MIAMI-DADE
BICYCLE NETWORK

Protected Shared-Use Path on SR 856/William Lehman Causeway

from US-1/Biscayne Blvd to SR A1A/Collins Ave

March 2022

FDOT DISTRICT 6

Table of Contents

Introduction

On August 3, 2020, the City of Aventura and City of Sunny Isles Beach requested the Florida Department of Transportation (FDOT) to conduct a lane elimination and repurposing analysis of SR 856/William Lehman Causeway to accommodate a shared-use path on the southside of the causeway adjacent to the eastbound travel lanes. This request originated due to the *North-South Transportation Needs for the Coastal Communities Feasibility Study* completed in June 2020 by the Miami-Dade County Transportation Planning Organization (TPO). This study recommended the construction of a barrier-separated shared-use path along the south side of SR 856/William Lehman Causeway by eliminating an eastbound travel lane from SR 5/US 1/Biscayne Boulevard to SR A1A/Collins Avenue.

On January 6, 2021, FDOT responded to the request and initiated this feasibility analysis to examine if a barrier-separated shared-use path can be accommodated on SR 856/William Lehman Causeway (Section 02, Roadway ID 87210000) from SR 5/US-1/Biscayne Boulevard (MP 0.000) to SR A1A/Collins Avenue (MP 1.704) while maintaining all existing travel lanes and outside shoulders given FDOT's current lane repurposing guidance is not applicable to Limited Access (L/A) facilities such as SR 856. **Appendix A** includes the requests from the cities and the proposed concept from the TPO's study.


WILLIAM LEHMAN
CAUSEWAY
BIKE PATH

Literature Review & Existing Conditions

SR 856/William Lehman Causeway is classified as a C5 Context roadway which connects the City of Aventura on the west end to the City of Sunny Isles Beach on the east end. Within the study area, SR 856/William Lehman Causeway has a design speed of 55 mph. The causeway is a principal arterial and is part of the National Highway System (NHS) and the State Highway System (SHS). **Figure 1** shows the study location map.

