south of the Golden Glades interchange, where the AADT exceeds 265,000. The highest traffic volumes in Palm Beach County are in the extreme southern portion, where the AADT is slightly below 190,000. The AADT in Palm Beach



I-95 HOV SYSTEM **I-95 Average Annual Daily Traffic**	DATE DWG. NAME	**Figure 1-4**	PROJECT NO. SHEET

Table 1-5
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
I-95 Mainline Traffic Volumes

		PEAK HOUR TRAFFIC VOLUMES											
		SOUTHBOUND						NORTHBOUND					
		AM			PM			AM			PM		
Location	AADT	HOV	GP (1)	TOTAL	HOV	GP (1)	TOTAL	HOV	GP (1)	TOTAL	HOV	GP (1)	TOTAL
South of SR 934 (NW 79th Street)	231,000	800	6,960	7,760	(2)	8,230	8,230	(3)	8,430	8,430	980	7,210	8,190
South of Golden Glades Interchange	265,000	1,500	6,020	7,520	(2)	7,280	7,280	(3)	8,120	8,120	1,560	7,370	8,930
North of SR 854 (Ives Dairy Road)	223,000	920	6,470	7,390	(2)	8,980	8,980	(3)	7,390	7,390	1,170	6,600	7,770
South of SR 822 (Sheridan Street)	257,000	730	7,490	8,220	1,460	8,740	10,200	1,190	8,940	10,130	1,150	7,660	8,810
South of I-595	265,000	660	7,290	7,950	1,580	8,560	10,140	1,200	8,710	9,910	1,030	8,100	9,130
South of SR 842 (Broward Boulevard)	278,000	640	8,250	8,890	1,600	8,930	10,530	1,260	9,000	10,260	1,210	8,680	9,890
South of SR 816 (Oakland Park Boulevard)	269,000	1,040	8,400	9,440	1,680	8,570	10,250	1,380	8,240	9,620	1,450	8,160	9,610
South of SR 814 (Atlantic Boulevard)	225,000	1,210	6,660	7,870	1,670	6,180	7,850	1,380	6,900	8,280	1,530	6,800	8,330
South of SR 810 (Hillsboro Boulevard)	201,000	930	5,630	6,560	2,070	5,790	7,860	1,590	6,420	8,010	1,170	5,840	7,010
North of SR 798 (Palmetto Park Road)	189,000	830	5,340	6,170	1,740	6,450	8,190	1,160	6,790	7,950	930	5,480	6,410
North of SR 808 (Glades Road)	181,000	590	5,470	6,060	1,610	5,730	7,340	1,130	6,300	7,430	930	5,380	6,310
North of Linton Boulevard	156,000	(4)	6,230	6,230	(4)	5,360	5,360	(4)	4,960	4,960	(4)	5,530	5,530

Notes:
(1) General purpose lanes.
(2) HOV lanes are not enforced for the northbound direction during the AM peak period in Miami-Dade County; traffic in HOV lane is included with general purpose traffic.
(3) HOV lanes are not enforced for the southbound direction during the PM peak period in Miami-Dade County; traffic in HOV lane is included with general purpose traffic.
(4) Existing terminus of HOV lanes is south of Linton Boulevard.

County decreases to approximately 156,000 north of Linton Boulevard, where the existing HOV system ends and the existing I-95 cross section narrows from eight lanes to six lanes.

Directional Flow

Table 1-6 presents the peak period directional distribution of traffic for the I-95 study corridor. Separate directional distributions are provided for the HOV lanes and the total traffic volume. According to the data presented in Table 1-6, the I-95 study corridor does not exhibit significant directional imbalance for total traffic volumes during the AM and PM peak periods. The highest directional imbalances occur north of SR 808 (Glades Road) in Palm Beach County, where approximately 56 percent of the traffic travels northbound during the AM peak period and southbound during the PM peak period.

Directional imbalance in total traffic volumes is not apparent in Miami-Dade County through examination of AM and PM peak hour volumes; however, traffic is so congested in the peak direction (southbound in the AM peak and northbound in the PM peak) that traffic volumes are constrained. In actuality, AM peak demand is higher for southbound travel and the PM peak demand is higher for northbound travel. This trend is demonstrated by the extension over a longer time period of the AM peak demand for the southbound direction and the PM peak demand for the northbound direction.

HOV volumes in the study corridor generally exhibit a heavier directional imbalance than the general purpose traffic. The higher directional imbalance may reflect that HOV trips tend to be longer in distance. During the AM peak period northbound HOV volumes are considerably higher than southbound HOV volumes at many locations in both Broward and Palm Beach Counties. The most drastic HOV lane directional imbalances during the AM peak period occur south of SR 842 (Broward Boulevard) and north of SR 808 (Glades Road), where approximately 66 percent of the HOV volume travels northbound. Because the HOV requirement in Miami-Dade County is only in effect in the southbound direction during the AM peak period and the northbound direction in the PM peak period, the segment of the I-95 in Miami-Dade County was not included in the analysis of HOV directional flow.

Table 1-6
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Peak Period Directional Distribution of Traffic

	PEAK PERIOD DIRECTIONAL DISTRIBUTION OF TRAFFIC							
	AM PEAK PERIOD				PM PEAK PERIOD			
	SOUTHBOUND		NORTHBOUND		SOUTHBOUND		NORTHBOUND	
Location	**HOV**	**TOTAL**	**HOV**	**TOTAL**	**HOV**	**TOTAL**	**HOV**	**TOTAL**
South of SR 934 (NW 79th Street)	100.00% (1)	47.93%	0.00% (1)	52.07%	0.00% (1)	50.12%	100.00% (1)	49.88%
South of Golden Glades Interchange	100.00% (1)	48.08%	0.00% (1)	51.92%	0.00% (1)	44.91%	100.00% (1)	55.09%
North of SR 854 (Ives Dairy Road)	100.00% (1)	50.00%	0.00% (1)	50.00%	0.00% (1)	53.61%	100.00% (1)	46.39%
South of SR 822 (Sheridan Street)	38.02%	44.80%	61.98%	55.20%	55.94%	53.66%	44.06%	46.34%
South of I-595	35.48%	44.51%	64.52%	55.49%	60.54%	52.62%	39.46%	47.38%
South of SR 842 (Broward Boulevard)	33.68%	46.42%	66.32%	53.58%	56.94%	51.57%	43.06%	48.43%
South of SR 816 (Oakland Park Boulevard)	42.98%	49.53%	57.02%	50.47%	53.67%	51.61%	46.33%	48.39%
South of SR 814 (Atlantic Boulevard)	46.72%	48.73%	53.28%	51.27%	52.19%	48.52%	47.81%	51.48%
South of SR 810 (Hillsboro Boulevard)	36.90%	45.02%	63.10%	54.98%	63.89%	52.86%	36.11%	47.14%
North of SR 798 (Palmetto Park Road)	41.71%	43.70%	58.29%	56.30%	65.17%	56.10%	34.83%	43.90%
North of SR 808 (Glades Road)	34.30%	44.92%	65.70%	55.08%	63.39%	53.77%	36.61%	46.23%
North of Linton Boulevard	(2)	55.67%	(2)	44.33%	(2)	49.22%	(2)	50.78%

Notes:
(1) HOV lanes only enforced for the southbound direction during the AM peak period and the northbound direction during the PM peak period in Miami-Dade County.
(2) Existing terminus of HOV lanes is south of Linton Boulevard.

Although to a slightly lesser extent, during the PM peak period HOV traffic exhibits the opposite directional imbalance in Broward and Palm Beach Counties; southbound HOV volumes are considerably higher at most locations than northbound HOV volumes. The most drastic HOV lane directional imbalances during the PM peak period occur in Palm Beach County, where between approximately 63 and 65 percent of the HOV volume travels southbound. The reversal of the directional flow may represent the return trip portion of the daily commute.

Truck Volumes

The I-95 corridor in Miami-Dade, Broward, and Palm Beach Counties is an important route for freight traffic accessing the South Florida region. Many truck operators prefer I-95 to the Florida's Turnpike because of the lack of tolls, which are paid by the axle on the Turnpike. In addition, I-95 passes closer to the major business districts and seaports in South Florida than Florida's Turnpike. Currently, trucks are not allowed to travel in the HOV lanes between 7:00 AM and 7:00 PM. However, providing a good overall level of service on I-95 is vital for trucks to access their South Florida destinations.

Truck traffic data was obtained from the FDOT Transportation Statistics Office and the *2000 I-95 HOV Lane Monitoring Report*. Table 1-7 presents the estimated daily truck volume along the I-95 HOV corridor. The data indicate that the percentage of truck traffic is higher in areas of the study corridor where the AADT is lower, and the percentage of truck traffic is lower in areas where the AADT is higher. However, in contrast to the total vehicular volume, which varies significantly in the corridor, the truck volume is relatively constant ranging between approximately 11,500 to 14,500 trucks per day.

Table 1 - 7: I-95 Truck Volumes

Location	Truck %	Average AADT	Estimated Truck Daily Volume
Miami-Dade County	5.4%	240,000	12,960
Broward County (South of Broward Boulevard)	4.3%	270,000	11,610
Broward County (North of Broward Boulevard)	5.4%	230,000	12,420
Palm Beach County	8.3%	175,000	14,525

Truck data from the *2000 I-95 HOV Lane Monitoring Report* was consulted to determine the number of trucks on I-95 during the HOV enforcement period, which also corresponds to the peak travel period on the I-95 HOV system. The data indicate that fewer trucks travel on I-95 in the study corridor during the peak traffic hours than during off-peak hours. Table 1-8 presents the peak-to-daily ratios for total traffic and truck traffic for the AM and PM peak periods. The lower peak-to-daily ratio for trucks demonstrates that trucks tend to travel during off-peak hours in the I-95 HOV corridor.

Table 1 - 8: Peak-to-Daily Traffic Ratios

Location	AM Peak Period		PM Peak Period	
	% of Total Traffic	% of Truck Traffic	% of Total Traffic	% of Truck Traffic
Miami-Dade County	6.5%	1.7%	6.9%	1.5%
Broward County	7.0%	1.6%	7.3%	2.3%
Palm Beach County	7.4%	1.0%	7.5%	1.3%

Ramp Volumes

Traffic volumes for interchanges in Broward and Palm Beach Counties along the I-95 HOV corridor were obtained to evaluate the system accessibility, a task described later in this report. The system accessibility task did not include an evaluation of the interchanges in Miami-Dade County, because of the programmed implementation of ramp metering and other measures as part of the intelligent corridor system (ICS) package. Therefore, interchange volumes were not obtained for Miami-Dade County.

Ramp volumes for all interchanges in Broward County were obtained from FDOT's Transportation Statistics Office. Ramp volumes for interchanges in Palm Beach County within the limits of the existing I-95 HOV system were obtained from Palm Beach County Engineering and Public Works. Additional ramp data collected for the system accessibility task include ramp lengths, number of lanes, and length of auxiliary lanes. Intersection turning movement counts were obtained at select interchanges to perform critical movement analysis as part of the system accessibility task.

Travel Speeds

Travel speed data was obtained from counts collected for the *2000 I-95 HOV Lane Monitoring Report*. Travel speed was collected for each lane at twelve count locations. However, much of the travel speed data were disregarded because of questionable accuracy.

Inaccuracies in Travel Speed Data

Many travel speeds were recorded over 85 miles per hour (mph), even at congested locations during peak traffic periods. For example, the speed data identified more vehicles traveling over 85 mph than all other travel speed ranges combined for northbound traffic on I-95 south of SR 842 (Broward Boulevard).

Additional travel speed inaccuracies were noted at many of the count locations. For northbound traffic on I-95 north of Ives Dairy Road, every recorded speed was within the 51 to 56 mph range for the entire 72-hour data collection period. For northbound traffic on I-95 south of I-595, every recorded speed data for the HOV lane was below 20 mph for the last 60 hours of the 72-hour data collection period; for the first 12 hours that speed data was collected at this location, every recorded speed was between 50 and 55 mph.

Because of the extensive inaccuracies in the travel speed data obtained for the *2000 I-95 HOV Lane Monitoring Report*, the travel speed data was not utilized in this analysis. However, speed data was required for level of service calculations. Therefore, speed data was obtained from an alternate source: travel time runs conducted for the *2000 I-95 HOV Lane Monitoring Report*.

Travel Time and Delay Runs

A series of travel time and delay runs were performed for the *2000 I-95 HOV Lane Monitoring Report*. Travel time runs were performed in both the AM and PM peak periods for both the HOV lanes and the general purpose lanes. For each case, six travel time runs were performed for both northbound and southbound directions. The travel speeds reported as part of the travel time runs were used to calculate average vehicle speed for the twelve locations where traffic volume counts were collected. The traffic volumes and travel speeds were matched by location to facilitate calculating level of service, which is described later in this report.

The results of the travel time and delay runs were reviewed for accuracy. Data from the travel time runs appeared significantly more accurate than data obtained from the travel speed study described previously. Table 1-9 presents average vehicular speed for both the HOV lanes and the general purpose lanes corresponding to the locations where traffic volume counts were collected.

The speed data from the travel time runs accurately reflect the peak period operating conditions in Miami-Dade County. Unlike the traffic volume data, the speed data shows that traffic conditions are worse in the southbound direction during the AM peak period and in the northbound direction during the PM peak period. In fact, the slowest speeds – 19 mph for the HOV lanes and 10 mph for the general purpose lanes – along the entire I-95 HOV system are found in Miami-Dade County in the southbound direction during the AM peak period.

A considerable slowdown in average travel speeds also occurs around the SR 810 (Hillsboro Boulevard) interchange. The average travel speeds decrease in the vicinity of this interchange for both the HOV and general purpose traffic; during the AM peak period the slowdown occurs for the northbound direction and during the PM peak period the slowdown occurs for the southbound direction.

Travel speeds are generally lower in the northbound direction during the AM peak period, in Broward and Palm Beach Counties. During the PM peak period travel speeds are generally lower in the southbound direction in Broward and Palm Beach Counties.

The data presented in Table 1-9 also demonstrates that travel speeds are generally significantly higher in the HOV lanes than in the general purpose lanes. During the AM peak period the average travel speed is 8 mph faster in the HOV lane than in the general purpose lanes in the southbound direction. In the northbound direction during the AM peak period, the average travel speed is 13 mph faster in the HOV lane than in the general purpose lanes. The most significant speed differential is found in the southbound direction during the PM peak period, when the average travel speed is 16 mph faster in the HOV lane than in the general purpose lanes. In the northbound direction during the PM peak period, the average travel speed is 10 mph faster in the HOV lane than in the general purpose lanes.

