

CRANDON BOULEVARD MASTER PLAN



A cooperative effort of:



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TRANSPORTATION TRUST FOR MIAMI-DADE COUNTY HALF-
PENNY TRANSIT TAX ALLOCATION***

I. EXECUTIVE SUMMARY

The Crandon Boulevard Master Plan study was approved by the Village of Key Biscayne and Miami-Dade County in an inter-local agreement dated February 8, 2002. Scope of work items were suggested by the Village Council, an 18-member citizen Advisory Committee appointed by Council on January 26, 2003, consultants and advisors, and members of the public. The recommendations of the Advisory Committee discussed in this report were presented to the public in a hearing on January 29, 2004, and to the Village Council on February 24, 2004. The Master Plan goals and objectives fall into the six general categories listed below:

- Improved Public Safety
- Easing of Traffic Congestion
- Traffic Calming
- Pedestrianization
- Improved Mass Transit
- Streetscape Improvements

The following table illustrates the goals and objectives that are addressed by each of the study scope items, and in which of the eight report sections the relevant details can be found.

<i>Scope Item</i>	<i>Improved Safety</i>	<i>Easing of Traffic Congestion</i>	<i>Traffic Calming</i>	<i>Pedestrianization</i>	<i>Improved Mass Transit</i>	<i>Streetscape Improvements</i>	<i>Report Section</i>
Identification of traffic deficiencies	★		★		★		VI
Need and justification for geometric improvements	★		★		★		VI, VII
Bicycle lanes			★		★		VII
Replacement of valley gutter with curb and gutter		★			★		VII
Wider decorative sidewalks		★			★	★	VII, VIII
Street trees		★	★			★	VII, VIII
Decorative pedestrian crosswalks		★	★		★	★	VI, VIII
Village entrance						★	VIII
Decorative signalization						★	VIII
Decorative illuminated street name signs					★	★	VIII
Swale irrigation system						★	VII
Improvements to Crandon Blvd. / Harbor Dr. intersection	★	★			★		VI
On-street parking					★	★	VII
Feasibility of trolley service on Crandon Blvd.	★			★			V
Level of Service	★						VI
Access on Fernwood					★		V
Island bus route				★			V
Golf Cart / Low-Speed Vehicles		★					V
Funding for maintenance						★	IX
Bus shelters				★			V
Overall design concept or theme for Crandon Blvd.						★	VIII
Historic designation						★	III
Off-street parking					★	★	VII
Zoning and development on Crandon Blvd.						★	VI
Median width, curb cuts, and turn lanes	★				★		VII

Dedicated pedestrian access to commercial properties		★			★		VII
Loading Zones	★						VII
Street Lighting						★	VIII
Decorative Traffic Signage						★	VIII
Pocket Parks / Mini-plazas					★	★	VIII
Street Furniture					★	★	VIII
Art in Public Places						★	VIII

The report text is followed by a set of 24 figures referred to in the body of the report, and five appendices. The single-page and oversized fold-out graphics consist of annotated aerial and at-grade photographs of typical existing and proposed street sections, and schematic diagrams.

Appendix A is a collection of the minutes recorded at the Advisory Committee meetings. Appendix B contains the data, analysis and results of a traffic study commissioned by the Village Council as part of the Crandon Boulevard Master Plan Study. Cost estimates for the three proposed implementation phases, as well as individual elements of the Master Plan, are given in Appendix C.

The improvements plan implementing these goals and objectives is summarized in the Master Plan Document contained in Appendix D of this report. The state and county historic designations for Crandon Boulevard will need to be amended in order to accomplish the improvements. The full cost of construction is estimated at approximately \$7.9 million. The most likely implementation schedule, and funding sources that have been identified to date, are as follows:

Phase I

Crandon Boulevard along the Civic Center frontage, including the intersection with West McIntyre Street and Galen Drive, has been identified as the first phase of implementation. Construction of this segment is scheduled for completion in 2004, and the estimated \$200,000 cost will be funded from the Civic Center project budget.

Phase II

Crandon Boulevard from the Village entrance to the West McIntyre/Galen Drive intersection, and Harbor Drive from Fernwood Road to Crandon Boulevard, are the areas targeted in the second phase of implementation. The cost, estimated at \$4.0 Million, will be funded from a variety of sources including: the Miami-Dade County half-penny transit surtax; developer contributions; potential state funding and the Village Public Works budget. Phase II construction is scheduled to begin in mid-2005.

Phase III

Crandon Boulevard from the West McIntyre/Galen Drive intersection to the entrance to Bill Baggs Cape Florida State Park is the focus of Phase III implementation. The cost estimate is \$3.9 Million for this phase. Potential sources of county funding are the Metropolitan Planning Organization, impact fees and gas taxes, and a general obligation program proposed for a referendum vote in 2004. State funding sources include the Florida Department of Transportation Local Assistance Program for off-system improvements, and the Conservation and Recreational Lands program.

Appendix E includes the letter of transmittal and Capital Improvement Project Request Form for the 5-Year People’s Transportation Plan (2003-2008) submitted by the Village of Key Biscayne to the Citizens’ Independent Transportation Trust on December 16, 2003. This plan

outlines the Village's proposed expenditures of the half-penny transit surtax levied by Miami-Dade County in 2002. The improvements in this transportation plan are based on those recommended in Crandon Boulevard Master Plan.

The adoption of the Crandon Boulevard Master Plan by the Village Council is important. The Plan will provide Village residents and leaders with a reference for the traffic and public safety impacts of future development or redevelopment of properties fronting Crandon Boulevard and its side streets.



Typical Master Plan Streetscape Proposed along Crandon Boulevard

II. INTRODUCTION

The Village of Key Biscayne entered into an interlocal agreement with Miami-Dade County in October 2001 for the purpose of cost-sharing and coordinating development of a master plan for improvements to Crandon Boulevard within the Village of Key Biscayne (see Figure 1). Subsequent to this agreement, the Village Council commissioned the firm of C3TS to undertake the Master Plan Study and prepare a report. In order to help guide the study toward solutions and recommendations that were reflective of, and sensitive to, the community, the Council established an 18-member citizen Crandon Boulevard Streetscape Master Plan Advisory Committee, and appointed its members on January 23, 2003. The majority of Advisory Committee members are residents of single-family homes and condominiums; several also were resident representatives of commercial properties, residential developments, and hotels within the Village. Representatives of Miami-Dade County's Crandon Park and Bill Baggs Cape Florida State Park, which share the island and Crandon Boulevard with the Village, also participated. The Advisory Committee was supported by Village and County Staff, and by municipal consultants with various fields of expertise.

The scope of the Crandon Boulevard Master Plan study in the inter-local agreement between the Village and Miami-Dade County included:

- Identification of existing operational traffic deficiencies in the Crandon Boulevard corridor
- Need and justification for geometric improvements of intersections and lane widths
- Bicycle lanes
- Replacement of valley gutter with type "D" curb and gutter
- Wider decorative sidewalks
- Street trees
- Decorative pedestrian crosswalks
- Village entrance
- Decorative signalization
- Illuminated street name signs
- Swale irrigation system

Upon commissioning the Master Plan study and establishing the Advisory Committee, the Village Council requested that the study also consider:

- Improvements to the Crandon Boulevard Boulevard/Harbor Drive intersection to reduce congestion and improve pedestrian safety
- On-street parking
- Feasibility of trolley service on Crandon Boulevard
- Level of service
- Pedestrian / bicycle / golf cart access from Fernwood Road to back side of Crandon Boulevard commercial properties
- Existing bus route on the island
- Golf cart / low speed vehicle operations on Crandon Boulevard

At the first public meeting of the Advisory Committee on March 13, 2003, and in subsequent meetings over the eleven-month life of the committee, the following items were added to the scope of the study:

- Funding for maintenance
- Bus shelters
- Overall design concept or theme for Crandon Boulevard
- Effect of historic designation on proposed improvements
- Off-street parking
- Effect on traffic of zoning and development along Crandon Boulevard
- Median curb cuts and turn lanes
- Dedicated pedestrian access to commercial properties on Crandon Boulevard
- On-site and off-site loading zones for commercial properties along Crandon Boulevard
- Street lighting
- Decorative traffic signage
- Pocket parks and mini-plazas along Crandon Boulevard
- Street furniture, including benches, trash cans, newspaper vending racks, water fountains, pet waste stations
- Collaboration with Art in Public Places Committee

The Advisory Committee members voted to increase meetings to twice monthly, and more if necessary, at the second public meeting on April 17, 2003 as the issues became more numerous and complicated. These meetings, and the presentations and discussions contained

therein, were the focal points of this Master Planning effort. The minutes of each of the meetings are included in this report as Appendix A.

III. HISTORY OF CRANDON BOULEVARD

Dade County constructed the Rickenbacker Causeway after World War II to connect the mainland to Virginia Key and Key Biscayne. The southern segment through the middle of Key Biscayne was named Crandon Boulevard. Much of the boulevard was laid along the path of earlier Indian trails leading from Bear Cut that had become a road during use of the island as a coconut plantation. The road extended as far south as a large tract of private land that occupied the southern quarter of the island. This property would eventually be sold to the State of Florida, and become Bill Baggs Cape Florida State Park in the mid 1960s.

