TPO
Miami-Dade Transportation Planning Organization

MIAMI-DADE
PEOPLE MOVER TECHNOLOGY AS AN OPTION TO FURTHER EXTEND THE REACH OF THE SMART PROGRAM

Final Report

PARSONS

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Contents

List of Figures

List of Tables

Acronyms

AGT	Automated Guideway Transit
APM	Automated People Mover
ATC	Automatic Train Control
ATS	Automatic Transit System
AWP	Adopted Work Program
BRT	Bus Rapid Transit
CAGR	Compound Annual Growth Rate
CCTV	Closed-Circuit Television
CIG	Capital Investment Grants
CIGP	County Incentive Grant Program
CMAQ	Congestion Mitigation and Air Quality
ConRAC	Consolidated Rental Car Facility
DB	Design-Build
DBOM	Design-Build-Operate-Maintain
DTPW	Department of Transportation and Public Works
FDOT	Florida Department of Transportation
FTA	Federal Transit Administration
ITF	Intermodal Transportation Facility

LAMP	Landside Access Modernization Program
LAWA	Los Angeles World Airports
LAX	Los Angeles International Airport
LPA	Locally Preferred Alternative
LRTP	Long Range Transportation Plan
MDT	Miami-Dade Transit
MIA	Miami International Airport
MPO	Metropolitan Planning Organization
MSF	Maintenance and Storage Facility
NEPA	National Environmental Policy Act
O&M	Operating and Maintenance or Operations and Maintenance
P3	Public-Private Partnership
PD&E	Project Development and Environment
PDS	Power Distribution System
PTP	People's Transportation Plan
RAISE	Rebuild American Infrastructure with Sustainability and Equity
RUE	Roadway Utility and Enabling Improvements
SCADA	Supervisory Control and Data Acquisition
SMART	Strategic Miami Area Rapid Transit
STIP	Statewide Transportation Improvement Program
STOPS	Simplified Trips-on-Project Software
TDP	Transit Development Plan
TIFIA	Transportation Infrastructure Finance and Innovation Act
TIP	Transportation Improvement Program
TOD	Transit-Oriented Development
TPO	Transportation Planning Organization

1. Introduction

1.1 Background

The Miami-Dade Department of Transportation and Public Works (DTPW) operates the Metromover through 21 stations and along three loops, serving Downton Miami's Central Business District, Brickell, and the Arts and Entertainment neighborhoods; it also connects to the Metrorail system and Tri-Rail/Brightline (Figure 1). On 23 February 2023, the TPO Governing Board approved Resolution 08-2023 authorizing the TPO Executive Director to develop a scope of services and budget to assess Automated People Mover (APM) technology as an option to extend and augment the reach of the Strategic Miami Area Rapid Transit (SMART) Program.

Interconnectivity with local/regional transportation services has the potential to unlock enormous benefits for Miami-Dade County, especially as tourism, housing, employment, and freight movement are projected to increase. APM technology may provide safe, convenient, and effective connectivity to major transit corridors and hubs throughout the County.

1.2 Objective

This study will assess the application of APM or similar technology to extend and augment the reach of the Strategic Miami Area Rapid Transit (SMART) Program in areas connecting to existing or future SMART Program corridors (Figure 2), and intermodal hubs where feasible. Additionally, this effort will provide the necessary information to evaluate and develop viable concepts for implementing the County's transportation network, consistent with the Miami-Dade Transportation Planning Organization's (TPO) Long-Range Transportation Plan. This study is intended to complement and build on Miami-Dade County's transportation network and to ensure greater integration with the SMART Program.

Ongoing growth and development along Metrorail stations countywide—including the development of new transit-oriented communities—present an opportunity to provide greater connectivity and enhanced transit service to county residents, workers, and visitors, who are increasingly pedestrian-oriented. Figure 3 depicts the Metrorail system map.

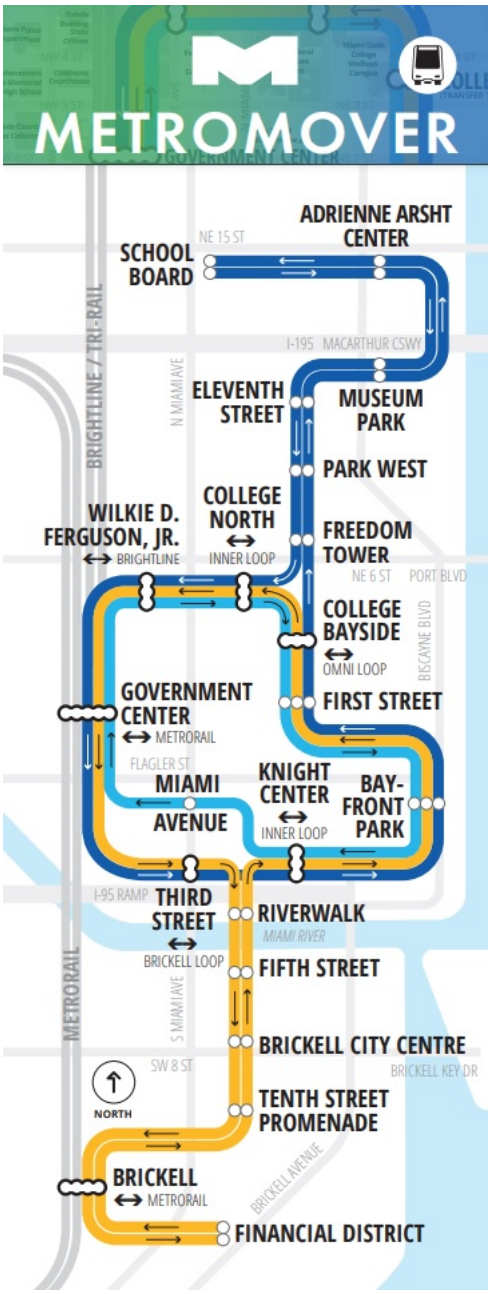


Figure 1. Metromover System Map.
Source: Miami-Dade DTPW

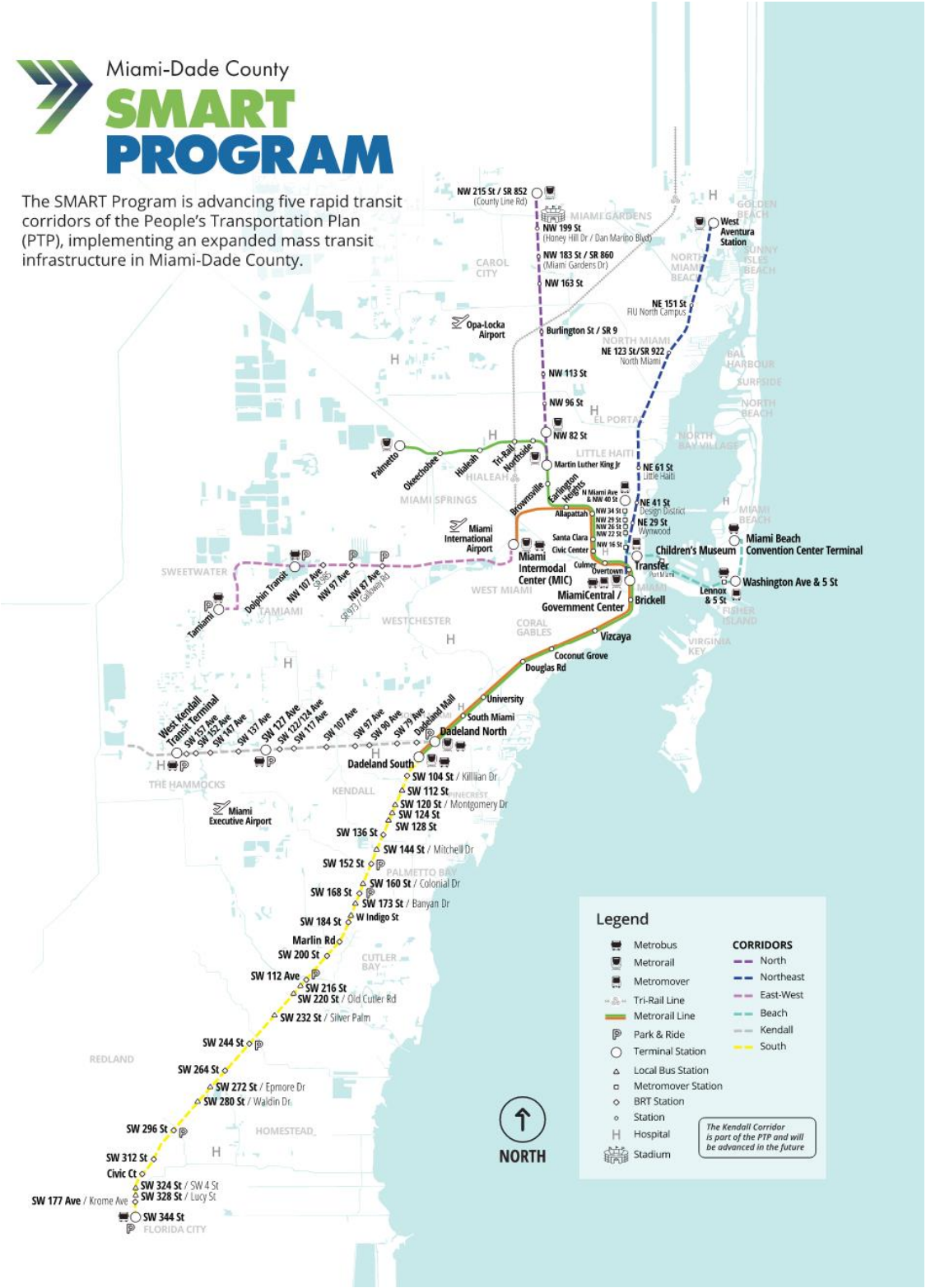


Figure 2. Miami-Dade County SMART Program Corridors.
Source: Miami-Dade DTPW.

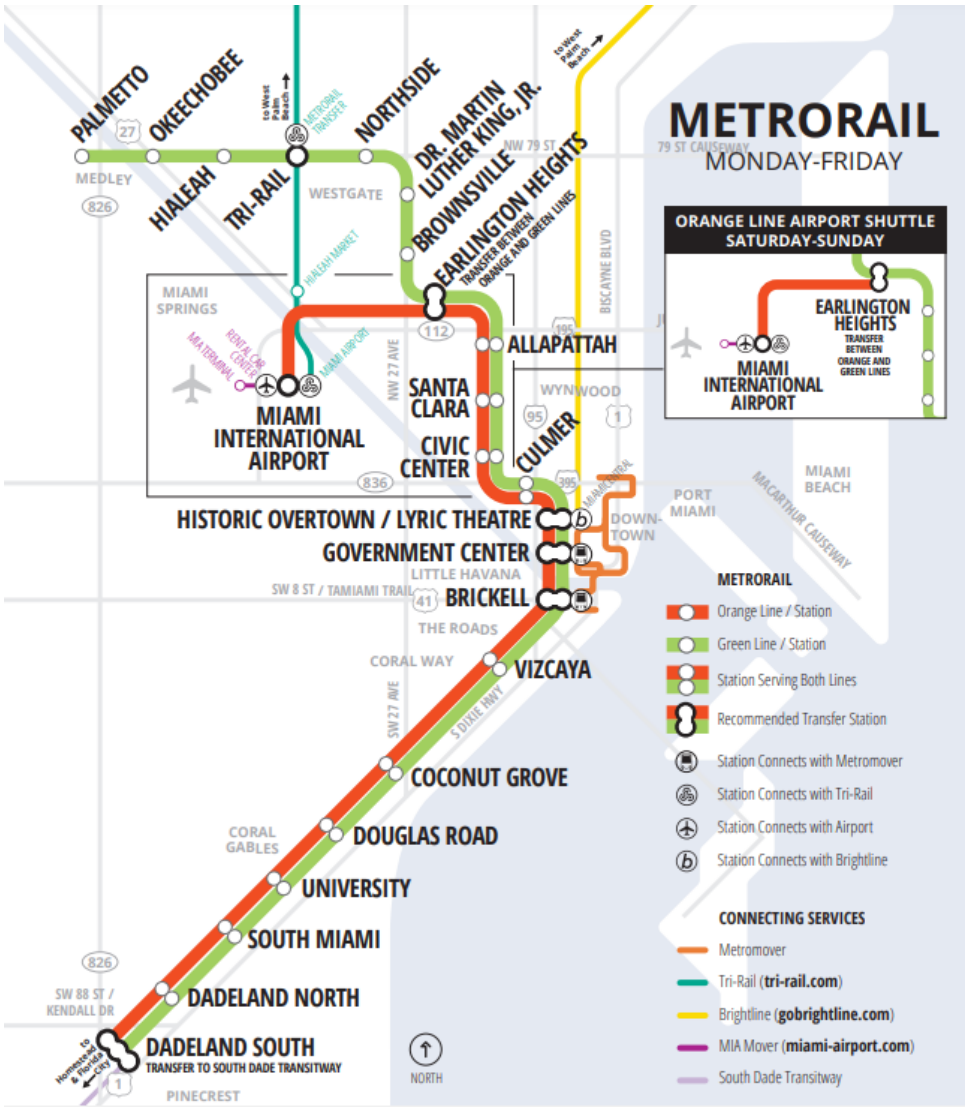


Figure 3. Metrorail System Map.
Source: Miami-Dade DTPW

1.3 Study Methodology

This study uses a two-tiered analysis to identify potential Metromover extensions—or applications of APM or similar technology—that would extend and augment the reach of the SMART Program. The first tier of analysis is geographic and includes splitting the county into four quadrants (Figure 4). Past studies were reviewed to determine feasible options for Metromover extension that may still be valid. Major origins and destinations were identified in each quadrant, and options to connect to the SMART Program corridors were assessed.

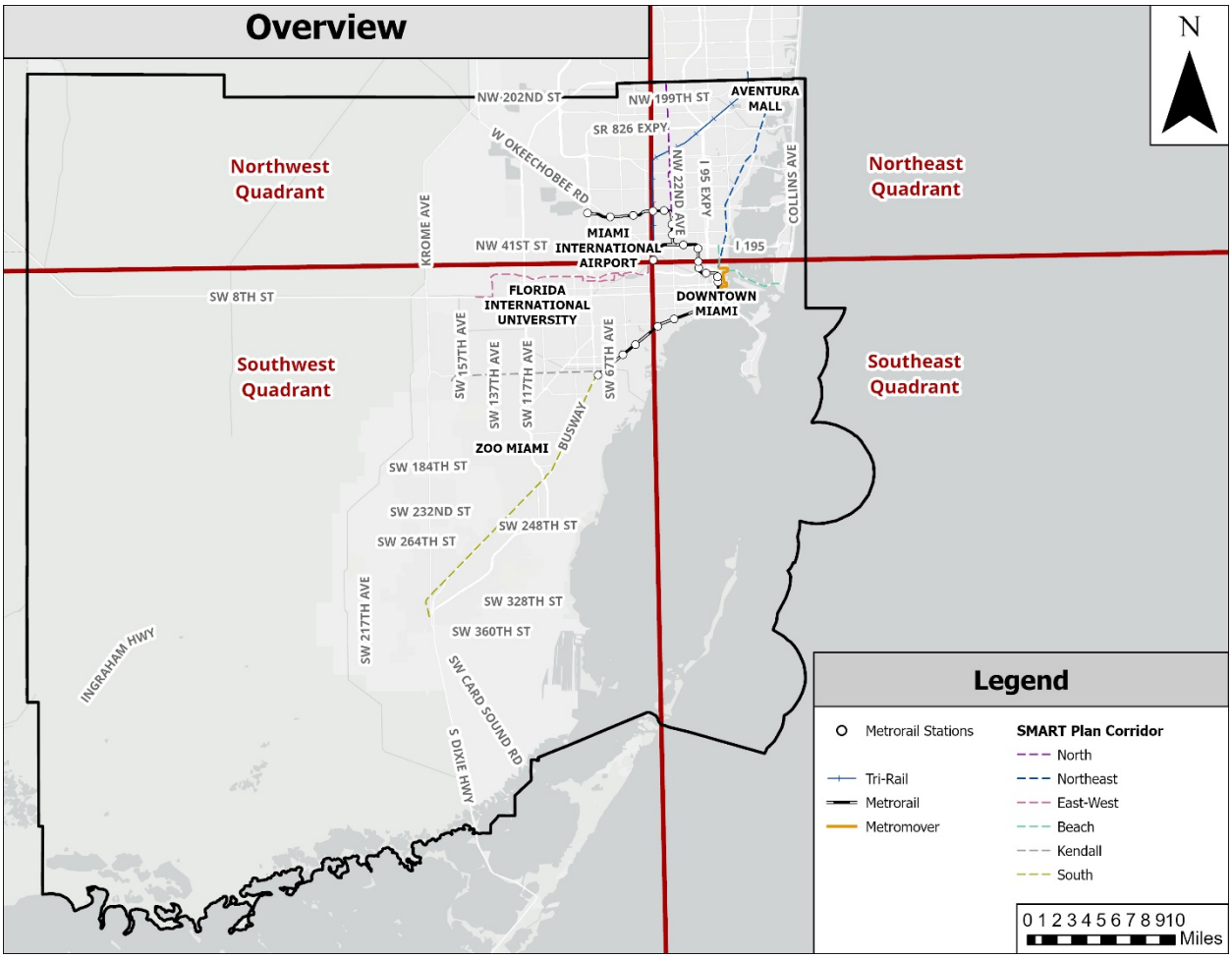


Figure 4. Quadrant Map.

The second tier of analysis included developing specific strategies and alignments for APM extension based on the Tier 1 screening, including assessing each extension's alignment with the other modalities of the SMART Plan. Refinements and recommendations were then developed for five feasible options. Figure 5 summarizes the study process.

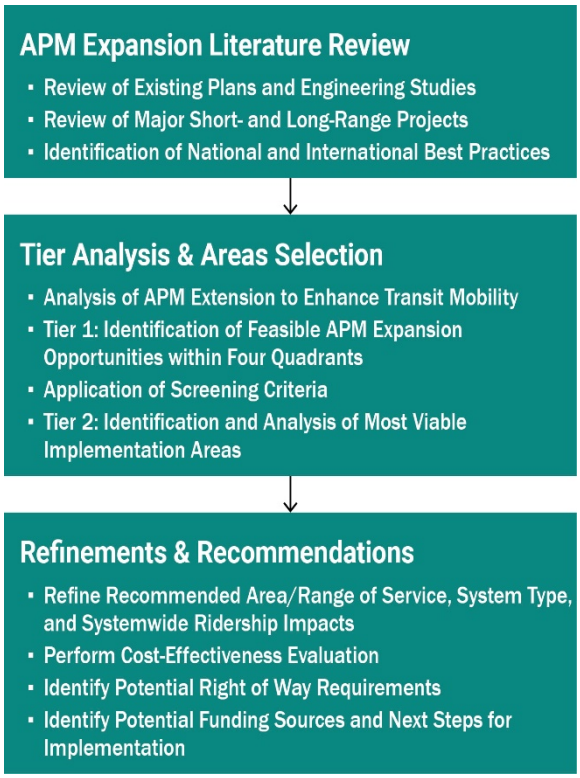


Figure 5. Study Process

2. Literature Review

2.1 Existing Plans and Engineering Studies

This section summarizes the review of existing plans and engineering studies completed related to the expansion of APM in Miami-Dade County. Relevant past studies include:

- Miami-Miami Beach (Baylink) Transportation Corridor Study, Miami-Dade Metropolitan Planning Organization (MPO), September 2004
- 2025 Downtown Miami Master Plan, Miami Downtown Development Authority, October 2009
- PortMiami 2035 Master Plan, PortMiami, November 2011
- Transit Options to PortMiami Feasibility Study, Miami-Dade MPO, June 2013
- Downtown Miami Intermodal Terminal Feasibility Study, Miami Dade MPO, December 2013
- Metromover System Expansion Study, Miami-Dade MPO, September 2014
- Beach Corridor Rapid Transit Project: Project Development and Environment (PD&E) Study, Miami-Dade DTPW, August 2018

As summarized below, past studies have focused mostly on Downtown Miami and Miami Beach, which will be considered as part of the southeast quadrant viable projects.

2.1.1 Miami-Miami Beach (Baylink) Transportation Corridor Study

The City envisioned the Baylink project, connecting Downtown Miami to Miami Beach (via MacArthur Causeway) as an 18-mile streetcar system to meet the growing transportation needs of Miami-Dade's economic engine. With access to a total of 42 stations, the Baylink would provide strategic intermodal connectivity to maximize Miami-Dade Transit's (MDT) $5 billion investment in mass transit options (including Metromover, Metrorail, and Metrobus); support over $50 million in public and private investment in the economic core (including the Convention Center, the Performing Arts Center, the Arena, and the Federal Courthouse Complex); support the transition to active transportation modes such as biking and walking; and provide for the area's transportation needs through 2025. The refined Locally Preferred Alternative (LPA) connected clockwise and counterclockwise Downtown Miami loops to a counterclockwise loop within South Beach, via a two-track line across MacArthur Causeway. The LPA also included a clockwise loop in South Beach called the Beach Circulator. See Figure 6.

