Utilization of Miami-Dade County Waterways for Urban Commuting Travel

Executive Summary

MIAMI-DADE MPO

Gannett Fleming

In coordination with:
Civil Works, Inc.

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Introduction

Many mobility options are available for the citizens of Miami-Dade County. Commuters have access to employment centers using many transportation modes. Even with the current range of options, congestion within the urban area of the county continues to increase. As a coastal county, Miami-Dade County includes waterways that are currently used for the transport of goods and for pleasure. These waterways include Biscayne Bay and the canals on the east and west side of the Bay. Biscayne Bay is bound on the east by Miami Beach and serves as the outlet for many manmade and natural waterways. This study will assess the feasibility of using the existing waterways within the Urban Growth Boundary of Miami-Dade County for commuter travel.

Commuter travel on the waterways is used to complement traditional land-based mass transit service in some jurisdictions. Locally, Broward County recently initiated scheduled water transit service in Fort Lauderdale that connects to Broward County Transit service. Water ferry services operate in the San Francisco Bay area, service between Logan Airport and the downtown financial district is available in Boston and Washington State has a history of operating a range of scheduled waterborne commuter services. In addition to reviewing existing successful operations to identify characteristics with applicability in Miami-Dade County, this assessment of the feasibility of using the waterways of Miami-Dade County for urban commuting travel will identify:

- Applicable vessel types and sizes, based on successful operations in other locations;
- A Feasible Waterways Network, based on an analysis of the physical and permitting opportunities and constraints in Biscayne Bay and the adjacent canals; and
- Estimated travel time between identified origins and destinations along potential routes for various modes of travel including potential waterborne travel.

Survey of Successful Waterborne Transit Operations

Nine waterborne transportation systems were surveyed to determined attributes of successful operations. **Table 1** summarizes the characteristics of existing waterborne transportation efforts surveyed and illustrates the common elements that contribute to their success and which may have applicability in Miami-Dade County.

In 1993/94, a private water taxi service was initiated in Miami-Dade County with service that targeted visitors and tourists. This service is no longer provided. Private service is currently provided between Fisher Island and Miami Beach.

Funding Sources

The following Federal programs are available to public agencies with local match for capital of waterborne commuter travel:

- Ferry Boat Discretionary Program (FBDP)
- Congestion Mitigation and Air Quality Improvement Program
- Bus and Bus-Related Capital Investment Grants

- Urbanized Area Formula Grants, Formula Grants
- Job Access and Reverse Commute
- Clean Fuels Formula Grant Program

Table 1. Characteristics of Surveyed Waterborne Transportation Systems

Transit Service	Land Based Transit Connection	Discount Fares	Interchangable Passes / Free Transfers - Water & Land Based Transit	# of Routes/Stops	Headway (minutes)	Operating Structure
Fort Lauderdale Waterbus	✓	✓	✓	2/22	60	Pub/Pvt
St Petersburg Hover Craft				1/3	60 - 150	Pvt
Golden Gate Larkspur Ferry	✓	✓	✓	2/4	30 - 45	Public
Baylink Ferry	✓	✓	✓	1/3	30 - 180	Fixed Fee
Alameda/Oakland Ferry	✓	✓	✓	2/4	60	Pub/Pvt
Logan Airport Water Shuttle	✓	✓	✓	1/3	7	Pvt
Corondo/San Diego Ferry				1/3	60	Pvt / Fixed Fee
Washington State Ferries	✓	✓	✓	10/20	n/a	Public
Harbor Hopper Water Taxi				1/5	60	Pvt

Recommendations for Potential Waterway Service in Miami-Dade County

The following recommendations for waterborne commuter service within Miami-Dade County are based on the characteristics of the successful operations surveyed and funding sources identified.

Recommended Service Characteristics

1. Waterborne transportation in Miami-Dade County should be connected to the existing land-based transit service. Discount passes should be made available and transfers between the two systems should be facilitated.
2. Park and ride facilities should be provided where demand is identified.
3. Because there are limited examples of successful service with multiple stops, Miami-Dade County should compare the travel time for proposed specific service route alternatives to the travel time for competing modes of travel after stops have been identified. Service of this type would be similar to local bus routes; many stops make access convenient, but greatly increase the time it takes to make a trip. Boarding times on a waterborne system are greater than those of a land-based system, requiring careful assessment of the benefit of multiple stops before "local" service characteristics are selected. Commute time should be comparable to that of competing modes.
4. Headways for service that cross Biscayne Bay may be as long as 60 minutes. Headways for multiple stop service should recognize peak hour demand and competing modes.

New transit service, whether land-based or waterborne, benefits from marketing and promotion efforts that highlight the new service characteristics. Implementation of waterborne commuter service in Miami-Dade County should include strategies for marketing the service to businesses that would be served. Promotions that permit a "free ride" would introduce the public to the new service and increase awareness of the new type of transit service available. Because waterborne service in Miami-Dade County was previously provided as a tourism-based private service, the fact that the new service would provide connection to land-based transit, operate on a regular and timely schedule and is intended to serve the needs of the commuter should be emphasized in marketing and promotion efforts.