During the 1950's and early 1960's, Crandon Boulevard south of Crandon Park was mostly a two-lane undivided road carrying light residential and hotel traffic. Bill Baggs Cape Florida State Park was opened to the public in 1967; the sole access to the park is via Crandon Boulevard. Consequently, the road began to experience heavier and heavier through-traffic as the popularity of the state park grew.

The Dade County Public Works Department, from 1969 to 1970, reconstructed Crandon Boulevard south of Crandon Park into a four-lane divided parkway to ease congestion. This widening was accomplished within the wide 120 ft right-of-way corridor previously reserved by the County for an earlier abandoned 1950's plan to widen Crandon Boulevard and build a causeway linking Key Biscayne and Key Largo.

Crandon Boulevard was designated a Historic Highway by the State of Florida and by Miami-Dade County in the late 1980s after a 1987 citizen protest of a county attempt to install a pedestrian underpass under Crandon Boulevard to transfer visitors to the newly built Tennis Center from parking lots on the east side of Crandon Park. The citizens were concerned that the Boulevard would be widened again to accommodate increased park and Key Biscayne residential traffic. This protest led to the incorporation of the Village of Key Biscayne in 1991. The historic designation legislation specifically states that no public funds shall be expended for "the alteration of the physical dimensions or location of Crandon Boulevard, the median strip thereof, of the land adjacent thereto, except for the routine or emergency utilities maintenance activities necessitated to maintain the road as a utility corridor serving the Village of Key Biscayne".

In light of these restrictions and the scope of the improvements contemplated under this Master Plan Study, the historic designation will need to be either repealed or amended in order to accomplish the planned improvements to Crandon Boulevard Boulevard. The Advisory Committee considered this matter.

Advisory Committee Recommendation: *An amendment to the State of Florida and Miami-Dade County historic designations rather than a repeal is the preferred strategy to pursue. A repeal would allow possible future widening of Crandon Boulevard. The road was designated as historic in the first place to prevent widening.*

Some aesthetic improvements have been made along Crandon Boulevard by the Village of Key Biscayne in recent years. The county historic designation was amended in 2003 for public safety purposes to allow a median cut in front of the newly completed Village Fire Station. The road has remained essentially unchanged since its 1969-1970 four-lane reconstruction.

IV. ROADWAY CLASSIFICATION AND JURISDICTION

The Federal Highway Administration (FHWA) and the Florida Department of Transportation (FDOT) designate streets and highways throughout the state, according to the character of service that they provide, every ten years following the national census. Crandon Boulevard carries all vehicular traffic entering and leaving Key Biscayne, and is classified along its entire length as a principal urban arterial roadway.

Crandon Boulevard within the boundaries of the Village of Key Biscayne is under the jurisdiction of, and maintained by, the Miami-Dade County Public Works Department (MDCPW). Crandon Boulevard north of the Village limits within Crandon Park is considered a park road and is under the jurisdiction of the Miami-Dade County Park & Recreation Department that is, in turn, bound by the Crandon Park Master Plan. The Crandon Park Master Plan was the result of a settlement between the Matheson family, who donated the Crandon Park land to the county after World War II, and the County, after the construction of the tennis facility that, according to the Mathesons, violated the not-for-profit use required for Crandon Park land. The Master Plan calls for most of Crandon Boulevard within Crandon Park to have a “serene character... a dense, refreshing green corridor of natural plants and historic coconut palms.”

Due to these jurisdictional matters and the historic designation, any improvements along Crandon Boulevard contemplated under the Village of Key Biscayne Master Plan must conform to the following:

- State of Florida and Miami-Dade County historic designation status

Both the state and county must review any improvement plans to Crandon Boulevard. The Village of Key Biscayne should file to amend both designations to allow improvements.

- Miami-Dade County Public Works Department criteria and standards

All work within the Crandon Boulevard right-of-way will require permitting approval from MDCPW. Specific improvements found to be technically acceptable by MDCPW and in conformance with their performance criteria, but not in conformance with MDCPW standards, will require a continuing maintenance agreement with the County. The Village may have to assume all or part of the maintenance costs and/or obligations for these specific improvements.

- The Crandon Boulevard Park Master Plan

Any improvements proposed north of the Village limits, along the Park/Village interface, will require approval from the Miami-Dade Park & Recreation Department.

V. TRANSIT AND ALTERNATIVE VEHICLES

a) Miami-Dade Transit Agency Bus Route / Bus Shelters

Key Biscayne is served by the Miami-Dade Transit Agency (MDTA) Bus Route B that runs from downtown Miami via Brickell Avenue and the Rickenbacker Causeway to Key Biscayne, and returns along the same route. In downtown Miami, Route B has connecting stops at the Brickell Metrorail Station and at the Downtown Bus Terminal (see Figure 2). Route B buses run at 30-minute intervals during the off-peak hours, and recently started running at 15-minute intervals during morning and afternoon peak hours. Upon entering the Village of Key Biscayne and reaching Harbor Drive, the buses alternate running down Crandon Boulevard to Bill Baggs Cape Florida State Park and back, or down Harbor Drive to West Mashta Drive and back. The

Advisory Committee met with a representative of MDTA and asked that the county use their new fleet of smaller buses whenever possible.

Advisory Committee Recommendation: *MDTA should utilize smaller buses on Route B whenever possible, such as during off-peak hours, as they are purchased and brought into the bus fleet.*

Eighteen designated MDTA bus stops exist along Crandon Boulevard within the Village limits. These well-distributed stops are located along southbound and northbound Crandon Boulevard. The Village constructed a large bus shelter at the northbound bus stop at the corner of Crandon Boulevard and East Heather Drive that is shown in the following photo.



Bus Shelter at Crandon Boulevard and East Heather Drive

A second, larger bus shelter is currently under construction along northbound Crandon Boulevard between Harbor Drive and the Village entrance. Buses stopping at that particular location often create a traffic bottleneck for northbound Crandon Boulevard motorists leaving the Village. To mitigate this condition, the Village will construct a bus bay adjacent to the new shelter that will permit buses to pull out of the stream of traffic while loading and unloading passengers.

The Advisory Committee reviewed the need for additional bus shelters along Crandon Boulevard, and considered several design options. Southbound bus stops are used almost exclusively by passengers getting off the buses, while the northbound stops are used primarily by passengers getting onto the buses. Therefore, adding bus shelters at the northbound stops, where most of the riders wait for the busses, was found to be well justified. The construction of

new bus shelters and enhancement of existing shelters by municipalities is encouraged by MDTA as a courtesy to their riders.

Advisory Committee Recommendation: *Eight small bus shelters should be built to accommodate passengers, and other pedestrians, on the east side of Crandon Boulevard that accommodates northbound MDTA bus traffic. The general locations of these shelters, and the bus stops on both the east and west sides of Crandon Boulevard, are shown in Appendix D, but can be adjusted slightly in coordination with MDTA. These shelters should be designed in the same basic style as the existing shelters; two shelter designs were selected (see Figure 3). The smaller of the two will be the standard. The slightly larger shelter will be used at stops where the Village determines that sufficient riders board the buses.*

b) Trolley Service on Crandon Boulevard and Collector Streets

The Village of Key Biscayne Senior Services Department previously conducted a projected ridership study for an island trolley or shuttle to ease traffic congestion and provide additional services to Village residents. The proposal was deemed to be unfeasible due to the high costs involved for comparatively low ridership. That study was primarily geared towards senior riders. A similar recommendation, for a mixed age group of riders, was made by the MDTA consultant to the Advisory Committee.

Advisory Committee Recommendation: *A trolley service owned and operated by the Village of Key Biscayne would entail extensive costs for equipment, personnel, and maintenance, and not have sufficient riders, to make it economically feasible at this time.*

A more detailed study in the future could be performed to determine if a different trolley/shuttle passenger mix, such as children attending island public and private schools, seniors, and MDTA bus riders, could be feasibly accommodated. The Miami-Dade County Metropolitan Planning Organization (MPO) Municipal Program has planning funds available for such studies, and interested municipalities can compete for these planning funds.

c) Golf Carts / Low-Speed Vehicles

Chapter 316 of the Florida Statutes allows the operation of golf carts on any city or county street, provided that the responsible local government has determined that golf carts can safely travel on that street. The Village of Key Biscayne enacted an ordinance that allows golf carts to operate on all roads under Village jurisdiction except for Crandon Boulevard, which is under Miami-Dade County jurisdiction. The County does not allow golf cart traffic on any arterial roadway. The Village is in agreement with the County but does allow golf carts to cross the Boulevard on intersecting side streets and major property driveways from west to east or vice-versa. Chapter 316 also prohibits the operation of golf carts on any sidewalks, and the Village enforces this rule.

F.S. Chapter 316 allows the operation of low-speed vehicles (also known as neighborhood electric vehicles) on roadways with posted speed limits of 35 mph or less, as long as the vehicle is registered and the driver is licensed. Low-speed vehicles are defined as vehicles meeting certain performance criteria and equipped with certain safety systems, lights and signals. The Village allows operation of these low-speed vehicles on Crandon Boulevard or on any Village road.