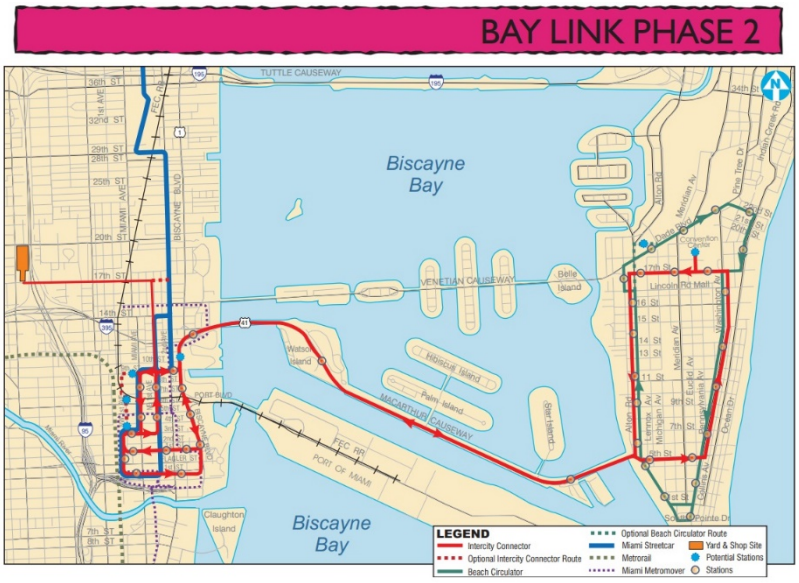


Figure 6. Refined Baylink - Proposed Route, 2004

2.1.2 2025 Downtown Miami Master Plan

The promotion of transit and regional connectivity is one of the five primary goals identified in the 2025 Downtown Miami Master Plan, with access strategies focused on the availability of "multiple and intermodal transportation options" that make it affordable and convenient to get to/from/around the downtown area and access external transportation systems. Specific implementation actions identified to expand Metromover service include closing the Brickell and Omni Loops. The proposed Miami Streetcar and a new neighborhood trolley service, slated to be implemented in a 5- to 10-year timeline from the Downtown Plan's publication, would complement the Metromover at the local level. At the metropolitan level, Miami Beach, Miami International Airport, and Florida International University connections are prioritized via the Baylink Route, water taxi, and BRT. The Miami Intermodal Center Earlington Heights extension of the Metrorail system would connect the downtown area to other cities on Florida's east coast via the Tri-Rail commuter service. On a long-term (15+ years) timeline, a Downtown Intermodal Center slated for development would provide joint access to Metrorail, Tri-Rail, Metromover, Streetcar, Baylink, trolley, light rail, and future transportation modes. The Downtown Miami Transportation Master Plan, referenced as a forthcoming complementary deliverable from the City, will incorporate each of these elements.

2.1.3 PortMiami 2035 Master Plan

This planning document outlines the Port's objective to continue aligning with federal, state, regional, and local entities on transportation planning to address the region's intermodal transportation constraints. Two multimodal transport hubs are proposed for the Port over a medium- to long-term timeline, with the goal of consolidating connections between various forms of waterside and ground transportation options (sea, air, rail, and road) for tourists and freight. The primary multimodal facility would serve cruise terminals CB1 to CB4 and is envisioned as an opportunity to connect to the Miami International Airport, provide more commercial and recreational uses, decrease the Port's onshore footprint, and increase sustainability and operational efficiency.

2.1.4 Transit Options for PortMiami Feasibility Study

The construction of the PortMiami Tunnel in 2014 to better connect port traffic to the expressway system did little to expand transportation options for cruise passengers and port workers. The purpose of this 2018 *Transit Options* study was to investigate the potential for intermodal transit connectivity at PortMiami, providing a people-focused transit connection between the port and Downtown Miami. This inquiry balanced project and development proposals from the port's Master Plan document with transportation service available in the Downtown area, including Metrorail, Metromover, and commuter rail lines. Importantly, the study ruled rubber tire alternatives unsuitable for the Port-to-Downtown route due to the capacity and frequency demanded of this connection.

Of the eight rail alternatives considered in the study's Tier 1 evaluation, only two alternatives were considered for implementation:

- Metromover Shuttle between Overtown and PortMiami (see Figure 7)
    - The cost of this route's 1.9-mile guideway would be $174 million per mile.
    - The Metrorail and the proposed commuter rail terminal would make an east-west oriented Metromover station difficult to design.
    - Maintenance/storage yard access will mean connecting the new Metromover tracks back to the Metromover mainline.

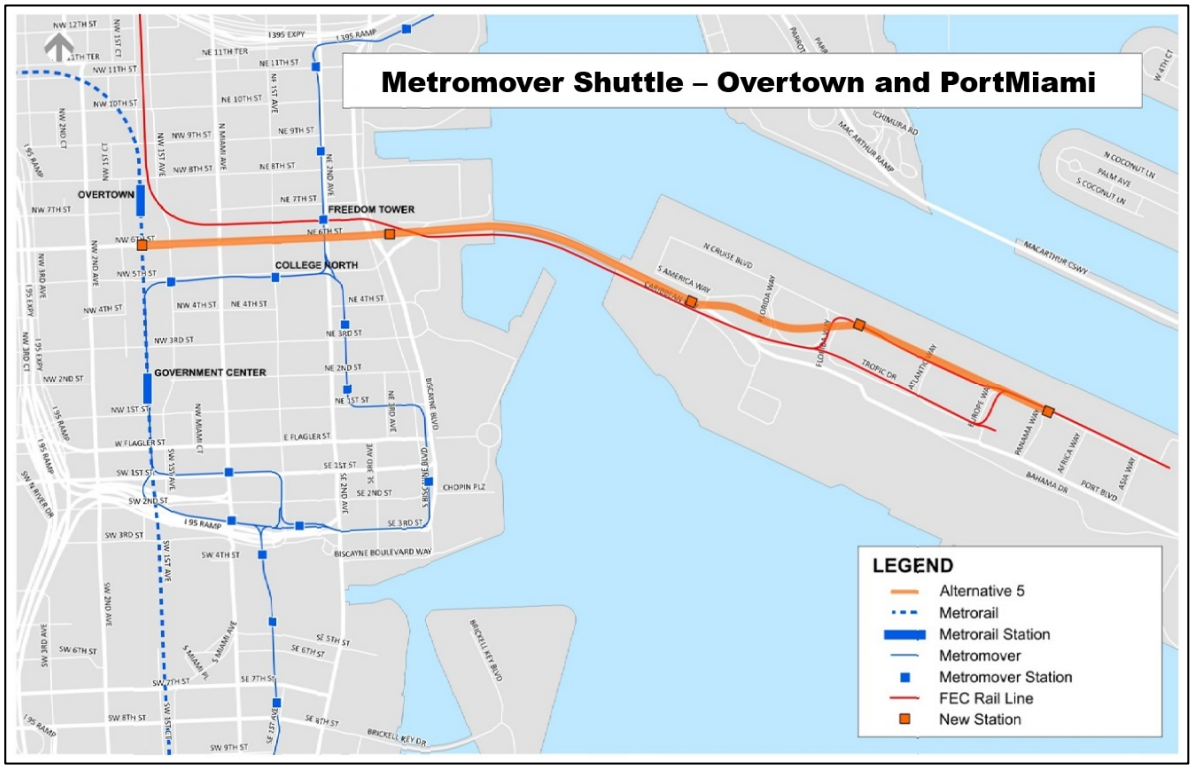


Figure 7. Metromover Shuttle between Overtown and PortMiami

- Light Rail (Streetcar) Shuttle from Overtown to PortMiami (see Figure 8)
  - Estimated average cost of this route's 1.9-mile guideway is $65 million per mile.
  - Undertaking this alternative means the potential for easier subsequent expansion of other light rail service in Central Miami and Miami Beach.
  - Streetcar's overhead wires would exacerbate an already visually cluttered Downtown streetscape.

Figure 8. Light Rail Shuttle from Overtown to PortMiami

2.1.5 Downtown Miami Intermodal Terminal Feasibility Study

This 2013 study identified a preferred site for the proposed mixed-use facility (Government Center, near the Metrorail/Metromover Station) and provided development, financial, and construction recommendations to integrate transit and pedestrian activities at the site. Proposed transportation options prioritized for the site include local, commuter, and regional bus connections; taxi, jitney, and car share operations; bicycle access and bike-share programs; City of Miami Trolley service; and other intercity and charter bus service. The intermodal facility's final site development concept also allocates space for a possible future Miami terminal for the Florida East Coast Railroad's 'All Aboard Florida' train (Figure 9). Figure 10 shows the initial study area alignment with Metromover stations.

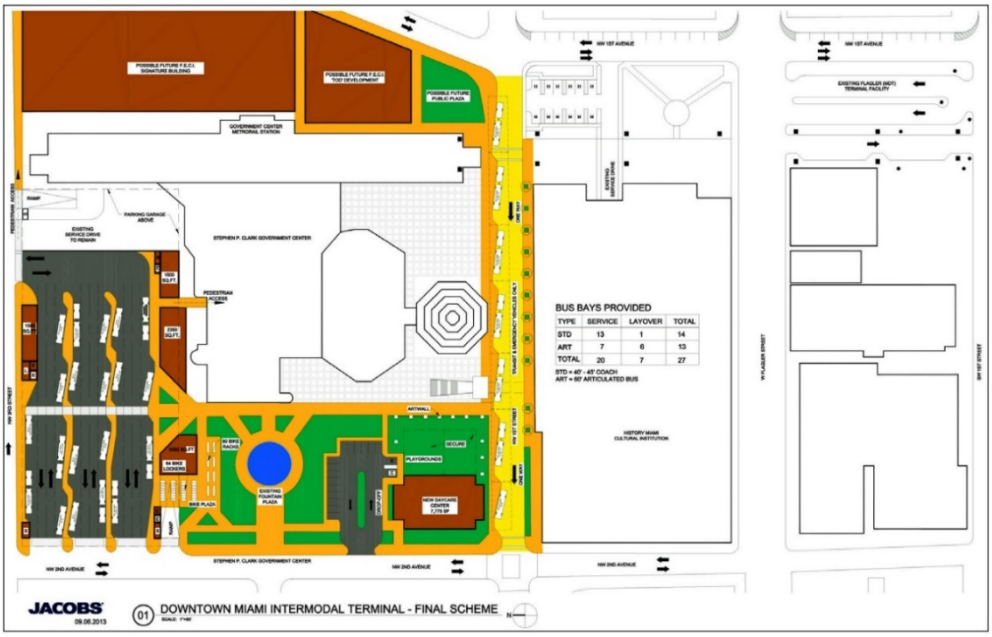


Figure 9. Downtown Miami Terminal - Final Scheme

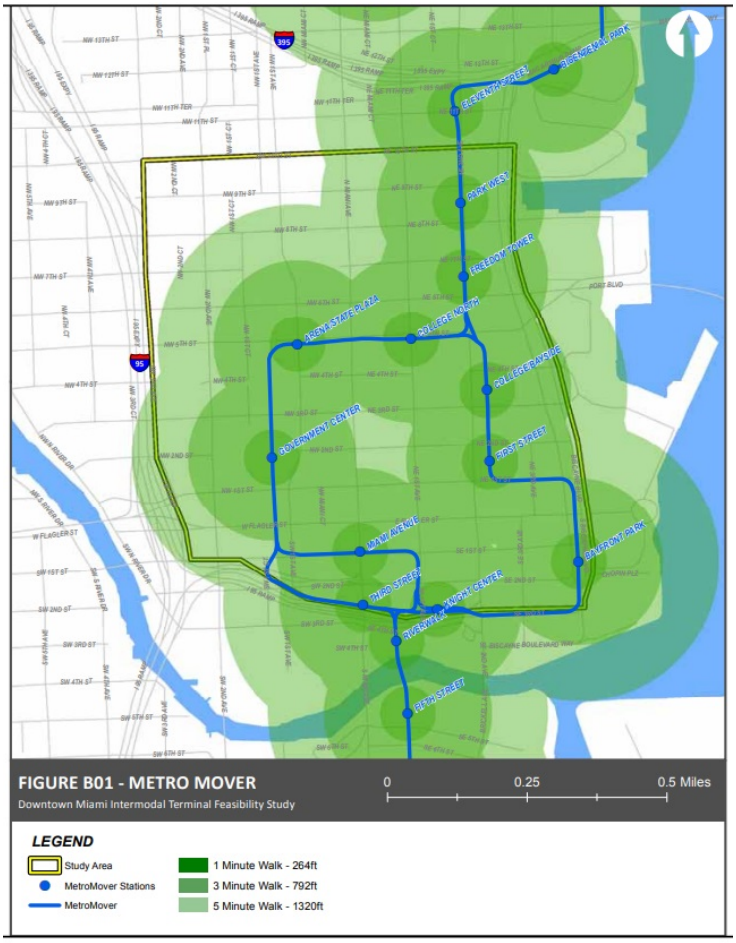


Figure 10. Possible Sites in/around Study Area with Connections to Metromover

2.1.6 Metromover System Expansion Study

By 2014, an increase in Metromover ridership signaled the need for another system expansion to meet the urban lifestyle needs of area residents, workers, and visitors. After a series of collaborative workshops and a comprehensive review of previous relevant agency plans and studies, six concepts for Metromover expansion were further developed into a Master Plan:

1. A North *extension* heading west from the School Board Metromover Station and terminating at the intersection of NE 39th Street and NE 1st Court.
2. A North *loop* starting westward from the School Board Metromover Station, terminating at Biscayne/US-1 and NE 15th Street and rejoining the existing Metromover alignment.
3. A South *extension* reaching east from the Financial District Metromover Station, terminating at Brickell Avenue/US-1 and SE 26th Road. This proposal overlaps significantly with the City of Miami Trolley service route, and so may no longer be appropriate.
4. A South *loop* starting eastward from the Financial District Metromover Station, terminating at the Brickell City Centre (8th Street) Metromover station. An additional inner loop was also proposed.
5. An East *extension* reaching east from the Metrorail Overtown Station, terminating at Panorama Way.
6. A West *extension* reaching west along NW 1st Street from the Government Center Metromover Station, terminating at Marlins Park.

This Master Plan (Figure 11) would add 5.8 miles of guideway, with an estimated implementation cost of nearly $2 billion, plus another $42.6 million annually to cover the added guideway's operations and maintenance (O&M) needs.

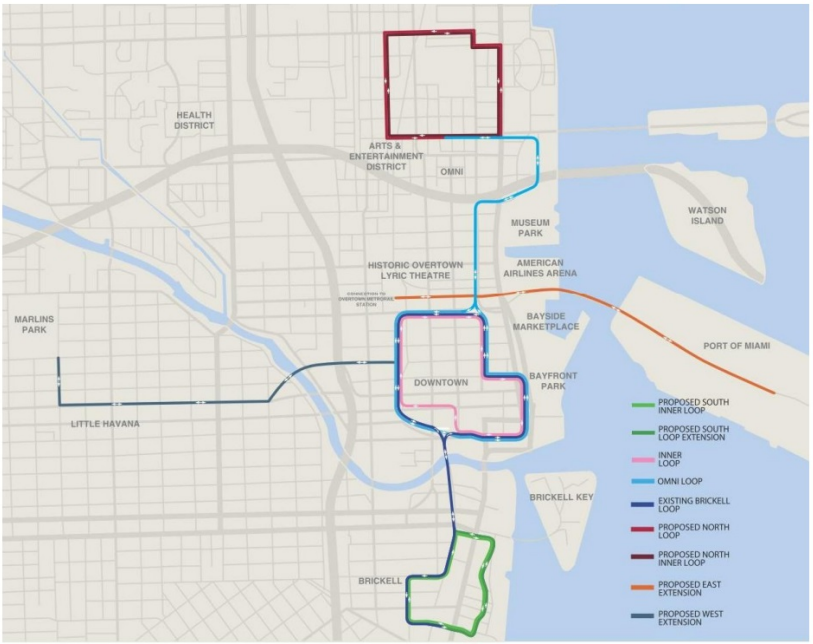


Figure 11. Metromover Expansion Master Plan

2.1.7 Beach Corridor Rapid Transit Project PD&E

The Beach Corridor reaches across Biscayne Bay to connect Downtown Miami and the Miami Design District with Miami Beach and surrounding locales, including the Miami Beach Convention Center. This PD&E study began in 2017 with the goal of enhancing the Beach Corridor's direct, convenient, and comfortable intermodal connectivity while remaining friendly to active modes of transportation such as biking and walking. Of the seven transit technologies originally identified as part of this study's Tier One evaluation, Automated Guideway Transit (AGT, e.g., Metromover and monorail), streetcar, and BRT remain under consideration for implementation. At the end of January 2020, the TPO approved the LPA for the entire study area: an extension from Downtown Miami (Museum Park station) to South Beach (Beach Corridor Trunkline); dedicated bus/trolley lanes along Washington Avenue to the Miami Beach Convention Center; and an extension of the Metromover along Miami Avenue to the Miami Design District (NW 41st Street). The project is ongoing, with DTPW now in the process of conducting community outreach and securing the required regulatory permitting to advance development.

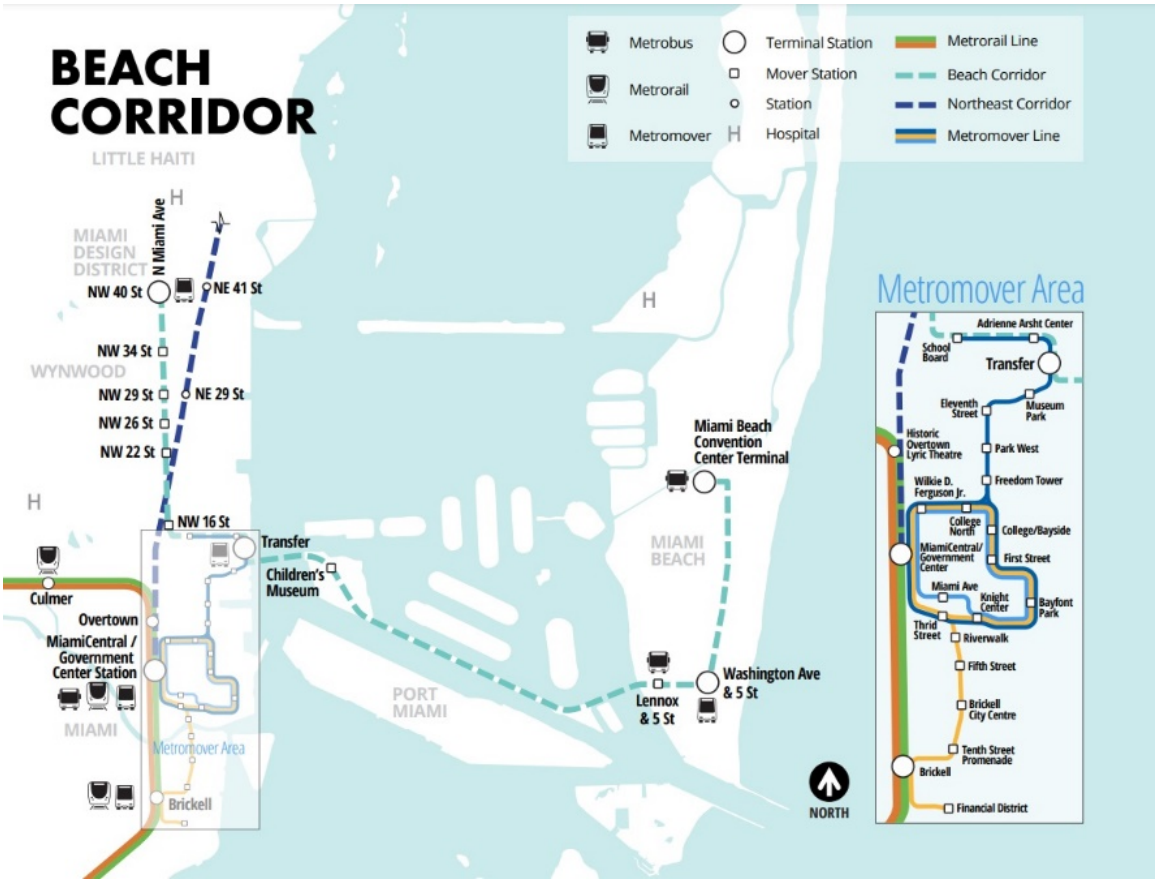


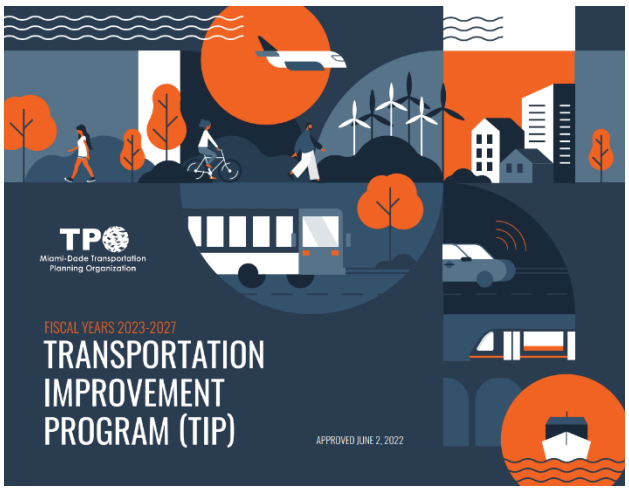
Figure 12. Beach Corridor of SMART Program

2.2 Review and Identification of Short- and Long-Range Projects

This section summarizes the review and identification of major short- and long-term projects related to the expansion of APM in Miami-Dade County within the study area. The following documents were reviewed:

- Miami-Dade TPO FY 2023-2027 Transportation Improvement Program (TIP)
- Miami-Dade 2040 LRTP, Miami-Dade MPO, October 2014
- Miami-Dade 2045 LRTP, Miami-Dade TPO, September 2019
- Florida Department of Transportation (FDOT) District 6 FY2024-2028 Adopted Work Program (AWP)
- Miami-Dade County DTPW Transit Development Plan (TDP)

2.2.1 Miami-Dade TPO FY 2023-2027 TIP



The TIP includes numerous projects related to the Metromover system. Not only will vehicles receive a midlife overhaul, but structural retrofitting will be undertaken to ensure continued system reliability. Perhaps the most important Metromover improvement detailed in this plan, however, is the Track & Guideway Rehabilitation to be implemented as part of the Metromover Comprehensive Wayside Overhaul. Many of the Metromover's subsystems have reached the end of their design life, including the Automatic Train Control (ATC) System, Data Transmission System (DTS) with Supervisory Control and Data Acquisition (SCADA), several Power Distribution System (PDS) elements (e.g. low voltage breakers, protective relays, ground switches, etc.), guideway switch equipment and the Central Control equipment. The project's goals are to maintain good equipment operations and an overall high Metromover System service availability. This subsystem replacement/refurbishment will include the design, supply manufacture, installation, testing and commissioning of the APM System into a fully functional, safe and reliable Metromover System. The project will address reverse-flow operations, with switches that will help have an improved travel time for the Beach Corridor from Government Center. The project was awarded to Alstom (formerly Bombardier). Construction began in 2022.