Table 1-9
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Peak Period Travel Speeds

	PEAK PERIOD AVERAGE TRAVEL SPEEDS (MPH) (1)							
	SOUTHBOUND				NORTHBOUND			
	AM		PM		AM		PM	
Count Location	**HOV**	**GP (1)**	**HOV**	**GP (1)**	**HOV**	**GP (1)**	**HOV**	**GP (1)**
South of SR 934 (NW 79th Street)	36	27	(2)	59	(2)	55	31	32
South of Golden Glades Interchange	19	10	(2)	46	(2)	32	52	38
North of SR 854 (Ives Dairy Road)	57	57	(2)	44	(2)	61	72	67
South of SR 822 (Sheridan Street)	69	49	67	54	61	70	52	43
South of I-595	54	41	46	34	69	54	60	49
South of SR 842 (Broward Boulevard)	72	72	67	33	66	36	71	63
South of SR 816 (Oakland Park Boulevard)	73	67	52	43	54	28	66	54
South of SR 814 (Atlantic Boulevard)	70	72	55	52	53	56	74	58
South of SR 810 (Hillsboro Boulevard)	73	53	48	29	42	25	69	64
North of SR 798 (Palmetto Park Road)	62	54	65	43	59	37	74	51
North of SR 808 (Glades Road)	64	56	60	47	52	45	69	69
Average Speed by Direction	59	51	58	42	57	44	63	53
Average Speed Differential (HOV vs. GP)	+8		+16		+13		+10	

Notes:

(1) Average travel speeds determined from a series of travel time and delay runs.

(2) General purpose lanes.

(3) HOV lanes only enforced for the southbound direction during the AM peak period and the northbound direction during the PM peak period in Miami-Dade County.

Finally, in the areas of the study corridor with the worst operating conditions for the general purpose lanes, the travel speed advantage in the HOV lanes is the most pronounced. The data presented in Table 1-9 demonstrates this travel speed advantage for several locations including south of the Golden Glades Interchange, south of SR 842 (Broward Boulevard), and south of SR 810 (Hillsboro Boulevard).

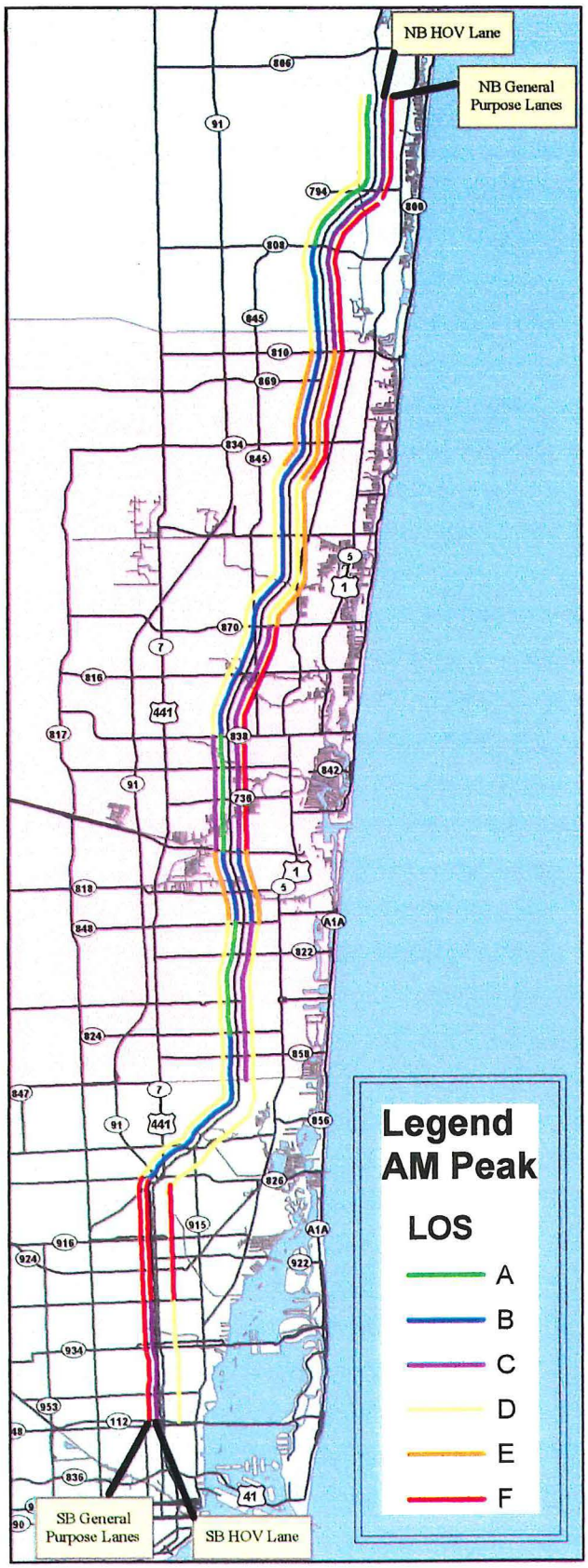
Level of Service

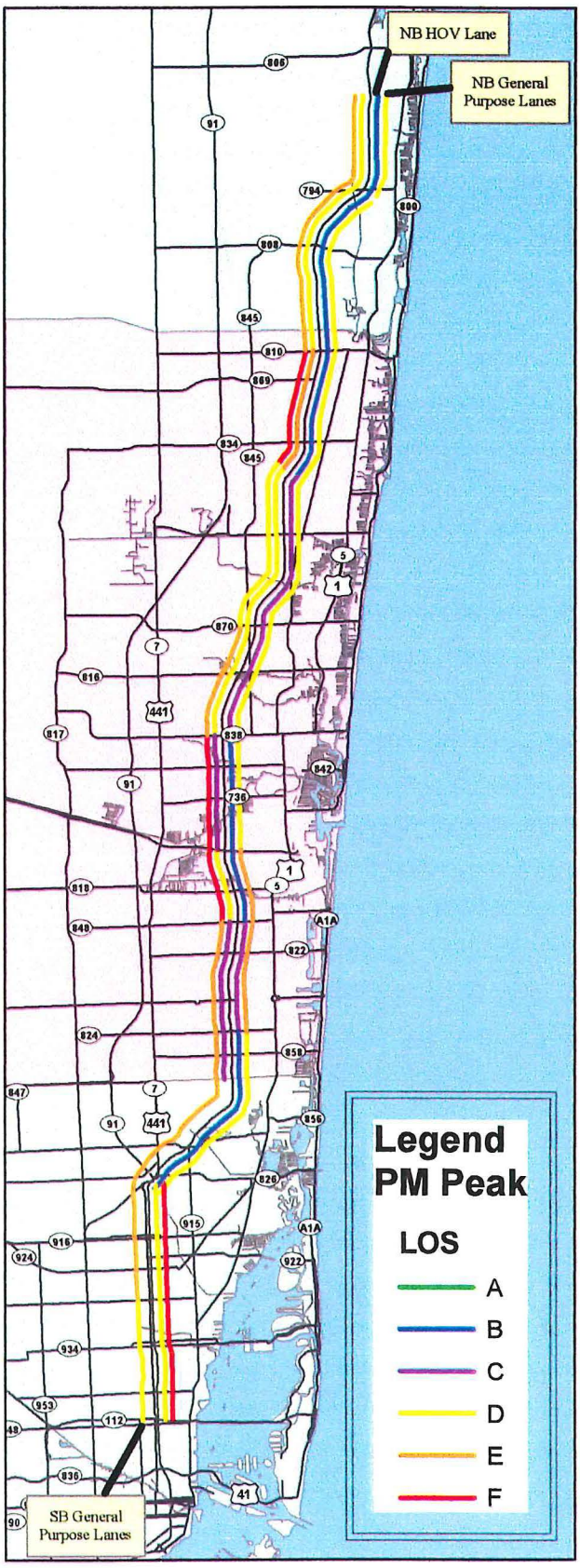
Level of service (LOS) is a quality measure describing operational characteristics within a traffic stream generally in terms of such measures as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. The level of service is represented by one of the letters A through F, with LOS A representing the best operating conditions and LOS F the worst. Analytical methods specified in the *Highway Capacity Manual* (HCM 2000) establish methodologies to approximate level of service based upon quantitative measures such as maximum flow rates, volume-to-capacity ratios, and travel speeds.

According to the *Highway Capacity Manual*, the appropriate measure to provide an estimate of level of service for a freeway segment is density. Density (vehicles per mile per lane) is a fundamental measure of traffic and is equal to the traffic volume divided by the traffic speed. Level of service thresholds for traffic density are provided for basic freeway segments in Chapter 23 of the *Highway Capacity Manual*. For the I-95 corridor density is superior to volume as a level of service measure because of the congested conditions that restrict flow during the peak periods.

Figure 1-5 presents directional level of service calculations based on density thresholds for both the HOV and general purpose lanes during the AM and PM peak periods, respectively. This level of service information is also summarized in Table 1-10. The level of service density calculations considered all vehicles utilizing the HOV lanes, including single-occupant violators. If these violators were factored out of the calculations, the level of service would improve for the HOV lanes. The degree of violation in the HOV lanes will be discussed later in this report.

During the AM peak period, level of service for the southbound HOV lane south of the Golden Glades Interchange is LOS F. The only other location that the HOV lane operates below LOS B in the southbound direction during the AM peak is south of SR 934 (NW 79th Street) in Miami-





I-95 HOV SYSTEM
Peak Period Level of Service

DATE	**Figure 1-5**	PROJECT NO.
DWG. NAME		SHEET

Table 1-10
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Peak Period Level of Service

	PEAK PERIOD LEVEL OF SERVICE (LOS) (1)							
	SOUTHBOUND				NORTHBOUND			
	AM		PM		AM		PM	
Location	HOV	GP	HOV	GP	HOV	GP	HOV	GP
South of SR 934 (NW 79th Street)	C	F	(2)	D	(2)	D	D	F
South of Golden Glades Interchange	F	F	(2)	E	(2)	F	D	F
North of SR 854 (Ives Dairy Road)	B	D	(2)	E	(2)	D	B	D
South of SR 822 (Sheridan Street)	A	D	C	E	C	D	C	E
South of I-595	B	E	D	F	B	E	B	E
South of SR 842 (Broward Boulevard)	A	C	C	F	C	F	B	D
South of SR 816 (Oakland Park Boulevard)	B	D	D	E	C	F	C	D
South of SR 814 (Atlantic Boulevard)	B	D	D	D	D	E	C	D
South of SR 810 (Hillsboro Boulevard)	B	E	E	F	E	F	B	D
North of SR 798 (Palmetto Park Road)	B	D	D	E	C	F	B	D
North of SR 808 (Glades Road)	A	D	D	E	C	F	B	D

Notes:

(1) Level of service calculations based on density thresholds provided in Chapter 23 of the *Highway Capacity Manual*.

(2) HOV lanes only enforced for the southbound direction during the AM peak period and the northbound direction during the PM peak period in Miami-Dade County.

Dade County, where the HOV lane operates at LOS C. The high level of service measures indicate there is additional capacity in the HOV lane that is not being utilized.

The level of service for the HOV lanes is lower for the northbound direction than the southbound direction in Broward and Palm Beach Counties during the AM peak period. In particular, the level of service for the northbound HOV lane south of SR 810 (Hillsboro Boulevard) is LOS E and the level of service south of SR 814 (Atlantic Boulevard) is LOS D. However, the level of service is still LOS C or better at most locations, indicating there is unutilized capacity.

During the PM peak period, level of service for the northbound HOV lane south of the Golden Glades Interchange is LOS D and this measure improves to LOS C or better throughout the rest of the study corridor. The level of service reverses from the AM peak period for the HOV lanes in Broward and Palm Beach Counties and is lower for the southbound direction during the PM peak period. The lowest level of service (LOS E) is again in the vicinity of SR 810 (Hillsboro Boulevard) and the rest of the corridor north of SR 816 (Oakland Park Boulevard) operates at LOS D.

Level of service is significantly lower in the general purpose lanes than in the HOV lanes during both peak periods. Generally, as a system-wide rule, level of service is approximately two letter measures worse in the general purpose lanes than in the HOV lanes. The general purpose lanes operate at LOS E or worse at many locations during both the AM and PM peak periods. In particular, the general purpose lanes operate at LOS F south of the Golden Glades Interchange in the southbound direction during the AM peak period and in the northbound direction in the PM peak period. The general purpose lanes also operate at LOS F at most locations north of SR 842 (Broward Boulevard) in the northbound direction during the AM peak period.

Vehicle Occupancy

Vehicle occupancy data was obtained from the *2000 I-95 HOV Lane Monitoring Report* at eight locations along the I-95 HOV system. The vehicle occupancy observations were conducted during the AM and PM peak periods on Tuesdays through Thursdays between October 3 and October 25, 2000. Vehicle occupancy data was collected for the HOV lane and the lane adjacent to the HOV lane for each direction during each time period. The vehicle occupancy data was used to calculate average vehicle occupancy (AVO) rates.

Table 1-10
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Peak Period Level of Service

	PEAK PERIOD LEVEL OF SERVICE (LOS) (1)							
	SOUTHBOUND				NORTHBOUND			
	AM		PM		AM		PM	
Location	HOV	GP	HOV	GP	HOV	GP	HOV	GP
South of SR 934 (NW 79th Street)	C	F	(2)	D	(2)	D	D	F
South of Golden Glades Interchange	F	F	(2)	E	(2)	F	D	F
North of SR 854 (Ives Dairy Road)	B	D	(2)	E	(2)	D	B	D
South of SR 822 (Sheridan Street)	A	D	C	E	C	D	C	E
South of I-595	B	E	D	F	B	E	B	E
South of SR 842 (Broward Boulevard)	A	C	C	F	C	F	B	D
South of SR 816 (Oakland Park Boulevard)	B	D	D	E	C	F	C	D
South of SR 814 (Atlantic Boulevard)	B	D	D	D	D	E	C	D
South of SR 810 (Hillsboro Boulevard)	B	E	E	F	E	F	B	D
North of SR 798 (Palmetto Park Road)	B	D	D	E	C	F	B	D
North of SR 808 (Glades Road)	A	D	D	E	C	F	B	D

Notes:

(1) Level of service calculations based on density thresholds provided in Chapter 23 of the *Highway Capacity Manual*.

(2) HOV lanes only enforced for the southbound direction during the AM peak period and the northbound direction during the PM peak period in Miami-Dade County.

Dade County, where the HOV lane operates at LOS C. The high level of service measures indicate there is additional capacity in the HOV lane that is not being utilized.

The level of service for the HOV lanes is lower for the northbound direction than the southbound direction in Broward and Palm Beach Counties during the AM peak period. In particular, the level of service for the northbound HOV lane south of SR 810 (Hillsboro Boulevard) is LOS E and the level of service south of SR 814 (Atlantic Boulevard) is LOS D. However, the level of service is still LOS C or better at most locations, indicating there is unutilized capacity.

During the PM peak period, level of service for the northbound HOV lane south of the Golden Glades Interchange is LOS D and this measure improves to LOS C or better throughout the rest of the study corridor. The level of service reverses from the AM peak period for the HOV lanes in Broward and Palm Beach Counties and is lower for the southbound direction during the PM peak period. The lowest level of service (LOS E) is again in the vicinity of SR 810 (Hillsboro Boulevard) and the rest of the corridor north of SR 816 (Oakland Park Boulevard) operates at LOS D.