Visibility of the waterborne service will be high, traveling on the waterways and in Biscayne Bay. A marketing and promotion plan should be developed that recognizes the uniqueness of the service and the marketing and promotion opportunities unique to this type of service.

Suitable Vessel Types

Based on the surveys of other waterborne transportation providers, waterborne services can be divided into one of three classes:

1. Water Taxi Service (Class I) – vessel capacity of less than 100. Service may be limited stop or to multiple stops along a route. Draft may be as little as 3 feet and the minimum vertical clearance requirement is 6 feet, increasing to 15 feet for some vessel designs. Vessels operate in bays and in canals/channels.

2. Water Ferry Service, Pedestrian only (Class II) – vessels capacity is greater than 100. Service is between two to four stops. Draft is typically 4 to 7 feet and minimum vertical clearance is generally 6 to 40 feet. Vessels operate in bays and harbors.
3. Water Ferry Service, Pedestrians and Cars (Class III) – vessels that accommodate automobiles as well as pedestrians. Service is between two to four stops. Minimum draft is 7 to 20 feet. Vertical clearance varies greatly by capacity and design. Vessels operate in bays and harbors.

Miami-Dade County has the opportunity to provide service in all of the three classes defined.

Within Biscayne Bay, all three service classes may be represented. Multiple stop service connecting locations on a single side of the Bay could connect residential generators located north and south of downtown with the Downtown. Limited stop service could be provided as express service between the same residential generators and downtown attractors (employers) on a single side of the Bay. Service could also connect the two sides of the Bay. Vessels that transport people and automobiles could be employed to provide connections on the Bay both on a single side of the Bay and across the Bay. Class III service would require the construction of a docking facility that would permit the loading and unloading of vehicles. Landward facilities that provide storage areas for vehicles waiting to board the vessel would be required.

Waterborne service within the waterways downstream of the salinity dams could also be of the three service classes identified. Limitations to Class II and III service are the water depth and vertical clearance within a particular canal and the availability of land to provide for the storage of vehicles waiting to board the vessel.

Upstream of the salinity dams located on each canal, service opportunities are limited to Class I or II. Opportunities for Class I and II service would be limited by the water depth and vertical clearance within a canal. Class III service could not be provided due to vessel size, particularly the minimum draft required by vessels that provide this type of service. Landward constraints may limit Class II service. The availability of land to provide parking facilities (park-n-ride) at stop locations may restrict opportunities.

Recommendation for Funding/Operations

While Miami-Dade County could provide service operated solely by a public agency, seven of the nine successful operations surveyed operated under public/private partnership. Benefits to this arrangement include access to public funds with reduced operation costs. The scale of a waterborne operation is small compared to land-based transit and a specialized operator is more cost-effective. Under a public/private partnership, the private vendor maintains and operates the waterborne service and scheduling is performed by the public agency. Performance standards and monitoring should be employed to insure contract compliance.

Financial subsidy of the service will likely be required to keep fares competitive with the cost of other transportation modes. Broward County made application for Ferry Boat Discretionary funds for three grant cycles before award. Congressional support was required

to secure the award. Miami-Dade County should recognize the time lapse between application for grant funding and award in its schedule of planning activities.

Miami-Dade Waterway Characteristics

Study Area

For the purpose of this assessment, the waterways within the urbanized area of Miami-Dade County are classified as Currently Navigable and Currently Non-Navigable to differentiate between the sources and completeness of data available for each classification. The study area is defined as Biscayne Bay and the following seven canals:

- C-2 Snapper Creek Canal
- C-3 Coral Gables Waterway/Canal
- C-4 Tamiami Canal
- C-6 Miami River/Canal
- C-7 Little River Canal
- C-9 Snake Creek Canal
- C-100 Cutler Canal

Currently Navigable Waters of Biscayne Bay and Adjacent Canals

For the purpose of this study, the Currently Navigable Waterways are defined as the following (canals are from the confluence of the canal with Biscayne Bay unless noted):

- Biscayne Bay
- Maule Lake
- Snapper Creek Canal (C-2) to S22 Control Structure
- Coral Gables Canal (C-3) to Ponce de Leon Bridge
- Tamiami Canal (C-4): Miami Canal to Blue Lagoon Lake
- Miami River/Canal (C-6) to S26 Control Structure
- Little River Canal (C-7) to S27 Control Structure
- Snake Creek Canal (C-9): Maule Lake to S29 Control Structure
- Cutler Canal (C-100) to S 123 Control Structure

Currently Non-Navigable Waterways

For the purpose of this study, the Currently Non-Navigable Waterways are defined as:

- Snapper Creek Canal (C-2): S22 Control Structure to UGB
- Coral Gables Canal (C-3): Ponce de Leon Bridge to UGB
- Tamiami Canal (C-4): Blue Lagoon Lake to UGB
- Miami River/Canal (C-6): S26 Control Structure to UGB
- Little River Canal (C-7): S27 Control Structure to UGB
- Snake Creek Canal (C-9): S29 Control Structure to the Urban Growth Boundary
- Cutler Canal (C-100): S123 Control Structure to UGB

Applicable Plans and Regulations

Regulations and plans have been adopted at the federal, state and local levels to regulate activity in and preserve the natural state of Biscayne Bay and the canals. At the Federal level, the Biscayne Bay National Park places restrictions on use within the Bay to prevent habitat destruction.