2.2.2 Miami-Dade 2040 LRTP, Miami-Dade MPO

The results of a transportation deficiency analysis performed by the County for the period 2020-2040 indicated that $15.2 billion of investment in mobility improvement projects was needed to keep pace with projected population increases through that period. The transit improvements prioritized in the plan were enhanced bus routes (East-West/Flagler Corridor, North/NW 27 Avenue Corridor, Douglas Road/37 Avenue Corridor, Kendall Corridor, Northeast/Biscayne Corridor, NW 7 Avenue); park-and-ride facilities at Kendall and Busway; the Dolphin Station Transit Terminal; the Palmetto Intermodal Terminal; and dedicated Bus Rapid Transit lanes on the North Corridor/NW 27 Avenue.

Unfunded projects include improvements to the Brickell Metrorail Station (connecting to Metromover and Metrorail); a central multi-modal terminal at PortMiami; enhancing bus service at the Civic Center Metrorail station; extending Metrorail service along US-1; East and West Light Rail facilities in Midtown (Miami Beach Convention Center/Allapattah Metrorail Station); a new Tri-Rail Station in Northern Miami-Dade (Ives Dairy Road); and expanding Metrorail service to connect Downtown Miami with Florida International University and the Marlins Stadium.

2.2.3 Miami-Dade 2045 LRTP, Miami-Dade TPO

The LRTP identifies highway, transit, freight, and non-motorized transportation improvements for the County through the next twenty years. The plan addresses mobility, safety, security, resiliency, and sustainability and considers the impact of emerging technologies and innovation on the County's existing and future transportation infrastructure. The plan recognizes that a connected and efficient multi-modal transportation system is the backbone for a thriving economy.

The plan reinforces the Miami-Dade TPO's SMART Plan as its highest priority. Relevant projects in the plan include:

- Metromover Brickell Loop Extension
- Metromover Omni Extension
- Transit Terminal Projects
- Station Access Improvement Projects
- Park-and-Ride Lot Projects
- Bicycle and Pedestrian Projects
- Freight Projects
- Sustainability/Resiliency Projects

The plan also highlights SMART demonstration projects, including trolley, flex, and on-demand service; circulators; feeder, express, and commuter routes; train service; and transit facilities. Many of the demonstration projects are meant to address first/last mile needs. The plan further describes ongoing TOD

projects within the County, new Metrorail and Metrobus fleets, and the SMART Trails program, which promotes the development of shared-use paths and other non-motorized facilities that connect to SMART Plan stations and associated TODs.

2.2.4 FDOT District 6 FY2024-2028 AWP

The current FDOT Five-Year AWP only identifies one specific Metromover project, a bridge inspection project. Other District 6 projects are assigned to categories such as transportation planning consulting, public transit development/grants, preliminary engineering consulting, and right-of-way support.

2.2.5 Miami Dade County DTPW TDP

This plan was created as an annual progress report to FDOT to keep the DTPW in good standing for the State Transit Block Grant Program. The TDP thoroughly examines existing conditions of the four modes DTPW operates: Metrobus, Metrorail, Metromover, and demand response service.

The plan identifies projects underway for the Metromover system, most of which pertain to station improvements like new elevators and escalators. In terms of Metromover extensions it references the Beach Corridor Study. The Beach Corridor PD&E presents recommendations, including elevated AGT for the trunk line, an extension of Metromover for the Midtown/Design District segment, and a dedicated-lane motorbus service on Washington Avenue. The Ten-Year Implementation Plan within the report mentions projects related to future extensions, including:

- Metromover Brickell Loop extension: Extension of the Metromover service in the Brickell area.
- Metromover Omni Extension Loop: Extension of the Metromover service to the Omni area.
- Bus and Rail Operations Maintenance Facility Improvements: Support facilities primarily built in the 1980s are now deteriorating due to aging. DTPW will develop a Needs Assessment and prepare design plans for a new Track and Guideway building.

The plan also addresses each SMART Plan corridor, describing 2021 work accomplished, status, and a detailed summary.

2.3 National and International APM Project Research

This section summarizes national and international research on best practices for expanding APM or similar technologies. The focus is on APM systems that have been newly constructed, expanded, or upgraded in the last 10 years to understand how other municipalities have incorporated new strategies or technologies to support APM infrastructure.

2.3.1 Overall Industry Trends

Industry trends for APMs, national and international, include the following:

- The global rail transportation industry is witnessing a trend which is expected to lead to a rise in the APM market.

- The overall autonomous train market is projected to grow at a compound annual growth rate (CAGR) of 6.7% annually through 2030 worldwide.
- The autonomous train market by technology is estimated at USD 6.4 billion in 2022 and is projected to reach USD 8.6 billion by 2030, at a CAGR of 3.7%. Note: The communications-based train control segment is estimated to lead the autonomous train market during the forecast period.
- The development of autonomous or driverless freight trains in the United States and the European region is expected to fuel the growth of the autonomous train market.
- Governments across different regions have started initiating smart city projects which require joint efforts from multiple stakeholders such as telecom operators, infrastructure providers, service providers, manufacturers, the public sector, and user groups.
- Some of the key issues for APMs are increased safety and service benefits for onboard passengers, increased budget allocations, and growing need for safety and compliance in rail transit.
- In the United States, many of the APMs that are operating are scattered throughout the nation's airports.
- Since Covid in 2020, many APM upgrades or extensions have been put on hold or delayed (e.g., JFK, Newark and LaGuardia), so the material for the study is limited. Exceptions include the recent Chicago O'Hare extension and the Los Angeles World Airports (LAWA) APM for the Los Angeles International Airport (LAX).

2.3.2 Case Study – Chicago O'Hare International Airport ATS Expansion and Modernization

2.3.2.1 System and Project Overview

Chicago O'Hare International Airport's three-mile driverless automatic transit system (ATS) is a dual-lane, fully automated rail system that operates 24/7. It is an important link between the airport's four airline terminals and Parking Lot E (remote and long-term parking). The original APM project replaced bus curbside pickup of rental car customers, thus mitigating traffic congestion and improving air quality by reducing vehicle emissions.

The expansion and modernization project involved replacing and expanding the APM system. The project included a 2,000-foot extension of trackwork to the newly consolidated rental car facility (ConRAC), an expansion of the maintenance and storage facility (MSF), and replacement of the 15-vehicle fleet with 36 new rail cars fitted with modern ATC, and traction power and communication systems improvements. The prime contractor and lead designer was responsible for final design, including integrating all systems. The prime

Source: J.A. Watts, Inc.

contractor designed the traction power, communications, and track work, as well as systems integration and commissioning work for the entire project.

The APM was modernized from a hard-wired fixed block ATC system to a wireless moveable block ATC system. This one-of-a-kind effort integrated a new system and new trains with existing infrastructure. The project required the existing APM system be kept operational during the modernization upgrading process through restricted work hours and tight coordination with the existing O&M contractor. The prime contractor managed the vehicle supplier and electrical and civil/structural installers on extremely complex interfaces with the existing and new systems to transition between the new and old systems.

Work elements included:

- Implementing a new fleet of vehicles and a new train control system designed and provided by a systems/vehicle supplier as part of the project team.
- Designing and installing new running surfaces, guidance systems, PDS, SCADA, platform screen doors, and communications systems.
- Interfacing management across all project elements.
- Testing and commissioning, maintenance and operations manuals, training, and safety certification.

2.3.2.2 Challenges

The interface design presented unique challenges, such as using the existing infrastructure of the original system that was installed nearly 30 years ago and the new vehicles had to be designed to work with the existing guideway. The project contractor allocated the vehicle design responsibility to the vehicles/systems supplier.

This project is design-build (DB) but with no O&M component. This created challenges in that the O&M expertise and knowledge of the existing Matra system was not an integral part of the project throughout the design and implementation of the new systems. The O'Hare O&M provider was not part of the DB contract, and interface information had to flow through the project management office organization overseeing the project contractor's work. The lack of involvement of the O&M provider made effective interface management more challenging.

A key challenge for this project was that being a combination of a brownfield and greenfield project. Modernization work had to be carried out while keeping the legacy APM system in operation. The design of the new infrastructure also had to match that of the legacy 30-year-old design. Vehicles and systems had to be compatible with and had to be interfaced to the existing infrastructure.

2.3.2.3 Outcomes/Lessons Learned

At the project start, the contract was changed from design-build-operate-maintain (DBOM) to DB, leaving the O&M of the existing and new system under a separate contract. Removing the O&M scope from the DBOM led to degradation and dilution of communications within the project regarding valuable knowledge gained from operating this unique system during the past 25 years. Had O&M been part of the contract, the operating experience could have better informed the design; enhanced the development of manuals, procedures, and training; and promoted a more integrated and effective testing and commissioning phase.

2.3.3 Case Study – LAWA LAMP Project at LAX

2.3.3.1 Project Overview

LAWA is undertaking the $5.5 billion Landside Access Modernization Program (LAMP) at LAX to improve access to and egress from the airport, improve air quality, reduce traffic congestion, and enhance the visitor experience. It is currently one of the largest U.S. infrastructure programs.

LAX is the world's busiest airport, the largest international airport on the West Coast, and a gateway to both Asia and Latin America. LAX accommodated 87.8 million passengers in 2019 and 2.21 million tons of cargo in 2018.

The City of Los Angeles is experiencing increased business and leisure travel as it prepares to host the 2028 Summer Olympics. By 2030, LAX is anticipated to see more than 125 million passengers annually. LAMP is a significant factor in accommodating visitor growth and creating a welcoming experience. LAMP will provide more airport access options, reduce traffic congestion, and provide a more predictable and reliable commute to and from the airport. Each LAMP component incorporates sustainability, design, and construction best practices.

2.3.3.2 LAMP

The LAMP elements include the APM, ConRAC, roadway utility and enabling improvements (RUE), and one intermodal transportation facility (ITF West—now known as the LAX Economy Parking Garage), with a second planned (ITF East). The APM and ConRAC elements have been procured using the design-build-finance-operate-maintain procurement methodology. Both are public-private partnerships (P3) and P3 Bulletin recognized the APM as the 2018 Global Public-Private Partnership of the Year. The ITF West facility employed a progressive DB model. RUE may have 30 projects underway at any one time using a more traditional design and construction methodology.

Source: Parsons Corporation

LAMP-wide, the project contractor is collaborating with the client to support facility and structural esthetics, public art, landscaping, and wayfinding to enhance the public's experience at LAX and to minimize construction disruptions to existing operations, airlines, and traffic. They are also coordinating stakeholder activities across the elements and supporting LAWA management. The project contractor has team members interspersed within ITF West and other utility and LAMP-enabling projects. The ITF West developer was selected in 2018 and completed the facility construction in October 2021.

The RUE team is the foundation of LAMP, as completing the roadway, utilities, and enabling projects is critical to keeping the construction on schedule. The project includes funding for an inclusivity team and

HireLAX, a program that provides community outreach messaging and support for local-hire training programs.

2.3.3.3 APM

From 2017 through 2018, a project contractor managed the pre-bid, request for proposal, and procurement of the P3 developer for the APM. They developed LAMP's structure, budget, and staffing plan (governance) and managed engineering and technical evaluations of proposals. The selected developer, a consortium of firms named LINXS, was scheduled to build the APM by 2023 and will provide O&M for 25 years.

The APM will connect to the ConRAC and LA Metro's Crenshaw Line and intermodal facilities. During peak operations, 36 vehicles will operate as nine four-car trains. Trains will run at a top speed of 45 mph with headways of approximately two minutes and 15 seconds.

The official APM groundbreaking was held in March 2019. In 2020, LINXS finalized the design and ramped up the foundation and aerial guideway column construction. The APM project included approximately 2.25 miles of elevated dual-lane grade-separated guideway with six stations, elevated pedestrian walkways, an MSF, and demolition and reconstruction of parking garages and roads around the airport. The APM is a zero-emission electric train that creates its own power through a regenerative braking system that captures energy otherwise lost during vehicle braking. A solar power system on the roof of the APM's MSF will provide 40% of the facility's energy needs and 7% of the APM's overall power requirements. Also, the APM's train cars are made from fully recyclable aluminum shells.

2.3.3.4 Outcomes/Lessons Learned

The project represents numerous lessons learned:

- The design-build-finance-operate-maintain procurement methodology allowed for an integrated approach to deliver the project including future operations.
- The approach allowed for minimized construction disruptions to existing operations, airlines, and traffic.
- The project involved an integrated approach with team members dispersed throughout key locations and agencies to ensure success.
- The project was supported by the robust RUE program which ensured that enabling projects were in place to allow construction to stay on schedule.
- The project included funding for an inclusivity team and the HireLAX program ensuring sufficient community outreach messaging and promoting local-hire training programs.

2.3.4 Case Study – Neihu Line, Taipei, Taiwan

2.3.4.1 Project History and Overview

The Wenhu (or Brown line) is a metro line in Taipei operated by Taipei Metro, named after the two districts which it connects: Wenshan and Neihu. It is an automated medium-capacity rubber-tired metro line and is 25.1 kilometers (15.6 mi) long, serving a total of 24 stations located in 7 districts in Taipei, of which 22 are elevated and 2 underground. As of April 2022, average ridership was approximately 140,000 passengers daily.

The Wenshan section began revenue service on March 28, 1996. The Neihu section began revenue service on July 4, 2009.

Construction of the Wenshan line began in December 1988 at a cost of NT$42.6 billion. It was plagued by controversy, cost overruns and technical problems from its development up to a few years after its opening. Originally slated to commence passenger service in December 1991, its revenue operation was repeatedly delayed through March 1996 owing to numerous accidents. Public confidence was shaken as incidents of lightning strikes, computer failures, two instances of rolling stock derailment and catching fire each were reported during the testing phase. In 1999, cracks were found on the elevated pillars forcing the line to shut down temporarily.

One of the largest suppliers for the system, Matra (which supplied the VAL 256 rolling stock and electrical systems for the line), sued the Department of Rapid Transit Systems of the Taipei City Government for cost overruns which Matra claimed resulted from the Department failing to provide the necessary infrastructure to build the line. Subsequently, the company pulled out of the operation of the line in 1994. Chen Shui Bian, then Mayor of Taipei declared that progress and operation of the line would continue despite a public walkout. After a 12-year-long legal tussle, in 2005, Matra was awarded NT$1.6 billion (approx. US$50 million) in damages by the Supreme Court of the Republic of China.

Services on the Wenshan line began with two-car operation of the VAL 256 vehicles. Eventually, increasing patronage on the system led to operation in four-car configurations. The opening of the Maokong Gondola in 2007 also boosted ridership from passengers traveling on the line to the Taipei Zoo for transfer.

The Wenshan line is connected to the Neihu Line, which opened in July 2009. It connects to Neihu and Taipei Songshan Airport. Since an alternative contractor Bombardier was awarded to supply the rolling stock and the signaling system for the new line, the Wenshan line's signaling system was converted to suit the new communications-based train control (CBTC) CITYFLO 650 to allow both the old Matra rolling stock and the new Bombardier rolling stock to run in co-existence. In December 2010, fifty-one pairs of retrofitted VAL 256's (from the Matra rolling stock) began testing on the entire line. After over half a year of testing, the additional trains decreased the time between trains at rush hour from 2 minutes to 72 seconds and brought the total number of trains operating on the line to 152 pairs.

Source: Subscriptshoe9, Wikipedia

The long-awaited Neihu line has had many delays prior to its opening. Since the Neihu line was planned as an extension to the Wenshan line, the original plan called for a similar elevated medium-capacity line. However, due to the growth of the Neihu District, many residents and politicians called for an underground, high-capacity line instead.

The initial cost estimate of the elevated line was NT$42.6 billion, but due to delays the price-adjusted cost estimate rose to over NT$60.3 billion. A shift to underground construction would have increased the cost to as high as NT$134.4 billion. However, the Central Government stated that if construction for the Neihu line did not start immediately, they would withhold the grant money for the line. In addition, due to the narrow streets and numerous turns in Neihu, construction of an underground high-capacity line would have been infeasible. Thus, the plan to build an elevated line continued after much delay.

There was also significant debate whether Songshan Airport should be included on the route. The addition of the station added an additional 1.9 kilometers (1.2 miles) to the line's length. Because of the inclusion of the station, the final cost of the line reached NT$66.7 billion.

The line was initially planned to begin service in 1996, and after 13 years of delay, the line finally began operations. However, the Neihu line has been criticized for its frequent malfunctions and safety issues.

2.3.4.2 Outcomes/Lessons Learned

The Neihu line and its predecessor line, the Wenshan section encountered overwhelming political, legal, and public sentiment challenges. The project was eventually constructed overcoming all these challenges but experienced significant delay in startup. Successful project elements included the conversion to a new communications-based train control system that allowed the older and newer rolling stock to run in co-existence and retrofit of the older VAL 256 vehicles.

3. Tier Analysis and Areas Selection

3.1 Alternatives Being Evaluated as Part of Other Studies

Several potential APM alternatives are being evaluated or advanced as part of other studies and were not included under this study. These include:

- Brickell Loop Expansion
- Omni Loop Expansion – Being evaluated as part of the Beach Corridor
- Flagler Street

3.2 Identification of Tier 1 Feasible Expansion Areas

The study team identified potential alternatives by:

- Identifying options to further extend and augment the reach of the SMART Program, in areas connecting to existing and/or future SMART Program corridors and intermodal hubs where feasible.
- Drawing from options identified in existing plans and studies
- Soliciting input from Miami-Dade TPO staff and member agencies

Ten alternatives were identified:

- Northeast Quadrant
  - Alternative F: Aventura
- Northwest Quadrant
  - Alternative D: Hialeah Metrorail Station to Downtown Hialeah

- Alternative G: Okeechobee Metrorail Station to Western Hialeah
- Alternative H: Palmetto Metrorail to Downtown Doral

- Southeast Quadrant
  - Alternative A: Government Center to Marlins Stadium
  - Alternative B: Culmer Metrorail Station to Marlins Stadium
  - Alternative E: Metromover Connection to Port Miami
- Southwest Quadrant
  - Alternative C: Blue Lagoon Circulator
  - Alternative I: FIU
  - Alternative J: Homestead

3.2.1 Description of Tier 1 Alternatives

3.2.1.1 Alternative A – Government Center to Marlins Stadium

Figure 13 shows the alignment Alternative A would follow, traveling west from Government Center along NW 2nd Street, north of the Miami River along North River Drive, crossing the Miami River on the NW 5th Street Bridge, continuing west along South River Drive, then along NW 7th Street to LoanDepot Park (Marlins Stadium).