Advisory Committee Recommendation: *The current Village rules prohibiting the use of golf carts along Crandon Boulevard, except to cross the street, and*

allowing the use of low-speed (neighborhood-electric) vehicles along Crandon Boulevard, are acceptable.

d) Golf Cart Access along Fernwood Road

As noted in the previous section, golf carts can operate on any Village road except Crandon Boulevard, but are allowed to cross Crandon Boulevard. Therefore, almost all points within the Village are reachable by golf cart, including the Key Biscayne Shopping Center that has a permanent opening between it and the adjacent office building that abuts the 600 block of Fernwood Road. Seven commercial properties fronting on Crandon Boulevard have no vehicular access to any side street, and are accessible only from Crandon Boulevard. These properties back up to Fernwood Road along their western boundaries. Fernwood Road is the transitional street between residential and commercial properties on the west side of Key Biscayne. The rear extents of building walls or parking lots of these commercial developments are buffered from the residential properties with walls and/or landscaping, as shown in the following photographs.



Rear of 240 Crandon Boulevard Office Building



Rear of The Square Shopping Center

The Advisory Committee discussed the feasibility of providing access to the commercial properties from Fernwood Road through openings sized for pedestrians, bicyclists, and golf cart drivers only as one means to ease congestion on Crandon Boulevard. It was decided that gold carts access could not be safely accommodated at this time, and that parking problems could occur along the eastern Fernwood Road swale if this access was encouraged.

Advisory Committee Recommendation: *Any new commercial developments along Crandon Boulevard should provide appropriately sized openings in walls along their property lines fronting Fernwood Road for access by pedestrians and bicyclists. The Village should endeavor to work with and encourage the owners of the seven existing developments currently accessible only via Crandon Boulevard to construct these accesses, as shown in the Master Plan Document (Appendix D). Parking in the swales in areas where these openings are provided should be monitored, and preventive measures, such as installation of curb and gutter near the access points, implemented as needed to discourage parking.*

A 6 ft wide golf cart path constructed of compacted, crushed shell should be provided along the north edge of the Village Green, from Fernwood Road to the northeast corner, to encourage less motorized vehicle trips to nearby commercial areas. A small golf cart parking area at the northeast corner of the Green will allow enhanced access to at least some of these properties (see Appendix D).

VI. TRAFFIC CAPACITY, OPERATIONS, AND SAFETY

One of the objectives of this Master Plan study was to analyze the usage patterns and volumes of vehicular traffic along Crandon Boulevard to determine if any deficiencies exist, assess the extent and nature of any deficiencies, and recommend appropriate geometric and operational improvements. The traffic analysis utilized the concept of level of service (LOS) as the measure of traffic performance.

According to the Transportation Research Board, LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of service measures such as speed and travel time, freedom to maneuver, traffic interruptions, and comfort and convenience. Safety is not included in the measures that establish service levels. The six levels of service range from LOS A (the best condition) to LOS F (the worst condition), and can be expressed at signalized intersections as the control (signal) delay time experienced by the driver measured in seconds per vehicle, as follows:

- LOS A: Control delay per vehicle is <10 sec/vehicle, and indicates an operating condition where the driver will experience free flow of traffic with minimal delays
- LOS B: Control delay per vehicle is >10 to 20 sec/vehicle
- LOS C: Control delay per vehicle is >20 to 35 sec/vehicle
- LOS D: Control delay per vehicle is >35 to 55 sec/vehicle
- LOS E: Control delay per vehicle is >55 to 80 sec/vehicle, and represents a facility that is operating at its capacity
- LOS F: Control delay per vehicle is >80 sec/vehicle, and indicates an operating condition where the driver will experience a heavily congested roadway with long delays and stop-and-start conditions.

The full traffic analysis and consultant's report are included in this report as Appendix B. The results discussed in the following sections are given in terms of traffic flow volumes during normal operating conditions and peak hour volumes. Peak hours for this study were the A.M. peak (7:00-9:00 A.M.) mid-day peak (11:00 A.M.-1:00 P.M.) and P.M. peak (4:00-6:00 P.M.). The locations of traffic count stations along Crandon Boulevard, and the adjustments to these counts made for seasonal traffic fluctuations in summer (increased park traffic), winter (winter resident influx) and during the school year are also given.

a) General Corridor Level of Service Along Crandon Boulevard

The Village of Key Biscayne is nearly fully developed, but the potential exists for increased future traffic volumes on Crandon Boulevard. An undeveloped commercial parcel across from Key Colony will likely be developed in the near future. An increase in commercial square footage also is possible for some of the existing commercial developments, given their current build-out below the allowable 0.50 Floor Area Ratio (FAR). Older single-family homes within residential areas are being redeveloped into larger homes for larger families with more cars. The Ocean Club condominium development, which currently has a very low average yearly occupancy rate of ~30%, could see an increase in occupancy rate over the next decade such as the Key Colony development experienced in the 1990's. These growth factors will certainly lead to increased traffic volumes. When taken together with a general increase in background traffic, an increase in traffic volume on Crandon Boulevard of approximately 10% could occur over the next 20 years.

The segment of the Crandon Boulevard corridor north of the Harbor Drive / Ocean Lane Drive intersection carries the highest traffic load within the Village limits with a current average daily Peak Hour volume of 2343 vehicles per hour. This equates to a level of service B for the existing four-lane divided roadway configuration. Even with the projected future traffic increases discussed previously, the level of service for this link remains at B, indicating that the existing four-lane section configuration has ample capacity and provides a very acceptable level of service.

The level of service at the signalized intersections along Crandon Boulevard is not as adequate. Three of the six signalized intersections along Crandon Boulevard perform at an acceptable, according to the Transportation Research Board, LOS D or above during A.M. peak, mid-day peak, and P.M. peak conditions. The other intersections experience LOS E or worse on the intersecting side streets. The three signalized intersections operating at a substandard LOS are, from North to South:

- Crandon Boulevard and Harbor Drive
- Crandon Boulevard and Key Colony Entrance
- Crandon Boulevard and West Wood Drive

b) Crandon Boulevard, Ocean Lane Drive, and the Harbor Drive Corridor to Fernwood Road

All traffic entering and leaving the Village of Key Biscayne and Bill Baggs Cape Florida State Park passes through the intersection of Crandon Boulevard with Ocean Lane Drive and Harbor Drive. The heaviest regular congestion experienced within the Village is at this intersection. The northbound and southbound Crandon Boulevard approaches to the intersection operate at LOS C at peak hour volumes, the worst level of service encountered on Crandon Boulevard. The delays for vehicles traveling from northbound Crandon Boulevard to westbound Harbor Drive are particularly bad, and queuing vehicles spill over into the inner northbound Crandon Boulevard through lane.

Congestion at this intersection is driven primarily by geometric factors which limit the effectiveness of two particular movements through the intersection: left turns onto Harbor Drive from northbound Crandon Boulevard, and left turns onto Crandon Boulevard from eastbound Harbor Drive. The first movement, left turns onto westbound Harbor Drive from northbound Crandon Boulevard, can be rectified by lengthening the northbound left turn bay in the Crandon Boulevard median. There is ample room in the median; lengthening the turn lane will require the relocation of a few coconut palms in the median.

The Harbor Drive eastbound approach to Crandon Boulevard operates at LOS E for A.M. peak and mid-day conditions. Harbor Drive is the primary collector street for much of the local and commuter traffic from the primarily single-family residential neighborhood on the west side of the Village. Three churches with day schools also are located along Harbor Drive. Consequently, this street carries a higher traffic volume than any other road in the Village except Crandon Boulevard. The delay experienced at the Crandon Boulevard signal causes A.M. peak hour vehicular queuing from the signal back to Fernwood Road.

Compounding the effect of the intersection's poor LOS are problems created by the existing multiple commercial access drives along Harbor Drive between Crandon Boulevard and Fernwood Road. Unrestricted movements into and out of these access drives, coupled with high pedestrian and bicycle activity, create unsafe conditions. These problems are particularly acute in the A.M. peak when the extensive vehicle queuing occurs along eastbound Harbor Drive as residents drive to work and return from dropping students off at the schools.

Resolution of the problems with the second movement (left turns onto Crandon Boulevard from eastbound Harbor Drive) requires a more extensive solution. The existing eastbound Harbor Drive lane configuration consists of a through/left lane, a short (100 ft long) left turn lane, and a very short right turn lane. During A.M. peak conditions, 20 or more vehicles wait between light changes, creating a queue back to Fernwood Road. On many occasions, at least two light changes are necessary to clear this intersection. Analysis confirms that the existing left turn lane on eastbound Harbor Drive is too short, and needs to be roughly doubled in length to

accommodate more left turning vehicles. The existing right turn lane is almost completely ineffective during peak hours due to its extremely short length. Right-turning vehicles have to wait in the through/left lane before getting to the right-turn lane, and thereby add to the congestion. This also leads to vehicles driving on the shoulder (or swale) to avoid the delay, creating safety and maintenance problems as shown below. For these reasons, the right-turn lane also needs to be extended.