Figure 1: Study Area

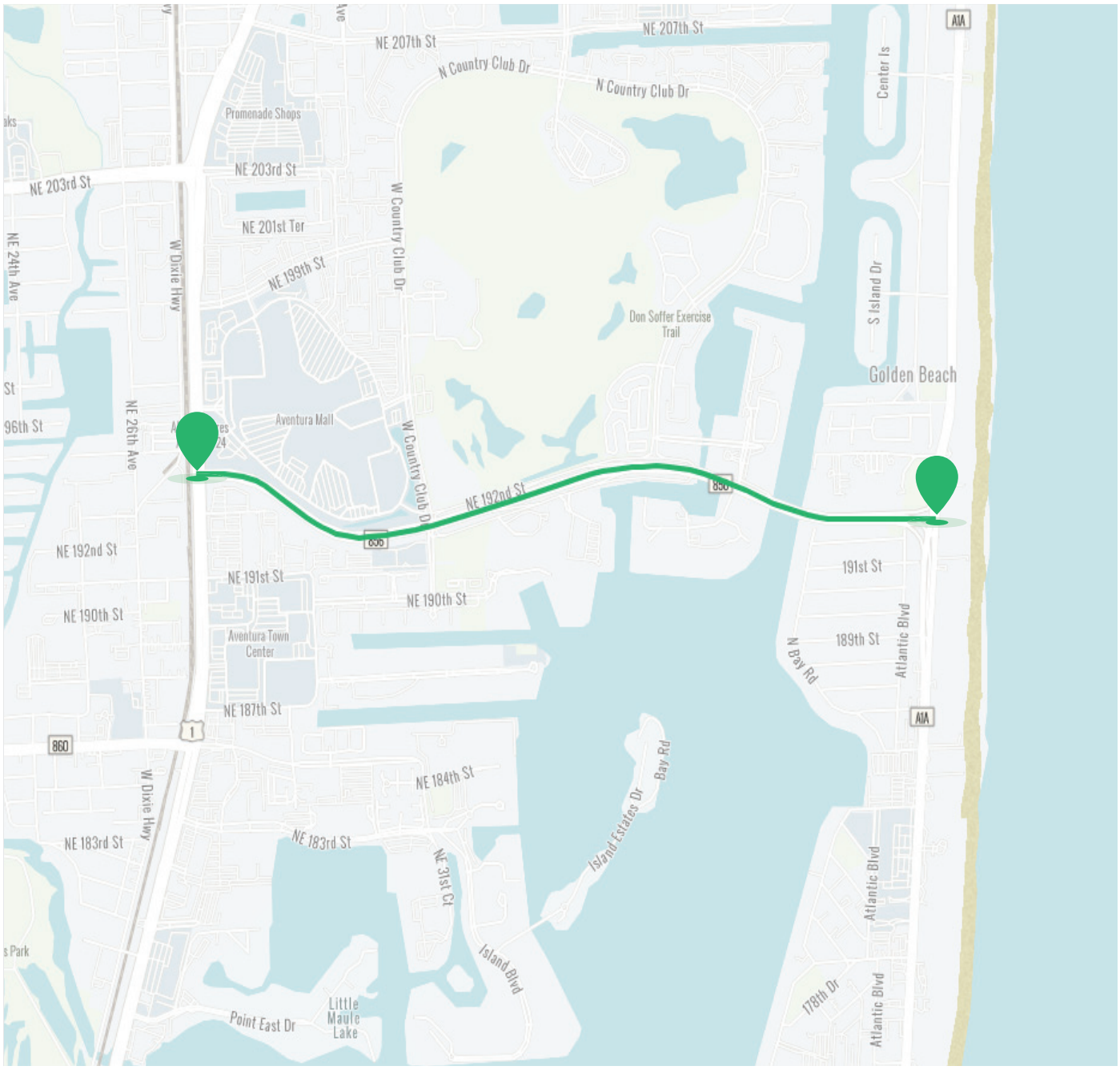
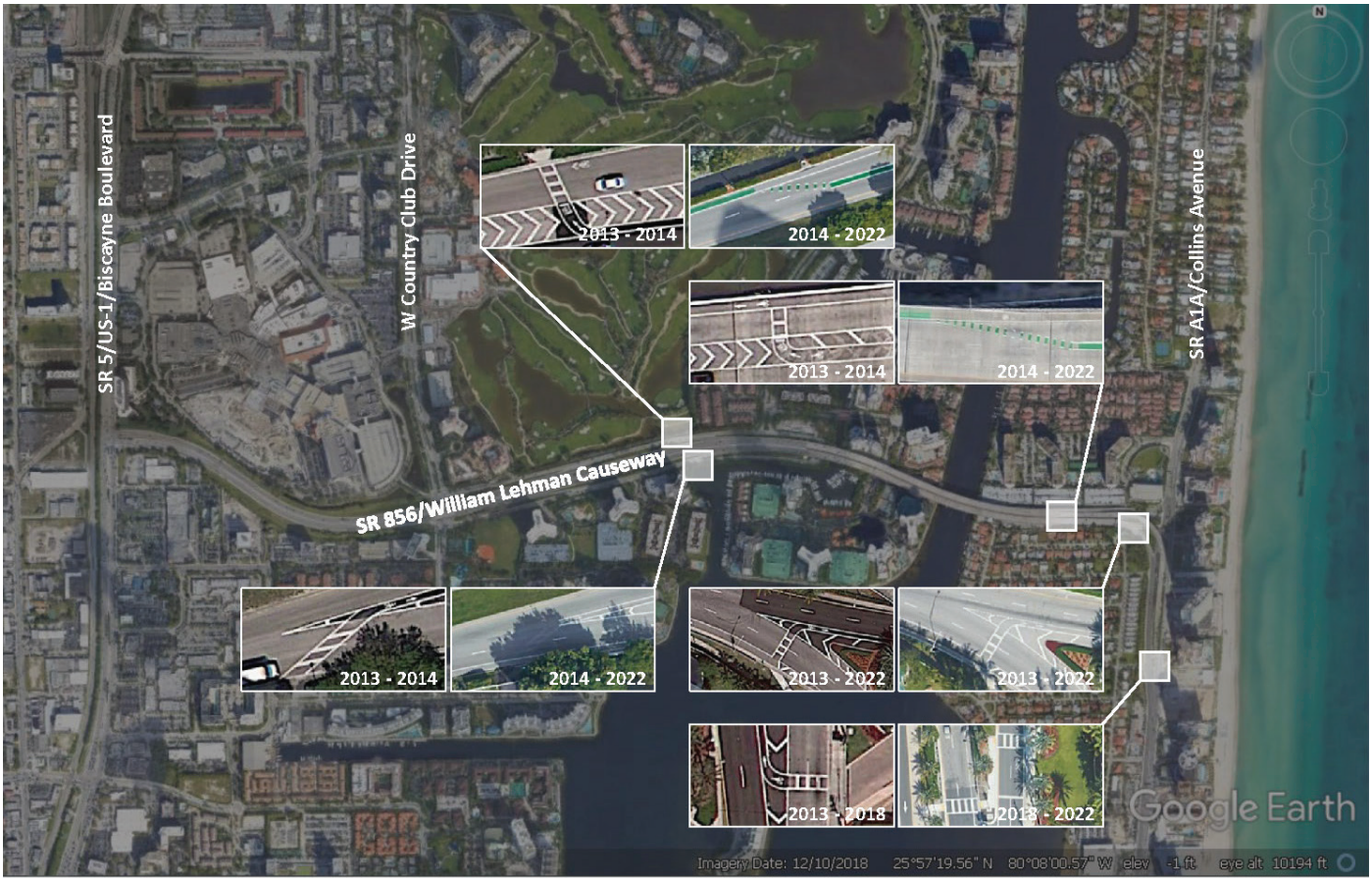