Level of service is significantly lower in the general purpose lanes than in the HOV lanes during both peak periods. Generally, as a system-wide rule, level of service is approximately two letter measures worse in the general purpose lanes than in the HOV lanes. The general purpose lanes operate at LOS E or worse at many locations during both the AM and PM peak periods. In particular, the general purpose lanes operate at LOS F south of the Golden Glades Interchange in the southbound direction during the AM peak period and in the northbound direction in the PM peak period. The general purpose lanes also operate at LOS F at most locations north of SR 842 (Broward Boulevard) in the northbound direction during the AM peak period.

Vehicle Occupancy

Vehicle occupancy data was obtained from the *2000 I-95 HOV Lane Monitoring Report* at eight locations along the I-95 HOV system. The vehicle occupancy observations were conducted during the AM and PM peak periods on Tuesdays through Thursdays between October 3 and October 25, 2000. Vehicle occupancy data was collected for the HOV lane and the lane adjacent to the HOV lane for each direction during each time period. The vehicle occupancy data was used to calculate average vehicle occupancy (AVO) rates.

Figures 1-6 and 1-7 present AVO for the AM and PM peak periods, respectively, for the entire HOV lane enforcement periods. In Miami-Dade County, the AVO was measured only for the southbound direction during the AM peak and the northbound direction during the PM peak.

Figure 1 - 6: AM Peak Period Average Vehicle Occupancy

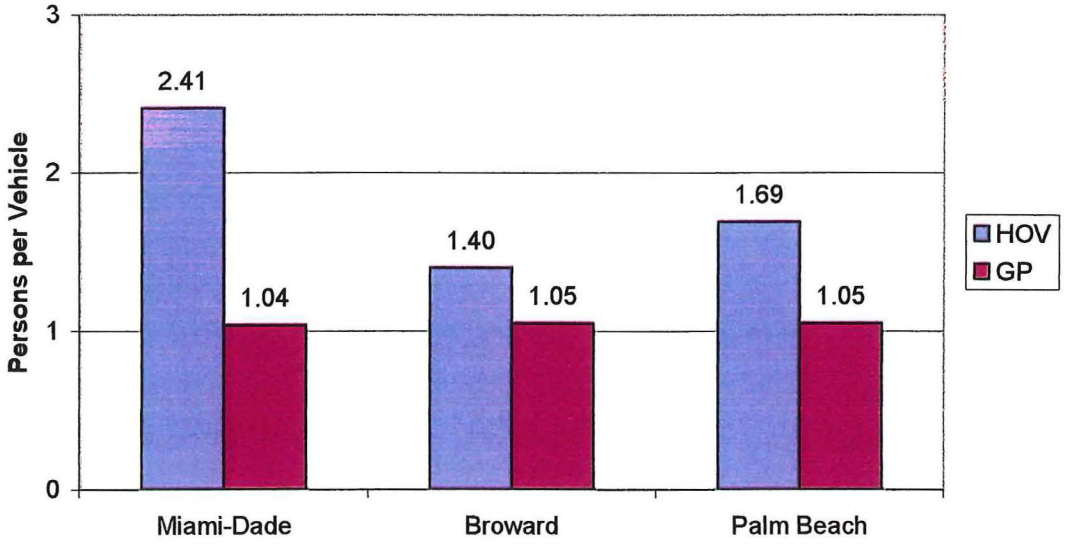
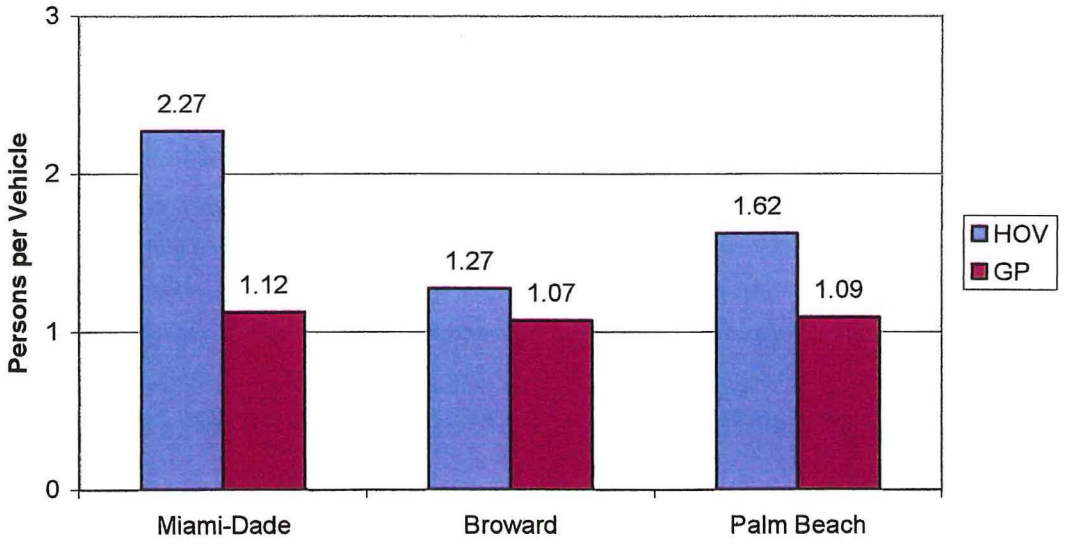


Figure 1 - 7: PM Peak Period Average Vehicle Occupancy



Figures 1-6 and 1-7 demonstrate that the I-95 HOV lanes have much higher AVO rates in Miami-Dade County than in Broward and Palm Beach Counties. The higher AVO rates are due in large part to the Miami-Dade Transit (MDT) Metrobus 95X routes. The Metrobus 95X routes are the only transit routes that currently utilize the I-95 HOV lanes; the routes travel in the HOV lanes from the Golden Glades Interchange to SR 112 in the southbound direction during the AM peak period and in the northbound direction during the PM peak period.

Even excluding the Metrobus 95X routes, the AVO rates in Miami-Dade County are approximately 2.00 persons per vehicle. Two reasons for the higher AVO rates in Miami-Dade County are (1) greater demand for HOV travel and (2) greater HOV enforcement rates. The greater demand for HOV travel is likely generated by Downtown Miami, which is the largest employment center in the study corridor, and better-utilized multimodal locations such as the Golden Glades Interchange Park-n-Ride facilities.

Figures 1-6 and 1-7 also suggest that HOV lane AVO rates are slightly lower in the PM peak period than in the AM peak period, which is the opposite of the AVO rates for the general purpose lanes. These data may indicate that a larger number of single occupant vehicle violators use the HOV lanes during the PM peak period.

Person Throughput

Person throughput is a common way of measuring the success of HOV systems, because an objective of an HOV facility is to increase the person-moving capacity of the facility. Person throughput measures the movement of persons per hour per lane.

Person throughput for the I-95 HOV system was calculated by multiplying the average vehicle occupancy rates and the traffic volumes discussed previously. Figures 1-8 and 1-9 present the person throughput for the I-95 HOV system at three locations: (1) south of the Golden Glades Interchange in Miami-Dade County, (2) south of SR 816 (Oakland Park Boulevard) in Broward County, and (3) north of SR 808 (Glades Road) in Palm Beach County.

Figures 1-8 and 1-9 clearly demonstrate that the person throughput is significantly higher in Miami-Dade County in the HOV lanes than the general purpose lanes. However, during the AM peak period the person throughput in Broward and Palm Beach Counties is less (approximately

21 percent) in the HOV lanes than the general purpose lanes. During the PM peak enforcement period, the person throughput for the HOV lanes and the general purpose lanes are roughly equal in both Broward and Palm Beach Counties.

Figure 1 - 8: AM Peak Hour Person Throughput

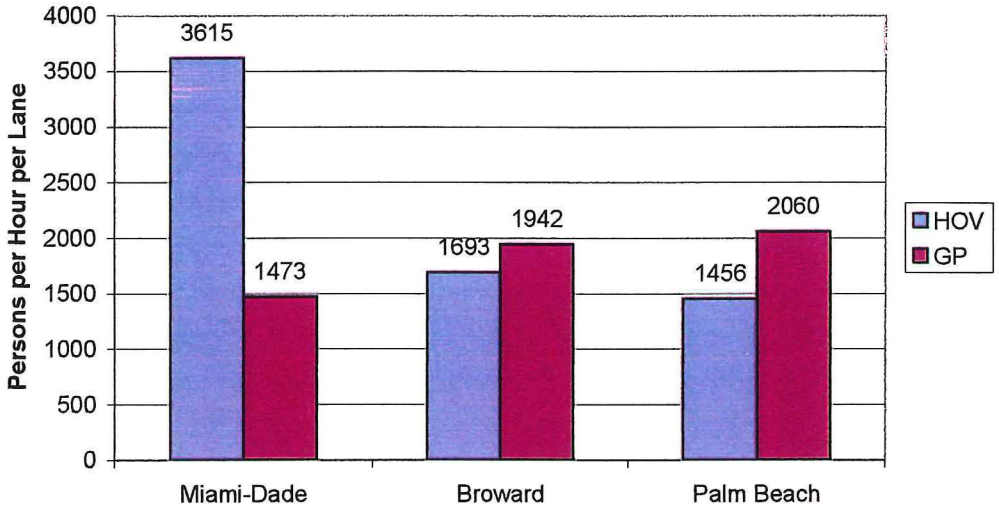
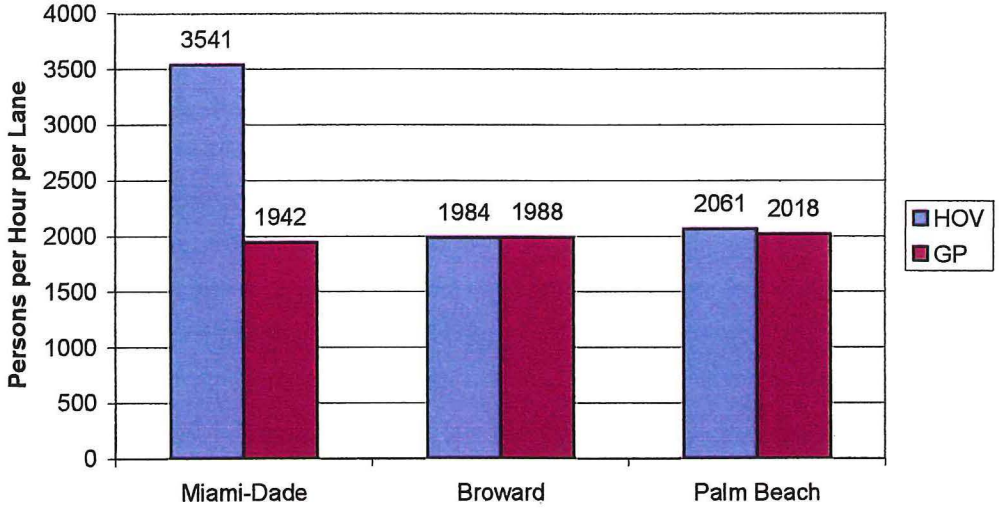


Figure 1 - 9: PM Peak Hour Person Throughput



The person throughput data clearly show the HOV lanes accomplish the objective of moving more persons in fewer vehicles in Miami-Dade County. However, increased person movement is not being realized in Broward and Palm Beach Counties. Strategies need to be developed in these counties to increase HOV usage; one approach may be to encourage use of the HOV lanes by express bus routes similar to the Metrobus 95X routes in Miami-Dade County.

Violation Rates

Enforcement is a critical element to the successful operation of an HOV facility to discourage unauthorized vehicles and protect HOV travel time savings. Visible and effective enforcement promotes fairness and maintains the integrity of the HOV facility to help gain acceptance of the facilities by users and non-users.

To determine the HOV lane violation rates, the number of single occupant vehicles (SOVs) using the HOV lanes during the AM and PM enforcement periods were recorded for the *2000 I-95 HOV Lane Monitoring Report*. The violation rate is defined as the percentage of the total HOV lane volume that is actually single occupant vehicles (SOVs) during the enforcement period.

Figures 1-10 and 1-11 present the range of HOV lane violation rates in Miami-Dade, Broward, and Palm Beach Counties during the AM and PM periods when the HOV requirement is in effect. The range of violation rates represents values recorded at different locations within the counties. In Miami-Dade County, the HOV requirement is in effect only for the southbound direction during the AM peak and only for the northbound direction during the PM peak.

Figures 1-10 and 1-11 demonstrate that HOV lane violation rates by SOVs are much lower in Miami-Dade County than in Broward and Palm Beach Counties. Two reasons HOV lane violation rates may be lower in Miami-Dade County are higher utilization of the lanes by HOVs and greater enforcement. In Miami-Dade County the HOV lanes operate closer to capacity, which creates less incentive for SOVs to violate the lanes. The higher level of enforcement in Miami-Dade County is reflected by the greater number of citations issued per HOV lane-mile. Table 1-11 presents citations issued per HOV lane-mile for the I-95 HOV system. The data presented in Table 1-11 accounts for the single direction enforcement in Miami-Dade County.