Swale Damage due to Vehicles Driving on Shoulder

A solution to the congestion and public safety concerns at the intersection of Crandon Boulevard, Ocean Lane Drive and Harbor Drive, and along the Harbor Drive corridor from Crandon Boulevard to Fernwood Road, has been a long-term, high priority item for the Village Council and was of particular importance to the Advisory Committee. The various problems with congestion, pedestrian safety and vehicular safety in this area are catalogued in Figure 4, a graphical representation of the existing conditions on the Harbor Drive approach to the Crandon Boulevard intersection. Several options were considered by the Advisory Committee to solve one or more of the problems. The options are discussed here as they were presented to the Committee, in increasing order of ability to solve the contributing problems, engineering and construction complexity, and cost.

Option 1

The first option studied for the relief of these problems was a minimalist solution that also was also the least involved and least costly. The existing pavement area would be utilized with minor widening, and restriped to provide a continuous eastbound left turn bay in the center of the Harbor Drive east of Fernwood Road. Curbing and other operational and pedestrian improvements also would be incorporated. As seen in Figure 5, this option addresses most of the pedestrian safety problems and one vehicular safety problem, but does nothing for vehicular congestion.

Option 2

The second option was similar to the first option, but incorporated additional improvements at the intersection of Fernwood Road as shown in Figure 6. Option 2 is more effective than Option 1 in terms of vehicular safety, but equally ineffective in relieving congestion.

Option 3: Plan Recommended by the Advisory Committee

Figure 7 illustrates the lane configuration improvements needed to reduce overall congestion at the Crandon Boulevard intersection with Ocean Lane Drive and Harbor Drive to LOS D for current and future anticipated traffic loads. A roundabout is proposed at the intersection of Harbor Drive and Fernwood Road. This large roundabout, which is navigable by buses and semi-trailers, resolves many of the aforementioned problems. The dog-leg between the northern end of Fernwood Road and the easternmost entrance to the St. Agnes Catholic Church property is eliminated, traffic flow from Fernwood Road at peak hour volumes is improved, pedestrian safety is enhanced, and, as discussed below, the roundabout serves as a legal U-turn for vehicles exiting the reconfigured commercial parking lot accessways along the northern frontage of the Harbor Drive corridor.

The primary vehicular safety problem at the Harbor Drive approach to the intersection is that of unrestricted commercial access driveways. The problem is particularly bad with regard to the vehicles exiting the access drives along the north side of Harbor Drive. Due to their uses, these properties (particularly the 7-11 convenience store in the Harbor Plaza shopping center, and the Oasis cafeteria) generate high A.M. peak demands. Vehicles exiting these driveways generally want to turn left onto eastbound Harbor Drive, where they must jockey for position into the queue of vehicles waiting at the Crandon Boulevard signal. These actions cause traffic conflicts and safety concerns. The recommended concept plan shown in Figure 7 addresses these access and safety issues by prohibiting left turns onto eastbound Harbor Drive and diverting exiting vehicles from these particular drives westbound toward Fernwood Drive, where they can safely U-turn at the new roundabout. The time delay to the vehicle drivers is less than 16 seconds, a minor trade-off compared to the safety and operational improvements gained along Harbor Drive.

The recommended plan also addresses existing pedestrian safety issues related to sidewalks, or, rather, the lack of sidewalks, along much of the north side of Harbor Drive. New 8 ft wide sidewalks are proposed along both sides of Harbor Drive. The problem with Oasis patron vehicles parking on, and backing over, the existing striped "sidewalk" (see photograph below) is resolved by the reconfiguration of the Oasis parking lot in a public/private venture, as shown on Figure 7.

The three redesign plans described above were presented to the owners and managers of the commercial properties, as well as to Village Council members, at a series of public meetings. All commercial and institutional (church) property owners along Harbor Drive attended the meeting on August 24, 2003. The owners expressed unanimous support for the draft Recommended Plan. Revisions were made to the plan to address their comments and concerns, as some of the recommended plan improvements occur on private property and affect the access to certain properties. The Village should execute agreements with each affected owner, prior to construction, as needed to record the approval of specific improvements affecting specific properties.



Existing Oasis Parking

c) Crandon Boulevard and Key Colony Entrance

Signal timing is one cause of the congestion problem at the intersection of Crandon Boulevard and the multi-part driveway that provides the only vehicular access to, and exit from, the Key Colony condominium complex. Delays along the short entrance and exit lanes cause operation at LOS E for the driveway at A.M. peak conditions.

Intermittent problems with right-turning and left-turning vehicles from Crandon Boulevard into Key Colony were reported and observed during the traffic study conducted for this report. Unsafe conditions along Crandon Boulevard are created when vehicles occasionally stack up in the southbound Crandon Boulevard left turn lane, or on the northbound outside through-lane due to vehicles queuing at the guardhouse entrance to Key Colony. This problem is not necessarily related to the peak traffic conditions or signal timing, but appears to be driven primarily by guardhouse gate operations for visitors and service vehicles.

The existing configuration of one of the Key Colony residents' entrance lanes is unusual in that it is located to the left of the central median and guard house, and thus appears to be one of the exit lanes (see left panel of Figure 10). The right turn northbound exit lane has a sweeping radius onto Crandon Boulevard, and is separated from the left-turn southbound exit lane by a heavily landscaped median. This configuration increases the pedestrian route distance across the entire entrance resulting in a safety problem due to restricted visibility.

Pedestrian safety also is compromised at this intersection. Currently, pedestrians leaving or entering Key Colony from the sidewalks along Crandon Boulevard are directed to the entrance's center median instead of to the corner of the intersection. This can be confusing to the pedestrian and to the motorist using the driveway. Due to the lack of curbing, pedestrians

crossing from the east side of Crandon Boulevard also must dodge northbound vehicles using the swale to make right-hand turns into Key Colony.

Advisory Committee Recommendation: *A reapportionment of the signal timing between phases will improve the LOS for the Key Colony entranceway that acts as a side street in the intersection with Crandon Boulevard. The Village should endeavor to work with Key Colony to resolve problems with guardhouse operation that contribute to stacking of incoming visitor and service vehicles across the entrance and into Crandon Boulevard. A reconfiguration of this intersection may resolve and lessen the various operational and safety problems discussed above; the proposed plan is detailed in the right panel of Figure 10.*

d) Crandon Boulevard and West Wood Drive

LOS A is maintained at this intersection for northbound and southbound Crandon Boulevard during A.M. peak, mid-day peak and P.M. peak periods. The intersecting side street, West Wood Drive, drops to LOS F for eastbound traffic during A.M. and P.M. peak conditions. This excessive side street delay is clearly caused by signal timing.

Another problem is the close proximity to the intersection of a driveway funneling one-way traffic westbound onto West Wood Drive out of the parking lot fronting units, including a Blockbuster Video store, at the southern end of the shopping center anchored by the Winn-Dixie market. The Village erected a no-left turn sign to discourage stacking of cars across both lanes of West Wood, and in the one-way exit, when one or more eastbound cars are waiting for the red light to change.

Advisory Committee Recommendation: *A reapportionment of the signal timing between phases, or a modification of the signal operation for split eastbound/westbound phasing, are the simplest solutions to the problem of excessive side street traffic delay for eastbound traffic at West Wood Drive and Crandon Boulevard. Alternatively, the eastbound approach could be reconfigured to provide a short left-turn lane at the easternmost end of West Wood Drive in order to improve the eastbound peak hour LOS.*

Increased law enforcement to prevent left turns, and a directionally restricted driveway reconfiguration, are recommended for the one-way exit from the shopping center parking lot that abuts the Crandon Boulevard/West Wood Drive intersection. Sidewalk and curb gutter along both sides of West Wood Drive to Fernwood Road will address public safety concerns raised by the high level of pedestrian and leisure bicycling activity in the area (see Figure 17).

e) General Pedestrian Safety Improvements at Intersections

A main objective of this Master Plan study, reiterated in many of the individual items considered by the Advisory Committee, is the pedestrianization of Crandon Boulevard. From a pedestrian safety perspective, this need is most evident at the numerous broadly sweeping intersections along the corridor. As a general rule, the existing radius returns at these intersection corners are excessively wide, resulting in longer than necessary pedestrian crossing routes.

Existing sidewalks are continuous along both sides of Crandon Boulevard. However, very few delineated pedestrian crosswalks cross Crandon Boulevard, the intersecting roadways, and major driveways. Only five marked pedestrian crosswalks currently exist across Crandon Boulevard within the Village limits, and only ten marked crosswalks exist across intersecting side

streets and major driveways. This condition is clearly substandard given the level of pedestrian activity along Crandon Boulevard.

The standard 10 ft wide crosswalks delineated by parallel 12 in wide white stripes, although in accordance with the Manual of Uniform Traffic Control Devices (MUTCD), are not the most effective means of conveying to the motorized vehicle drivers that they are approaching a pedestrian priority area. The use of a contrasting material on the crosswalk itself, as well as the infield of the intersection, is much more desirable and effective.

The use of pedestrian activated high-intensity inset flashing lights at pedestrian crosswalks has gained popularity in various jurisdictions as an added safety measure. These low-profile lights are set flush with the pavement along the edges of the crosswalks, and provide a rapidly flashing yellow light when pedestrians are crossing (see Figure 8).