State plans are implemented by Section 403.061 *Outstanding Florida Waters* and Chapter 258, *Biscayne Bay Aquatic Preserve Act* of the Florida Statutes. These designations limit or prohibit dredging or filling and regulate the sale, transfer or lease of state-owned lands within most of Biscayne Bay. The 2002 Biscayne Bay Action Plan was adopted to balance the environmental interests in Biscayne Bay with its economic and recreational opportunities.

The Dade County Manatee Protection Plan (DCMPP) is a local plan that provides for the implementation of policies to ensure the protection of the manatee and its habitat in Florida. The Manatee Protection Plan is regulatory in nature and restricts use through speed zones and Marina Siting Criteria.

The use of the waterways and construction of docks in Biscayne Bay and the adjacent canals are regulated by the following federal, state and local agencies:

- Army Corps of Engineers (ACOE)
- U.S. Fish and Wildlife Service (USFWS)
- Department of Environmental Protection (FDEP)
- South Florida Water Management District (SFWMD)
- Florida Fish and Wildlife Commission (FFWC)
- Miami-Dade County Department of Environmental Resources Management (DERM)
- Miami-Dade County Planning Department

Operating Constraints

Currently Navigable Waterways

Operating constraints within the Currently Navigable Waterways, including Biscayne Bay consist of:

- Water Depth
- Vertical Clearance
- Channel Locations
- No Entry Zones/Speed Zones
- Seagrass Locations
- Existing Dock Locations

Water Depth and Vertical Clearance

The water depth and vertical clearance within the Currently Navigable Waters is documented on the NOAA Navigable Charts sold commercially to boaters. The 3 foot minimum water depth for the operation of non-hovercraft vessels is available immediately adjacent to the shoreline or at minimal distance from shore and is provided by maintained channels to existing docks within Biscayne Bay.

A minimum water depth of 3 feet is available in Maule Lake and the Currently Navigable sections of the Snake Creek Canal, Little River Canal, Miami River/Canal, Coral Gables Canal, Snapper Creek Canal, Cutler Canal and the Tamiami Canal.

Minimum vertical clearance required for the operation of small commuter vessels with a passenger capacity of less than 100 (based on existing vessels designs) is 6 feet when ADA access is accommodated at the dock. Passenger-only vessels with a capacity of greater than 100 also have a minimum vertical clearance of 6 feet but can require up to 40 feet based on vessel design. All bridges within Biscayne Bay except those along the Venetian Causeway have a vertical clearance of 6 feet or greater. Minimum vertical clearance is also available in Maule Lake and in the Currently Navigable sections of the seven canals within the study.

Channel Location

The Intracoastal Waterway (ICW) is maintained on the west side of Biscayne Bay. To limit impacts to seagrasses and shoreline habitat, commuter service that connects only a few stops along the western shore of the Bay (north/south travel) may be required to use the dredged channels, including the ICW. Service to multiple stops located on a single side of the Bay may be permitted to travel outside the ICW based on an assessment of impacts to seagrasses and manatees.

No Entry/Speed Zones

The speed zones (including no entry) established by the DCMPP act as an operating constraint on the Bay and the Currently Navigable sections of the canals within the study. Speed zones change during certain months of the year, becoming more restrictive in the winter months when manatees are present in greater numbers. Commuter travel opportunities and service must be available to users of the system year-round. Waterborne commuter travel is not possible within areas of the Bay with a No Entry designation for any portion of the year.

Opportunities for multiple stop service in areas with idle and slow speed restrictions for any portion of the year are limited due to the increased travel time as a result of the speed restrictions. Multiple stop waterborne transportation service, like local land-based transit service, is most competitive with other modes when serving the short trip or the captive rider.

Seagrass Locations

Protected seagrasses provide habitat for West Indian Manatee and are considered areas where sensitive activities occur. Protected grasses exist at Chicken Key, south of the Miami River and at the Little River Canal, affecting north-south travel in Biscayne Bay.

Existing Dock Facilities

The DCMPP and the designation of Biscayne Bay as an Aquatic Preserve limit the ability to construct new docks within some parts of the study area. Within the Biscayne Bay Aquatic Preserve, waterborne transit service offered by Miami-Dade County may have to rely on access provided by existing dock facilities. Various regulations limit construction of transient docks or commercial use docks in Biscayne Bay and the seven canals in the study with Currently Navigable sections. For this study, access to existing dock facilities with

purposes other than single-family and industrial are assumed to be available for public water transportation service.

Currently Non-Navigable Waterways

The network of canals that drain into Biscayne Bay was constructed in the early 1900's by the U.S. Army Corp of Engineers (ACE) primarily for drainage to provide land for agriculture and other development. Canals are maintained (cleaned and dredged as required) by the Miami-Dade County Public Works Department (Secondary Canals) and the South Florida Water Management District (Primary Canals). All canals included in the evaluation of feasibility for waterways travel are Primary Canals maintained by the SFWMD except the Coral Gables Canal, which is maintained by the City of Coral Gables.