Figure 1 - 10: AM Peak Period HOV Lane Violation Rates

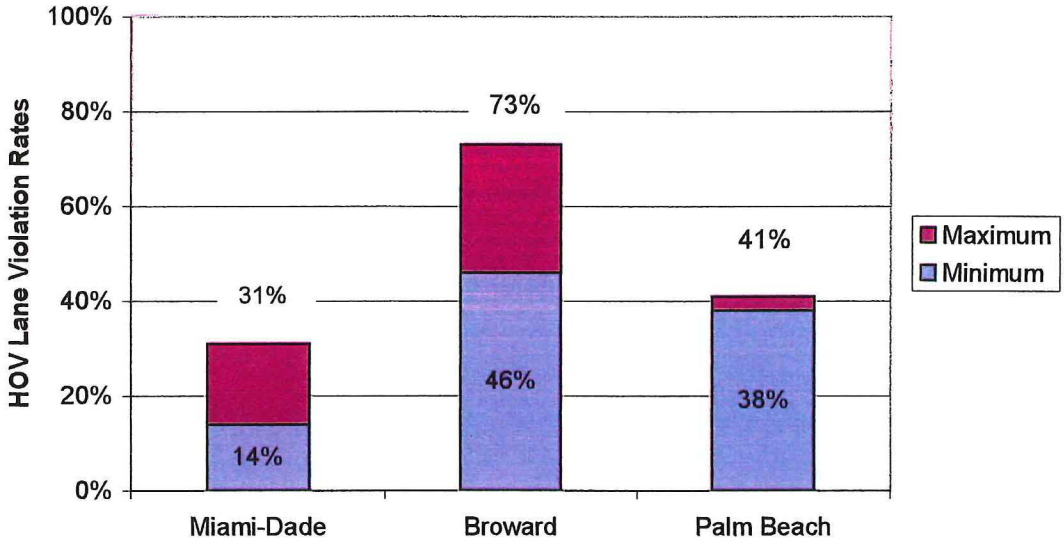


Figure 1 - 11: PM Peak Period HOV Lane Violation Rates

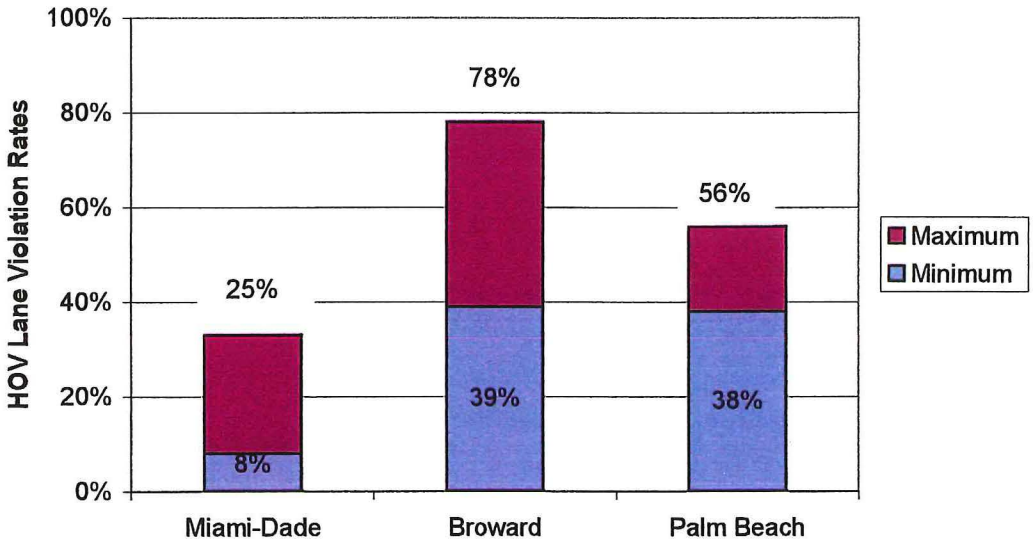


Table 1 - 11: HOV Lane Violation Citations

Location	HOV Lane Citations Issued per HOV Lane-Mile
Miami-Dade County	369
Broward	121
Palm Beach	315

By far the fewest number of citations per HOV lane-mile are issued in Broward County; accordingly, Broward County has the highest HOV violation rates. Increased enforcement would enhance the HOV operations in Broward County.

Summary

Traffic data was assembled from previous studies and reviewed to determine the existing operating characteristics of the I-95 HOV system. These data included traffic volumes, travel speeds, vehicle occupancy, person throughput, and violation rates.

The highest traffic volumes in the I-95 HOV corridor are found in Miami-Dade County and in southern Broward County. Traffic volumes decrease significantly in northern Broward County, where the I-95 cross section narrows from ten lanes to eight lanes. Traffic volumes in the HOV lanes during the hours of HOV enforcement vary widely throughout the study corridor; however, single occupant vehicle violators comprise a significant portion of the traffic volume, particularly in Broward and Palm Beach Counties. Truck volumes are relatively constant throughout the study corridor, ranging between 11,500 to 14,500 trucks per day.

Speed data obtained from travel time runs demonstrate that the slowest speeds along the entire I-95 HOV system are found in Miami-Dade County in the southbound direction during the AM peak period. The speed data also demonstrates that travel speeds are significantly higher in the HOV lanes than in the general purpose lanes.

Level of service was calculated for the HOV corridor based on density thresholds. The level of service is significantly lower in the general purpose lanes than in the HOV lanes during peak traffic periods. On a system-wide basis, the level of service is generally about two letter measures worse in the general purpose lanes than in the HOV lanes.

The I-95 HOV lanes have much higher average vehicle occupancy rates in Miami-Dade County than in Broward and Palm Beach Counties. The higher vehicle occupancy rates are largely attributable to the Metrobus 95X routes, which are the only transit routes that currently utilize the I-95 HOV lanes.

Person throughput calculations demonstrate that the person throughput (persons per hour per lane) is significantly higher in the HOV lanes than in the general purpose lanes in Miami-Dade County. Significant benefits in person throughput are not realized in Broward and Palm Beach Counties; strategies need to be developed in these counties to increase HOV usage.

Effective enforcement of HOV facilities is a critical element toward successful operation. HOV lane violation rates by single occupant vehicles are much lower in Miami-Dade County than in Broward and Palm Beach Counties because of higher utilization of the lanes by HOVs and greater enforcement. The lowest level of enforcement is found in Broward County, which has the highest HOV lane violation rates.

SYSTEM ACCESSIBILITY

Access to and from the I-95 HOV system was evaluated for purposes of identifying locations where users may have difficulty accessing the HOV lanes stemming from capacity deficiencies around interchanges and/or congested weaving sections. Improved access to the I-95 HOV system could represent travel time savings for HOVs that are as considerable as the actual travel time savings provided by the HOV lanes. This further reduction in travel time will make HOVs an even more attractive alternative to the single occupant vehicle (SOV) for travel in the corridor. Improved access for HOVs, especially direct ramps, also enhances the operations of the general purpose lanes by eliminating weaving movements into and out of the HOV lanes.

The system accessibility evaluation did not include the portion of the I-95 HOV system in Miami-Dade County because ramp metering and other measures are programmed to be implemented as part of the Intelligent Corridor System (ICS) package. The focus of this package of improvements is to improve traffic operations on I-95. The portion of the I-95 HOV system in Broward and Palm Beach Counties are considered in the analysis of ramps and weaving sections described below.

Ramp Analysis

The ramp analysis performed for this study focused on identifying congested interchanges/ramps that impede access to the I-95 HOV lanes. A two-step screening process was used to identify the congested interchanges/ramps that inhibit access to the I-95 HOV system. The "Tier I" screening was accomplished through the development of three ratios measuring the level of ramp congestion: (1) volume-to-capacity (v/c) ratio, (2) volume-to-ramp length ratio, and (3) traffic density (volume-to-speed ratio). The congested ramps identified during the "Tier I" screening were carried forward to a more refined "Tier II" screening process based on critical movement analysis, which considered conflicting movements. The outcome of the "Tier II" screening was a ranked list of congested interchanges/ramps, along with conceptual improvement needs at these locations.

"Tier I" Ramp Analysis

All access ramps at each I-95 interchange in Broward and Palm Beach Counties were evaluated to identify the ten most congested interchanges along the I-95 HOV system. Existing traffic volumes for ramps providing access to I-95 and turning movement volumes for ramp intersections with arterial roadways were obtained from the FDOT Transportation Statistics Office, the Broward County Transportation Planning Division, and Palm Beach County Engineering and Public Works. All traffic counts were reviewed for reasonableness and accuracy. Additional data required for the "Tier I" ramp analysis included ramp lengths, ramp widths (number of lanes), and free flow ramp speeds.

The three evaluation criteria employed in the "Tier I" ramp analysis are explained below.

- Volume-to-capacity (v/c) ratio – This ratio was calculated by dividing the peak hour ramp volume by the hourly capacity determined for each ramp. The capacity of each ramp (passenger cars per hour) was determined from Exhibit 25-3 in the *2000 Highway Capacity Manual* based on the free-flow speed of the ramp and the number of lanes. Each ramp was classified as either loop, diamond, or free-flow in order to estimate its free-flow speed.
- Volume-to-ramp length ratio – This ratio was calculated by dividing the peak hour ramp volume by the length of the ramp, which was obtained from FDOT District 4 *Straight-Line Diagram Roadway Inventories*.
- Traffic density – Traffic density is a fundamental traffic flow measure, which was calculated by dividing the peak hour ramp volume by the free-flow speed of the ramp. The traffic density was expressed as the number of vehicles per mile per lane.

Table 1-12 presents the ten most congested access ramps along the I-95 HOV system in Broward and Palm Beach Counties based on the v/c ratio. One may note that the v/c ratios presented in Table 1-12 may be slightly better than what exists in the field; a conversion was not made from vehicles to passenger car equivalents, although the ramp capacities from the *2000 Highway Capacity Manual* are based on passenger cars. Converting ramp volumes to passenger car equivalents was not possible because of a lack of vehicle classification data for the ramps.

The results presented in Table 1-12 demonstrate that the loop ramp from northbound I-95 to westbound SR 794 (Yamato Road) is the most congested ramp within the I-95 HOV system. In general, loop ramps have less capacity than other ramp types due to the slower speeds required to negotiate the curve. Other congested ramps were identified in Table 1-12 based primarily on the high peak hour traffic volumes, such as the SR 870 (Commercial Boulevard) northbound off-ramp and the SR 842 (Broward Boulevard) southbound off-ramp.

Table 1 - 12: Most Congested Ramps Based on v/c Ratio

I-95 Interchange	Access Ramp	Ramp Type	v/c Ratio
SR 794 (Yamato Road)	NB Off	Loop	1.08
SR 870 (Commercial Boulevard)	NB Off	Diamond	0.97
SR 842 (Broward Boulevard)	SB Off	Diamond	0.88
I-595	SB Off	Free-flow	0.83
SR 858 (Hallandale Beach Boulevard)	NB On	Diamond	0.81
SR 858 (Hallandale Beach Boulevard)	SB Off	Diamond	0.77
SR 798 (Palmetto Park Road)	SB Off	Diamond	0.76
SR 838 (Sunrise Boulevard)	NB Off	Loop	0.76
SR 838 (Sunrise Boulevard)	SB On	Diamond	0.76
Copans Road	SB On	Diamond	0.76

Table 1-13 presents the ten most congested access ramps along the I-95 HOV system in Broward and Palm Beach Counties based on the volume-to-ramp length ratio. The results presented in Table 1-13 again demonstrate that the loop ramp from northbound I-95 to westbound SR 794 (Yamato Road) is the most congested ramp within the I-95 HOV system. Additionally, many on-ramps are identified in Table 1-13, indicating these ramps may not be long enough to provide adequate acceleration distance for the high volume of traffic accessing I-95.

Table 1 - 13: Most Congested Ramps Based on Volume-to-Ramp Length Ratio

I-95 Interchange	Access Ramp	Ramp Type	Volume-to-Ramp Length Ratio
SR 794 (Yamato Road)	NB Off	Loop	1.96
SR 838 (Sunrise Boulevard)	SB On	Diamond	1.47
SR 858 (Hallandale Beach Boulevard)	NB On	Diamond	1.37
SR 869 (SW 10 Street)	SB On	Diamond	1.36
SR 816 (Oakland Park Boulevard)	SB On	Diamond	1.34
SR 816 (Oakland Park Boulevard)	NB Off	Loop	1.18
SR 794 (Yamato Road)	SB On	Diamond	1.15
SR 838 (Sunrise Boulevard)	NB Off	Loop	1.14
SR 798 (Palmetto Park Road)	NB Off	Diamond	1.05
SR 822 (Sheridan Street)	NB On	Diamond	1.02

Table 1-14 presents the ten most congested access ramps along the I-95 HOV system in Broward and Palm Beach Counties based on the traffic density measure. The results presented in Table 1-14 once again demonstrate that the loop ramp from northbound I-95 to westbound SR 794 (Yamato Road) is the most congested ramp within the I-95 HOV system. Additionally, many loop ramps appear in Table 1-14 because the lower free flow speeds of these ramps influence the density calculations.

Table 1 - 14: Most Congested Ramps Based on Traffic Density

I-95 Interchange	Access Ramp	Ramp Type	Density (1)
SR 794 (Yamato Road)	NB Off	Loop	82.40
SR 838 (Sunrise Boulevard)	NB Off	Loop	57.60
SR 870 (Commercial Boulevard)	NB Off	Diamond	45.33
SR 816 (Oakland Park Boulevard)	NB Off	Loop	44.00
Cypress Creek Road	NB Off	Loop	42.40
SR 842 (Broward Boulevard)	SB Off	Diamond	41.11
SR 869 (SW 10 Street)	NB On	Loop	39.20
SR 858 (Hallandale Beach Boulevard)	NB On	Diamond	37.78
I-595	SB Off	Free-flow	36.40
SR 858 (Hallandale Beach Boulevard)	SB Off	Diamond	36.22

Note:
(1) Density = vehicles per mile per lane

Table 1-15 was compiled by blending the three ratios used to analyze I-95 ramps in the "Tier I" ramp analysis. Rankings were developed for the separate criteria and the results were summed to produce the ten most congested interchanges along the I-95 HOV system in Broward and Palm Beach Counties. These interchanges are listed geographically in Table 1-15 from south to north. The ten interchanges identified in Table 1-15 were carried forward into the more detailed "Tier II" ramp analysis.

Table 1 - 15: Most Congested Interchanges Based on the "Tier I" Ramp Analysis

I-95 Interchange	Access Ramp	Ramp Type	AADT	v/c Ratio	Volume-to-Ramp Length Ratio	Density (1)
SR 858 (Hallandale Beach Boulevard)	NB On	Diamond	22,500	0.81	1.37	37.78
SR 858 (Hallandale Beach Boulevard)	SB Off	Diamond	21,500	0.77	0.92	36.22
I-595	SB Off	Free-flow	42,500	0.83	0.25	36.40
SR 842 (Broward Boulevard)	SB Off	Diamond	24,500	0.88	0.82	41.11
SR 838 (Sunrise Boulevard)	NB Off	Loop	19,000	0.76	1.14	57.60
SR 838 (Sunrise Boulevard)	SB On	Diamond	21,000	0.76	1.47	35.33
SR 816 (Oakland Park Boulevard)	NB On	Diamond	19,500	0.70	0.94	32.67
SR 816 (Oakland Park Boulevard)	SB Off	Diamond	19,500	0.70	0.73	32.67
SR 816 (Oakland Park Boulevard)	NB Off	Loop	14,500	0.58	1.18	44.00
SR 816 (Oakland Park Boulevard)	SB On	Loop	11,000	0.44	0.70	33.20
SR 870 (Commercial Boulevard)	NB Off	Diamond	27,000	0.97	1.01	45.33
Cypress Creek Road	NB Off	Loop	14,000	0.56	1.00	42.40
SR 869 (SW 10 Street)	NB On	Loop	13,000	0.52	0.86	39.20
SR 798 (Palmetto Park Road)	SB Off	Diamond	19,500	0.76	0.78	35.33
SR 798 (Palmetto Park Road)	NB Off	Diamond	18,800	0.73	1.05	34.00
SR 794 (Yamato Road)	NB Off	Loop	25,200	1.08	1.96	82.40
SR 794 (Yamato Road)	SB On	Diamond	18,100	0.70	1.15	32.89

Note:
(1) Density = vehicles per mile per lane

"Tier II" Ramp Analysis

The "Tier I" ramp analysis was the initial screening exercise to identify the ten most congested interchanges/ramps along the I-95 HOV system. The ten most congested interchanges identified in the "Tier I" analysis were advanced into a "Tier II" ramp analysis that utilized critical movement analysis to identify problem movements. The purpose of the "Tier II" ramp analysis was to develop a ranking of congested interchanges/ramps, along with conceptual improvement needs to improve access to the I-95 HOV lanes.