Advisory Committee Recommendation: *The intersections of Crandon Boulevard and side streets should be modified by reconstructing the turning radii to smaller dimensions, thereby greatly reducing the distance of roadway traversed by pedestrians at a crossing. The smaller radii also will reduce the speed of turning vehicles. This traffic calming element will increase pedestrian safety.*

Full intersection pedestrian crosswalks, such as the one currently planned by the Village at West McIntyre Street-Galen Drive-Crandon Boulevard intersection, should be provided along Crandon Boulevard at each intersection of a side street or major driveway. The pedestrian crosswalks should be located immediately adjacent to the end of the median bull nose for added pedestrian safety, and well delineated and contrasted with the pavement to clearly indicate that it is a pedestrian priority area.

Red brick pavers were selected as the preferred material for the crosswalks, and blue-gray pavers, as shown below, were selected for the infields of the intersection. These materials and colors will be similar to materials used recently throughout the Village on various civic projects, as shown below. High-intensity inset flashing lights should be at all crosswalks across Crandon Boulevard in order to enhance pedestrian safety.



Palette of Pavers to be Used at Intersections

Figures 9 through 20 depict each intersection of Crandon Boulevard with a side street or major driveway. The figures shown on the left of the fold-out panels are the existing configurations with identification of the problems at the intersections. Proposed improvements for the intersection, designed in accordance with the Committee discussions, are shown on the right of each fold-out panel.

VII. ROADWAY TYPICAL SECTION ELEMENTS

a) Right-of-Way Utilization

The Crandon Boulevard right-of-way maintains a 120 ft width throughout the Village limits. The existing, 6 ft wide, meandering sidewalks were constructed when Crandon Boulevard was widened by Dade County to its current four-lane divided configuration from 1969 to 1970. The meanders in the sidewalk cause the dimension from back-of-sidewalk to back-of-sidewalk to vary from 100 to 120 ft. In some areas, the back of sidewalk is at the right-of-way line. In other areas, the back-of-sidewalk can be as much as 10 ft from the right-of-way line.

The meandering sidewalk was an aesthetic design element of the roadway reconstruction project, and was not done to avoid existing trees and landscaping, although trees and landscaping were undoubtedly preserved. Since then, many of these unoccupied right-of-way pockets created by the meanders have been heavily landscaped as shown below:



Landscaping in Right-of-Way behind Sidewalk



Landscaping in Right-of-Way behind Sidewalk

Advisory Committee Recommendation: *The existing back of the sidewalk line should be respected in proposed Master Plan improvements to preserve as much existing landscaping along Crandon Boulevard as possible. Given the extreme width of the right-of-way, improvements such as bicycle lanes and wider sidewalks could be easily accommodated while largely maintaining the existing back-of-sidewalk line. The only exception is for sidewalks abutting existing walls along the right-of-way line. A small setback of 3 ft from the wall is recommended to create room for landscaping between the wall and the sidewalk.*

b) Median Width, Curb Cuts, and Turn Lanes

The existing Crandon Boulevard median is 22 ft in width, including the 2 ft wide concrete curb and gutter on either side. The existing median width and curbing are adequate to meet current safety standards. The 18 ft wide curb-to-curb portion of the median is landscaped with staggered rows of coconut palms and sod. The median has sixteen openings within the Village limits. Fifteen of these openings occur at intersections with side streets or major driveways. One opening, in front of the Village Green, exists solely for U-turns. Most of these median openings have associated left-turn bays at one or both approaches. Where left-turn lanes are provided, the medians are pinched down to accommodate the turn lanes, and landscaped with low flowering shrub material. Typical median conditions for both full median and left-turn lane areas are shown below.



Typical 22 Ft Wide Median



Typical Pinched Median at Left-Turn Bay

Advisory Committee Recommendation: *Leave the existing median configurations as is, with three exceptions:*

1. *The existing gray concrete curb and gutter should be replaced to match the Key Coral color selected for the sidewalks and the outside edge curb and gutter / valley gutter.*
2. *The left turn bays on Crandon Boulevard at the intersection with West Enid Drive and Sunrise Drive are configured, and locked into, a problematic dog leg intersection. The bays should be slightly offset across from each other to provide clearer sight lines and safer operating conditions at this intersection (see Figure 15).*
3. *The existing median bullnoses and turn lanes should be cut back or extended as needed to accommodate the intersection safety improvements described in Section VI (e) of this report*

c) Traffic Lanes

Crandon Boulevard currently has two southbound and two northbound through lanes. All lanes are 12 ft wide. The traffic analysis of the corridor, as discussed in Section VI.a, indicates that the number of lanes is appropriate and adequate to meet current and projected future traffic volumes.

Advisory Committee Recommendation: *Reduce the width of all four through lanes along Crandon Boulevard from 12 ft to 11 ft in accordance with current Miami-Dade County Public Works standards. This lane narrowing will have a mild*

traffic calming effect and provide space for continuous northbound and southbound bike lanes.

d) Bicycle Facilities (On-Road)

Many road cyclists and leisure cyclists utilize the Crandon Boulevard northbound and southbound outside traffic lanes during the week and, especially, on weekends. As shown below, a cyclist can easily occupy the outside third of the lane. Large groups of cyclists traveling along the corridor on weekends often occupy 1/2 to almost all of the outside lane. Drivers traveling in that lane often swerve into the inside lanes to avoid hitting the cyclist.



Road Cyclist on Outside Travel Lane

This condition of cyclists sharing the outside lane with motorized traffic creates a potential safety hazard. The American Association of State Highway Transportation Officials (AASHTO) recommends wide outside lanes or bicycle lanes of a 4 ft minimum width for roadways subject to bicycle traffic in urban conditions.

Advisory Committee Recommendation: *Construct a 4 ft wide bicycle lane along each side of Crandon Boulevard within the Village. Connect these lanes to the existing bicycle lanes within Crandon Park that now end at the northern Village limits. Since the traffic lanes are being narrowed from 12 ft to 11 ft in width, 2 ft of pavement widening on either side of Crandon Boulevard, combined with a 2 ft reduction in the swale width will result a 4 ft wide bicycle lane on both sides of the street.*

e) Curbing (Outside Edge of Pavement)

Nearly the entire length of Crandon Boulevard has a 3 ft wide, green-tinted, concrete valley gutter along the outside edge of the pavement. This valley gutter, shown in the photograph below, was constructed by Dade County from 1969 to 1970 during the four-lane expansion of Crandon Boulevard, and serves to define the roadway edge and to convey storm water runoff into the drainage system.



Existing Valley Gutter at Edge of Pavement

Some segments of Crandon Boulevard have raised curb and gutter along the outside edge of the pavement, and at a few intersection radius returns. Taken together they amount to less than 10% of the total length of the road. The valley gutter is problematic in commercial areas of the Village because delivery and other vehicles park on, or drive over, the swales (see photo below). Most importantly, the valley gutter creates safety concerns where sidewalks are in close proximity to the road.



Parking in Swale Area

Advisory Committee Recommendation: *Provide curb and gutter along the outside edge of pavement where the Crandon Boulevard fronts commercial*

property, in addition to areas where the sidewalk is in close proximity to the road. All other areas should have valley gutter along the outside edge of pavement.

f) Sidewalks – Shared Pedestrian / Bicycle Facilities

The majority of existing sidewalks along both sides of Crandon Boulevard are 6 ft wide, constructed of green-colored concrete, and are continuous throughout the Village limits. Exceptions are the new, 8 ft wide, Key Coral-colored patterned sidewalk in front of the Pankey Institute near the Village Entrance, the new 8 ft to 10 ft wide red paver sidewalks in front of Fire Station and the Suntrust Buidling at the Civic Center, and the lack of a sidewalk for the last few hundred ft along the west side approach to Bill Baggs Cape Florida State Park. The 6 ft sidewalk width is in accordance with current standards for pedestrian sidewalks. However, this width is narrow since Crandon Boulevard sidewalks are subject to a wide variety of uses and a fairly high volume of combined pedestrian and leisure bicycle activity as illustrated below. In addition, the sidewalks in some areas have cracks and uneven surfaces that are a safety concern.



Typical Sidewalk Use

The Village, in recent years, has required that reconstructed portions of Crandon Boulevard sidewalks be widened to 8 ft or more, as illustrated below. This is in compliance with current standards for shared pedestrian/bicycle facilities that require a minimum sidewalk width of 8 ft. Sidewalk installation costs are paid by the developer of the new construction.



Sidewalk in front of Lake Park



Sidewalk in-front of Pankey Institute

Advisory Committee Recommendation: *Provide minimum 8 ft wide concrete sidewalks along both sides of Crandon Boulevard in the Village standard Key Coral color, with the pattern and finish to match the sidewalk constructed in front of the Pankey Institute property at the entrance to the Village (as shown in the picture above, and to the right). The sidewalk on the west side of Crandon Boulevard shall be extended a few hundred ft from its current southern endpoint to the edge of Bill Baggs Cape Florida State Park.*

The Advisory Committee supports the Village requirement that new developments and redevelopments along Crandon Boulevard pay for installation of new sidewalks. The Village should encourage developers to provide dedicated pedestrian access from the Crandon Boulevard sidewalk into the development's internal pedestrian circulation system. This access is separate from the vehicular access. The Village also should work with owners of existing commercial properties to provide safe, dedicated pedestrian access for customers and employees. Stop signs, speed control devices, and pedestrian crossing signs are recommended at each driveway that crosses a sidewalk.

g) On-Street and Off-Street Parking / Commercial Property Access

Currently, no designated on-street parking exists along Crandon Boulevard within the Village boundaries. Parking on the swales is not permitted, except along the Village Green frontage for special or recreational events on weekends, holidays, and weekday afternoons during sports seasons when the parking demand is high. The existing off-street parking lots, garages, and side street parking are not meeting the parking demands of the various commercial developments along Crandon Boulevard. The Village has authorized a special study relating to this issue. The addition of on-street parking on Crandon Boulevard could adversely affect traffic safety and bicycle safety, and would only be justified by a substantial unmet parking demand.