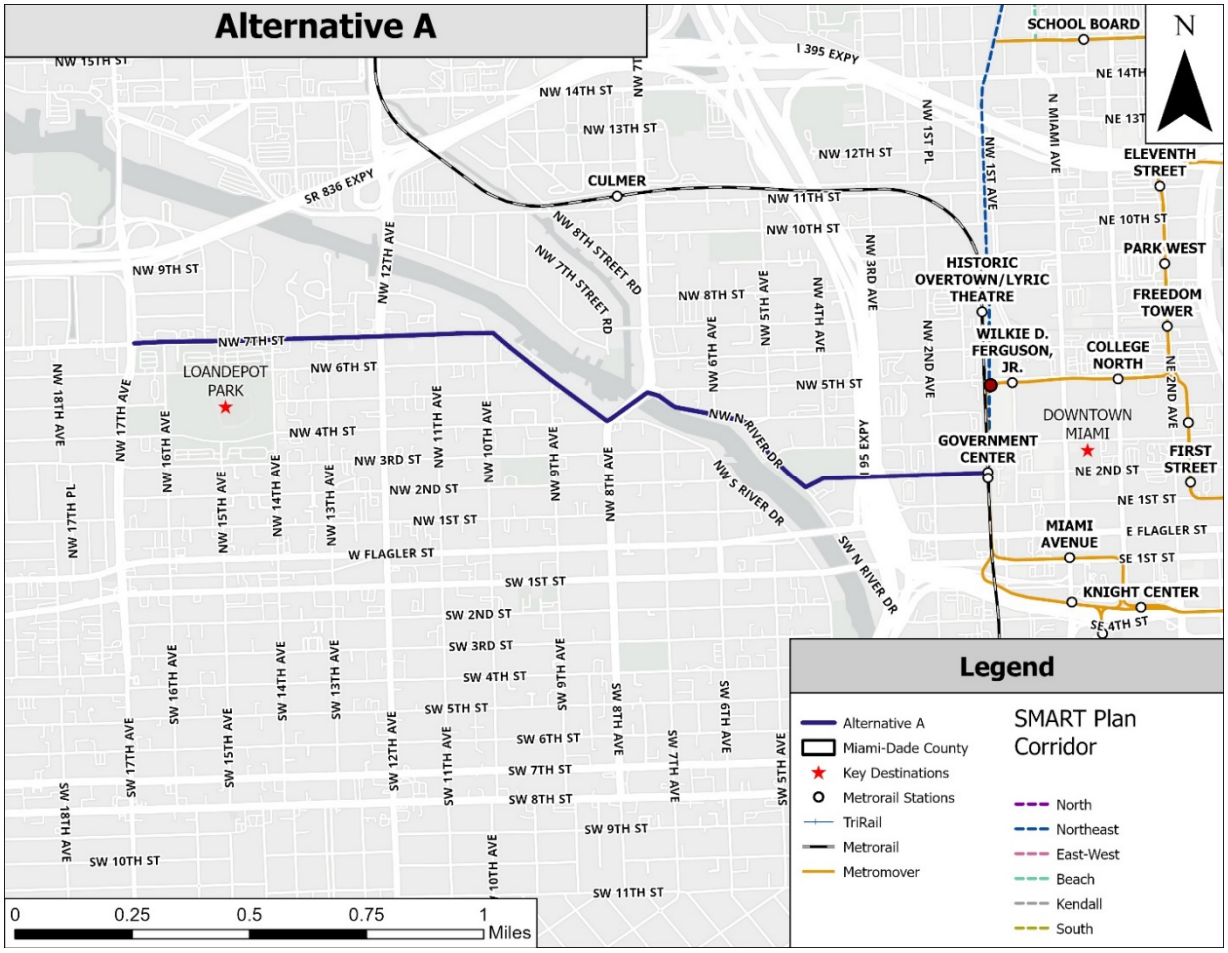


Figure 13. Alternative A – Government Center to LoanDepot Park (Marlins Stadium).

Although Alternative A would not connect directly to the Metromover system, it would provide access at Government Center station using the unused Metrorail platform built in the 1980s. Four parking garages at LoanDepot Park (Marlins Stadium) would provide shared-use opportunities as transit access points so the APM could run directly in front of the stadium. Travelers north, south, and west of the stadium, as well as in Little Havana, would be able to access the Metromover easily. This alternative was presented to the study's first Project Working Group meeting attendees on August 2, 2023.

3.2.1.2 Alternative B – Culmer Metrorail Station to Marlins Stadium

Figure 14 shows the alignment Alternative B would follow, traveling west along NW 11th Street from the Culmer Metrorail Station, south along NW 12th Avenue crossing the Miami River, and west along NW 7th Street to LoanDepot Park (Marlins Stadium).

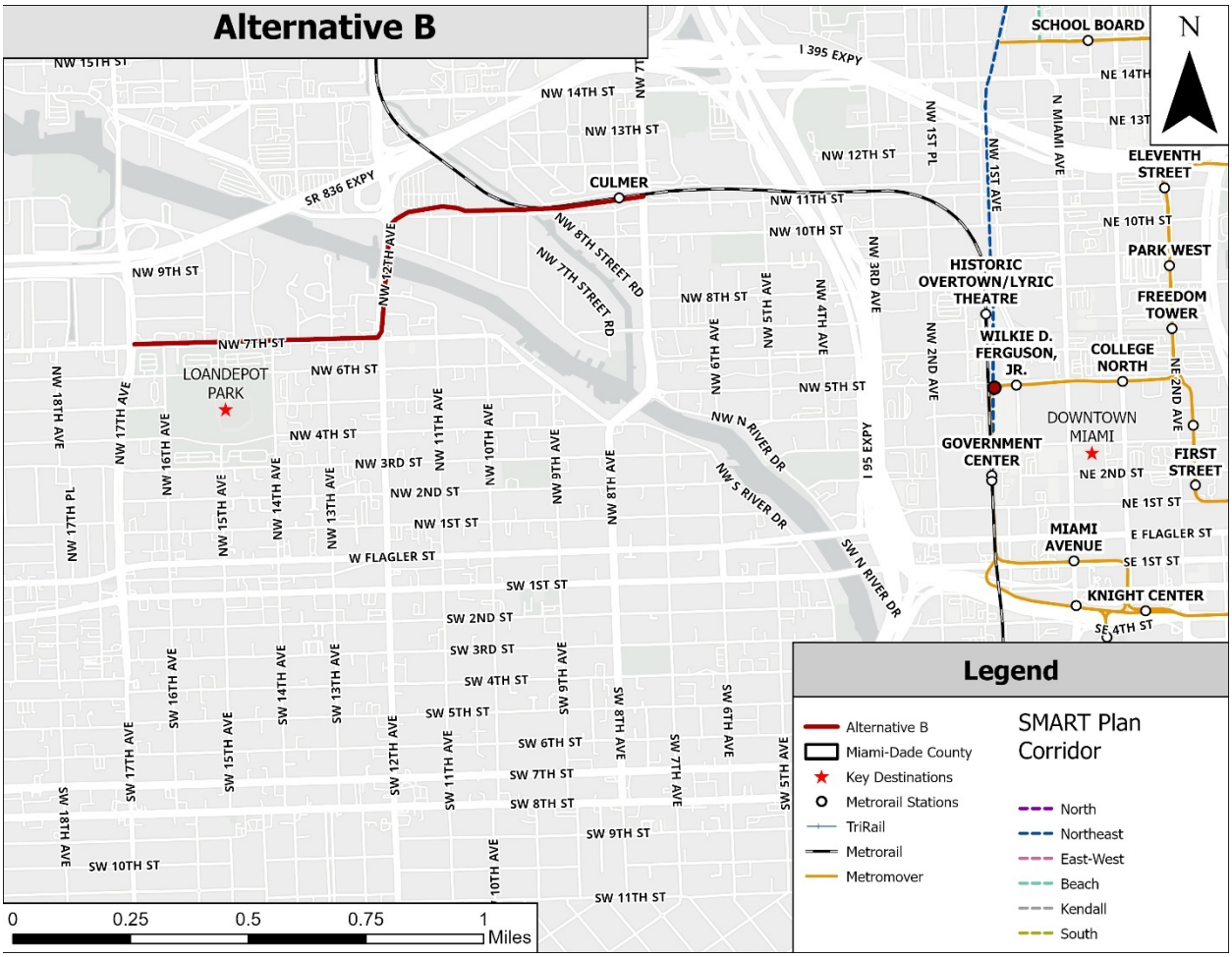


Figure 14. Alternative B – Culmer Metrorail Station to Marlins Stadium.

Alternative B would not connect directly to the Metromover system. Four parking garages at LoanDepot Park (Marlins Stadium) would provide shared-use opportunities as transit access points so the APM could run directly in front of the stadium. Travelers north, south, and west of the stadium, as well as in Little Havana, would be able to access downtown Miami via the Metrorail system. This alternative was recommended by attendees of the study's first Project Working Group meeting on August 2, 2023.

3.2.1.3 Alternative C – Blue Lagoon Circulator

Alternative C is proposed as a circulator within the Blue Lagoon development south of the Miami International Airport. Figure 15 shows the alignment the alternative would follow, traveling from the Hilton Miami Airport Blue Lagoon west along Waterford District Drive through NW 57th Avenue and past the Pullman Miami Airport Hotel, south on NW 65th Avenue, and west along NW 7th Street to Milam Dairy Road and the DoubleTree by Hilton Hotel Miami Airport and Convention Center.

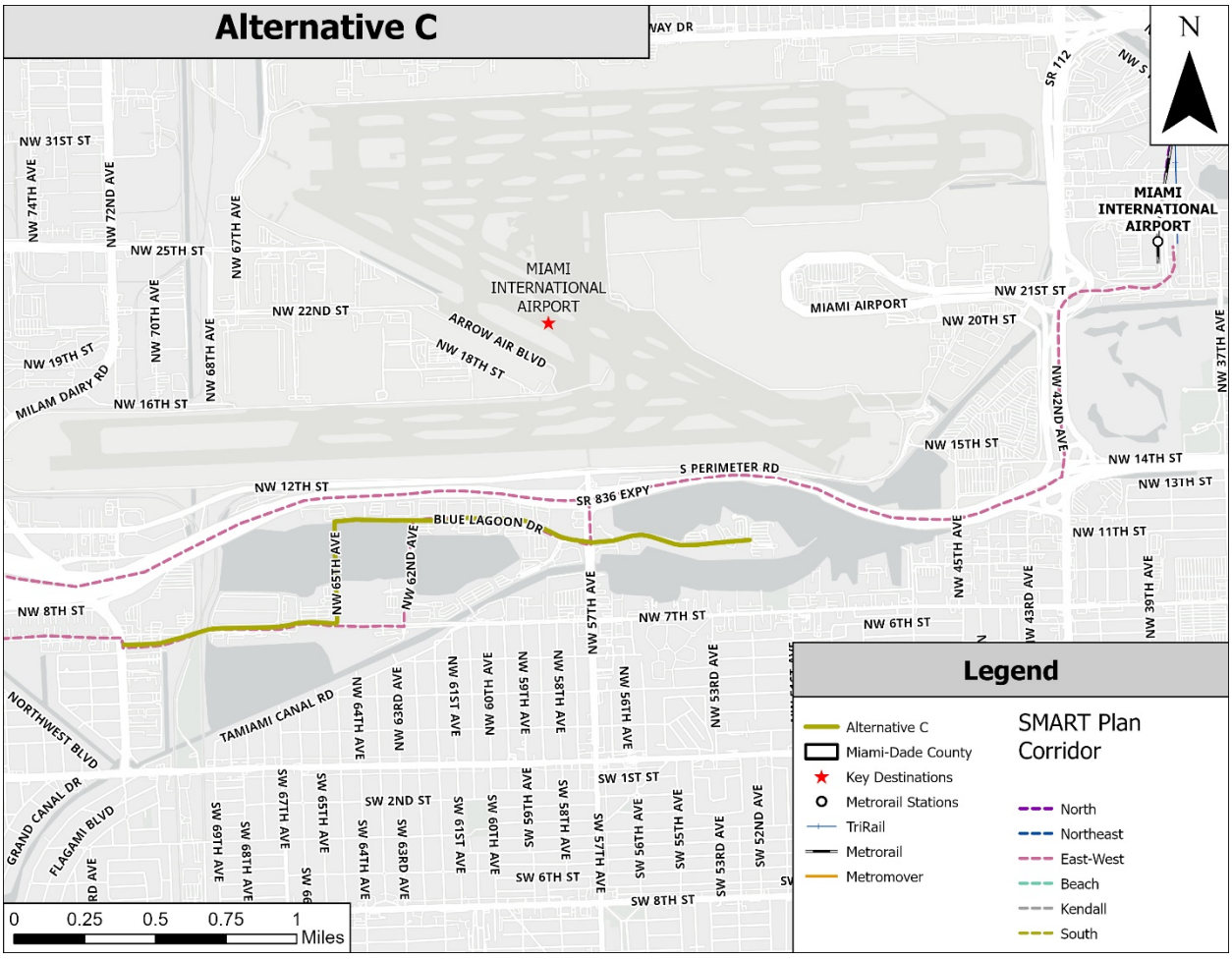


Figure 15. Alternative C – Blue Lagoon Circulator.

While Alternative C would tie into the SMART Plan's East-West corridor, it would not connect to the airport or to the existing Metromover system and would require a separate maintenance facility. This alternative was presented to the first Project Working Group meeting attendees on August 2, 2023.

3.2.1.4 Alternative D – Hialeah Metrorail Station to Downtown Hialeah

Figure 16 shows the alignment Alternative D would follow from the Hialeah Metrorail station, west along E 21st Street, south along Palm Avenue to Hialeah City Hall, east along E 5th Street, north along E 1st Avenue, then east along E 21st Street back to the Hialeah Metrorail station.

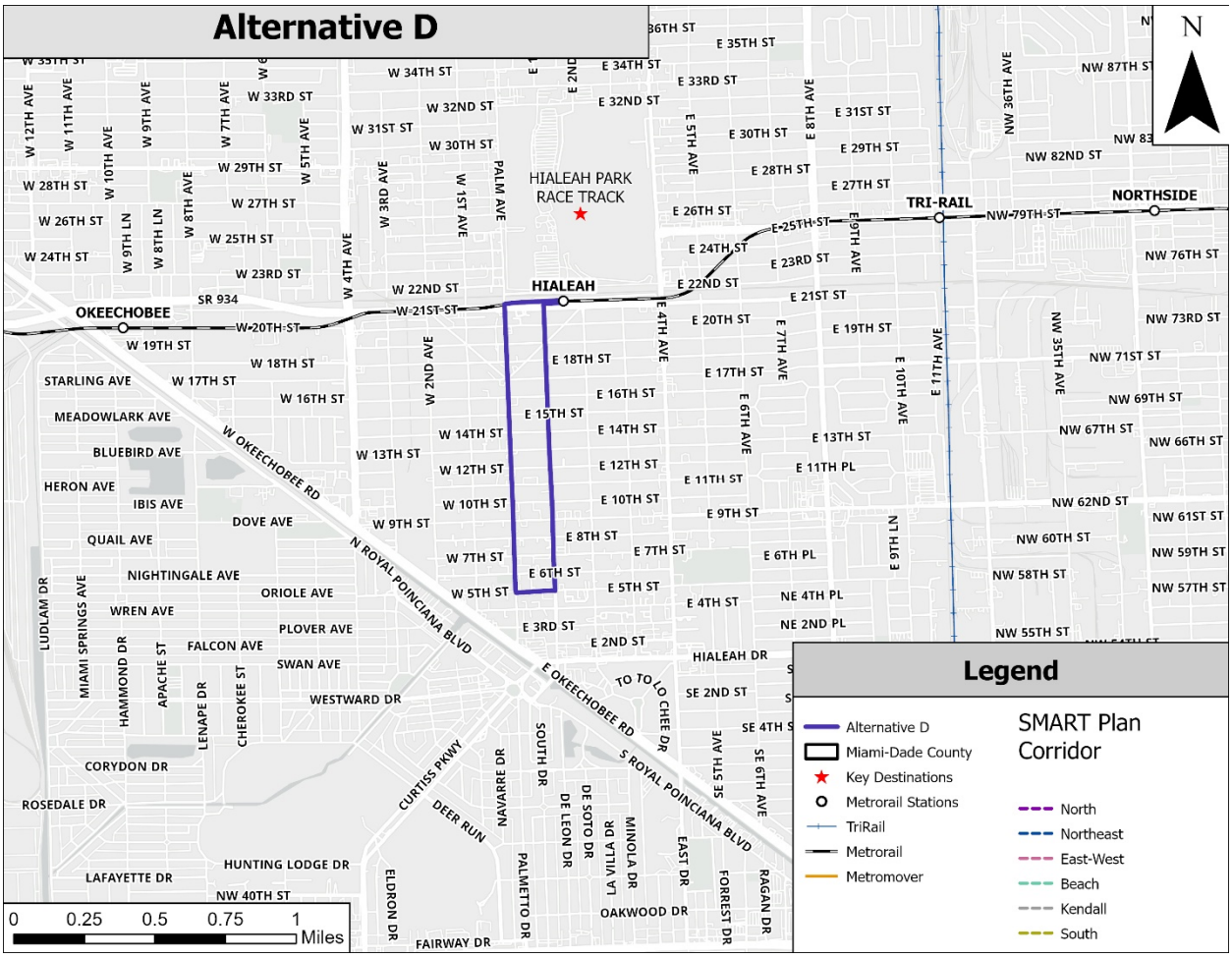


Figure 16. Alternative D – Hialeah Metrorail Station to Downtown Hialeah.

Alternative D would function as a loop within the City of Hialeah connecting future TOD at the Hialeah Metrorail station with downtown Hialeah. The alternative does not include a connection to the existing Metromover system and would require a separate maintenance facility. This alternative was presented to the first Project Working Group meeting attendees on August 2, 2023.

3.2.1.5 Alternative E – Metromover Connection to Port Miami

Figure 17 shows the alignment Alternative E would follow from the Freedom Tower Metromover Station, east along NE 6th Street, across the Port Miami Bridge, and along Port Boulevard to the various cruise terminals.

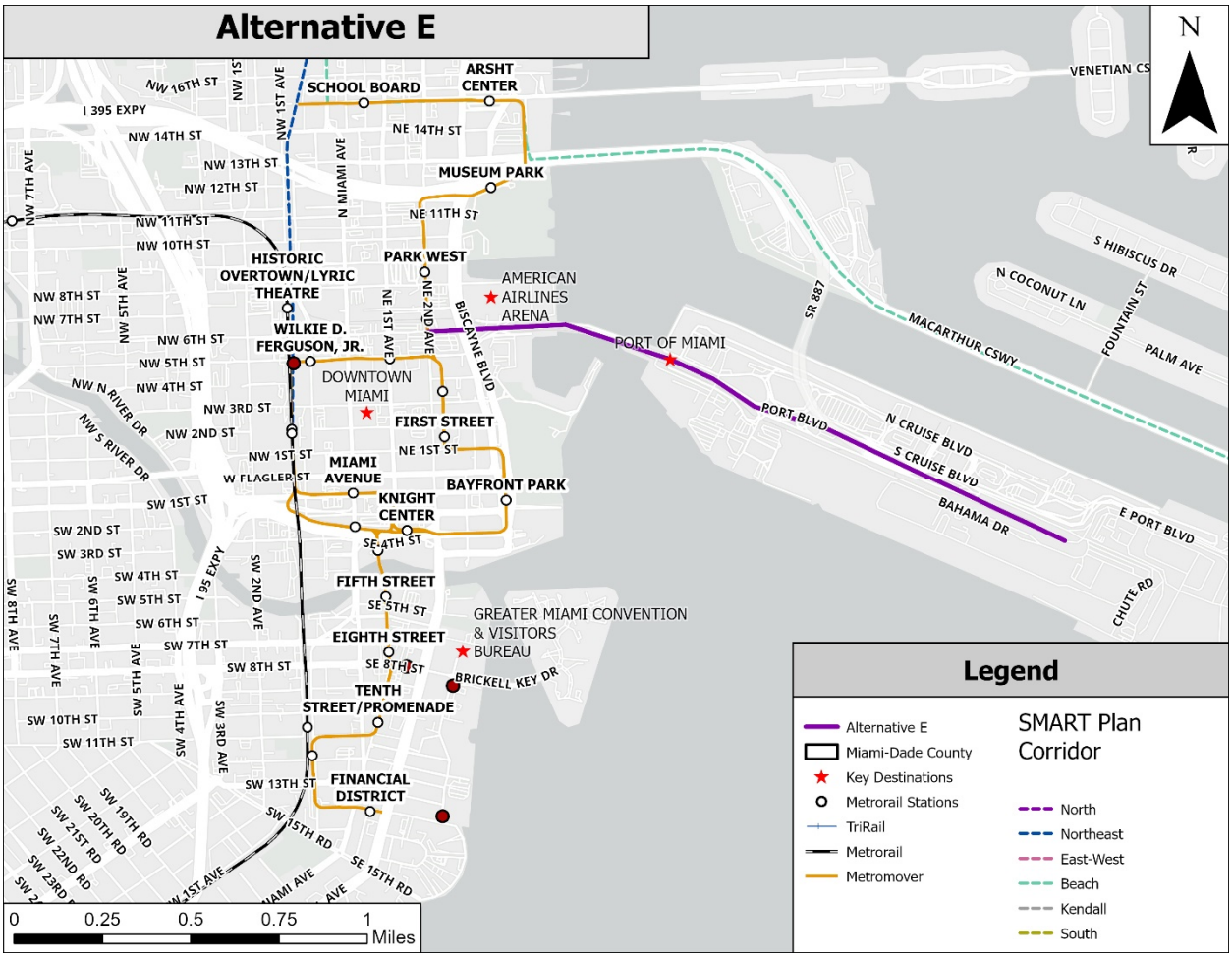


Figure 17. Alternative E – Metromover Connection to Port Miami.