Critical movement analysis was performed for the ten congested interchanges identified in the "Tier I" analysis. The critical movement analysis considered conflicting movements at access ramps to I-95 that reduce capacity and impact accessibility to HOV lanes. Other factors considered in the "Tier II" analysis included ramp capacity, ramp length, and length of auxiliary lanes on the I-95 mainline. Additionally, the *I-95 / I-595 Master Plan Study* was reviewed to determine if conceptual improvements have already been developed to address any of the access deficiencies identified in the "Tier I" analysis. Conceptual improvements were not developed as part of this analysis for locations where conceptual improvements have already been identified in the *I-95 / I-595 Master Plan Study* to avoid duplication of effort.

Table 1-16 presents a summary of the "Tier II" ramp analysis. The ten most congested interchanges along the I-95 HOV system in Broward and Palm Beach Counties are ranked based on a combination of ramp volumes, critical movements, capacity, length, and density. The purpose of the ranking is to prioritize improvements at these locations. As presented in Table 1-16, the Yamato Road interchange was identified as the location where improvements to address deficiencies should be implemented first.

Table 1-16 also provides conceptual improvement needs for the congested interchanges along the I-95 HOV system in Broward and Palm Beach Counties. Conceptual improvements identified in the *I-95 / I-595 Master Plan Study* are highlighted to differentiate these improvements from the conceptual improvement needs identified as part of this study effort. The improvements identified in Table 1-16 are preliminary recommendations based primarily on operational needs; other factors (environmental issues, constructability, right-of-way requirements, costs-to-benefits, etc.) will need to be considered as final recommendations are developed in the Interchange Modification Report (IMR)/Project Development & Environment (PD&E) phase.

Table 1-16
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Ranked List of Congested Interchange Ramps with Conceptual Improvements

Rank	I-95 Interchange	Critical Movement	Ramp Type	Conceptual Improvements
1	SR 794 (Yamato Road)	NB Off-Ramp to WB Yamato Road	Loop	Remove loop ramp and reconstruct NB off-ramp on the south side of Yamato road to provide two NB left-turn lanes.
2	SR 838 (Sunrise Boulevard)	NB Off-Ramp to WB Sunrise Boulevard	Loop	Additional capacity is required to reduce the queue that blocks the I-95 mainline; this may require removal of the loop ramp and reconstruction of the NB off-ramp on the south side of Sunrise Blvd.
3	SR 858 (Hallandale Beach Boulevard)	EB Hallandale Beach Boulevard to NB I-95	Diamond	Widen the NB on-ramp to provide additional merge distance for vehicles accessing I-95 from dual EB left-turn lanes on Hallandale Beach Blvd.
4	SR 816 (Oakland Park Boulevard)	NB Off-Ramp to WB Oakland Park Boulevard	Loop	Additional capacity is required to reduce the queue that blocks the I-95 mainline; this may require removal of the loop ramp and reconstruction of the NB off-ramp on the south side of Oakland Park Blvd.
5	SR 870 (Commercial Boulevard)	NB Off-Ramp to WB Commercial Boulevard	Diamond	Provide additional capacity for NB off-ramp to WB Commerical Blvd.
6	SR 842 (Broward Boulevard)	SB Off-Ramp to EB Broward Boulevard	Diamond	Provide additional capacity for SB off-ramp to EB Broward Blvd.
7	I-595	SB Off-Ramp to WB I-595	Free-Flow	Reconstruct SB I-95 off-ramp to WB I-595 to improve curve radius and merge.
8	SR 869 (SW 10 Street)	NB On-Ramp	Loop	Improve NB On-Ramp to allow faster speeds for merging onto I-95
9	Cypress Creek Road	NB Off-Ramp to WB Cypress Creek Road	Loop	Reconstruct loop ramp to provide additional capacity for NB to WB movement.
10	SR 798 (Palmetto Park Road)	NB Off-Ramp to WB Palmetto Park Road	Diamond	Provide additional capacity for NB off-ramp to WB Palmetto Park Rd.

Note:
Access deficiencies are addressed by conceptual improvements identified in the *I-95 / I-595 Master Plan*.

Weaving Sections

The I-95 HOV system in Broward and Palm Beach Counties was evaluated to determine which sections present the most adverse weaving conditions for HOVs. Ensuring that HOVs can safely merge into and out of the HOV lanes is critical to the success of the I-95 HOV system. Vehicles must weave across three to five lanes of traffic to access the HOV lanes from interstate on-ramps; likewise, vehicles must perform the opposite weaving maneuver to exit the interstate from the HOV lanes.

The validated Florida Standard Urban Transportation Model Structure (FSUTMS) travel demand models for Broward and Palm Beach Counties were consulted to obtain information on the ingress and egress demand of HOVs on the I-95 HOV network. However, the traffic volumes shown accessing the HOV lanes in the model were not considered reliable; at many locations the HOV lanes ingress and egress volumes either did not make sense intuitively based on the overall volume of traffic accessing the interstate or the model did not show any traffic accessing the HOV lanes. Therefore, the HOV lanes vehicular ingress and egress demand was assumed to be the same percentage of the total traffic accessing the interstate as the HOV traffic is of the total traffic on the interstate mainline.

A two-tier screening process was utilized to identify deficient weaving sections within the I-95 HOV system. The "Tier I" analysis identified potential adverse weaving conditions impacting the I-95 HOV system by examining the weaving volume at interchanges and the available weaving distance between adjacent intersections. The deficient weaving locations identified during the "Tier I" screening were evaluated in the "Tier II" analysis. The "Tier II" analysis utilized the *Highway Capacity Software 2000* (HCS 2000) *Freeway Weaving Analysis* to rank the deficient weaving locations.

"Tier I" HOV Weaving Analysis

The "Tier I" HOV weaving analysis was performed using HOV volumes determined from ramp volumes and distances between I-95 interchanges. For each ramp along the I-95 HOV system in Broward and Palm Beach Counties, the peak hour ramp volume was determined from existing traffic data compiled earlier in the study. Next, an HOV factor was determined by calculating the percentage of total mainline I-95 traffic that is HOV traffic at the count locations along the

corridor. The peak hour ramp volumes were then multiplied by the HOV factors to determine the peak hour HOV demand at each ramp along the I-95 HOV system.

The peak hour HOV volume on each ramp was assumed to equal the weaving demand between the HOV lanes and the ramps. For example, the HOV volume on an exit ramp was considered to equal the egress weaving demand from the HOV lane upstream of the subject ramp. In this manner, the HOV ramp volumes were used to approximate the ingress and egress weaving demand between each interchange along the I-95 HOV system.

The weaving distances between interchanges, in miles, were obtained from FDOT District 4 *Straight-Line Diagram Roadway Inventories* and the HOV ingress and egress volumes for each interchange were divided by the weaving distance to calculate a "weaving score." The "weaving score" is an effective methodology for identifying weaving deficiencies, as the measure considers both the volume of weaving traffic and the distance between interchanges available for the traffic to perform the weave.

For the "Tier I" HOV weaving analysis, the "weaving score" was used to identify the corridor's most deficient weaving sections. Since weaving volume is the numerator of the "weaving score" equation, higher volumes lead to a higher weaving score. Likewise, since distance between interchanges is the denominator of the "weaving score" equation, a shorter distance between interchanges leads to a higher weaving score.

Table 1-17 presents the results of the "Tier I" HOV weaving analysis. The twenty most deficient weaving locations are ranked based on the "weaving score." According to the "Tier I" screening, the most deficient weaving section results from the northbound HOV ingress volume at SR 858 (Hallandale Beach Boulevard). This location exhibits a moderate northbound HOV ingress volume and there is an extremely short weaving distance between the northbound on-ramp and the SR 824 (Pembroke Road) northbound off-ramp. Other locations identified as deficient HOV weaving locations include the northbound HOV egress movement at I-595, the southbound HOV ingress movement at SR 834 (Sample Road), and the southbound HOV egress movement at SR 858 (Hallandale Beach Boulevard). Deficient weaving conditions were also identified in the vicinity of Cypress Creek Road. The deficient weaving sections around Cypress Creek Road result from a combination of the close proximity to the Commercial Boulevard interchange ramps, high HOV lane ingress and egress demand, and the location of the park-and-ride lot.

Table 1-17
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
"Tier I" List of Deficient HOV Weaving Locations

Rank	Location of Deficient HOV Weaving Segment	Direction	Peak Hour Ramp Volume	HOV Factor (1)	Peak Hour HOV Ramp Volume	Weaving Distance (2)	Weaving Score (3)
1	SR 858 (Hallandale Beach Boulevard)	NB Ingress	1,700	0.118	200	0.327	611.621
2	I-595	NB Egress	3,210	0.119	380	0.681	558.003
3	SR 834 (Sample Road)	SB Ingress	1,510	0.202	310	0.570	543.860
4	SR 858 (Hallandale Beach Boulevard)	SB Egress	1,630	0.110	180	0.334	538.922
5	Cypress Creek Road	SB Ingress	1,750	0.134	230	0.480	479.167
6	SR 834 (Sample Road)	NB Egress	1,440	0.176	250	0.550	454.545
7	Cypress Creek Road	NB Egress	1,870	0.172	320	0.731	437.756
8	SR 838 (Sunrise Boulevard)	NB Egress	2,070	0.138	290	0.682	425.220
9	I-595 / Davie Boulevard	SB Egress	5,350	0.114	610	1.444	422.438
10	SR 842 (Broward Boulevard)	SB Egress	1,850	0.134	250	0.592	422.297
11	SR 842 (Broward Boulevard)	NB Ingress	1,930	0.138	270	0.682	395.894
12	SR 870 (Commercial Boulevard)	SB Egress	1,360	0.134	180	0.480	375.000
13	SR 798 (Palmetto Park Road)	SB Egress	1,590	0.148	240	0.672	357.143
14	SR 838 (Sunrise Boulevard)	SB Ingress	1,590	0.134	210	0.592	354.730
15	SR 808 (Glades Road)	SB Ingress	1,550	0.147	230	0.672	342.262
16	I-595 / Davie Boulevard	NB Ingress	4,490	0.119	530	1.646	321.993
17	SR 822 (Sheridan Street)	NB ingress	1,440	0.118	170	0.548	310.219
18	I-595	SB Ingress	3,770	0.114	430	1.442	298.197
19	SR 824 (Pembroke Road)	NB Ingress	1,360	0.118	160	0.537	297.952
20	SR 798 (Palmetto Park Road)	NB Ingress	1,490	0.140	210	0.750	280.000

Notes:

(1) The percentage of the total I-95 mainline traffic that is HOV traffic.

(2) The available weaving distance, in milesbetween interchanges available for the HOV traffic to perform the weave.

(3) The weaving score was calculated by dividing the peak hour HOV ramp volume by the weaving distance (a higher score represents a more deficient weaving section).

"Tier II" HOV Weaving Analysis

The "Tier I" HOV weaving analysis was the initial screening effort to identify potential adverse weaving sections for HOVs along the I-95 HOV system. The ten most deficient HOV weaving locations identified in the "Tier I" analysis were advanced into a "Tier II" HOV weaving analysis, which utilized the *Highway Capacity Software 2000* to evaluate the weaving sections. Although only five locations were originally targeted for the "Tier II" HOV weaving analysis, a decision was made to analyze ten locations during the "Tier II" analysis to decrease the likelihood of omitting a deficient weaving section.

The *I-95 / I-595 Master Plan Study* was reviewed to determine if conceptual improvements have already been developed to address any of the weaving deficiencies identified in the "Tier I" analysis. Improvements have been identified in the *I-95 / I-595 Master Plan Study* for two of the ten worst weaving locations: the northbound HOV egress movement at I-595 and the southbound HOV ingress movement at Cypress Creek Road. Since improvements have already been identified at these two locations, they were not evaluated in the "Tier II" analysis to avoid duplication of effort.

The *HCS 2000 Freeway Weaving Analysis* was employed to evaluate deficient weaving locations in the "Tier II" analysis. Traffic inputs to the software included HOV lane ingress weaving volume, the HOV lane egress weaving volume, and the through volume (which represented the through traffic volume on the I-95 mainline). Geometric inputs to the software included the number of lanes on the I-95 mainline and the weaving segment length. Additional software inputs included the free-flow speed, peak hour factor, and the percentage of heavy vehicles.

Table 1-18 presents the results of the "Tier II" HOV weaving analysis. The worst weaving sections are ranked in Table 1-18 based on the output from the *HCS 2000* analysis, which evaluates the weaving segments by "Weaving Segment Density" (vehicles per mile per lane) and level of service (LOS). The most deficient weaving section identified in the analysis was northbound HOV egress movement at Cypress Creek Road; this traffic must merge across the I-95 through traffic and a heavy volume of northbound ingress traffic from SR 870 (Commercial Boulevard).

Table 1-18
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
"Tier II" Ranked List of Deficient HOV Weaving Locations

Rank	Locations of Deficient Weaving	Direction	Weaving Score (1)	Weaving Segment Density (2)	Weaving Level of Service
1	Cypress Creek Road	NB Egress	437.756	52.58	F
2	SR 838 (Sunrise Boulevard)	NB Egress	425.220	52.08	F
3	SR 858 (Hallandale Beach Boulevard)	NB Ingress	611.621	47.99	F
4	SR 842 (Broward Boulevard)	SB Egress	422.297	45.16	F
5	I-595 and Davie Boulevard	SB Egress	422.438	44.65	F
6	SR 834 (Sample Road)	NB Egress	454.545	43.42	F
7	SR 858 (Hallandale Beach Boulevard)	SB Egress	538.922	43.10	F
8	SR 834 (Sample Road)	SB Ingress	543.860	37.77	E
(3)	I-595	NB Egress	558.003		
(3)	Cypress Creek Road	SB Ingress	479.167		

Notes:
(1) Weaving score from the "Tier 1" weaving analysis.
(2) Weaving Segment Density = Vehicles Per Mile Per Lane
(3) Weaving deficiencies are addressed by conceptual improvements identified in the *I-95 / I-595 Master Plan.*

Summary

Access to and from the I-95 HOV system was evaluated to identify congested interchanges/ramps and deficient weaving sections along the I-95 corridor. In some instances travel time savings provided by improved access to the I-95 HOV system may be as significant as travel time savings provided by the HOV lanes. Ensuring that HOVs can safely merge into and out of the HOV lanes is also critical to the system's success. The system accessibility evaluation did not include the portion of the I-95 HOV System in Miami-Dade County, because ramp metering and other measures are programmed to be implemented as part of the Intelligent Corridor System (ICS) package.