The lack of a cross connection between adjacent shopping center parking lots was a concern of the Advisory Committee. This condition can lead to intermittent parking shortages, and also results in a profusion of driveways along the Crandon Boulevard frontage. Cross connection of some of these commercial property parking lots would be a desirable improvement, and would help even out intermittent parking saturation problems. This would allow the overflow from one parking lot to feed into the neighboring property, and vice-versa. The cross-connection of the lots also would allow shared driveway use, and could result in fewer curb cuts across the swales and sidewalks by elimination of some of the less than ideally located driveways.

Advisory Committee Recommendation: *The Village should work with and encourage Crandon Boulevard commercial property owners to allow cross-*

connections between properties and directional driveway openings for one-way traffic conditions.

h) Loading Zones

The unlawful use of the grass swales, and the left turn bays in the median of Crandon Boulevard, for commercial vehicle deliveries and loading was identified as a public safety concern within the Village. The problem is limited primarily to the west side of Crandon Boulevard from Harbor Drive to West Mashta Drive, adjacent to the various commercial shopping centers that exist along that segment. None of these shopping centers have designated loading zones on site. This use of the right-of-way for commercial loading appears to be driven by the lack of adequate loading zones within most of the commercial properties fronting Crandon Boulevard. Loading zones in some of the shopping centers have apparently been converted into parking spaces or other uses. In some cases, a new loading zone cannot physically be accommodated within a given commercial property. Loading zone requirements for new commercial developments have been in the Miami-Dade County and Village of Key Biscayne Zoning Codes for many years. These requirements certainly were in place for the County when most of the commercial development along Crandon Boulevard occurred prior to the incorporation of the Village. The resolution of this loading zone conversion issue is best handled with site plan and zoning code enforcement.

The unlawful use of the right-of-way for commercial loading is a public safety matter for law enforcement that should be coordinated with the zoning code enforcement effort in order to minimize the disruption of commercial deliveries to the affected shopping centers. The proposed installation of curb and gutter along the outside edge of pavement fronting commercial developments along Crandon Boulevard will discourage the use of swales for loading.

Regulation of commercial delivery hours was discussed by the Advisory Committee as a possible solution to the right-of-way use as loading zone issue. The theory was that if delivery hours could be restricted to very early morning, for example, then the shopping center parking lots would be empty and available as loading zones. Research into how other jurisdictions have enacted delivery hour regulation ordinances indicated that these regulations were invariably implemented as a result of, and in response to, a lack of adequate on-street parking. The use of curbside areas for loading can severely restrict parking in a given commercial district. This is not the case along Crandon Boulevard.

A case was brought before the Advisory Committee by three property owners in November 2003 alleging that on-street were justified since on-site loading zones could not be physically accommodated within their adjacent commercial properties at 800 Crandon Boulevard, 30 West Mashta Drive, and 50 West Mashta Drive.. The original request was for Committee approval for one semi-trailer loading zones and two delivery zones in the swale of the right-of-way along West Mashta Drive that, according to the presenters' proposed site plan, would cover most of the southern swale with pavers. The Committee, after heated discussion, voted against bricking over the swale and instead recommended a single community loading/delivery zone for all properties at the western edge of the 800 Crandon Boulevard's swale along West Mashta Drive.

Advisory Committee Recommendation: Commercial developments along Crandon Boulevard should have dedicated loading zones within their properties. Zoning code enforcement should be used to resolve situations where loading zones have been converted to parking spaces or other uses. The Village should discourage the dangerous use of the right-of-way (i.e., swales, turn lanes) for commercial loading via strict law enforcement and the installation of curb and gutter along the outside edge of pavement fronting commercial developments.

The Village should not consider regulations to restrict delivery hours to the very early morning or late at night. Such rules would place an undue and unfair burden on the commercial properties.

A community loading/delivery zone is recommended along the western edge of the 800 Crandon Boulevard property's West Mashta Drive frontage to serve the delivery needs of that property, the office buildings at 30 West Mashta Drive and 50 West Mashta Drive, and the Le Phare condominium.

i) Street Trees and Swale Irrigation System

Street trees along Crandon Boulevard within the 120 ft right-of-way are, with very few exceptions, limited to the staggered double row of coconut palms in the median. The lack of shade on the streets or on the sidewalks is demonstrated by the typical conditions shown below:



In fact, a study of shade coverage indicated that less than 15% of the sidewalk area, and even less of the pavement area, is shaded at noontime. The Village Council and the Advisory Committee felt strongly about the need to provide more shade on the sidewalks to encourage pedestrian activity. Examples of the level of shade coverage proposed along Crandon Boulevard are shown below in views of some local roads in Miami.



Examples of Proposed Levels of Shade Coverage for Crandon Boulevard

Advisory Committee Recommendation: Increase tree canopy coverage and plant density along Crandon Boulevard and adjacent sidewalks by installing shade trees, palms, shrubs and other plant materials.

Canopy shade trees will be planted at approximately 35 ft to 40 ft on centers. Due to applicable AASHTO clear zone requirements, these trees shall be set back at least 10 ft from the edge of the outside travel lane when planted along a valley gutter section of roadway. This distance can be reduced to 4 ft from the face of the curb for a curb and gutter roadway section. Coconut palms will be added along the median and in clusters within the swales to enhance the existing coconut-themed streetscape. Palms with small diameter trunks will replace the canopy trees at intersections due to sight line and visibility concerns. Flowering trees will be used to add interest and color along the corridor.

The installation of an irrigation system within the swales is recommended to optimize the health and maintenance of the various plantings proposed along the roadside. Species selection and planting locations will be made by a landscape architect selected by Village Council as part of the Crandon Boulevard engineering and landscape implementation team.

j) Drainage

The existing roadway drainage system along Crandon Boulevard consists of a series of large valley gutter-type catch basins connecting into a continuous large diameter (≥ 36 in) positive drainage system. The system was constructed in 1969 to 1970 by Dade County when Crandon Boulevard was widened to four lanes, and discharges to the bay via two large diameter outfalls. One outfall is located at the southern end of Crandon Boulevard at the Pines Canal, and the other is located on Harbor Drive near the Key Biscayne Yacht Club. The drainage system for Crandon Boulevard appears to be in very good condition. Problems with ponding or lack of drainage have not been reported.

The proposed improvements along Crandon Boulevard will have the combined effect of increasing the impervious area within the right-of-way by less than 8% due to wider sidewalks, and the removal of a 2 ft wide portion of each swale for bike lanes. Considering the condition of the existing drainage system, and the high safety factors to which arterial roadway drainage systems are designed by MDCPW, the existing system should be easily capable of accommodating the marginally higher runoff from the increased impervious area. The existing catch basins are wide enough to be easily modified to accommodate the new runoff inlets that

will be slightly offset from the existing structure centerlines due to the 2 ft widening of the road surface to accommodate the proposed bicycle lanes.

k) Proposed Typical Sections

Figure 21 shows the five typical sections proposed for the Crandon Boulevard Master Plan, including the design of various typical section elements discussed above. The sections are labeled A through E. The third sheet of Figure 21 indicates the areas where each of these five typical sections is applicable along the corridor.

VIII. STREETScape IMPROVEMENTS

a) Streetscape Design Concept

The Advisory Committee held a series of discussions, presentations, and workshops on the overall design concept for the Crandon Boulevard Master Plan Streetscape, including the design of individual streetscape elements. “Visioning” exercises were conducted to evince key word associations about living in the Village of Key Biscayne, in particular, and on an island, in general, from the members of the Committee. Key words were grouped into themes that provided guidance in deciding on the overall design concept. The themes were then woven into a narrative that was used to identify proposed streetscape improvements that fit into the design philosophy. The overall idea is to maintain and enhance the existing character of Crandon Boulevard, while making the road safer, more efficient and more pedestrian-friendly. The Committee approved the following Design Concept Narrative:

Entrance / Arrival / Transition

- Entering through dense forest / Then clearing at Village
- Extend “jungle” to Village limits
- Large, dense, natural shade trees and understory planting to create a transition before entering Village

First Impression / Welcoming / Clean / Home

- Human Scale / Village
- Existing coconut trees in median
- History of coconut groves on island
- Shade trees interspersed with coconut palm trees in median and swales to provide shade for sidewalk
- Low, irregular planting below coconut palm trees
- *Ficus repens* growing over existing low walls

Image / Peaceful / Calming / Understated Elegance / Laid-Back

- Disconnect between understated elegance and laid back
- Small trunk palm trees at intersections, in keeping with understated elegance
- Combinations of coconut palm trees and shade trees in swales for laid-back feel

Place / Island / Laid-Back

- Colored concrete for sidewalk
- Same pattern as existing in front of the Pankey Institute
- Key coral color concrete for sidewalk with broom, rock salt and stipple finish
- Blue-gray pavers at intersection, change in color
- Red brick pavers at crosswalks

In order to break the “sameness” along Crandon Boulevard, the plan extends the Village Green into street. A hiatus in the coconut trees in medians and swales is filled in by the use of the same trees at the same density as they are used in the park. The effect should be as if the street is part of the park. The design concept also provides a transition in the road via a change in material when entering and when leaving the Village Green. Art can be placed in the median to further create this break.

b) Village Entrance

The sense of arrival to the Village will be accentuated by an increase in density of trees and understory plantings just north of the Village limits. This is consistent with the County’s Crandon Park Master Plan. These dense plantings will create a greater contrast upon leaving Crandon Park and entering the Village. The addition of curb and gutter along the outside edge pavement from the Village entrance to Harbor Drive will control the problems with parking on, and driving over, the swales that now give the entrance a ragged and unkempt appearance.