Operating constraints within the Currently Non-Navigable Waterways consist of:

- Water Depth
- Vertical Clearance
- Control Structure Locations
- Speed Zones

Water Depth and Vertical Clearance

Water depth within the seven canals included in the study is a function of the elevation of the groundwater and flows into the canal. Flows into a canal consist of stormwater flows and controlled releases through the gates and control structures managed by the SFWMD. The SFWMD can schedule upstream releases into Biscayne Bay daily. Water levels within the canals vary by season and storm event.

Water depth plays two roles in the determination of the feasibility of waterborne transportation on the Non-Navigable sections of the seven canals under study. Water depth must be great enough to permit the vessel to operate and must be low enough to maintain adequate vertical clearance for the vessel to pass beneath vertical obstructions.

Sections of the seven Currently Non-Navigable Waterways under evaluation for waterborne transportation do not have adequate vertical clearance based on the Average Groundwater Elevation (USGS). These sections of the Currently Non-Navigable Waterways are not suitable for commuter transportation service.

Control Structures

The discharge rate in each of the seven Currently Non-Navigable Waterways into Biscayne Bay is controlled by hydraulic gates and salinity control structures. Each structure represents an obstruction to navigation. Within the segments of the Currently Non-Navigable Waterways with sufficient vertical clearance, control structures represent the boundary between the Currently Navigable and Currently Non-Navigable sections of the canal.

Connection to Biscayne Bay is not obstructed from the Coral Gables Waterway/Canal or the Miami River/Canal. All other canals have control structures within close proximity to the Bay. On these canals, if service is provided on a canal and connection to the Bay is desired, passengers would be required to disembark one vessel and board another, crossing a platform that spans the control structure, on the remaining five canals.

No Entry/ Speed Zones

The DCMPP imposes operating constraints on five of the canals that are classified as Currently Non-Navigable. The Snapper Creek Canal and Miami River/Canal are not constrained by No Entry or Speed Zones within the sections of the canal that are Currently Non-Navigable.

Portions of the Currently Non-Navigable section of the Coral Gables Waterway are subject to No Entry Zones between November 15 and April 30, and are not suitable for commuter travel. The entire length of the Waterway is subject to Idle Speed Zones. The Tamiami Canal is subject to Slow Speed restrictions in the Non-Navigable section between Glide Angel Lake and the S25B Control Structure.

Feasible Waterways Network

Currently Navigable Waterways

Service within the Currently Navigable Waterways may be Class I, Class II or Class III. Class III service may be limited within canals based on vessel design (maneuverability). Landward constraints to the provision of facilities and parking have not been assessed.

Within the Currently Navigable Waterways, waterborne transportation is generally feasible throughout Biscayne Bay, traveling north and south along the western and eastern banks of the Bay or traveling east and west to serve the two sides of the Bay. While most of the Bay is subject to limits associated with speed zones, seagrass beds, and the construction of new or the expansion of existing dock facilities, only the area northwest of Virginia Key and a section of the Little River Canal are subject to No Entry restrictions.

Currently Non-Navigable Waterways

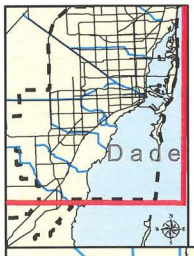
Due to the limited availability and reliability of data, three assumptions are required to identify a Feasible Waterways Network within the Currently Non-Navigable Waterways:

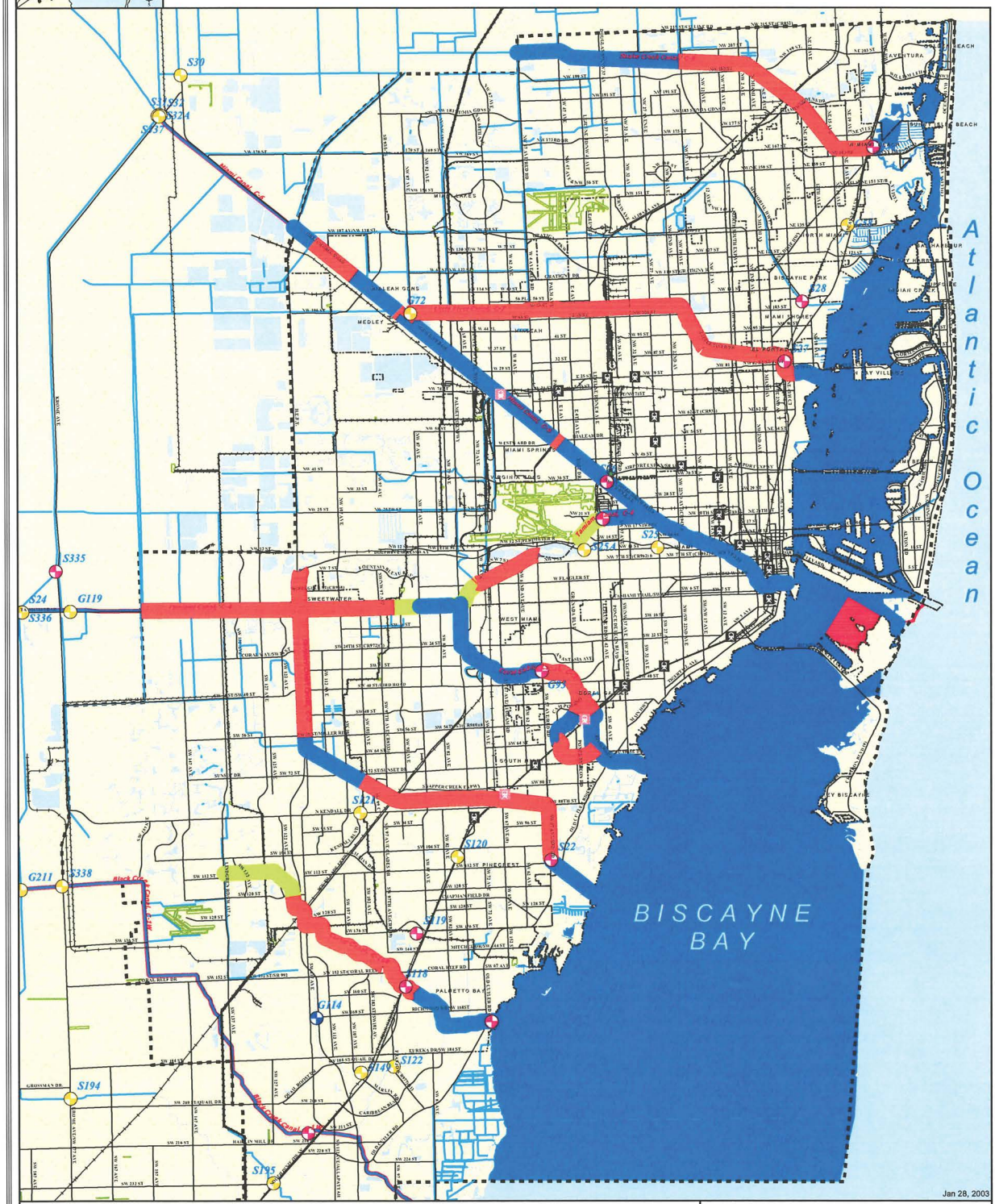
- Water depth is 3 feet or greater in all sections of the Currently Non-Navigable Waterways;
- Vertical clearance determined using Average Groundwater Elevations from USGS sources is the best available data and is the basis for a preliminary assessment of suitability; and
- The available lowest member data represents all vertical obstructions.

The Feasible Waterways Network is depicted on **Map 1**.

UTILIZATION OF MIAMI-DADE COUNTY WATERWAYS FOR URBAN COMMUTING TRAVEL
MAP 1. FEASIBLE WATERWAYS NETWORK

BISCAYNE BAY AREA
FROM GOLDEN BEACH TO CORAL GABLES





Legend

Navigable Waterways
- Navigable
- Not Navigable
- Unknown

SFWMD Structures
- Culvert
- Lock
- Plug
- Pump
- Spillway
- SPlock
- Temp Pump
- Weir

- Metrorail Stations within 1/4 mile
- Metrorail Stations
- Tri-Rail Station

- Study Canal
- All Other Canals
- State Named Local Roads
- Railroads
- 2015 Urban Area Boundary
- MUNICIPALITY

0 0.5 1 2 3 Miles
1:155,000

N W E S

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Connectivity

Access

Successful waterborne commuter transit service must provide access to desired origins and destinations. Access can be on foot (walk), by automobile or by land-based transit. Access to waterborne transit occurs at a stop location defined by a dock. Accessibility for pedestrians is defined by a walking distance of one-quarter mile, the distance identified in the 2000 Highway Capacity Manual as the walking distance a person will travel to transit. Within the one-quarter mile walking distance, pedestrian access can be limited by land ownership and physical barriers. Upon selection of preliminary stop locations, an assessment of the land ownership and physical barriers to an individual stop (dock) location will be required. If federal grant funds are used to support the service, compliance with ADA requirements for access will be necessary.

Accessibility to the stop for automobiles is available if the road network lies within the one-quarter mile walking distance for pedestrian access. Access to a particular stop location may require the construction of access drives and parking facilities. Access to all segments of the Feasible Waterways Network is available within one-quarter mile of the roadway network.

Access to fixed route transit service can be accomplished through expansion of the existing bus routes if demand is demonstrated. With road access to all segments of the Feasible Waterways Network, access to bus transit is assumed. Access to Tri-Rail and/or MetroRail stations was evaluated. The following Tri-Rail and MetroRail stations lie within one-quarter mile of the Feasible Waterways Network:

- Dadeland North Metrorail Station at Snapper Creek Canal
- University Metrorail Station at Coral Gables Waterway/Canal
- Okeechobee Metrorail Station at Miami Canal
- Miami Airport Tri-Rail Station at Miami and Tamiami Canals

Land Use

A component of planning for successful waterborne transportation includes identification of residential densities and non-residential activity centers within one-quarter mile of the planned service. This information can guide the general location of stops by identifying where population and employment densities are high enough to support transit. In Miami-Dade County, the Future Land Use Map depicts the location of Urban Centers at the Community, Metropolitan and Regional levels. Urban Centers located within one-quarter mile of the Feasible Waterways Network are also used to guide the location of stops.

Finally, non-residential employment centers defined as employers with 100 employees or greater or clusters of smaller employers are used to guide the location of stops. The InfoUSA® database was used to identify employers that lie within one-quarter mile of the Feasible Waterways Network.