Alternative E, which would operate back and forth between the Freedom Tower Metromover Station and the Port of Miami, would tie into the existing Metromover system and would not require a separate maintenance facility. This alternative was recommended by attendees of the study's first Project Working Group meeting on August 2, 2023. Prior studies and plans identified during the Task 1 Literature Review also recommended a connection to the Port.

3.2.1.6 Alternative F – Aventura

Figure 18 shows the alignment Alternative F would follow from the Brightline Aventura Station east along Abigail Road adjacent to Aventura Mall, east along the William Lehman Causeway (SR 856), and then branching both north and south on A1A (Collins Avenue/Ocean Boulevard).

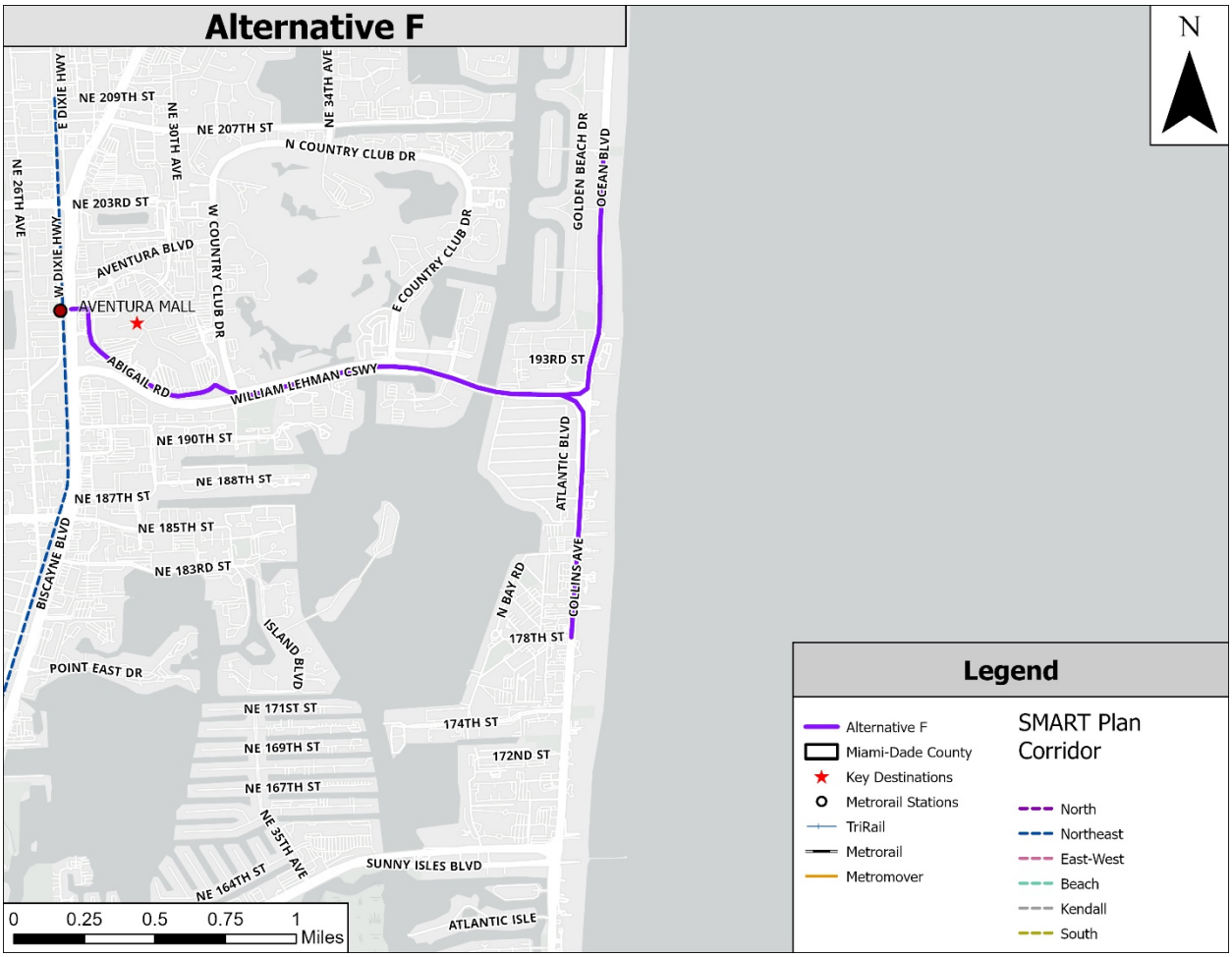


Figure 18. Alternative F – Aventura.

Alternative F would function as a pinched loop at each end – designed like a dual-lane shuttle, trains would reverse direction at end stations and utilize switches to change lanes, therefore serving all stations in both directions. The alternative does not include a connection to the existing Metromover system and would require a separate maintenance facility.

3.2.1.7 Alternative G – Okeechobee Metrorail Station to Western Hialeah

Figure 19 shows the alignment Alternative G would follow from the Okeechobee Metrorail Station, northwest along W Okeechobee Road, north on W 18th Avenue, north on W 18th Court, and across W 49th Street to Westland Mall. The alternative would serve the Miracle Mile Shopping Center, Westland Promenade, Westland Hialeah Senior High School, Florida National University, Miami-Dade College - Hialeah Campus, and Westland Mall.

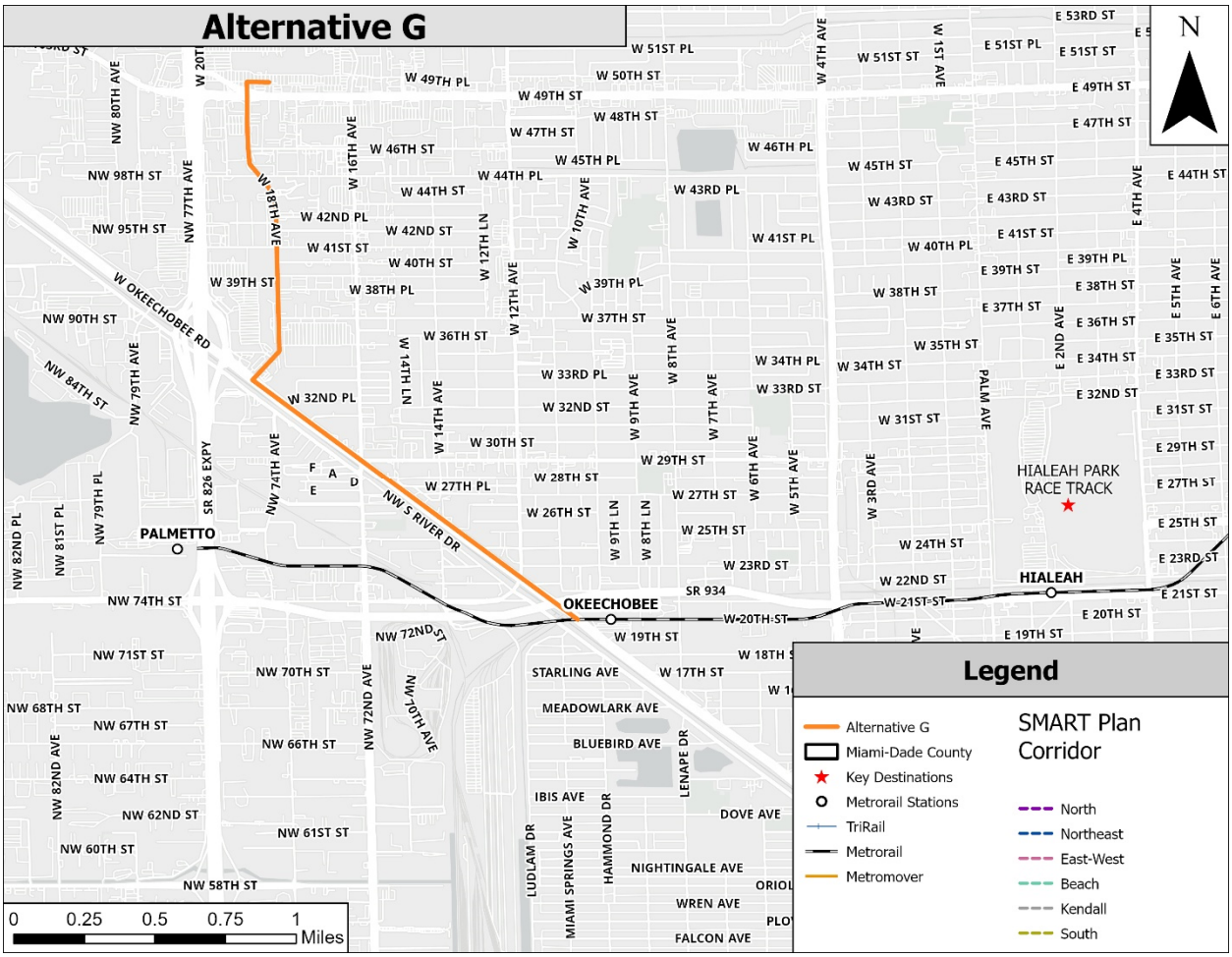


Figure 19. Alternative G – Okeechobee Metrorail Station to Western Hialeah.

Alternative G would function as a pinched loop at either end. The alternative does not include a connection to the existing Metromover system and would require a separate maintenance facility.

3.2.1.8 Alternative H – Palmetto Metrorail to Downtown Doral

Figure 20 shows the alignment Alternative H would follow from the Palmetto Metrorail Station, south on NW 79th Place, west on NW 74th Street, south on NW 87th Avenue, east on NW 53rd Street, and west on NW 54th Street. The alternative would serve downtown Doral.

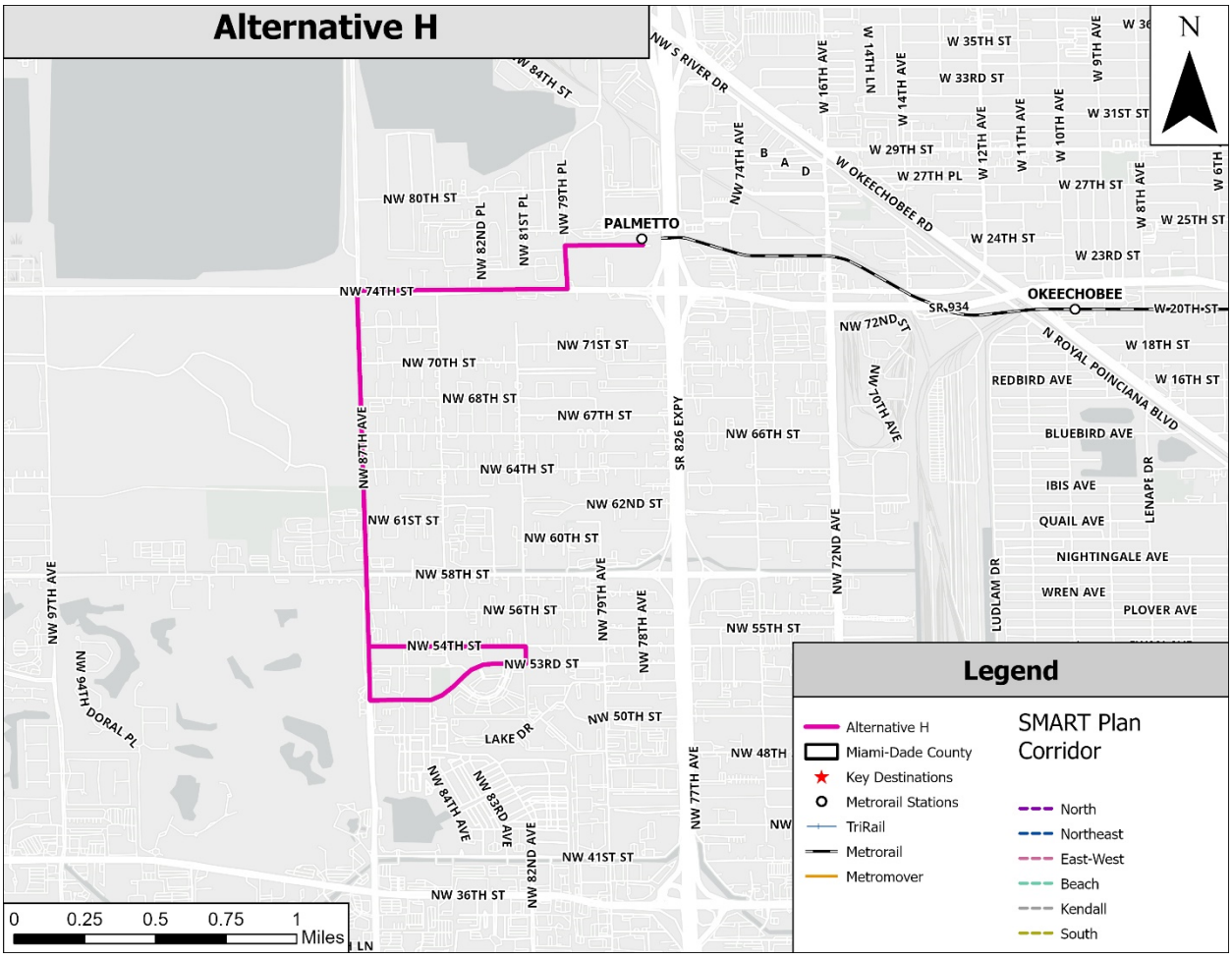


Figure 20. Alternative H – Palmetto Metrorail to Downtown Doral.

Alternative H would function as a pinched loop at the north end and as a loop in downtown Doral. The alternative does not include a connection to the existing Metromover system and would require a separate maintenance facility.

3.2.1.9 Alternative I – Florida International University (FIU)

Figure 21 shows the alignment Alternative I would follow from the FIU Maidique Campus Bus Terminal, northwest along SW 108th Avenue, north along SW 17th Street and E Campus Circle, north on University Drive, north on SW 109th Avenue to W Flagler Street. The alternative would circulate through FIU serving the university and areas to the north.

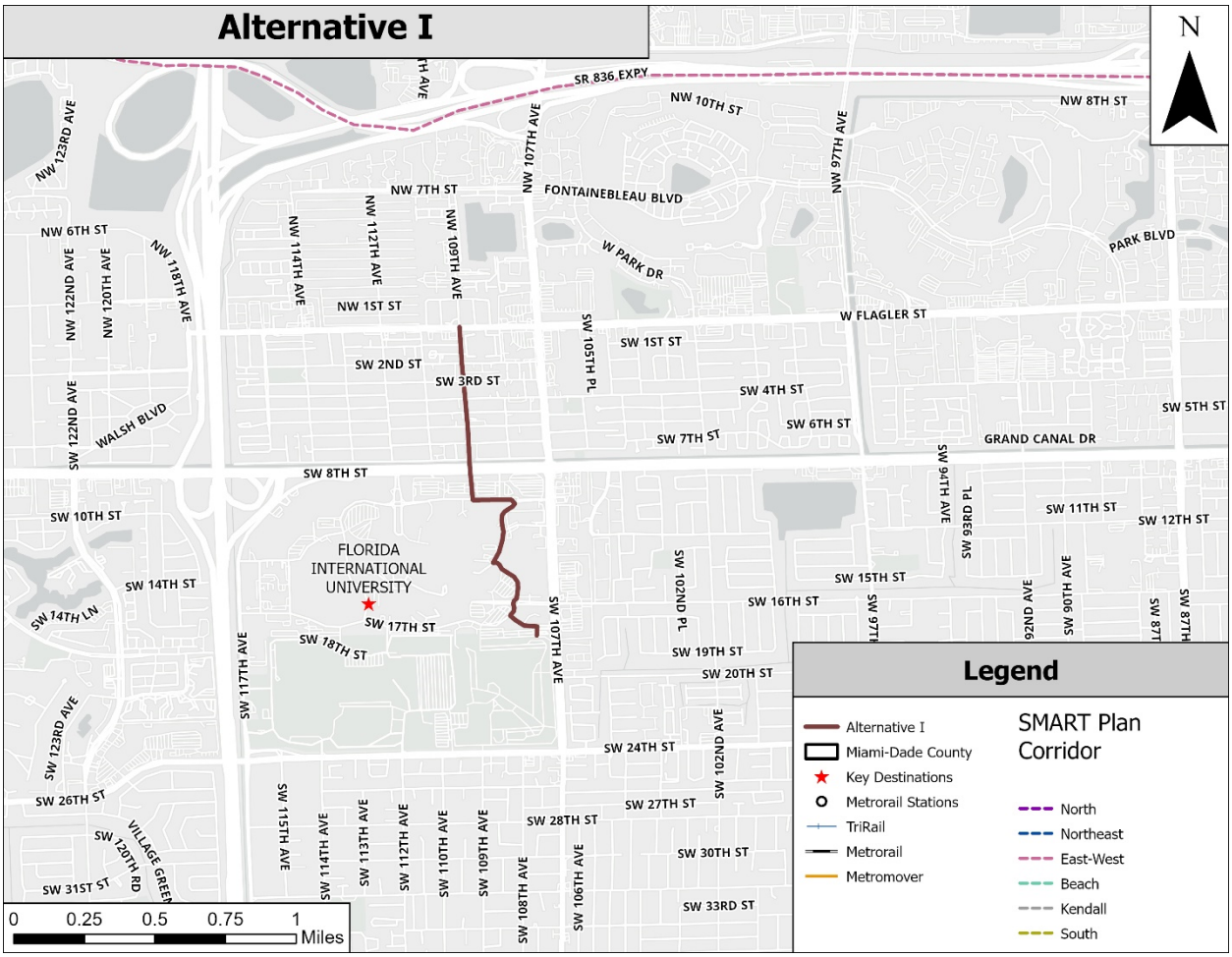


Figure 21. Alternative I – FIU.

Alternative I would function as a pinched loop at either end. The alternative does not include a connection to the existing Metromover system and would require a separate maintenance facility.

3.2.1.10 Alternative J – Homestead

Figure 22 shows the alignment Alternative J would travel south on Homestead Boulevard, west on SE 4th Street, northwest on SE 2nd Drive, north on Krome Avenue, and east on Campbell Drive connecting to the S Miami-Dade Busway. The alternative would serve Sedano's Supermarkets, Homestead Towne Square, Somerset Academy South Homestead Middle/High, EVO Entertainment Homestead + IMAX, Seminole Theatre, Homestead City Hall, the Miami-Dade College Homestead Campus, and Homestead Plaza.