The Village had an entrance feature in the median of Crandon Boulevard located just north of the Village limits (see photograph on next page). Because it was built on Crandon Boulevard Park property prior to incorporation and prior to the implementation of the Crandon Park Master Plan, the Village was required to demolish the structure. The Committee reviewed several ideas and designs for a new Village entrance feature, a Village announcement board and a mounting for civic organization signs.

The existing commercial developments along the west side of the Crandon Boulevard, now housing La Carreta Restaurant and the Stefano’s complex, were constructed many years ago, and were apparently not required to provide a landscaped strip to buffer and shield the view of the parking lots from the roadway. This condition is unsightly, especially since it occurs at the entrance to the Village.

Advisory Committee Recommendation: *A new entrance feature, similar in character to the original coral rock feature, should be constructed just within the northern limit of the Village of Key Biscayne. The designs and locations for the new entrance feature, an announcement board and a mounting for civic organization signs are depicted in Figure 22.*

The new 8 ft wide sidewalk fronting the commercial area just south of the Village entrance should be offset approximately 5 ft to 6 ft from the right-of-way line to allow the construction of a 4 ft high coral rock wall along the right-of-way line. The area between the wall and the back-of-sidewalk will be planted to create a landscaped buffer behind the sidewalk and to obscure the view of the adjacent parking lots.



Original Village Entrance Feature

c) Pocket Parks / Mini-Plazas

Large areas of existing pavement within the right-of-way will be eliminated and will revert to the pedestrian and landscape realms as a result of the intersection improvements and reconfigurations described in Section IV (e) of this report. These newly created pockets of usable land should be configured for the use of pedestrians.

Advisory Committee Recommendation: Create pedestrian-friendly pocket parks and mini-plazas along Crandon Boulevard out of swales reclaimed from pavement during Master Plan reconstruction at locations shown in Appendix D. Due to the existing geometry of the intersecting roadways, new pocket parks will be created only at the southern end of Crandon Boulevard, where the angle between the intersecting roadway centerlines is more acute. These mini-plazas would consist of small areas of pavers with benches surrounded by trees, and landscaping, and could have trash cans, newspaper vending machines or Art in Public Places displays. The locations of public art would be determined in cooperation with the Art in Public Places Committee.

d) Street Furniture and Locations of Public Art

The Advisory Committee reviewed several designs and colors for benches, trash containers, bicycle racks, and drinking fountains for use along Crandon Boulevard. The Committee discussed newspaper vending machines in the public right-of-way, and the unsightliness of these items due to the proliferation of different colors, sizes, and shapes. Municipalities are precluded from prohibiting these newspaper racks by laws guaranteeing free speech, but they can regulate the type, color, size, shape and locations of vending machines. The need for pet waste stations and the existing locations of large commercial mailboxes also were addressed.

Advisory Committee Recommendation: Benches, trash receptacles and bicycle racks are recommended in the designs shown in Figure 23. All items will have a powder-coat finish in a Hunter Green color, similar to the Tiger Drylac brand color RAL6028. The street furniture will be concentrated in areas where pedestrians tend to congregate such as near corners, at bus stops and shelters, and at proposed mini-plazas and pocket parks.

Drinking fountains identical to those at the Village Green should be installed along Crandon Boulevard at Lake Park, the Library and the large bus shelter just north of Harbor Drive. These drinking fountains are not water coolers. They require a portable water service, but not an electrical service.

Uniform newspaper vending racks should be installed at a few strategic points along Crandon Boulevard, such as near bus stops. These racks will have a Hunter Green finish, and will be located such that surrounding landscaping will soften their profiles.

Pet waste stations should be located at strategic areas along Crandon Boulevard. The Village would be responsible for maintenance of these stations and for disposing of the waste.

The Village should work with owners of large commercial shopping centers to relocate mailboxes within their properties, making it more convenient for users.

e) Signalization

Signals exist at six of the intersections along Crandon Boulevard:

- Harbor Drive / Ocean Lane Drive
- Key Colony Entrance
- Sonesta Drive
- West McIntyre Street / Galen Drive
- West Wood Drive / East Wood Drive (Ocean Club North Entrance)
- West Mashta Drive / Ocean Club South Entrance

With the exception of the Key Colony Entrance span wire assembly, the signal systems are all Miami-Dade County standard mast arm-mounted signals as shown below:



Typical Mast Arm Signal Assembly

The Advisory Committee considered replacement of the existing signal systems along Crandon Boulevard with various decorative signal mast arms. Miami-Dade County utilizes unpainted steel mast arms with horizontally mounted signal heads. The replacement of the existing signals with decorative signal mast arms that are not in accordance with Miami-Dade County Public Works standards will make the Village responsible for the cost of their construction and maintenance. The cost estimate for these decorative signals was nearly \$100,000 per intersection.

Miami-Dade County reports that the Key Colony wire span signal assembly may be replaced when improvements are made to the intersection. The cost of replacement may be borne by the County if major reconstruction of the medians or islands is required.

Advisory Committee Recommendation: *Retain the existing MDCPW standard mast arms and electrolytically paint the steel with a Hunter Green color, in keeping with the color selected for the other streetscape elements. Replacement with the decorative signal assembly selected by the Advisory Committee could be reconsidered in the future if additional external funding is secured for purchase and installation costs.*

Encourage Miami-Dade County to work with the Village in redesigning the Crandon Boulevard- Key Colony intersection, and fund the replacement of the existing signal assembly

f) Street Lighting

The existing Village street lighting system along Crandon Boulevard was installed by the Village in the mid-1990s under permit from the MDCPW. The system is compliant with the Miami Dade County roadway illumination and electrical design criteria. The design and color of the existing light poles and luminaries are shown below.



Existing Street Lights

The Advisory Committee felt that the form and style of the existing poles and light fixtures is in keeping with the streetscape envisioned for Crandon Boulevard. However, the existing gray color of the light poles is not.

The existing light fixtures use high-pressure sodium lamps which emit an orange light. This type of light fixture is highly energy efficient, and it is widely used for street lighting systems. However, the orange light is considered undesirable by some communities. The Village of Key Biscayne opted for fixtures with a white light for recent Village road projects and, in the process, established a guideline for future improvements. The metal halide lamps that have been installed emit a very brilliant clear white light but are not as highly energy efficient as the high-pressure sodium lamps. A hybrid, color-corrected high-pressure sodium light fixture was considered by the Advisory Committee as a way of maintaining the energy efficiency of the high-pressure sodium lamp while providing a somewhat less brilliant white light than the metal halide.

Advisory Committee Recommendation: *Repaint the existing light poles and fixtures electrolytically in the Hunter Green color selected for the other streetscape elements. Replace existing lamps along Crandon Boulevard with a hybrid, color-corrected high-pressure sodium light fixture. This modification may be as simple as replacing the globe on the existing fixtures, but may require the replacement of the lamp and ballast as well.*

g) Traffic and Street Name Signage

The Advisory Committee was tasked with a review of the existing traffic signage on Crandon Boulevard to determine if the number and size of the signs could be reduced, and to recommend aesthetic enhancements to improve the look of the remaining signs. According to the Miami-Dade County Public Works Department, the existing traffic signs on Crandon Boulevard are already the smallest size that the Manual of Uniform Traffic Control Devices (MUTCD) allows for arterial roadways. They are actually smaller than the recommended size for arterials by MUTCD. All existing signs, with the exception of some parking signs, are required to meet the MUTCD criteria. Some of the parking restriction signs could be eliminated with the addition of curb and gutter along various segments of Crandon Boulevard.

The appearance of street name signs mounted on the signalization mast arms and the desirability of replacing the standard MDCPW reflective signs with internally illuminated signs were also discussed. Two internally illuminated options are available; one utilizes a fluorescent light with translucent panels, and the other an LED light source. Neither is currently a MDCPW standard item, so their maintenance may become a Village obligation after installation.



Advisory Committee Recommendation: *Replace the existing steel signposts with a decorative painted round pole fitted with a decorative metal placard. The actual traffic sign will be mounted and framed by the placard in a style similar to the examples shown below. The assembly will be in the same Hunter Green color as the other streetscape elements.*

Replace the mast-arm mounted metal side street name signs at the six signalized intersections with internally illuminated street name signs.

h) Utilities

In order to improve the overall aesthetics of the corridor, the Advisory Committee felt that steps should be taken to mitigate the visual impact of utilities, tree up-lights and electrical boxes, and irrigation services.