Characterization of Connectivity

The connectivity of the Feasible Waterways Network can be characterized as very high, high, moderate or low based on the type and density of land use adjacent to the Network. Connectivity is the extent to which the Feasible Waterways Network provides connection between trip origins and destinations. The following summary identifies the level of connectivity for the Feasible Waterways Network.

Biscayne Bay

Area 1. Moderately Connective: Biscayne Bay immediately south of the Cutler Canal

Area 2: Very Highly and Highly Connective: Biscayne Bay north of the Coral Gables Waterway, from Grand Avenue to the northern county line

Snapper Creek Canal (C-2)

Segment 1. Moderately Connective: From SW 56th Street at the HEFT to SW 107th Avenue

Coral Gables Canal (C-3)

Segment 1. Highly Connective: From the Tamiami Canal to Red Road

Segment 2. Moderately Connective: Le Jeune Road to Biscayne Bay

Tamiami Canal (C- 4)

Segment 1. Highly Connective: From SW 87th Avenue to SW 72nd Avenue

Segment 2. Highly Connective: From the S 25B Control Structure (MIA) to the Miami River

Miami River/Canal (C-6)

Segment 1. Very Highly and Highly Connective: Between the Little River Canal (approximately NW 87th Avenue) and Biscayne Bay

Snake Creek Canal (C-9)

Segment 1. Moderately Connective: From NW 47th Avenue to NW 27th Avenue

Segment 2. Highly Connective: From NW 27th Avenue to the Turnpike

Cutler Canal (C-100)

Segment 1. Highly Connective: From the western Urban Growth Boundary to SW 122nd Street

Segment 2. Highly Connective: From approximately SW 103rd Street to Richmond Drive

Preliminary Service Routes and Termini

The preliminary service routes and termini consider the physical and operating constraints within the waterways evaluated and the characteristics of the adjacent land use. Termini identified represent a general location. Specific docking locations cannot be recommended because landward constraints associated with access, ownership, and use (zoning and land use) have not been determined. Where constraints to the construction of docks for commuter transportation service is limited by the County's Marina Siting Plan or the designation of Biscayne Bay as an Aquatic Preserve, no assessment of the right to access an existing dock within the area of the terminus has been performed and no assessment of the terms that may be required by the permitee for access has been undertaken.

Five preliminary routes have been identified for further analysis. Eleven preliminary termini are identified in Biscayne Bay, four within the Coral Gables Waterway/Canal and five within the Miami River. Travel on a short segment of the Tamiami Canal is included as a travel on the Coral Gables Waterway/Canal and the Miami River/Canal. One terminus on each the Coral Gables Waterway and the Miami River are located at the confluence of Biscayne Bay. **Map 2** depicts the preliminary Service Routes selected for further evaluation.

Travel Time Analysis

To be successful, waterborne commuter service in Miami-Dade County must compete effectively with other modes. The travel time associated with each mode is a key component in an individual's decision to choose a mode of travel. Auto travel time is calculated between the preliminary termini for single occupancy vehicles (SOV) and high occupancy vehicles (HOV) in the peak and off-peak periods using the 1999 Base Year Network developed for the 2025 Update to the Miami-Dade County Long Range Transportation Plan Update. The Miami-Dade Transportation Model was used to calculate the auto and transit travel times between the TAZs in which the preliminary termini are located.