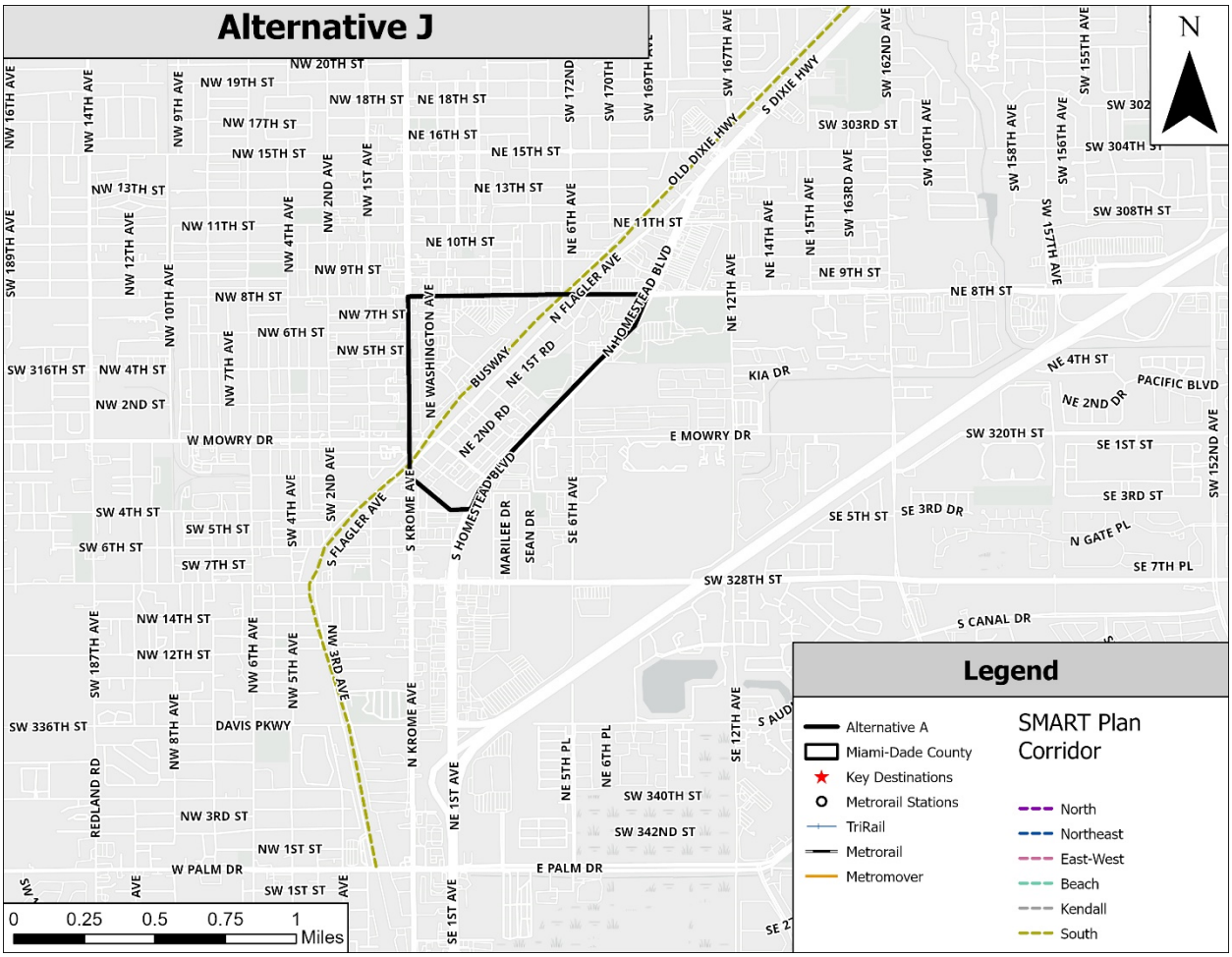


Figure 22. Alternative J – Homestead.

Alternative J would function as a one-way loop. The alternative does not include a connection to the existing Metromover system and would require a separate maintenance facility.

3.3 Screening Criteria

Screening of the Tier 1 alternatives applies the following criteria:

- Roadway Network Congestion
- Demographics
  - Population Density
  - Employment Density
- Transit-Supportive Land Uses
- Connectivity to Other Rapid Transit Corridors or SMART Program
- Available Right-of-Way Constraints and Opportunities
- Pedestrian and Cycle Accessibility and Mobility Accommodation
- Existing Adjacent Ridership

- Transit Station Park-and-Ride/Kiss-and-Ride Access Opportunities
- Affordability
- Access to Transit Modes

Relative scores were assigned using Harvey balls per Table 1.

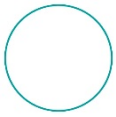
Relative Score	High (5 pts)	Medium-High (4 pts)	Medium (3 pts)	Low-Medium (2 pts)	Low (1 pt)
Harvey Ball					

Table 1. Harvey Ball Relative Scoring Description.

3.3.1 Roadway Network Congestion

The study team used Google Maps to observe live traffic conditions for roadways adjacent to the alternative alignments during a typical weekday afternoon (Appendix A). Alternatives with more roadway network congestion indicate a stronger need for a transit investment and were scored higher. Table 2 shows relative scores.

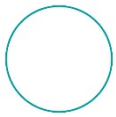
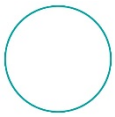
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Roadway Network Congestion Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Roadway Network Congestion Relative Score					

Table 2. Roadway Network Congestion Scoring.

3.3.2 Demographics

3.3.2.1 Population Density

Population density was mapped for each alternative using 2020 US Census data by Census Block Group. Appendix B includes individual alternative population density maps. Population density varies among the alternatives, as summarized in Table 3.

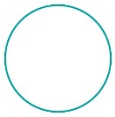
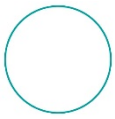
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Population Density Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Population Density Relative Score					

Table 3. Population Density Scoring.

3.3.2.2 Employment Density

Employment density was mapped for each alternative using 2020 employment data provided by the Miami-Dade TPO. Appendix C includes individual alternative employment density maps. Employment density varies among the alternatives, as summarized in Table 4.

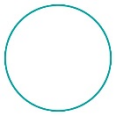
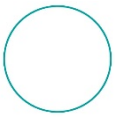
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Employment Density Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Employment Density Relative Score					

Table 4. Employment Density Scoring.

3.3.3 Transit-Supportive Land Uses

Miami-Dade County's Transit Oriented Communities Tool was used to assess the level of transit-supportive land use occurring along each alternative, as indicated by the intensity of developed land cover.[1] Appendix D contains individual maps. While there is some variation, most alignments run through areas with medium or high development intensity. Table 5 shows relative scores.

[1] https://experience.arcgis.com/experience/3bf14a86d5444edc81dc9c63d5b76d45/page/page_46/

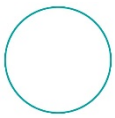
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Transit-Supportive Land Use Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Transit-Supportive Land Use Relative Score					

Table 5. Transit-Supportive Land Use Scoring.

3.3.4 Connectivity to Other Rapid Transit Corridors or SMART Program

All the alternatives connect to an existing Metrorail or Metromover line or to a proposed SMART Program corridor except Alternative I:

- *Alternative A: Government Center to Marlins Stadium* – connects to Government Center Metrorail and Metromover stations
- *Alternative B: Culmer Metrorail Station to Marlins Stadium* – connects to Culmer Metrorail Station
- *Alternative C: Blue Lagoon APM Circulator* – connects to SMART Program's proposed East-West Corridor
- *Alternative D: Hialeah Metrorail Station to Downtown Hialeah* – connects to Hialeah Metrorail Station
- *Alternative E: Metromover Connection to Port Miami* – connects to Freedom Tower Metromover Station
- *Alternative F: Aventura* – connects to Brightline Aventura Station
- *Alternative G: Okeechobee Metrorail Station to Western Hialeah* – connects to Okeechobee Metrorail Station
- *Alternative H: Palmetto Metrorail to Downtown Doral* – connects to Palmetto Metrorail Station
- *Alternative I: FIU* – connects to FIU Maidique Campus Bus Terminal
- *Alternative J: Homestead* – connects to South Dade TransitWay SW 312th Street Station

As such, the alternatives score equally compared to each other as shown in Table 6. Two exceptions are that Alternative C was assigned a slightly lower score due to the East-West Corridor being a planned versus an existing line, and Alternative I was assigned a lower score due to it not connecting to an existing Metrorail or Metromover line or to a proposed SMART Program corridor.

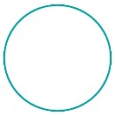
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Connectivity to Other Rapid Transit Corridors and/or SMART Program Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Connectivity to Other Rapid Transit Corridors and/or SMART Program Relative Score					

Table 6. Connectivity to Other Rapid Transit Corridors or SMART Program Scoring.

3.3.5 Available Right-of-Way Constraints and Opportunities

The study team made high-level observations of right-of-way opportunities and constraints:

- *Alternative A: Government Center to Marlins Stadium* – has existing platform available for use at Government Center; built-up urban environment for remainder of alignment
- *Alternative B: Culmer Metrorail Station to Marlins Stadium* – built-up urban environment
- *Alternative C: Blue Lagoon APM Circulator* – built-up urban environment
- *Alternative D: Hialeah Metrorail Station to Downtown Hialeah* – built-up urban environment
- *Alternative E: Metromover Connection to Port Miami* – built-up urban environment
- *Alternative F: Aventura* – built-up urban environment
- *Alternative G: Okeechobee Metrorail Station to Western Hialeah* – built-up urban environment
- *Alternative H: Palmetto Metrorail to Downtown Doral* – built-up urban environment
- *Alternative I: FIU* – built-up urban environment
- *Alternative J: Homestead* – built-up urban environment

Table 7 shows assigned relative scores.

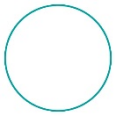
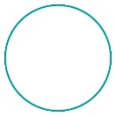
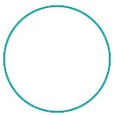
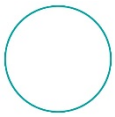
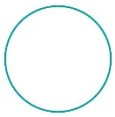
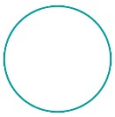
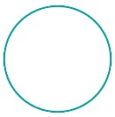
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Available Right-of-Way Constraints and Opportunities Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Available Right-of-Way Constraints and Opportunities Relative Score					

Table 7. Available Right-of-Way Constraints and Opportunities Scoring.

3.3.6 Pedestrian and Cycle Accessibility and Mobility Accommodation

Pedestrian and cycle accessibility and mobility were evaluated using a variety of methods, including a review of the Walk and Bicycle Comfort/Opportunities data available in the County's Transit Oriented Communities Tool. The availability of sidewalks, paved paths, and bike lanes proximal to the County's transit system access points were primary factors contributing to each alternative's score, as shown in Table 8.

	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Accommodation of Pedestrian and Cycle Accessibility and Mobility Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Accommodation of Pedestrian and Cycle Accessibility and Mobility Relative Score					

Table 8. Accommodation of Pedestrian and Cycle Accessibility and Mobility Scoring.

3.3.7 Existing Adjacent Ridership

Projected utilization was evaluated based on historical ridership trends at stations where each alternative is proposed to connect to the Metrorail/Metromover system. Ridership Technical Reports published by Miami-Dade County DTPW served as the basis for this evaluation, specifically a review of total monthly

boardings by station (or Metrobus stop in the case of Alternatives C, I, and J, which have no rail service).[2] Because the Freedom Tower station that Alternative E connects to has been closed since August 2020, ridership from the nearby Metromover stations at Park West, College North, and College Bayside was reviewed. Table 9 shows the assigned relative scores. Alternative F would connect at the Aventura Brightline station, which opened in Dec 2022 – limited publicly-available data exists to enable a ridership comparison.

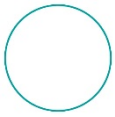
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Existing Adjacent Ridership Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Existing Adjacent Ridership Relative Score					

Table 9. Existing Adjacent Ridership Scoring.

3.3.8 Transit Station Park-and-Ride/Kiss-and-Ride Access Opportunities

While not all Metrorail/Metromover stations have dedicated parking facilities, the County reports parking patronage data as part of its monthly Ridership Technical Reports. This provides some information on the availability of public parking at certain stations -- the list below summarizes the parking reports as well as the potential for new park-and-ride opportunities to be developed along each alignment:

- Alternative A: Government Center to Marlins Stadium
  - The municipal West Lot Garage (capacity: 800 spaces) is within walking distance of the Government Center station.
  - The alternative proposes new Park-and-Ride facilities using the Marlin's stadium parking garages.
- Alternative B: Culmer Metrorail Station to Marlins Stadium
  - There is an existing parking facility at the Culmer station (capacity: 40 spaces).
  - The alternative proposes new Park-and-Ride facilities at underutilized Marlin's stadium parking garages.
- Alternative C: Blue Lagoon APM Circulator
  - No parking facilities exist which are not privately-owned.
- Alternative D: Hialeah Metrorail Station to Downtown Hialeah
  - There is an existing parking facility at the Hialeah station (capacity: 338 spaces).
- Alternative E: Metromover Connection to Port Miami

[2] https://www.miamidade.gov/global/transportation/ridership-technical-reports.page

  - PortMiami maintains several parking garages to serve its cruise terminals.
  - No parking facilities exist near Freedom Tower which are not privately-owned.
- Alternative F: Aventura
  - There is an existing parking facility at the Aventura Brightline station, but no parking facilities at the two beach ends which are not privately owned.
- Alternative G: Okeechobee Metrorail Station to Western Hialeah
  - There is an existing parking facility at the Okeechobee Metrorail Station (1,398 spaces), and there is ample (albeit private) parking at the proposed north end of this alignment (Westland Mall).
- Alternative H: Palmetto Metrorail to Downtown Doral
  - There is a parking facility at the Palmetto Metrorail Station (700 spaces), but no parking facilities at the south end of the alignment which are not privately owned.
- Alternative I: FIU
  - This Alternative connects at the FIU Maidique Campus bus terminal, which includes limited paid parking facilities for students, staff, and visitors.
  - Limited public parking options available at the north end of the alternative (along SW 109th Street).
- Alternative J: Homestead
  - There are several public parking options in this area: the park-and-ride lot at S Flager Avenue and Mowry Drive; Homestead City Hall parking lot on Washington Avenue (S of 2nd Street); and the Show Biz Parking Garage, a public lot at 4 S Krome Avenue.
  - The Miami Dade College - Homestead Campus maintains parking lots at Washington Avenue and NE 6th Street, as well as along Parkway Street adjacent to the campus; there is also public parking on the other side of the Miami-Dade Busway, along N Flager Avenue.

Table 10 shows the relative scores for this criterion.

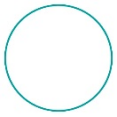
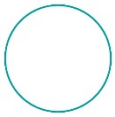
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Transit Station Park-and-Ride/Kiss-and-Ride Access Opportunities Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Transit Station Park-and-Ride/Kiss-and-Ride Access Opportunities Relative Score					

Table 10. Transit Station Park-and-Ride/Kiss-and-Ride Access Opportunities Scoring.

3.3.9 Affordability

Affordability varies among the alternatives depending on the length of the alterative and whether a new maintenance facility would be required:

- Alternative A: Government Center to Marlins Stadium – approximately 1.8-mile two-way line; requires new maintenance facility
- Alternative B: Culmer Metrorail Station to Marlins Stadium – approximately 1.1-mile two-way line; requires new maintenance facility
- Alternative C: Blue Lagoon APM Circulator – approximately 2.4-mile two-way line; requires new maintenance facility
- Alternative D: Hialeah Metrorail Station to Downtown Hialeah – approximately 2.3-mile one-way loop; requires new maintenance facility
- Alternative E: Metromover Connection to Port Miami – approximately 1.8-mile two-way line; does not require new maintenance facility
- Alternative F: Aventura – approximately 3.5-mile two-way line; requires new maintenance facility
- Alternative G: Okeechobee Metrorail Station to Western Hialeah – approximately 2.5-mile two-way line; requires new maintenance facility
- Alternative H: Palmetto Metrorail to Downtown Doral – approximately 2.3-mile two-way line and 1.3 mile one-way loop; requires new maintenance facility
- Alternative I: FIU – approximately 1.3-mile two-way line; requires new maintenance facility
- Alternative J: Homestead – approximately 2.6-mile one-way loop; requires new maintenance facility

Table 11 shows the relative score for affordability for each alternative.

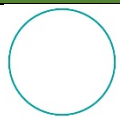
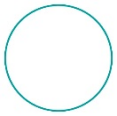
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Affordability Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Affordability Relative Score					

Table 11. Affordability Scoring.

3.3.10 Access to Transit Modes

This criterion scores alternatives based on their access to Metrorail, Metromover, Tri-Rail, and bus. Alternatives score higher if they lack access to these modes. The intent is to prioritize implementation of alternatives with limited access to transit.

Table 12 shows the relative score for access to transit modes for each alternative.

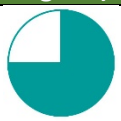
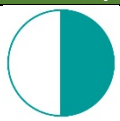
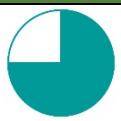
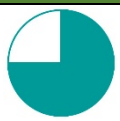
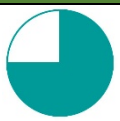
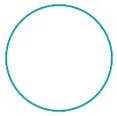
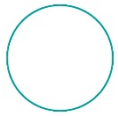
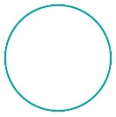
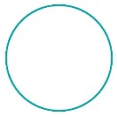
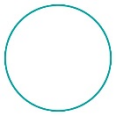
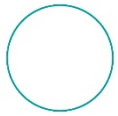
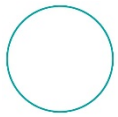
	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Downtown Hialeah)	Alt E (Port)
Access to Transit Modes Relative Score					
	Alt F (Aventura)	**Alt G (Western Hialeah)**	**Alt H (Doral)**	**Alt I (FIU)**	**Alt J (Homestead)**
Access to Transit Modes Relative Score					

Table 12. Access to Transit Modes Scoring.

3.3.11 Screening Criteria Summary

Table 13 summarizes the results for all screening criteria. Assigning a "5" for a full Harvey ball, a "4" for a three-quarter Harvey ball, and so forth, the bottom row provides the overall score for each alternative. This approach assumes each criterion is weighted equally.

Screening Criterion	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Hialeah)	Alt E (Port)	Alt F (Aventura)	Alt G (Western Hialeah)	Alt H (Doral)	Alt I (FIU)	Alt J (Homestead)
Roadway Network Congestion										
Population Density										
Employment Density										
Transit-Supportive Land Uses										
Connectivity to Other Rapid Transit Corridors and/or SMART Program										
Available Right-of-Way Constraints and Opportunities										

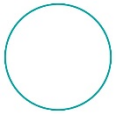
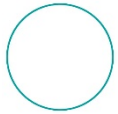
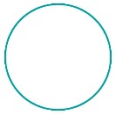
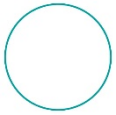
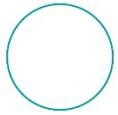
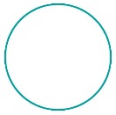
Screening Criterion	Alt A (Gov. Ctr.)	Alt B (Culmer)	Alt C (Blue Lagoon)	Alt D (Hialeah)	Alt E (Port)	Alt F (Aventura)	Alt G (Western Hialeah)	Alt H (Doral)	Alt I (FIU)	Alt J (Homestead)
Accommodation of Pedestrian and Cycle Accessibility and Mobility										
Existing Adjacent Ridership										
Transit Station Park-and-Ride/Kiss-and-Ride Access Opportunities										
Affordability										
Access to Transit Modes										
TOTAL	**43**	**40**	**25**	**32**	**34**	**32**	**36**	**28**	**23**	**30**

Table 13. Overall Scoring Summary.

3.4 Recommended Tier 2 Expansion Areas

Alternative A: Government Center to Marlins Stadium and Alternative B: Culmer Metrorail Station to Marlins Stadium are variations of the same option to serve the Marlins Stadium. Since Alternative A scores higher, it is recommended that Alternative B be eliminated from further consideration. Alternatives A and B are recommended by the TPO for additional analysis under future studies and therefore will not be evaluated further under this study.

Another high-scoring alternative is Alternative E: Metromover Connection to Port Miami. Alternative E will be evaluated further through a study directed by TPO Resolution 03-2024. Therefore, Alternative E will not be evaluated further under this study.

The next five highest-scoring alternatives recommended to be advanced to Tier 2 are:

- Northeast Quadrant
  - Alternative F: Aventura
- Northwest Quadrant
  - Alternative D: Hialeah Metrorail Station to Downtown Hialeah
  - Alternative G: Okeechobee Metrorail Station to Western Hialeah
  - Alternative H: Palmetto Metrorail to Downtown Doral
- Southwest Quadrant
  - Alternative J: Homestead

4. Additional Refinements to Tier 2 Alternatives

4.1 Tier 2 Alternatives

4.1.1 Alternative D – Hialeah Metrorail Station to Downtown Hialeah

Figure 23 shows the alignment Alternative D would follow from the Hialeah Metrorail Station, going west along E 21st Street, south along Palm Avenue to Hialeah City Hall, east along E 5th Street, north along E 1st Avenue, and then east along E 21st Street back to the Hialeah Metrorail Station. Potential stations are also shown for reference.