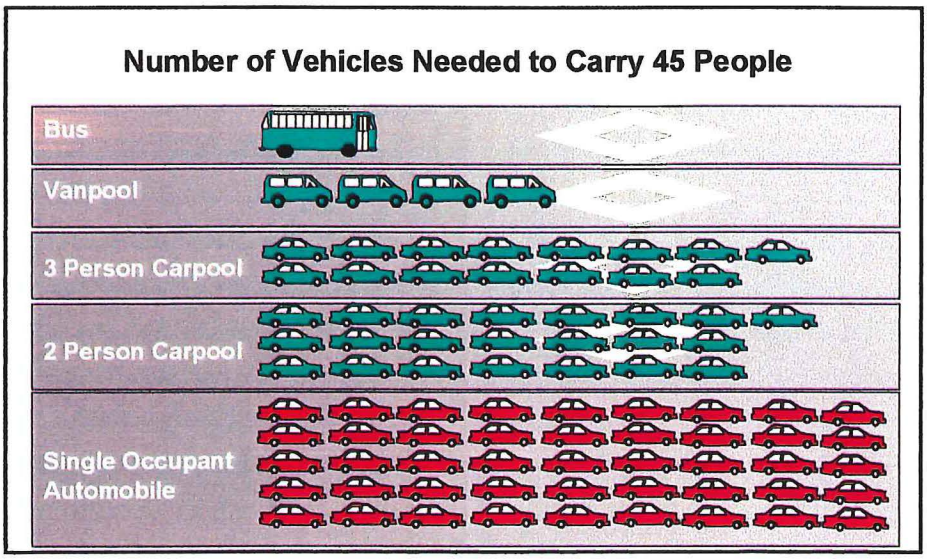
A two-step screening process was used to identify the congested interchanges/ramps that inhibit access to the I-95 HOV system. The "Tier I" screening was accomplished through the development of three ratios measuring the level of ramp congestion. The congested ramps identified during the "Tier I" screening were further analyzed in a "Tier II" screening process based on critical movement analysis. The ten most congested interchanges along the I-95 HOV system in Broward and Palm Beach Counties were ranked based on a combination of ramp volumes, critical movements, capacity, length, and density, and conceptual improvement needs were identified for these ten interchanges. The purpose of the ranking is to prioritize improvements at these locations.

A two-tier screening process was also utilized to identify deficient weaving sections within the I-95 HOV system. The "Tier I" analysis developed a "weaving score," which is a measure that considers both the volume of weaving traffic and the distance between interchanges for weaving maneuvers. The most deficient weaving locations identified during the "Tier I" screening were further analyzed in the "Tier II" analysis utilizing the *Highway Capacity Software 2000* (HCS 2000) *Freeway Weaving Analysis*. Based on the results of the "Tier II" analysis, a ranked list of deficient weaving segments was identified to prioritize improvements at these locations.

EXISTING TRANSIT SERVICE AND SUPPORT FACILITIES

Existing transit service and support facilities along the I-95 HOV corridor were inventoried to gauge current transit service levels and multimodal opportunities. HOV facilities offer a number of advantages to transit operators that may enhance the potential for attracting new and retaining current passengers. In addition, bus routes within HOV facilities can dramatically increase the person throughput of both the HOV lanes and the overall corridor, as is illustrated within the I-95 HOV system in Miami-Dade County. Figure 1-12 illustrates the potential that buses offer toward increasing the person movement capacity of the HOV corridor.

Figure 1 - 12: Person Movement Capacity of Buses



Transit service in the study corridor is provided by several agencies including the Tri-County Commuter Rail Authority (Tri-Rail), Miami-Dade Transit (MDT), Broward County Transit (BCT), and the Palm Beach County Surface Transportation Department (PalmTran). Tri-Rail operates Florida's only commuter rail system in the South Florida Rail Corridor (SFRC) parallel to I-95 in Miami-Dade, Broward, and Palm Beach Counties. Coordination of HOV and rail transit services may maximize the coverage and operating effectiveness of both systems and the systems may share support facilities, such as park-n-ride lots and transit stations. Along with bus

routes that actually operate on I-95, bus routes that provide connections to Tri-Rail stations and park & ride lots in the I-95 corridor were included in the transit analysis.

Transit support facilities that are commonly used with HOV facilities include park-ride lots, transit stations, intermodal facilities, and bus stops and shelters. Transit support facilities are integral parts of HOV facilities that offer opportunities to change between low and high occupancy vehicles and may provide access to automobiles, vanpools, transit routes, pedestrians, and bicyclists.

The existing transit service and support facilities in the I-95 HOV corridor are presented next including:

- Bus service that utilizes the HOV lanes
- Tri-Rail commuter rail service
- Bus service that connects to park-n-ride lots, transit stations, and intermodal facilities
- Park-n-ride lots and intermodal facilities

Bus Service in the I-95 HOV Lanes

The only bus service that presently benefits from the travel time and schedule adherence advantages provided by I-95 HOV lanes is the express bus service provided by MDT. The Metrobus 95X routes operate between the Golden Glades park-n-ride facility and Downtown Miami in the southbound direction during the AM peak period and the northbound direction during the PM peak period.

The Metrobus 95X express bus service is comprised of six separate routes; however, all six routes operate along the same portion of the I-95 HOV system. The routes utilize the I-95 HOV lanes between the Golden Glades interchange and the southern terminus of the HOV system at SR 112 (Airport Expressway). Between SR 112 and Downtown Miami, the routes operate in the I-95 general purpose lanes.

Route schedules are coordinated so that buses depart from the Golden Glades approximately every five minutes between 6:15 AM and 8:45 AM during the morning peak period; buses depart

from the Omni Bus Terminal in Downtown Miami approximately every five minutes between 3:30 PM and 6:15 PM during the afternoon peak period.

The six Metrobus 95X routes are described below:

- **Route 95X Aventura Mall** serves an area of northeast Miami-Dade County including the Aventura Mall, Skylake Mall, and 163rd Street Mall, as well as the Golden Glades park-n-ride lot. The southern portion of this route serves Downtown Miami, Biscayne Boulevard, and the Brickell area. The route operates three times during each peak period.

- **Route 95X Carol City** serves the Carol City area along NW 183rd Street in addition to the Golden Glades park-n-ride lot. On the route's southern end, some buses serve the Civic Center, while other buses serve Biscayne Boulevard and the Brickell area. The route operates five times during each peak period.

- **Route 95X Brickell Norwood** serves the Norwood area around NW 199th Street and NW 7th Avenue in addition to the Golden Glades park-n-ride lot. The southern portion of this route serves Downtown Miami, Biscayne Boulevard, and the Brickell area. The route operates three times during each peak period.

- **Route 95X Civic Center Norwood** also serves the Norwood area around NW 199th Street and NW 7th Avenue in addition to the Golden Glades park-n-ride lot. However, the southern portion of the route serves the Civic Center and Veteran Affairs (VA) Hospital along NW 12th Avenue. The route operates two times during each peak period.

- **Route 95X Downtown Civic Center Norwood** follows the same path as the 95X Civic Center Norwood route except the southern end of this route also serves Downtown Miami and Biscayne Boulevard.

- **Route 95X Earlington Heights** also serves the Norwood area around NW 199th Street and NW 7th Avenue in addition to the Golden Glades park-n-ride lot. However, the southern portion of the route proceeds west on SR 112 and serves the

Earlington Heights Metrorail Station. The route also serves the Miami-Dade Police Department and the Doral area further to the west along NW 87th Avenue and NW 97th Avenue between NW 41st Street and NW 25th Street. The route operates once per peak period.

MDT reports one combined ridership figure for the Metrobus 95X express bus service. Table 1-19 presents the average daily ridership for the Metrobus 95X express service, along with the average passengers per bus per revenue hour. The ridership data demonstrates over 1,400 passengers utilize this service daily.

Table 1 - 19: Metrobus 95X Express Service Ridership Data

Month	Average Daily Ridership	Passengers Per Bus Per Revenue Hour
July 2001	1,352	24.2
June 2001	1,342	24.1
May 2001	1,438	25.8
April 2001	1,387	24.9
March 2001	1,532	27.5
February 2001	1,590	27.6
January 2001	1,453	25.3
Average	**1,442**	**25.6**

Source: Miami-Dade Transit Ridership Technical Report

Tri-County Commuter Rail Authority

The Tri-Rail commuter rail system extends from the Miami International Airport to Mangonia Park in Palm Beach County. Tri-Rail service was originally initiated in January 1989 as part of a major traffic mitigation effort during construction and expansion of I-95. Tri-Rail provides access to the region's three international airports: Miami International Airport, Ft. Lauderdale-Hollywood International Airport, and Palm Beach International Airport.

Tri-Rail runs directly parallel to the I-95 HOV system along the northern 38 miles of the 46-mile HOV system. South of the Golden Glades interchange, the I-95 corridor continues due south toward Downtown Miami while the Tri-Rail corridor veers to the southwest. The southern

portion of the Tri-Rail route serves Opa Locka, Hialeah, and the Miami International Airport. Tri-Rail users wishing to access Downtown Miami must either transfer to express buses at the Golden Glades park-n-ride lot or transfer to Metrorail at Tri-Rail's Metrorail Transfer Station near NW 79th Street.

Tri-Rail service presently operates on 60-minute and 120-minute headways on weekdays and weekends, respectively. Average daily ridership is approximately 8,500 on weekdays and approximately 3,500 on weekends, and the average passenger trip length is 33 miles.

Nine of Tri-Rail's eighteen stations are located directly adjacent to the I-95 HOV system – four stations are located west of the I-95 corridor in Miami-Dade County and five stations are located in Palm Beach County north of Linton Boulevard, which is the northern terminus of the existing I-95 HOV system. The nine Tri-Rail stations located adjacent to the existing I-95 HOV system are listed below.

- Golden Glades
- Hollywood (located at Hollywood Boulevard)
- Sheridan Street
- Fort Lauderdale Airport (located at Griffin Road)
- Fort Lauderdale (located at Broward Boulevard)
- Cypress Creek
- Pompano Beach (located at Sample Road)
- Deerfield Beach (located at Hillsboro Boulevard)
- Boca Raton (located at Yamato Road)

All Tri-Rail stations have some parking available and some stations (Golden Glades, Sheridan Street, Broward Boulevard, and Cypress Creek Road) are shared facilities with larger park-n-ride lots.

According to *National Cooperative Highway Research Program Report 414: HOV Systems Manual*, different approaches can be used to integrate and coordinate buses, carpools, and vanpools operating on HOV facilities with rail service operating in the same corridor. The different levels of integration range from minimal coordination to shared facilities. A moderate level of coordination presently exists between Tri-Rail and the I-95 HOV system. Transfer

connections are available for buses, carpools, and vanpools at shared facilities along the I-95 corridor, which acts to extend the reach of the commuter rail system. Further integration could be achieved by integrating fares to allow for fast and convenient transfers between modes.

Transit Service Connecting to Supporting Facilities in the I-95 HOV Corridor

Connecting transit service is provided at several park-n-ride lots and Tri-Rail stations along the I-95 HOV corridor. Bus service is provided by Miami-Dade Transit (MDT), Broward County Transit (BCT), PalmTran, and Tri-Rail shuttles. Additionally, MDT's Metrorail service may be accessed from the Earlington Heights Metrorail Station, west of the southern terminus of the I-95 HOV system along SR 112.

Connecting Local Bus Service

A number of local bus routes provide connections to supporting facilities along the I-95 HOV corridor. Table 1-20 presents the connecting transit service at supporting facilities to the I-95 HOV system and also highlights the operational characteristics of these transit routes.

Table 1-20 demonstrates that the Golden Glades park-n-ride facility has a much higher level of connecting transit service than the other supporting facilities in the corridor. The Golden Glades park-n-ride facility is served by MDT's Metrobus 95X express bus routes, seven additional Metrobus routes, and two BCT bus routes. Low levels of connecting bus service are provided at the Hollywood Tri-Rail Station and the Congress Avenue park-n-ride lot; each of these two locations are only served by one bus route operating on a 30-minute headway.

Table 1-21 presents the daily boardings and alightings at BCT bus stops at supporting facilities along the I-95 HOV corridor. A portion of the ridership activity at some of these locations is related to surrounding land uses and not solely to the supporting facilities along the HOV corridor. Table 1-21 demonstrates that supporting facilities at Broward Boulevard (Fort Lauderdale Tri-Rail Station) and Cypress Creek Road generate the most significant BCT ridership. The data obtained for the Sheridan Street facility appears unusually low and its accuracy is questionable.

Table 1-20
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Transit Connections at Supporting Facilities in the I-95 HOV Corridor

Supporting Facility	Transit Connections	Headways (Minutes)	Hours of Operation
Earlington Heights Metrorail Station and Parking Garage	Miami-Dade Metrorail	6/15 (1)	5:00 AM - 12:30 AM
	Metrobus Route 95X Earlington Heights	5	AM Peak, PM Peak
	Metrobus Route 17	15/30 (1)	4:47 AM - 1:22 AM
	Metrobus Route 22	20/30 (1)	4:44 AM - 12:33 AM
Golden Glades Park-n-Ride and Tri-Rail Station	Metrobus Route 95X Aventura Mall	5 (2)	AM Peak, PM Peak
	Metrobus Route 95X Brickell Norwood	5 (2)	AM Peak, PM Peak
	Metrobus Route 95X Carol City	5 (2)	AM Peak, PM Peak
	Metrobus Route 95X Civic Center Norwood	5 (2)	AM Peak, PM Peak
	Metrobus Route 95X Downtown Civic Center Nor	5 (2)	AM Peak, PM Peak
	Metrobus Route 95X Earlington Heights	5 (2)	AM Peak, PM Peak
	Metrobus Route 22	20/30 (1)	4:44 AM - 12:33 AM
	Metrobus Route 42	60	4:44 AM - 8:48 PM
	Metrobus Route 77	10/15 (1)	4:40 AM - 1:57 AM
	Metrobus Route E	60	5:43 AM - 9:05 PM
	Metrobus Route V	60	8:14 AM - 5:53 PM
	Metrobus Night Owl Route	30	10:30 PM - 6:00 AM
	Metrobus North Dade Connection	30/60 (1)	5:26 AM - 9:47 PM
	BCT Route 2	30	6:05 AM - 8:35 PM
	BCT Route 18	15	AM Peak, PM Peak
Hollywood Tri-Rail Station	BCT Route 7 (3)	30	5:00 AM - 11:00 PM
Sheridan Street Park-n-Ride and Tri-Rail Station	Tri-Rail Shuttle SS 1	60	AM Peak, PM Peak
	BCT Route 3	60	5:55 AM - 7:50 PM
	BCT Route 12	40	6:00 AM - 8:00 PM
	BCT Route 17	40	5:40 AM - 8:30 PM
Fort Lauderdale Airport Tri-Rail Station	Tri-Rail Shuttle FLA 1	60	5:57 AM - 8:39 PM
	SFEC TMA Tri-Rail Shuttle	30	6:35 AM - 7:00 PM
	BCT Route 3 (3)	60	5:55 AM - 7:50 PM
	BCT Route 6 (3)	30	5:10 AM - 9:55 PM
	BCT Route 15 (3)	45	5:00 AM - 10:00 PM
	BCT Route 84 (3)	30	5:45 AM - 8:00 PM
Broward Boulevard Park & Ride and Fort Lauderdale Tri-Rail Station	Tri-Rail Shuttle FL 1	30	5:33 AM - 8:54 PM
	BCT Route 9 (3)	40	6:00 AM - 10:25 PM
	BCT Route 22	20	5:35 AM - 11:25 PM
	BCT Route 81 (3)	30	6:00 AM - 11:40 PM
Commercial Boulevard Park-n-Ride Lot	BCT Route 55 (3)	40	5:15 AM - 9:05 PM
	BCT Route 60 (3)	30	5:15 AM - 10:50 PM
Cypress Creek Park-n-Ride and Tri-Rail Station	Tri-Rail Shuttle CC 1	30	AM Peak, PM Peak
	Tri-Rail Shuttle CC 2	30	AM Peak, PM Peak
	Tri-Rail Shuttle CC 3	30	AM Peak, PM Peak
	BCT Route 60	30	5:15 AM - 10:50 PM
	BCT Route 62	45	5:00 AM - 8:15 PM
Pompano Beach Tri-Rail Station	Tri-Rail Shuttle PB 1	60	AM Peak, PM Peak
	BCT Route 34	30	5:30 AM - 10:10 PM
	BCT Route 93 (3)	90	9:30 AM - 4:40 PM
	BCT Route 95 (3)	90	8:20 AM - 5:45 PM
Deerfield Beach Tri-Rail Station	Tri-Rail Shuttle DB 1	60	AM Peak, PM Peak
	Tri-Rail Shuttle DB 2	60	AM Peak, PM Peak
	BCT Route 92 (3)	45	7:50 AM - 4:00 PM
Boca Raton Tri-Rail Station	T-REX Technology Center Tri-Rail Shuttle	60	AM Peak, PM Peak
	PalmTran Route 2	30	6:00 AM - 10:00 PM
	PalmTran Route 94	60	6:45 AM - 6:55 PM
Congress Avenue Park-n-Ride Lot	PalmTran Route 2 (3)	30	6:00 AM - 10:00 PM

Notes:
(1) Peak/Off-Peak
(2) Average headway for segment of route between Golden Glades and Downtown Miami.
(3) These transit connections operate witin a 1/4 mile walking distance of the supporting facility but do not actually enter the premises.