Travel Time Comparison for the Peak Hour

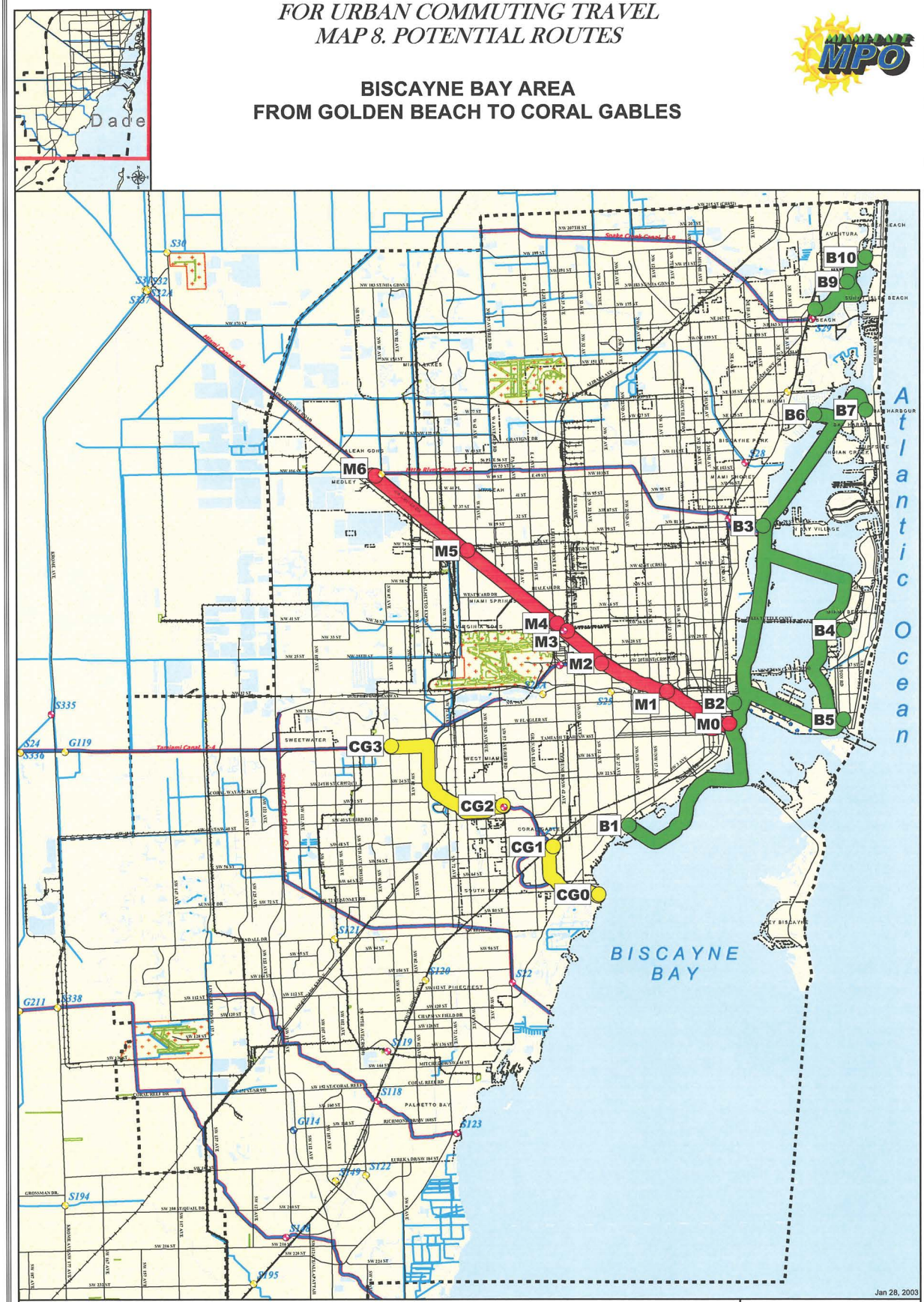
Conventional Waterborne Alternative vs. Auto

In the peak period, travel between all preliminary termini on Biscayne Bay is slower than travel by auto except travel between the Little River Urban Center and NE 135th St at Biscayne Bay. Travel time between Alton Road at 1st Street in South Miami Beach and the CBD is the same for conventional waterborne service and auto. Travel by waterborne commuter service is longer than the auto travel time between the remaining pairs of preliminary termini by an average of 11 minutes. In the off-peak period, this average increases to 14 minutes.

Because of the Idle Speed Zones within the Coral Gables Waterway and Miami River, travel times for waterborne travel using conventional vessels are not comparable to travel by auto between Ponce de Leon Boulevard and Biscayne Bay on the Coral Gables Waterway and between the Tamiami Canal and Biscayne Bay on the Miami River. Between Le Jeune Road and NW 87th Avenue on the Miami River, travel by waterborne commuter service is comparable to travel by auto in both the peak and off-peak periods.

UTILIZATION OF MIAMI-DADE COUNTY WATERWAYS FOR URBAN COMMUTING TRAVEL
MAP 8. POTENTIAL ROUTES

BISCAYNE BAY AREA
FROM GOLDEN BEACH TO CORAL GABLES



Conventional Waterborne Alternative vs. Land-based Transit

Waterborne commuter travel on Biscayne Bay on Preliminary Service Routes 1, 2 and 3 is comparable to travel by land-based transit in the peak and off-peak periods between all termini.

Because of the Idle Speed Zones within the Coral Gables Waterway and Miami River, travel time for waterborne travel using conventional vessels is not comparable to land-based transit in the peak or off-peak periods between Ponce de Leon Boulevard and Biscayne Bay on the Coral Gables Waterway and between the Tamiami Canal and Biscayne Bay on the Miami River.

Travel by waterborne commuter service is faster than travel by land-based transit in the peak and off-peak periods on the Miami River/Canal between the Tamiami Canal and NW 37th Ave and between Le Jeune Road and Red Road. Waterborne travel on the western limits of the Coral Gables Canal is faster than by land-based transit.

Hovercraft Alternative vs. Auto

The hovercraft alternative eliminates the constraint of speed imposed by the Speed Zones in the DCMPP. Based on a travel speed of 20 mile per hour, the peak hour travel times for the hovercraft alternative are faster between all preliminary termini than land-based transit and within five minutes of most auto travel times.

Opportunities for Commuter Service on the Waterways

This study evaluates the physical and operating constraints and opportunities for the provision of urban commuting transportation on the waterways in Miami-Dade County. The study concludes that there are opportunities for service with transportation benefits. Travel is faster by waterborne commuter service than by transit between all the termini studied and is competitive with the auto mode at current levels of congestion. Further study is recommended for each of the waterborne service routes evaluated.

Within the Feasible Waterways Network, opportunities are greatest within Biscayne Bay. Constraints associated with potential impacts to the West Indian Manatee may be overcome by the use of hovercraft, increasing the potential for service within the Coral Gables Waterway and Miami River.