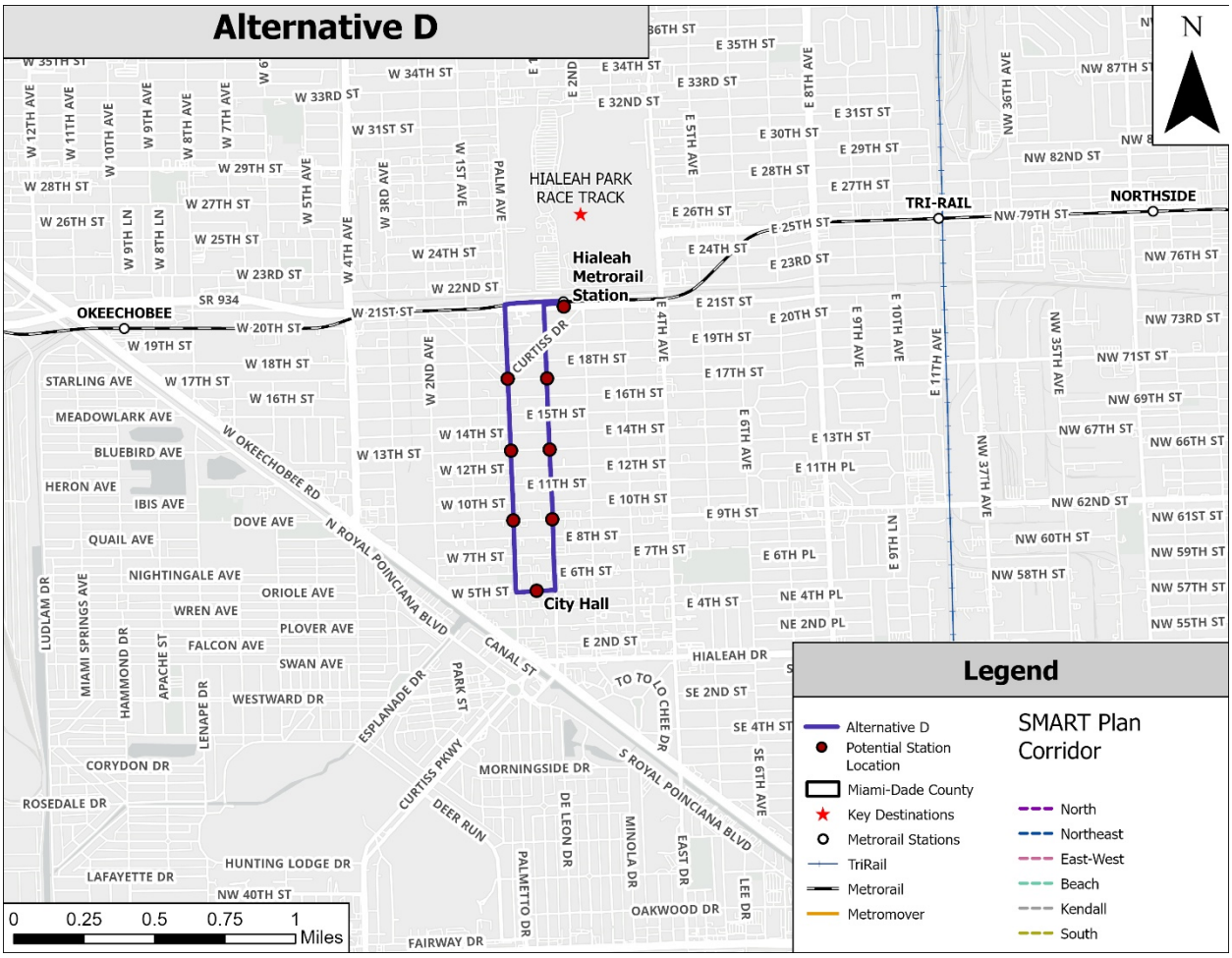


Figure 23. Alternative D – Hialeah Metrorail Station to Downtown Hialeah with Potential Stations.

Alternative D would function as a loop within the City of Hialeah connecting future transit-oriented development (TOD) at the Hialeah Metrorail station with Downtown Hialeah and its Central Business District. The alternative does not include a potential connection to the existing Metromover system and would require a separate maintenance facility.

4.1.2 Alternative F – Aventura

Figure 24 shows the alignment Alternative F would follow from the Brightline Aventura Station (and potential future Northeast Corridor Station) east along Abigail Road adjacent to Aventura Mall; east along the William Lehman Causeway (SR 856); and then branching both north and south on A1A (Collins Avenue/Ocean Boulevard). Potential stations are also shown.

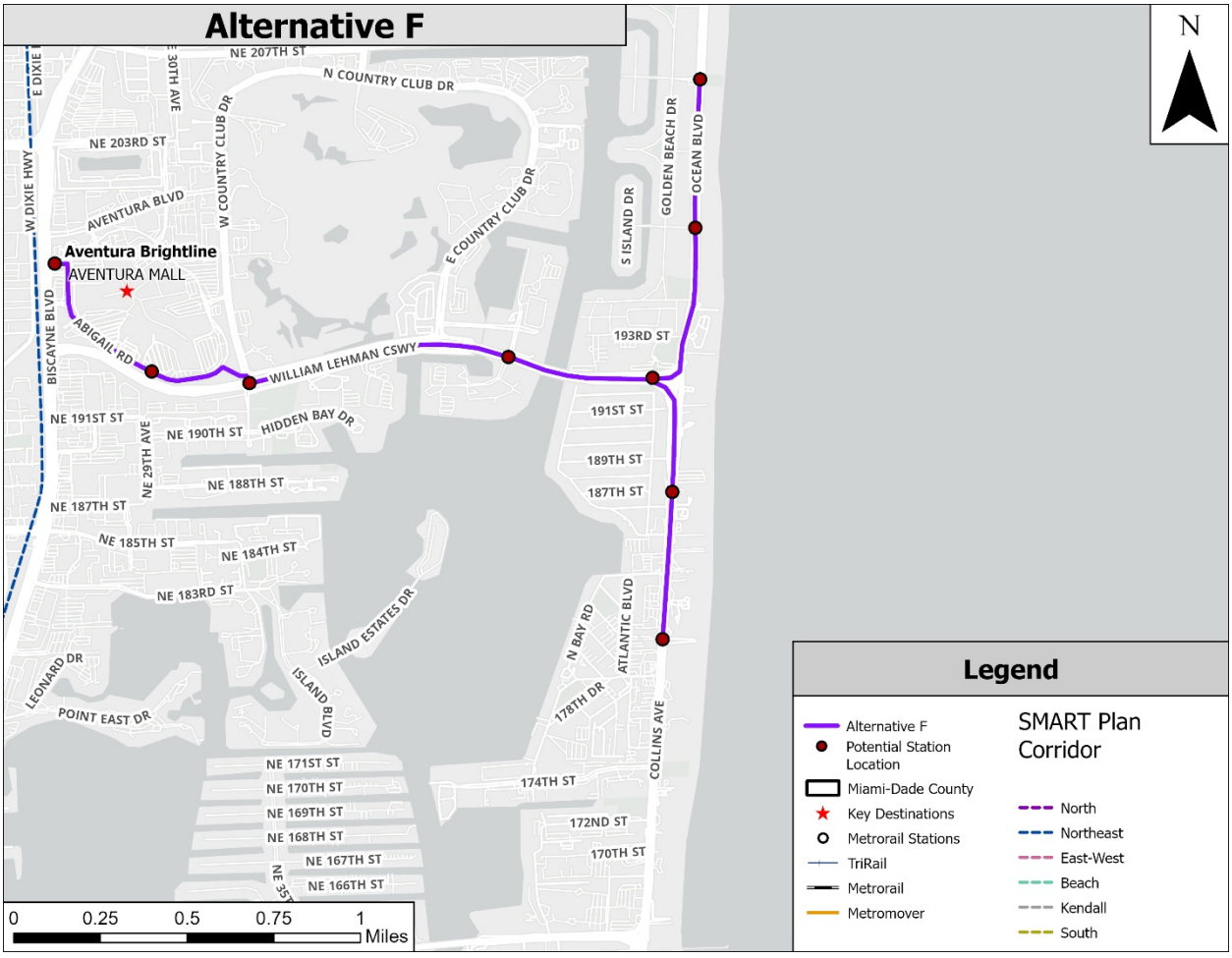


Figure 24. Alternative F – Aventura with Potential Stations.

Alternative F would function as a pinched loop at each end. The alternative does not include a potential connection to the existing Metromover system and would require a separate maintenance facility.

4.1.3 Alternative G – Okeechobee Metrorail Station to Western Hialeah

Figure 25 shows the alignment Alternative G would follow from the Okeechobee Metrorail Station, northwest along W Okeechobee Road, north on W 18th Avenue, north on W 18th Court, and then across W 49th Street to Westland Mall. The alternative would serve the Miracle Mile Shopping Center, Westland Promenade, Westland Hialeah Senior High School, Florida National University, Miami-Dade College - Hialeah Campus, and Westland Mall. Potential stations are also shown.

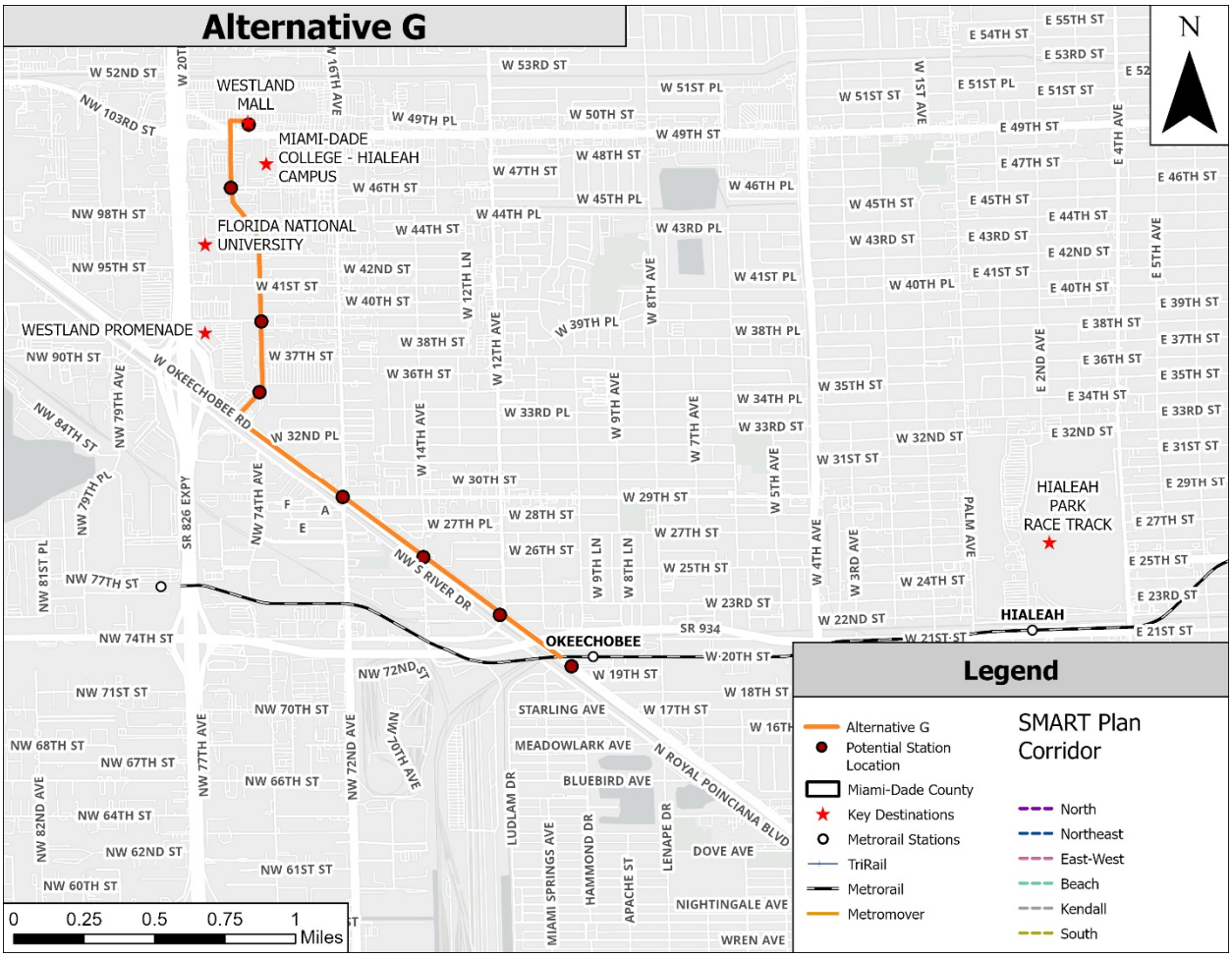


Figure 25. Alternative G – Okeechobee Metrorail Station to Western Hialeah with Potential Stations.

Alternative G would function as a pinched loop at either end. The alternative does not include a potential connection to the existing Metromover system and would require a separate maintenance facility.

4.1.4 Alternative H – Palmetto Metrorail to Downtown Doral

Figure 26 shows the alignment Alternative H would follow from the Palmetto Metrorail Station, south on NW 79th Place; west on NW 74th Street, south on NW 87th Avenue, east on NW 53rd Street, and then west on NW 54th Street. The alternative would serve Downtown Doral. Potential stations are also shown.

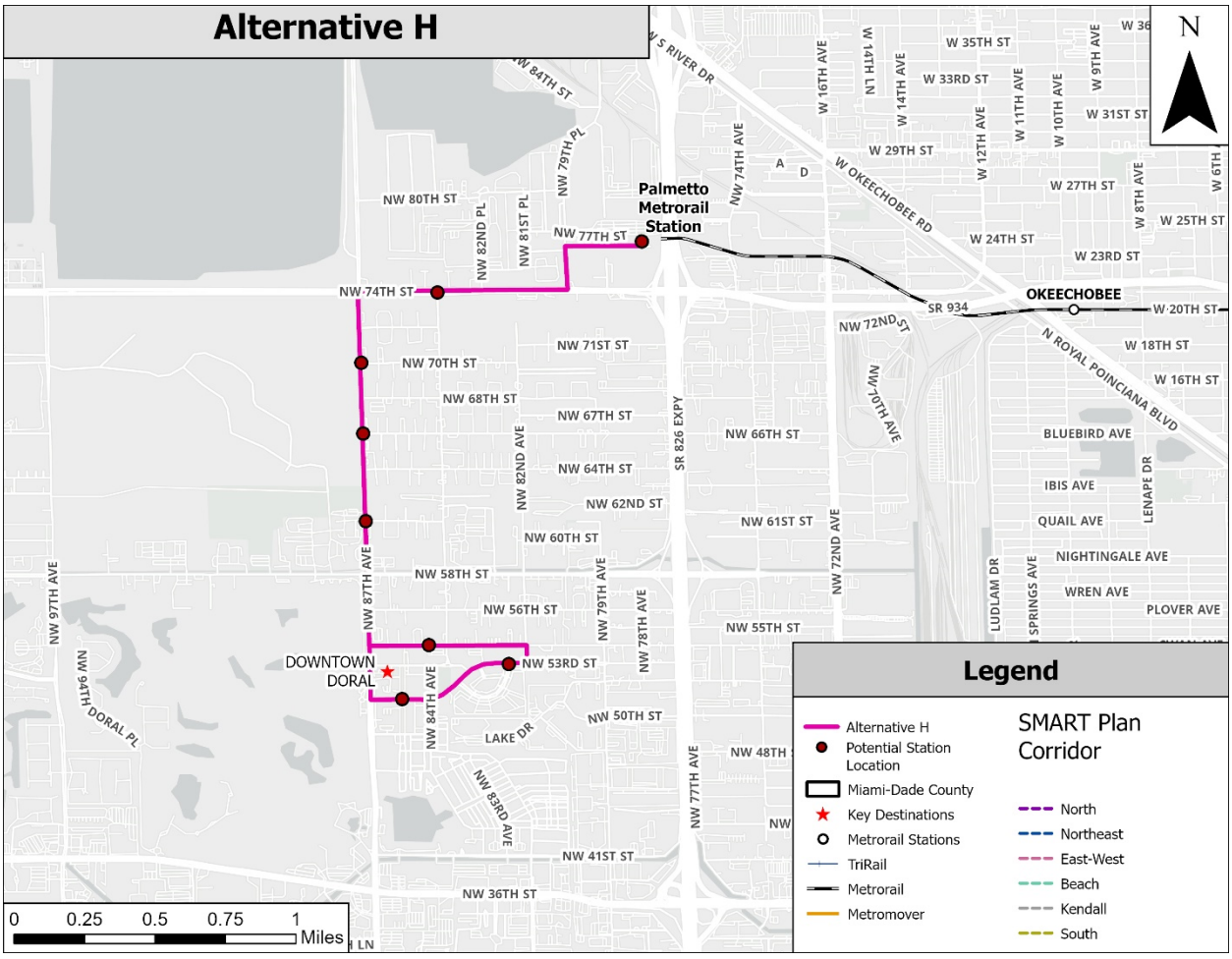


Figure 26. Alternative H – Palmetto Metrorail to Downtown Doral with Potential Stations.

Alternative H would function as a pinched loop at the north end and as a loop in Downtown Doral. The alternative does not include a potential connection to the existing Metromover system and would require a separate maintenance facility.

4.1.5 Alternative J – Homestead

Figure 27 shows the alignment Alternative J would travel south on Homestead Boulevard, west on SE 4th Street, northwest on SE 2nd Drive, north on SR 997/Krome Avenue, and then east on Campbell Drive connecting to the South Miami-Dade Busway. The alternative would serve Sedano's Supermarkets, Homestead Towne Square, Somerset Academy South Homestead Middle/High, EVO Entertainment Homestead + IMAX, Seminole Theatre, Homestead City Hall, the Miami-Dade College Homestead Campus, and Homestead Plaza. Potential station locations are also shown.

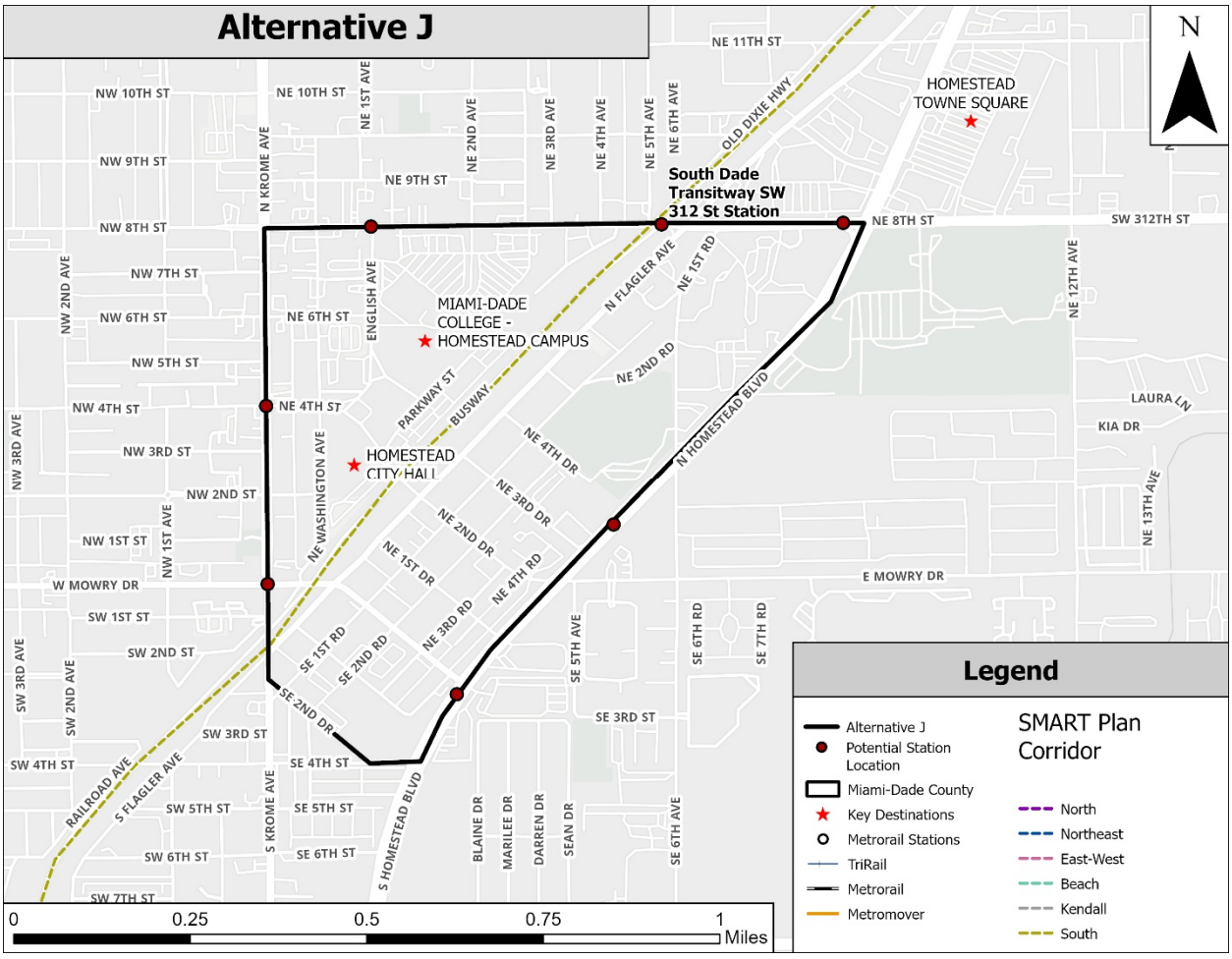


Figure 27. Alternative J – Homestead with Potential Stations.