Table 1 - 21: Daily Boardings and Alightings for BCT at Supporting Facilities

Supporting Facility	Daily BCT Boardings	Daily BCT Alightings	Total Ridership
Golden Glades Park-n-Ride Lot and Tri-Rail Station	56	56	112
Hollywood Boulevard Tri-Rail Station	62	42	104
Sheridan Street Park-n-Ride Lot and Tri-Rail Station	2	23	25
Fort Lauderdale Airport Tri-Rail Station	13	23	36
Broward Boulevard Park-n-Ride Lot and Fort Lauderdale Tri-Rail Station	153	177	330
Commercial Boulevard Park-n-Ride Lot	79	51	130
Cypress Creek Park-n-Ride Lot and Tri-Rail Station	144	174	318
Pompano Beach Tri-Rail Station	38	42	80
Deerfield Beach Tri-Rail Station	14	10	24

Source: Broward County Transit

Connecting Tri-Rail Shuttles

Tri-Rail shuttles provide connections at six of the nine Tri-Rail stations that are adjacent to the I-95 HOV corridor. The schedules of the Tri-Rail shuttles are coordinated with the arrival and departure of the commuter trains. The highest utilization of the Tri-Rail shuttles is at the Fort Lauderdale Tri-Rail Station at Broward Boulevard followed by the Fort Lauderdale Airport Station at Griffin Road. The highest proportion of Tri-Rail commuter rail passengers that also ride the Tri-Rail shuttles is at the Fort Lauderdale Airport Station, where approximately 25% of rail passengers also ride the shuttle. Table 1-22 presents average weekday daily ridership for the Tri-Rail shuttle routes along the I-95 HOV corridor for 2000 and 2001.

Table 1 - 22: Ridership on Tri-Rail Shuttles at Connecting Facilities

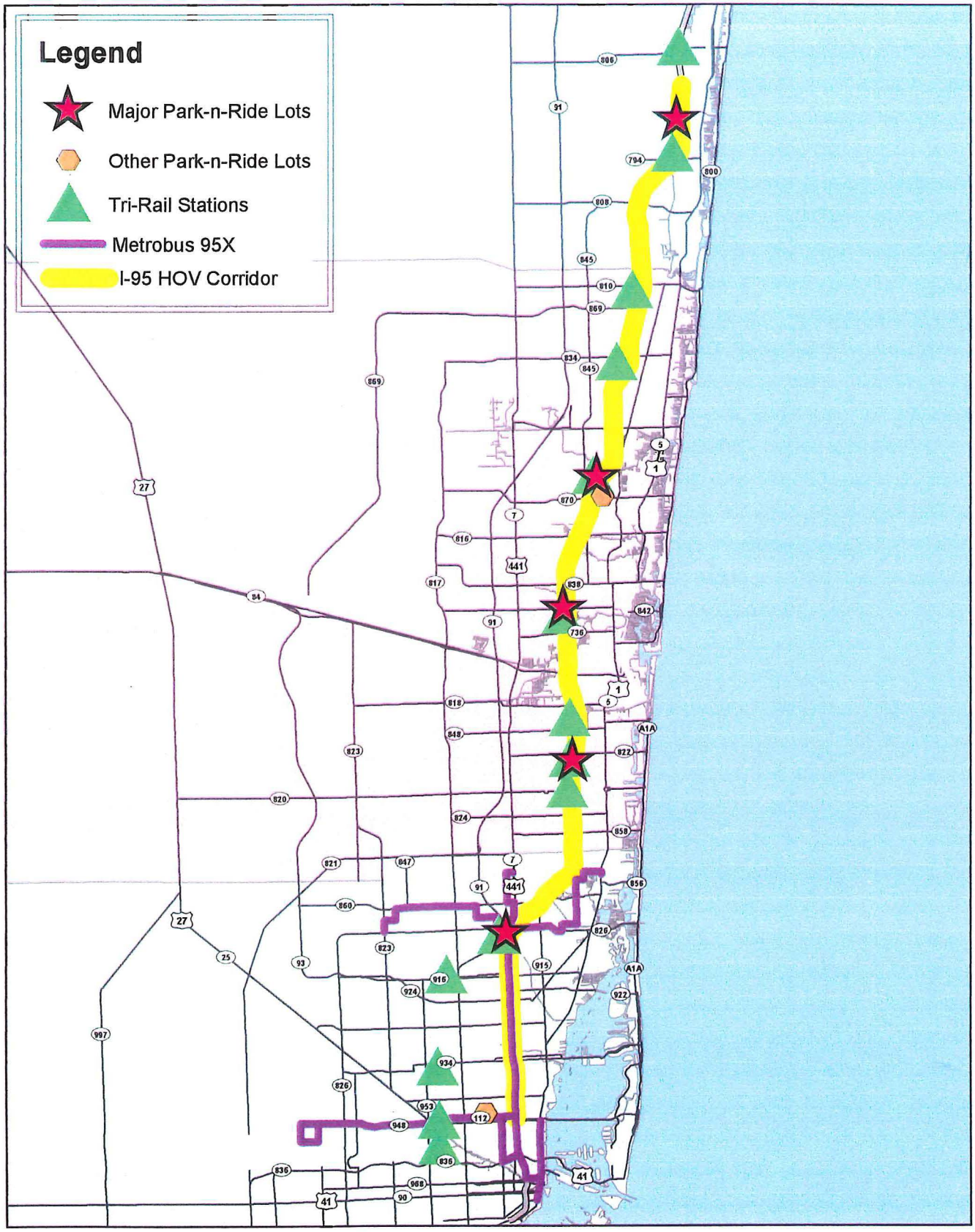
Tri-Rail Shuttle	2000 Average Daily Ridership	2001 Average Daily Ridership
Sheridan Street	21	19
Ft. Lauderdale Airport	178	183
Ft. Lauderdale	258	279
Cypress Creek 1	34	26
Cypress Creek 2	32	41
Cypress Creek 3	34	42
Pompano Beach	94	48
Deerfield Beach 1	35	46
Deerfield Beach 2	48	51

Source: Broward County Transit ridership reporting

Park-n-Ride Lots and Intermodal Facilities

Park-n-ride lots and intermodal facilities are integral components of HOV systems that provide opportunities to change between low and high occupancy vehicles. Park-n-ride lots are usually oriented toward commuters changing from an automobile to a carpool or vanpool. Intermodal facilities serve multiple modes, providing commuters an opportunity to change from one mode to another, and are usually relatively large. The Golden Glades is an example of an intermodal facility in the I-95 HOV corridor.

A total of twelve park-n-ride lots are adjacent to the I-95 HOV corridor. The locations of these twelve park-n-ride lots are depicted on Figure 1-13. Six of these park-n-ride lots are located in conjunction with Tri-Rail stations: Hollywood Boulevard, Sheridan Street, Fort Lauderdale Airport Tri-Rail (Griffin Road), Sample Road, Hillsboro Boulevard, and Yamato Road. An additional three of the park-n-ride lots are located within a ¼-mile walking distance of Tri-Rail stations: Golden Glades, Broward Boulevard, and Cypress Creek. Two other park-n-ride lots are located at Commercial Boulevard and Congress Avenue. The remaining park-n-ride lot is located at the Earlington Heights Metrorail Station in Miami-Dade County; this park-n-ride lot is located approximately one mile west of the I-95 corridor along SR 112. The Earlington Heights park-n-ride lot was included in this analysis because a southbound HOV ramp exists from I-95 to westbound SR 112 that allows HOV users to access Metrorail at the Earlington Heights station.



I-95 HOV SYSTEM
Transit Service and Support Facilities

DATE

DWG. NAME

Figure 1-13

PROJECT NO.

SHEET

Parking Utilization

Table 1-23 presents the number of parking spaces (parking capacity) for each of park-n-ride lots along the I-95 HOV corridor. Also presented in Table 1-23 is parking utilization data for these facilities; the number of occupied spaces was inventoried during both the spring and fall of 2001. The average utilization based on these two inventories is also presented in Table 1-23.

Table 1-23 demonstrates the Golden Glades (1,350 parking spaces), Sheridan Street (871 parking spaces), Broward Boulevard (770 parking spaces), and Cypress Creek (551 parking spaces) are the largest park-n-ride lots. These locations fit the definition of intermodal facilities because of their size and the multiple modes that are served, as all these facilities also provide connections to bus routes and Tri-Rail. However, parking utilization at both Sheridan Street (15.0 percent) and Broward Boulevard (16.2 percent) is quite low. The low utilization of the Broward Boulevard park-n-ride lot is particularly discouraging, because access is provided to the facility by ramps connecting directly to the I-95 HOV lanes.

The highest parking utilization is at the Hillsboro Boulevard park-n-ride lot (78.9 percent), which is a smaller facility (123 parking spaces). The Deerfield Beach Tri-Rail station at this location generates much of the parking demand at this location. The lowest parking utilization is at the Congress Avenue park-n-ride lot (10.8 percent utilization in 353 parking spaces); this facility does not provide a connection to Tri-Rail.

Figure 1-14 presents the total number of spaces for the park-n-ride lots in the I-95 HOV corridor and the number of spaces utilized as determined in the 2001 inventories of the facilities. Figure 1-14 graphically illustrates the available parking capacity at these lots.

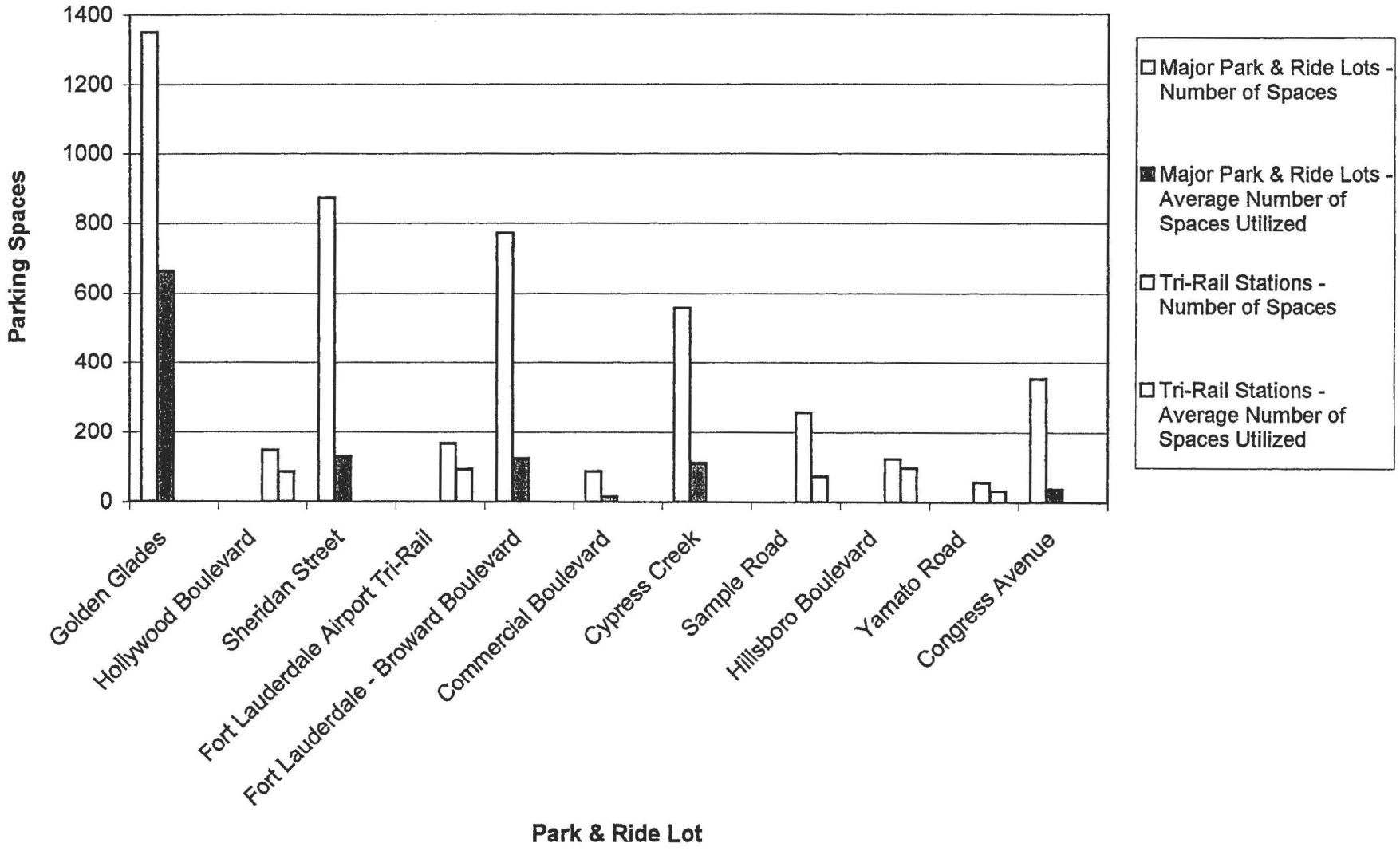
Table 1-24 presents the historical utilization in terms of the percentage of spaces occupied at the park-n-ride lots in the I-95 HOV corridor. FDOT District 4 has inventoried the usage and condition of all park-n-ride lots in Broward County and Palm Beach Counties since 1997. The historic utilization statistics presented in Table 1-24 are an average of two inventories per year. Utilization data was available for some the larger park-n-ride lots before 1997.