The greatest challenge to waterborne service within Miami-Dade County will be access between the waterborne service and land-based destinations. The regulatory environment continues to limit opportunities for new docking facilities. The use of existing facilities requires that the right to access be secured from individual permitees. Access by the public through private property and requirements for parking to meet demand may require improvements to address ADA requirements. Connections to existing transit service and/or an improved pedestrian access/environment may be required to serve waterborne transportation needs.

Vessel Types

The vessel type for service within the Currently Navigable Waterways including Biscayne Bay may be Class I Service (passenger vessel with a capacity of less than 100), Class II Service (passenger vessels with a capacity of greater than 100) or Class III (vessels serving passengers and vessels). Class II service should be limited to Biscayne Bay.

The recommended vessel type for service within the Currently Non-Navigable Waterways is Class I or II.

Travel Time Comparisons

Travel time comparisons between waterborne service by conventional vessel and auto and transit modes indicate that travel time for conventional vessels are competitive in Biscayne Bay and the western portions of the Coral Gables Canal and Miami Canal, but are not competitive in the Coral Gables Waterway east of Ponce de Leon Boulevard or in the Miami River east of the Miami International Airport (Tamiami Canal) due to speed restrictions. Waterborne commuter travel is not obstructed by control structures between Biscayne Bay and the Coral Gables Waterway or Miami River; if routes are selected that provide for travel on these two waterways to continue into Biscayne Bay, hovercraft are recommended to facilitate competitive travel times within the eastern portions of these two waterways. Commuter routes that do not provide service in the Miami River east of the Tamiami Canal or in the Coral Gables Waterway east of Ponce de Leon Boulevard exhibit competitive travel times using conventional vessels. Hovercraft as a technology exhibits better travel times than conventional vessels between most preliminary termini.

Potential Routes

intensity, connections to existing Urban Centers designated by the County in its comprehensive plan and the number of employers located adjacent to the Feasible Waterways Network. Preliminary stops along each route have been identified for the purpose of comparing travel time by mode in the peak and off-peak periods. Waterborne commuter service is recommended to be limited stop or express service, consistent with the service plans of successful operations surveyed for this study. Opportunities for multiple stop service to serve trip purposes other than the commuter trip (home -based work) are available on the Feasible Waterways Network but have not been evaluated in this study. These opportunities include tourism-based service within the Downtown and across Biscayne Bay to Miami and South Miami Beaches and service between Miami International Airport and the Downtown.

Additional service planning should be undertaken for all Potential Routes depicted on **Map 2**. In addition to transit service planning to evaluate demand and establish routes and schedules, the development and collection of additional data will be required. This additional effort includes development of the engineering data required to assess the physical constraints to commuter service on the Currently Non-Navigable Waterways and an analysis of the land-based constraints associated with preliminary stop locations.

While this study has confirmed the potential for successful waterborne commuter service in Miami-Dade County, additional planning and data development efforts are necessary prior to the implementation of service. Traditional transit service planning efforts must be supplemented by engineering and permitting evaluations that are unique to waterborne service.
Next.

Next Steps Toward Implementation of Service

Data Collection/Development

This study identified significant data deficiencies that required the identification of the Feasible Waterways Network to be based on assumptions related to vertical clearance and water depth within the Currently Non-Navigable Waterways. Efforts should be initiated to develop the necessary data to confirm the Feasible Waterways Network:

1. Coordination with the South Florida Water Management District to initiate hydrological modeling of the Currently Non-Navigable Waterways that are included in the Feasible Waterways Network to establish mean high water elevations; and,
2. Survey of the Currently Non-Navigable Waterways to confirm low member elevations obtained from the records of the South Florida Water Management District and to document the bottom elevation.

Service Planning

Transit service planning should be undertaken to estimate demand, establish preliminary headways and estimate ridership on the Potential Routes. The location of the preliminary termini should be adjusted to match demand. Fares should be optimized for ridership.

Operating and Maintenance costs for specific vessels and sizes should be evaluated and vessels selected. A financial analysis establishing the relationship between cost and revenue should be performed. At the policy level, the County should identify the proposed organizational structure for operation of a waterborne transit system.

The County should identify the public agency that would serve as the public operator if service were to be initiated and include the selected agency in further planning and technical efforts.

Unique to waterborne service and the regulatory environment in Miami-Dade County, the identification of specific docking locations will require agency coordination and may include the acquisition of easements. In areas where the construction of new docking facilities are limited by regulation, coordination with the regulatory agencies should be initiated to determine the conditions associated with the permitting of new facilities. Coordination with the regulatory agencies should be initiated if the construction of new docking facilities is identified as necessary to meet service goals.

If new facilities cannot be constructed, access will be limited to existing facilities authorized by permits that would allow access by transient vessels. The County should identify those existing facilities authorized for said access and initiate negotiations for access with those located at or near the stops on preliminary routes. Coordination with the applicable regulatory agencies should be initiated.

Unlike land-based transit that operates within the roadway where stops may be located within public right-of-way, stops that serve the waterborne service will be likely be located on private property. Within the vicinity of the preliminary termini, the County should evaluate the landward constraints to access including land use/zoning, parking, security, ADA compliance and pedestrian access to proposed stop locations.

Gannett Fleming