Alternative J would function as a one-way loop. The alternative does not include a potential connection to the existing Metromover system and would require a separate maintenance facility.

4.2 System Type (APM or Similar Technology)

Although the study assumes that each of the five alternatives would use APM technology similar to the existing Metromover system, there are many variations to the APM technology currently in use throughout the nation and the world. For example, the Metromover and similar systems use rubber-tired vehicles, whereas many other systems are operating on rail. As this study is part of the early planning stages, an assumption was made and further alternatives with varying APM technologies were not studied.

4.3 Estimated Ridership

The Federal Transit Administration's (FTA) Simplified Trips-on-Project Software (STOPS) was used to develop ridership estimates for each of the five alternatives. STOPS modeling input assumptions are shown in Table 14.

Assumptions	Alt D (Downtown Hialeah)	Alt F (Aventura)	Alt G (Western Hialeah)	Alt H (Doral)	Alt J (Homestead)
Number of Stations	8	9	8	8	7
Span of Service	5 AM to Midnight				
Frequency (Minutes)	10	5/10[1]	10	10	10
Fare (Initial)	$2.25				
Fare (Transfer to Metrorail)	Free				
Fare (Transfer to Metromover)	Free				
Fare (Transfer to Tri-Rail)	Full Fare (Based on Zone)				
Fare (Transfer to Metrobus	Free				
New Park and Ride Lots	No	No	No	No	No

Table 14. STOPS Modeling Input Assumptions.

[1]Aventura frequency assumed as 5 minutes for east-west segment and 10 minutes for two north-south segments along beach.

STOPS modeling ridership estimates are shown in Table 15. Year 2045 average daily boardings assume that year's background bus service, plus the Northeast Corridor project with 2045 demand.

Year	Alt D (Downtown Hialeah)	Alt F (Aventura)	Alt G (Western Hialeah)	Alt H (Doral)	Alt J (Homestead)
2045	900-1,300	2,600-3,000	1,900-2,300	300-700	700-1,100

Table 15. Average Daily Boardings.

4.4 Potential Right-of-Way Requirements

4.4.1 General APM Dimensions

The Metromover's elevated guideway is approximately 13 feet or 26 feet wide for a one-way or two-way section, respectively. This includes an allowance for pedestrian refuge. At station stops, the guideway is approximately 38 feet wide. Sufficient street width would need to be available to accommodate the elevated guideway and structural support elements. Supporting columns are spaced uniformly, pursuant to some maximum distance of separation which will maintain the system's structural integrity.

Figure 28 and Figure 29 show examples of existing column supports and elevated guideway structures, adjacent to the roadway, for the Miami Metromover system. Figure 30 shows examples from the Bay Area

Rapid Transit's Oakland Airport Connector, which employs a straddle beam and column supports to traverse overhead a major roadway.

Figure 28. Column Supports for Two-Way Section – Existing Metromover System.
Source: Flickr

Figure 29. Column Supports and Guideway approaching a Station – Existing Metromover System.
Source: frenchdistrict.com.

Figure 30. Column and Straddle Beam Supports for Oakland Airport Connector.
Source: The Business Journals.

4.4.2 Maintenance Facility Requirements

Since none of the alternatives connect to the existing Downtown Metromover system, each of the five alternatives would need sufficient right-of-way for a dedicated maintenance facility. The parcel would need to be adjacent to the alternative alignment or be connected to it.

Table 16 summarizes the vehicle requirements for each of the alternatives. Each maintenance facility would need to be sized to sufficiently accommodate a fleet of that size.

Assumptions	Alt D (Downtown Hialeah)	Alt F (Aventura)	Alt G (Western Hialeah)	Alt H (Doral)	Alt J (Homestead)
Vehicle Requirements (including Spares)	3	9	5	5	3

Table 16. Vehicle Requirements.
Note: Based on assumed frequency shown in Table 14, alternative length, assumed average travel speed of 10 mph, and computed round trip travel time.

Figure 31 and Figure 32 shows the Joseph Bryant Metromover Maintenance Facility for the Miami Downtown Metromover system.

Figure 31. Joseph Bryant Metromover Maintenance Facility.
Source: Google.

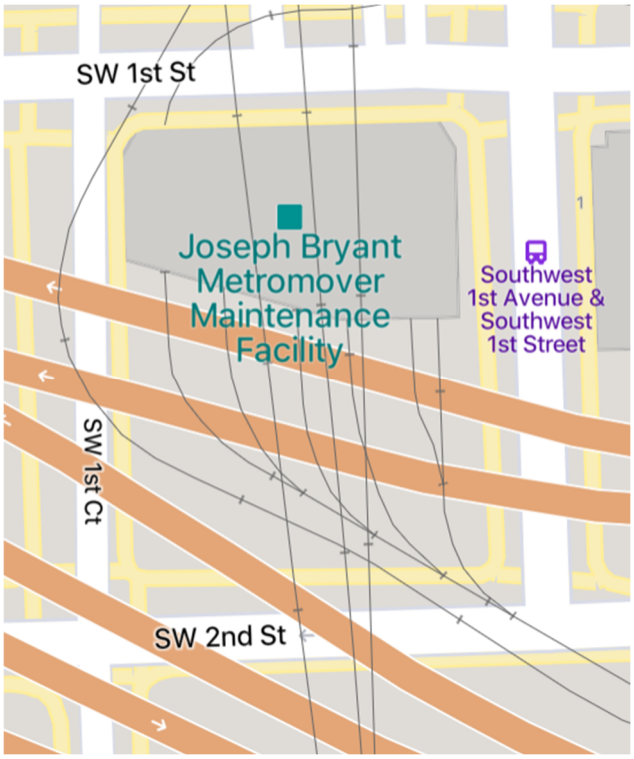


Figure 32. Joseph Bryant Metromover Maintenance Facility Map.
Source: mapcarta.com.

4.4.3 Specific Alternative Right-of-Way Requirements

In addition, for Alternative H: Palmetto Metrorail to Downtown Doral, an easement or right-of-way would be needed for the north-south transition in downtown between NW 53rd Street and NW 54th Street at approximately NW 82nd Avenue as shown in Figure 33.

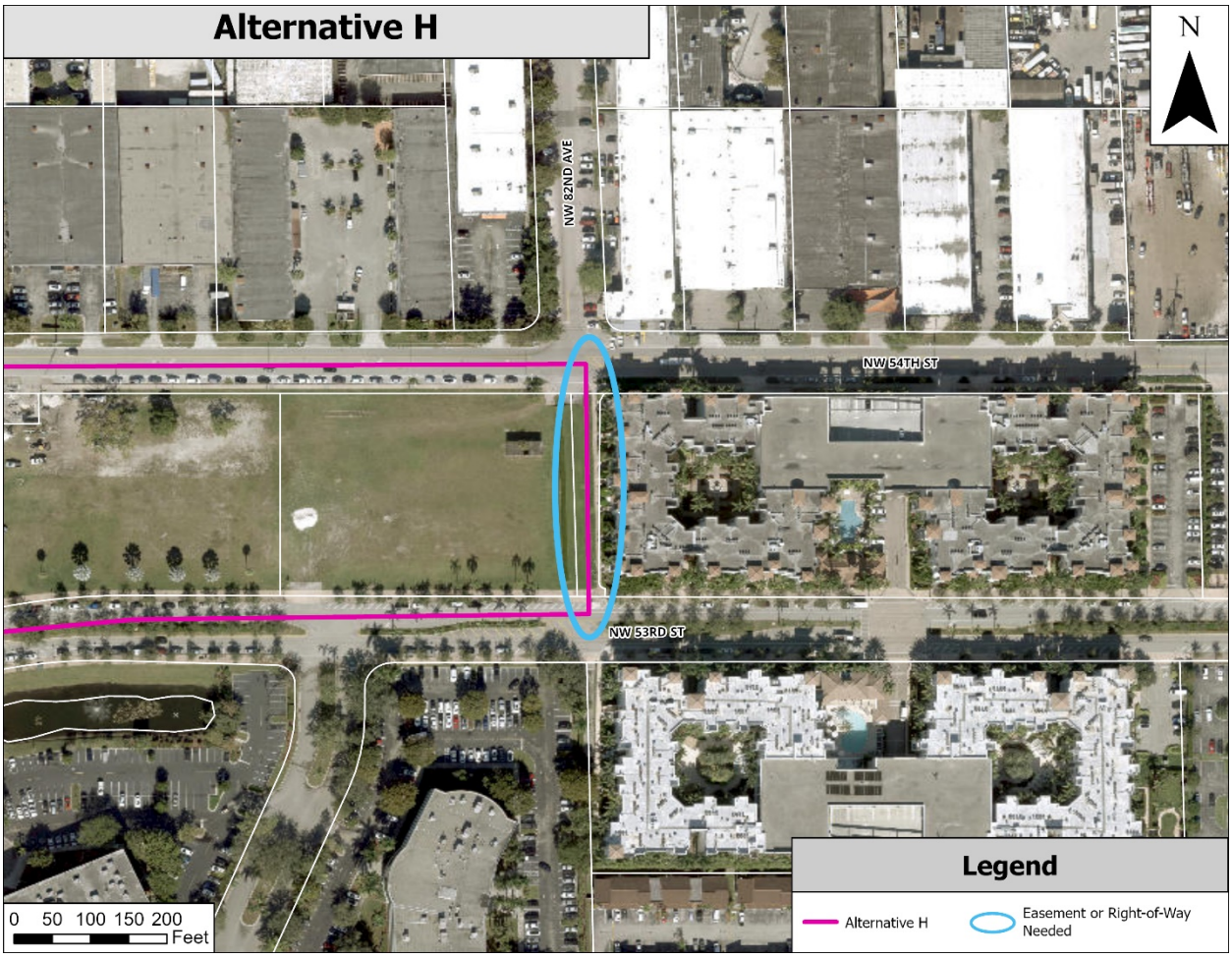


Figure 33. Right-of-Way Easement needed for Alternative H in Downtown Doral.

4.5 Cost-Effectiveness Threshold

4.5.1 Cost Estimates

Order of magnitude cost estimates were developed for each alternative. Unit costs to account for guideway construction, stations, demolition, systems, and vehicle costs, as well as average annual operating and maintenance (O&M) costs are shown in Table 17. The unit costs were derived from the 2014 Metromover System Expansion Study, with an annual escalation factor of 3.5% applied to the unit cost assumptions in that study.

Item	Cost (2024)
Guideway (Cost per Mile)	$184.8 M
Station	$10.6 M
Demolition (Cost per Mile)	$10.6 M
Vehicle	$3.6 M
Other System Costs, Including Maintenance Facility (Cost per Vehicle)	$15.6 M
Average Annual O&M (Cost per Mile)	$10.36 M

Table 17. Cost Estimate Unit Cost Assumptions.

Cost estimates (in 2024 dollars) for each alternative are shown in Table 18.

Item	Alt D (Downtown Hialeah)	Alt F (Aventura)	Alt G (Western Hialeah)	Alt H (Doral)	Alt J (Homestead)
Corridor Length (Miles)	2.33	3.53	2.54	3.60	2.59
Guideway Construction	$430.0 M	$652.6 M	$469.4 M	$665.3 M	$478.7 M
Station Construction	$84.8 M	$95.4 M	$84.8 M	$84.8 M	$74.2 M
Demolition	$24.7 M	$37.5 M	$27.0 M	$38.2 M	$27.5 M
Vehicles	$10.8 M	$32.4 M	$18.0 M	$18.0 M	$10.8 M
Other System Costs, Including Maintenance Facility	$46.8 M	$140.4 M	$78.0 M	$78.0 M	$46.8 M
Sub-Total	$597.1 M	$958.3 M	$677.2 M	$884.3 M	$638.0 M
25% Contingency and Soft Costs	$149.3 M	$239.6 M	$169.3 M	$221.1 M	$159.5 M
Total Capital Cost	**$750 M**	**$1,200 M**	**$850 M**	**$1,110 M**	**$800 M**
O&M Annual Cost	**$24.2 M**	**$36.6 M**	**$26.4 M**	**$37.3 M**	**$26.9 M**

Table 18. Cost Estimates.

4.5.2 Cost Effectiveness

For New Starts projects, an overall rating of "Medium" or better is required. For the cost effectiveness criterion, medium is no longer required for a project to be eligible for funding, but it is highly desirable for the project to be competitive as compared to all projects nationwide. The threshold for medium is an annual capital and operating cost per trip of $9.99 or better as shown in Table 19.

Rating		Range
High		$3.99 or less
Medium-High		$4.00 to $5.99
Medium		$6.00 to $9.99
Medium-Low		$10.00 to $14.99
Low		$15.00 or more

Table 19. New Starts Cost Effectiveness Breakpoints.
Source: https://www.transit.dot.gov/sites/fta.dot.gov/files/2023-01/CIG-Policy-Guidance-January-2023.pdf

Ratings for the cost effectiveness criterion for the FTA's New Starts program were calculated for each of the alternatives using the ridership estimates, annualized capital costs, and annual operating and maintenance costs. As shown in Table 20, all five alternatives would receive a "Low" rating based on the generally low ridership and high costs. The best performing alignment, Alternative G, is over the medium threshold by a factor of eight times.

New Starts Criterion	Alt D (Downtown Hialeah)	Alt F (Aventura)	Alt G (Western Hialeah)	Alt H (Doral)	Alt J (Homestead)
Cost Effectiveness	$136.80	$87.21	$81.30	$549.67	$193.10
Cost Effectiveness Rating	Low	Low	Low	Low	Low

Table 20. Cost Effectiveness Ratings.

4.6 Potential Funding Sources

The section below outlines federal, state, and local funding opportunities that may be available for implementing any of the five APM alternatives. Eligibility and funding amounts vary depending on project type and scope.

4.6.1 Federal

4.6.1.1 FTA Capital Investment Grants Program (CIG Section 5309)

The CIG Program includes three grant categories: Small Starts, New Starts, and Core Capacity. All three categories have similar eligibility criteria but are separated by award amounts, with additional criteria for Core Capacity projects.

Small Starts

Small Starts projects must be new fixed guideway projects, extensions to existing fixed guideway systems, or corridor-based bus rapid transit projects. Small Starts projects must have a total estimated capital cost of less than $400 million and must be seeking less than $150 million in CIG program funds.

New Starts

New Starts projects must be new fixed guideway projects or extensions to existing fixed guideway systems that have a total estimated capital cost of $400 million or more, or that are seeking $150 million or more in CIG Program funds.

Core Capacity

Core Capacity projects must be a substantial corridor-based investment in an existing fixed guideway system, and they must:

- Be corridor specific, not system-wide, and be located in a corridor that is at or over capacity or will be in ten years.
- Increase capacity by 10% over ten years.
- Can not include project elements designated to maintain a state of good repair.

Potential Uses: Technology, equipment, train cars, and infrastructure if all aligned with capacity increases.

4.6.1.2 Rebuild American Infrastructure with Sustainability and Equity (RAISE)

Eligibility: Surface transportation capital projects that are highway, bridge, or other road projects, public transportation projects, passenger and freight rail transportation projects.

Potential Uses: Planning, National Environmental Policy Act (NEPA), multimodal and multi-jurisdictional infrastructure, test pilots, etc.

4.6.1.3 Transportation Infrastructure Finance and Innovation Act (TIFIA)

Eligibility: Projects must be identified in State Transportation Improvement Program (STIP), with a capital cost of at least $50 million (or 33.3% of a state's annual apportionment of Federal-aid funds, whichever is less). Project also must be supported in whole or in part from user charges or other non-Federal dedicated funding.

Potential Uses: Can be utilized as a revenue source while FTA grant funds ramp up. This funding is considered low-interest rate financing, with a 35-year to 75-year repayment period and deferrable repayments for five years after project completion. Any project or technology to be funded through this source must be aligned with the CIG application for consistency and NEPA documentation.

4.6.2 State

4.6.2.1 Moving Florida Forward Infrastructure Initiative

The newly approved state budget includes $7-11 billion for Governor DeSantis's Moving Florida Forward Infrastructure Initiative to accelerate funding for major capacity projects, all aimed at reducing congestion throughout the state. The initiative will focus on critical improvements to ensure that transportation infrastructure can meet the demands of current and future residents and visitors, including investments to major interstates and arterial roadways to ensure people and goods can move safely. As of May 2024, details about the timing of funding availability and how to apply are not yet available.

4.6.2.2 County Incentive Grant Program (CIGP)

The CIGP was created to provide grants to counties to improve transportation facilities, including transit, which is located on the State Highway System (SHS), or which relieves traffic congestion on the SHS. Projects are evaluated based on economic benefits, project readiness, partnerships, new technologies, environmental sustainability, intermodal transportation, and safety. Grant funds can be used for 50 percent of eligible project costs. Typically, the total amount of funding available through CIGP is $4.5 - $4.7 million annually. Projects can be submitted on a rolling basis.

4.6.2.3 Public Transit Block Grant Program

Public Transit Block Grant funds can be used by public transit providers for eligible capital and operating costs upon the completion of an FDOT approved TDP. Eligible transit capital costs include park-and-ride facilities, intermodal terminals, and passenger amenities at station locations. Projects must be consistent with applicable approved local government comprehensive plans. State participation is limited to 50% of the non-federal share of capital projects. Miami-Dade County DTPW prepares a TDP annually with a TDP Major Update every five years, providing strategic direction on eligible transit capital, service, and state of good repair investment projects.

4.6.3 Local

State and local funds are required as match for certain federal grant programs. Local funds would be needed to fill any gaps in funding.

4.7 Next Steps for Implementation

If an alternative has local support and is deemed worthy of advancing, the following should be performed:

- Conduct a feasibility study.
    - Perform environmental scan.
    - Identify any fatal flaws.
    - Develop preliminary engineering:
        - Identify any challenges or constraints (e.g., narrow street widths, utility conflicts, bridges, water crossings).
        - Determine if acquiring right of way (purchase/easement/lease) will be necessary. If needed, right-of-way acquisition could significantly increase the project's overall budget.
        - Advance engineering to inform cost estimates.
    - Develop more detailed cost estimates.
- Add projects to local and regional plans.
    - Have project adopted into the fiscally constrained metropolitan transportation plan.
    - Add project to community-based plans.
- Pursue funding.
    - Start CIG funding application process, if desired.
        - Follow required steps to enter program, advance project, and receive grant funding.
            - Evaluate alternatives and identify a locally preferred alternative.
            - Get acceptance into the New Starts or Small Starts program pipeline.

        - Complete environmental review process under NEPA as signified by a final FTA environmental decision (e.g., categorical exclusion, finding of no significant impact, combined final environmental impact statement/record of decision, or record of decision).
        - Complete Project Development phase within two years.
        - Obtain a Medium or higher overall rating.
        - Complete Engineering phase.
        - Follow required steps and process to secure grant award.
        - Meet all CIG program requirements.
    - Apply for other federal and state grant programs.
    - Secure local funding as match for grant programs and for balance of needed funding.
- Adopt transit-supportive programs and policies.
    - Adopt plans and zoning that will encourage density around proposed stations.
    - Promote bicycling and walkability projects as part of urban design.
- Foster stakeholder support.
    - Identify and promote the goals, equity benefits, and value of the project.
    - Engage the public to promote awareness and solicit input.
    - Build a strong base of public and stakeholder support.
    - Identify champions that will advance the project.

5. Conclusions

The purpose of this study was to assess the application of APM or similar technology as an option to extend and augment the reach of the SMART Program in areas connecting to existing or future SMART Program corridors. This report defined the study team's five recommended Tier 2 alternatives within four geographic quadrants of the County, identifying specific areas or range of service, system type (APM or similar technology), estimated ridership, cost-effectiveness threshold, potential right-of-way requirements, potential funding sources, and next steps for implementation.

Introducing more elevated transit options such as an APM is a valid transportation option. It can provide safe, efficient, fully grade separated transportation service. As with any solution, however, costs can quickly escalate beyond the capacity of the region to absorb.

The results of this study's ridership estimates showed that introducing new elevated transit services in the test case communities may not consistently attract enough riders (under current conditions) to make the investment viable from the most reasonable funding source available, the FTA's Capital Investment Grant Program, as well as FDOT. However, it should be noted that many of these communities are implementing projects from their respective master plans, which will likely alter future ridership trends.

Even if a way could be found to have FDOT, the County, and other involved municipalities dedicate street space to allow for at-grade operation (which would significantly reduce the capital cost outlay), the cost of implementation as well as the need for new full-service maintenance facilities would still far outweigh the criteria used by the FTA to make their funding decisions.

Despite the study results, communities may wish to further study how an APM could more efficiently be implemented by conducting a feasibility study as described in the next steps for implementation section. There may be ways to reduce cost by eliminating low-performing stations, adjusting service frequency, or changing the alignment.