Table 1-23
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Park-n-Ride Lot Capacity and Utilization in 2001

Park-n-Ride Lot	Number of Spaces			Spaces Utilized		Percent Utilized		Average Utilization 2001
	General	Disabled	Total	March 2001	October 2001	March 2001	October 2001	
Earlington Heights Metrorail			93					
Golden Glades			1,350 (1)	695 (1)	633 (2)	51.5%	46.9%	49.2% (1, 2)
Hollywood Boulevard	140	8	148	91	78	61.5%	52.7%	57.1%
Sheridan Street	852	19	871	139	122	16.0%	14.0%	15.0%
Fort Lauderdale Airport Tri-Rail	157	10	167	97	86	58.1%	51.5%	54.8%
Fort Lauderdale - Broward Boulevard	738	32	770	107	142	13.9%	18.4%	16.2%
Commercial Boulevard	84	2	86	13	17	15.1%	19.8%	17.4%
Cypress Creek	551	5	556	155	69	27.9%	12.4%	20.1%
Sample Road	246	11	257	0 (3)	73	0.0%	28.4%	28.4%
Hillsboro Boulevard	117	6	123	93	101	75.6%	82.1%	78.9%
Yamato Road	54	3	57	99 (3)	33	173.7%	57.9%	57.9%
Congress Avenue	342	11	353	52	24	14.7%	6.8%	10.8%

Notes:
(1) Data obtained from the *Golden Glades Multimodal Transportation Facility Implementation Plan, October 2001*
(2) Data obtained from *Metrobus Parking Patronage Summary, October 2001*
(3) Data does not appear accurate and was not included in the average utilization calculation

Figure 1-14
Park-n-Ride Lots Total Spaces and Usage



g:\040005186\task3\transit.xls\Chart for Report

Table 1-24
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Park-n-Ride Lot Historical Utilization

Park-n-Ride Lot	Number of Spaces	Percentage of Spaces Occupied						
		1995	1996	1997	1998	1999	2000	2001
Earlington Heights Metrorail	93							
Golden Glades	1,350 (1)						51.5% (1)	46.9% (2)
Hollywood Boulevard	148			69.6%	78.4%	80.1%	54.7%	57.1%
Sheridan Street	871		7.3%	7.7%	6.1%	6.5%	12.9%	15.0%
Fort Lauderdale Airport Tri-Rail	167			38.1%	28.5%	29.7%	42.3%	54.8%
Fort Lauderdale - Broward Boulevard	770		19.5%	16.3%	11.9%	14.6%	14.2%	16.2%
Commercial Boulevard	86	14.0%	10.5%	13.0%	11.6%	11.1%	9.9%	17.4%
Cypress Creek	556	38.7%	32.4%	42.0%	28.7%	21.7%	17.4%	20.1%
Sample Road	257			20.6%	22.4%	24.7%	31.4%	28.4%
Hillsboro Boulevard	123			46.3%	58.2%	46.4%	52.0%	78.9%
Yamato Road	57			82.5%	82.5%	71.9%	79.0%	57.9%
Congress Avenue	353	0.3%	7.4%	22.6%	5.4%	2.7%	1.7%	10.8%

Notes:
(1) Data obtained from the *Golden Glades Multimodal Transportation Facility Implementation Plan, October 2001*
(2) Data obtained from *Metrobus Parking Patronage Summary, October 2001*
(3) All other parking utilization data obtained from the Florida Department of Transportation, District 4.

The larger park-n-ride lots along the I-95 HOV corridor in Broward and Palm Beach Counties have historically low utilization levels in terms of percentage of spaces occupied. The Sheridan Street park-n-ride lot has exhibited a steady increase in usage since 1998 with utilization increasing from 6.1 percent 15.0 percent. The 15.0 percent utilization translates to approximately 130 occupied spaces; however, the existing excess parking capacity is still approximately 740 spaces at this location. Usage of the Broward Boulevard park-n-ride lot has been inconsistent over the study period. At the Cypress Creek park-n-ride lot, the utilization in 2001 has decreased significantly over the study period.

On a positive note, eight of the ten park-n-ride lots along the I-95 HOV corridor in Broward and Palm Beach Counties exhibited an increase in utilization between 2000 and 2001. This increase resulted in the utilization of an additional 125 parking spaces in these facilities.

Table 1-25 summarizes the park-n-ride lot statistics from 1997 to 2001 for the ten park-n-ride lots along the I-95 HOV corridor in Broward and Palm Beach Counties. These ten park-n-ride lots provide a total of 3,388 parking spaces and the system-wide utilization varied between approximately 20 percent to 25 percent over the past five years.

Table 1 - 25: Overall Usage of Park-n-Ride Lots in Broward and Palm Beach Counties

Year	Occupied Spaces	Vacant Spaces	System-wide Utilization
1997	841	2,547	25%
1998	673	2,715	20%
1999	638	2,750	19%
2000	674	2,714	20%
2001	799	2,589	24%

Source: Florida Department of Transportation, District 4.

Park-n-Ride Lot Accessibility

Accessibility to the park-n-ride lots is an important feature because accessing the facilities adds time to the users' commute. If the park-n-ride lots are not readily accessible, the extra time required to access the facility may offset the travel time savings realized through utilization of the

HOV lanes. The analysis also considered the transit accessibility of the park-n-ride lots, since increased utilization of the HOV system by transit offers the potential of significantly increasing the corridor's throughput.

The level of vehicular accessibility between the park-n-ride lots and the I-95 HOV lanes was ranked in three groupings: good, moderate, and poor. A "good" rating refers to locations where the park-n-ride lots are connected to the I-95 HOV lanes by direct access HOV ramps. A "moderate" rating refers to park-n-ride lots with direct access ramps from the I-95 general-purpose lanes. A "poor" rating was assigned to park-n-ride lots that do not have direct access to and from I-95; users access these park-n-ride lots from a surface street off I-95.

The accessibility between the park-n-ride lots and county bus service was rated as either "good" or "within walking distance." If a bus route actually enters the park-n-ride lot and a stop is provided within the facility, the accessibility was rated as "good." If a bus stop is provided within a ¼ mile of a park-n-ride lot, the bus accessibility was considered to be "within walking distance." The proximity of the park-n-ride lots to Tri-Rail stations was also identified.

Table 1-26 presents the results of the accessibility evaluation for the twelve park-n-ride lots along the I-95 HOV system. The only park-n-ride lot to receive a "good" rating for vehicular access to the I-95 HOV system for both directions of travel is the Broward Boulevard park-n-ride lot. The accessibility between the Golden Glades park-n-ride lot and I-95 is "good" to and from the south, but the Golden Glades park-n-ride is not as accessible to and from the north. However, improvements planned for the Golden Glades Center intermodal facility will improve access between the facility and I-95 to the north. The only other park-n-ride lot not to receive a "poor" rating for vehicular access is the Cypress Creek park-n-ride lot, which secured a "moderate" rating. Difficulty in accessing the park-n-ride lots contributes to the under-utilization of these facilities.

Table 1-26 demonstrates that several of the park-n-ride lots are readily accessible by bus service. Seven of the twelve park-n-ride lots are accessed by bus routes and contain a bus stop located at a designated spot within the facility. The park-n-ride lots at Commercial Boulevard and at Hillsboro Boulevard are so small that buses do not enter the facility, but bus accessibility is not

Table 1-26
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Park-n-Ride Lot Accessibility Ratings

Park and Ride Lot	Accessibility to and from I-95 HOV System	Accessibility with County Bus Service	Proximity to Tri-Rail
Earlington Heights Metrorail	Poor	Good	No
Golden Glades	NB - Good; SB - Moderate	Good	Adjacent with Pedestrian Bridge
Hollywood Boulevard	Poor	Within Walking Distance	Yes
Sheridan Street	Poor	Good	Yes
Fort Lauderdale Airport Tri-Rail	Poor	Within Walking Distance	Yes
Fort Lauderdale - Broward Boulevard	Good	Good	Adjacent
Commercial Boulevard	Poor	Within Walking Distance	No
Cypress Creek	Moderate	Good	Adjacent without Pedestrian Bridge
Sample Road	Poor	Good	Yes
Hillsboro Boulevard	Poor	Within Walking Distance	Yes
Yamato Road	Poor	Good	Yes
Congress Avenue	Poor	Within Walking Distance	No

Notes:

Accessibility from I-95 HOV System:

good =direct ramps from I-95 HOV system

moderate = direct ramps from I-95

difficult = must travel along signalized roadway

Proximity to Tri-Rail

adjacent refers to park & ride lots located within a 1/4 mile walking distance from a Tri-Rail station

Accessibility from County Bus Service

good = county buses directly serve the Tri-Rail station or park and ride lot and have a designated bus stop on the premises

degraded significantly at these locations. The Hollywood Boulevard park-n-ride lot and the Congress Avenue park-n-ride lot are the two largest facilities that are not directly accessed by bus routes. Finally, although most of the park-n-ride lots are accessible by bus, the level of bus service is poor for many of these facilities, with infrequent service by a limited number of routes.

Accessibility between the park-n-ride lots and the I-95 HOV lanes is generally poor. However, accessibility to and from the Broward Boulevard park-n-ride lot from the I-95 HOV lanes is excellent, yet this facility is still underutilized, which suggest that other factors in addition to accessibility contribute to the usage of the facilities. Some of these factors include the maintenance of the facilities, which is discussed next.

Park-n-Ride Lot Condition and Maintenance

Biannual maintenance inspections are performed for all park-n-ride lots along the I-95 HOV corridor in Broward and Palm Beach Counties. These inspections report on the condition of the park-n-ride lots and identify maintenance needs to improve the users experience with the facilities. Common recommendations provided in these maintenance reports include:

- Re-striping the parking lot
- Removing graffiti from buildings and signs
- Removing garbage
- Improving the landscaping
- Installing better signage
- Removing abandoned vehicles
- Providing a more inviting transit connection area
- Providing better bicycle storage

Table 1-27 summarizes recommendations from the FDOT District 4 *Biannual Park-n-Ride Maintenance Report, Fall 2001*, and Table 1-28 summarizes recommendations from the FDOT District 4 *Biannual Park-n-Ride Comments and Suggestions Report, Fall 2001*. According to the findings presented in these tables, the least maintained park-n-ride lots in the I-95 HOV corridor in Broward and Palm Beach Counties include the facilities located at Sheridan Street, Broward

Table 1-27
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Recommendations from the Biannual Park-n-Ride Maintenance Report

Park-n-Ride Lot	Restripe Lot	Realign Parking Curbs	Repave Lot	Repaint Amenities / Fixtures	Remove Debris	Prune / Weed	Repair Fence	Remove Graffiti	Replace / Repair Lot Signage	Improve / Add Directional Signage	Illegally Parked Cars	Other
Hollywood Boulevard						X				X		
Sheridan Street			X		X			X	X		X	X
Fort Lauderdale Airport Tri-Rail										X		
Fort Lauderdale - Broward Boulevard				X	X	X			X			
Commercial Boulevard					X					X	X	
Cypress Creek						X			X		X	X
Sample Road	X	X							X			X
Hillsboro Boulevard												
Yamato Road	X											X
Congress Avenue	X	X		X				X		X		

Source: Florida Department of Transportation, District 4

Table 1-28
I-95 HOV SYSTEM-WIDE OPERATIONS STUDY
Recommendations from Biannual Park-n-Ride Comments and Suggestions Report

Park-n-Ride Lot	Provide Bus Route / Schedule Info.	Provide Bench / Shelter at Bus Stop	Remove Abandoned Cars	Provide Bike Shelter	Landscape Improvements	Improve / Add Directional Signage	Other
Hollywood Boulevard		X		X		X	
Sheridan Street							
Fort Lauderdale Airport Tri-Rail		X				X	X
Fort Lauderdale - Broward Boulevard					X		
Commercial Boulevard		X			X	X	
Cypress Creek	X				X		X
Sample Road	X	X		X			X
Hillsboro Boulevard		X		X			X
Yamato Road	X	X					X
Congress Avenue	X		X		X	X	

Source: Florida Department of Transportation, District 4

Boulevard, Sample Road, and Congress Avenue. On the positive side, the park-n-ride lots with the fewest suggestions for improvements and maintenance requirements are the Fort Lauderdale Airport Tri-Rail and Hillsboro Boulevard facilities.

Summary

The existing transit service and support facilities in the I-95 HOV corridor were inventoried including (1) bus service that utilizes the HOV lanes, (2) Tri-Rail, (3) bus service that connects to support facilities, and (4) park-n-ride lots and intermodal facilities. Transit services and support facilities are critical components of successful HOV systems that can assist in increasing the corridor person throughput.

The only bus service that presently utilizes the I-95 HOV lanes are the Metrobus 95X routes operated by Miami-Dade Transit (MDT). Person throughput data demonstrate that these express routes contribute to the HOV lanes moving more persons in fewer vehicles in Miami-Dade County.

The Tri-Rail commuter rail line runs directly parallel to the I-95 HOV system along the northern 38 miles of the 46-mile HOV system. A moderate level of coordination presently exists between Tri-Rail and the I-95 HOV system with transfer connections available at several shared facilities along the corridor.

A number of local bus routes provide connections at supporting facilities along the I-95 HOV corridor. However, with the exception of the Golden Glades park-n-ride facility, the level of bus service is poor for many of these facilities, with infrequent service by a limited number of routes.

Park-n-ride lots and intermodal facilities are integral components of facilities that provide opportunities to change between low and high occupancy vehicles. The larger park-n-ride facilities in Broward and Palm Beach Counties have low utilization rates; the highest utilization rates are found at smaller facilities that are contiguous to Tri-Rail stations, such as at Hillsboro Boulevard. Accessibility to the park-n-ride lots is an important feature because accessing the facilities adds to the commute time. The only park-n-ride lot to receive a "good rating" for vehicular access to the I-95 HOV system is the Broward Boulevard park-n-ride lot. Difficulty in accessing the park-n-ride lots contributes to the under-utilization of these facilities.

NEXT STEPS

This study is examining the I-95 HOV system in a system-wide manner as part of the regional alternative mode system. This report documents an analysis of existing transportation data for the I-95 HOV corridor including a review of previous and ongoing studies, a summary of existing operating conditions, an evaluation of system accessibility, and an inventory of transit service and support facilities.

The analysis presented in this report provides the necessary base to begin to develop short-term strategies to maximize the effectiveness of the HOV system and more effectively integrate the HOV system into the regional alternative mode system. As an interim step, an enhanced evaluation program will be developed for the HOV system to help identify ways that the system can better accomplish its primary objective, which is people movement. Additionally, a panel of national HOV experts will be brought together with local agency representatives in an interactive workshop to discuss opportunities for maximizing the performance of the HOV system.