Advisory Committee Recommendation: *Mitigate the visual impact of overhead utility lines, roadside utility boxes, tree up-lights and electrical boxes, and irrigation sprinkler heads along the Crandon Boulevard corridor. Bury the overhead lines crossing Crandon Boulevard at several locations, and running along the west right-of-way line of Crandon Boulevard from Knollwood Drive to the entrance to Bill Baggs Cape Florida State Park.*

Any final design of the Crandon Boulevard improvements needs to be closely coordinated with utility companies, and provisions made to incorporate any future infrastructure or infrastructure upgrades they may be planning.

IX. COST ESTIMATES, FUNDING AND IMPLEMENTATION

a) Cost Estimates

A detailed Estimate of Probable Construction Cost was prepared for all of the improvements proposed in this report for Crandon Boulevard and the segment of Harbor Drive between Crandon Boulevard and Fernwood Road. The estimate was broken down by roadway segment

between intersections in order to facilitate phasing of the project. The estimate was based on computed quantities for the various items of construction multiplied by budgetary unit prices for each item. The resulting subtotal costs were then increased by established percentages to account for unquantifiable items such as contractor mobilization, maintenance of traffic, dust control and clean-up, utility conflicts and contractor performance bond. The full estimate is included in Appendix C.

Also included in the estimate were the required professional services for final design and construction documents, permitting, and construction administration. A 10% contingency was then added to the estimate to allow for items which are unforeseeable at this early master-planning stage of the project. The estimate of probable construction cost totals \$7,907,618, and can be broken down by roadway segment and intersection as shown in Figure 24.

b) Funding Sources

A variety of potential funding sources were investigated for the proposed improvements to Crandon Boulevard. The sources are detailed below with a discussion on fund amounts, limitations on spending and the likelihood of their availability. They are presented in order from the most readily available and within the control of the Village, to the least available at the time of this report.

Village General Fund

Allocations from the general fund are within the control of the Village Council, subject only to the budget process and the Village debt cap.

Half-Penny Transit Tax

The Village of Key Biscayne will receive approximately \$300,000 per year from the half-penny transit tax approved by Miami-Dade County voters in 2002. The use of these funds must be in accordance with the People's Transportation Plan that was submitted by the Village of Key Biscayne to the Citizens' Independent Transportation Trust (CITT) on December 16, 2003, prior to the December 31, 2003 deadline to be eligible for these monies. The Village submitted an earlier draft of this Master Plan report along with a cover letter and a 5-year implementation and funding plan in fulfillment of the CITT request (see Appendix E).

The CITT was established by Miami-Dade County to oversee allocation of the half-penny tax to municipalities within the County, and will review the municipal proposals for compliance with the CITT guidelines. Spending must be split in 20/80 ratio, with 20% of the funds dedicated to transit. Transit refers to mass transit, and includes expenditures to own and operate buses, trolleys, shuttles and rail, and the costs of bus shelters and bus benches. The other 80% must be spent on transportation projects such as roadways, bicycle facilities, and traffic calming, sidewalks, and landscaping essential to the project. These transit tax funds can be pledged by the Village to back a loan or bond. This will raise an estimated \$2,300,000 subject to the Village debt cap.

Metropolitan Planning Organization (MPO)

Crandon Boulevard is a county road and a principal urban arterial. The MPO partially funded the Master Plan Study for Crandon Boulevard. These two factors indicate a county commitment to the improvements along Crandon Boulevard, and could result in additional MPO funds for project implementation. The available funds stem from a variety of mechanisms including impact fees and gas taxes that are already in place. The Village would need to compete with the county and other municipalities to secure additional funds.

State of Florida

The State of Florida normally has very limited funds available for transportation improvements along non-state owned facilities. The current state budget problems limit these funds even further, and make their acquisition in the near term a remote possibility. Two particular state programs were identified as potential sources: the Florida Department of Transportation (FDOT) Local Assistance Program for off-system improvements, and the Conservation and Recreational Lands (CARL) program. The use of CARL funds is usually reserved for state land acquisition. However, the Bill Baggs Cape Florida State Park property was acquired with state Land Acquisition Trust Fund (LATF) money. There is precedence for using CARL funds to improve access roads to state parks that were purchased under the CARL program. This precedence may extend to the LATF program.

Miami-Dade County General Obligation Program

The County has proposed to bring before the electorate in 2004 a referendum to approve a bond issue in excess of \$1 billion. The bond money will be used for a variety of countywide improvements within both incorporated and unincorporated areas. The scope of these improvements has yet to be determined, and will be the result of a competitive political process.

Advisory Committee Recommendation: *The Village should lobby Miami-Dade County and the State of Florida for funds to implement the longer-term phases of the Crandon Boulevard Master Plan. Work to include the Crandon Boulevard Master Plan as part of the County's 2004 bond issue.*

c) Phasing and Implementation

The amount and availability of funding will be the two primary determining factors in the implementation schedule for the proposed improvements. The phasing discussed below is the most probable implementation strategy for the Crandon Boulevard Improvements and is based on the best available information and projections (see Figure 25).

Phase I

The Village of Key Biscayne is completing the Civic Center project with the construction of the Community Center and the streets in and around the Civic Center. The proposed reconfiguration of the intersection of Crandon Boulevard and West McIntyre Street, as planned for the Civic Center project, has been incorporated into the Crandon Boulevard Master Plan as Phase I. These planned intersection improvements extend north and south from West McIntyre Street, and east to Galen Drive, and include new signal mast arms, sidewalks and landscaping along Crandon Boulevard. This first phase is scheduled for completion in 2004, and it will be funded by the existing Civic Center construction project.

Phase II

The half-penny transit tax has been identified as the primary source of funds for the second phase of the Crandon Boulevard Master Plan implementation. This second phase has been estimated at \$4.0 Million. The transit surtax, as previously noted, can be leveraged to raise approximately \$2,300,000 for this purpose. In addition, the transit surtax funds collected by the Village prior to Phase II implementation (estimated at \$632,000) should be allocated to this phase. The surtax funds will be implemented by contributions from developers currently planning to redevelop commercial properties in this area. There is also an increasingly likely potential for State contributors estimated at \$1,000,000 in additional funding. Finally, the Village Public Works transportation budget (baseline spending) should also contribute. The

Advisory Committee recommends that the second phase consist of master-planned improvements along Crandon Boulevard from the Village entrance to the West McIntyre/Galen Drive intersection, and along Harbor Drive from Crandon Boulevard to Fernwood Road. This area is by far the most in need of reconstruction in terms of congestion, public safety and aesthetics.

The financing, final design, and permitting for the implementation of Phase II will take at least eight to ten months. A period of three to four months will include the bid process, selection of a contractor and awarding of the contract. Construction could begin as early as March or April of 2005, but will probably begin no earlier than late May 2005 after the school year is over. This will mitigate the impact of traffic disruptions, especially along Harbor Drive.

Phase III

Specific funding for the implementation of the Crandon Boulevard Master Plan beyond Phases I and II has not been identified. However, funding may be available from a variety of county and state sources. An example of a single source is the proposed 2004 County General Obligation Bond. A partial source could be the state CARL Fund. The exact mix of funding sources, and the amount of money obtainable, is unknown at this time. The location and scheduling of Phase III improvements may be controlled by the source and type of funding obtained. For example, state CARL and/or LATF funds (see Section IX (b)) may be available only if used to improve the southern portion of Crandon Boulevard as it approached Bill Baggs Cape Florida State Park. For unrestricted funds, priority should be given to commercial areas since many of these frontages have been identified as in need of improvement for public safety and circulation reasons.

Advisory Committee Recommendation:

The Village Council, upon approving this Master Plan, should establish a Crandon Boulevard Master Plan Implementation Committee to ensure continuity in the process, preserve the details, spirit and intent of the Plan, and assist in securing additional funding for the project.

d) Maintenance Budget

Crandon Boulevard is a Miami-Dade County Public Works arterial roadway, and maintenance of the asphalt, curbs, sidewalks, drainage, signals, street lighting, pavement markings and signage are the responsibility of the county. The Village of Key Biscayne contracts with a landscaping company to maintain the trees and landscaping in the median of Crandon Boulevard, and to mow the grass along the median and swales. In addition, the Village maintains the existing irrigation in the median and pays for the water usage. The Village also sometimes performs incidental sidewalk and other repairs, though this is really a Miami-Dade County responsibility. The total annualized cost to the Village for maintenance activities on Crandon Boulevard is roughly \$42,000.

The proposed improvements to Crandon Boulevard contemplated under this Master Plan will increase the Village's maintenance responsibilities. In addition to the costs associated with the maintenance of the proposed trees, landscaping and irrigation in the swales, the Village will likely also be responsible for items such as the paint finish on the signal mast arms, the pavers at the crosswalks and intersections, and the street furniture. The exact allocation of responsibilities and costs for the maintenance of these and other items will need to be coordinated with the County upon final implementation. However, the Village's increased annual maintenance costs upon the full implementation of the Master Plan can be roughly estimated to be no less than \$100,000 per year in addition to the current \$42,000 budget.