Figure 2: Existing Bicycle Lane Crossings on SR 856/Lehman Causeway (2013 - 2022)



Throughout the study area, the existing typical section of the causeway includes six 12-feet wide general travel lanes (three in each direction), 10-feet wide outside shoulders, and 9-feet wide inside shoulders with a 20-feet wide median with raised concrete barrier. The existing bridge over W Country Club Drive comprises six 12-feet wide general travel lanes (three in each direction), one 12-feet wide eastbound auxiliary lane, 10-feet wide and 6.5-feet wide outside shoulders westbound and eastbound respectively, 8-feet wide inside shoulders, and a 20-feet wide median with raised concrete barrier. East of W Country Club Drive, the causeway has a north frontage road with 10-feet wide shared-use path, 6-feet wide sidewalk, curb and gutter, 4-feet wide bicycle lane, two 10-feet wide westbound general travel lanes, and a 5-feet wide shoulder. The south frontage road has 4-feet wide shoulders and two 10-feet wide eastbound general travel lanes.

In 2012, FDOT established a two-year pilot program that permits bicyclists to travel on three L/A facilities over water bodies, including SR 856/William Lehman Causeway from SR 5/US-1/Biscayne Boulevard to SR A1A/Collins Avenue. By March 2013, FDOT installed bicycle lane markings on the eastbound and westbound outside shoulders of the causeway, and along the causeway frontage roads, from West Country Club Drive to SR A1A/Collins Avenue as part of this pilot program. In late 2014, FDOT redesigned several bicycle lane crossings and installed green colored pavement on areas where bicyclists and other roadway traffic have conflicting weaving or crossing movements. **Figure 2** presents existing bicycle lane crossing configurations on the causeway and how they have been modified over the years.

FDOT published a final report for the pilot project on August 2015. The conclusion of this report states:

> During the course of the pilot project, data shows that bicycle usage increased steadily over the pilot period for the William Lehman and Julia Tuttle Causeways, and held steady for the Pineda Causeway. Bicycle usage tended to be higher on the weekends. Speed data from an independent study demonstrated that drivers reduced their speed by approximately 2.2 MPH when overtaking bicyclists on the causeway segments of the bridges. At the merge areas, both drivers and bicyclists were found to actively search for other traffic and yield appropriately.
>
> The frequency of bicycle crashes did not significantly increase on the pilot corridors, even with the increase in bicycle activity. Overall crashes (those involving all vehicle types and crash types) increased on the Julia Tuttle Causeway and remained the same for the other two causeways.

The final report recommends caution when implementing similar bicycle facilities on other L/A corridors, especially on corridors with high speeds, high truck volumes, and narrow shoulders. The final report recommended extending the pilot project for two additional years to evaluate crash data and identify any potential trends related to the additional bicycle traffic. **Appendix B** includes the pilot project final report and bicycle and pedestrian count memorandum. **Appendix C** includes a plot of existing conditions displaying the vehicular and bicycle lane configurations of the causeway in addition to vertical alignment grades as available in as-built plans.

FDOT has also extensively analyzed the feasibility of providing a pedestrian walkway along the northside of SR 856/William Lehman Causeway from the westbound exit at the Frontage Road (MP 0.968) to SR A1A/Collins Avenue. A 2012 feasibility study determined that pedestrian activity was high, especially on weekends, on both the north and south shoulders of the causeway regardless of signs prohibiting vulnerable road users from traveling on the causeway. This study evaluated retrofitting the causeway's north shoulder by adding a 5.5-feet wide sidewalk cover plate with a 32-inch F Shape Barrier and pedestrian railing. This design approach required design exceptions to reduce the widths of the causeway mainline travel lanes to 11-feet, ramp travel lane to 13-feet with a new 4-feet wide undesignated bicycle lane, and shoulders to 4-feet inside and 8-feet outside. The study also recommended evaluating a similar walkway on the southside due to significant bicycle and pedestrian activity observed during field reviews. In 2015, FDOT commissioned a reevaluation study of the proposed northside walkway. This feasibility study looked at three engineering alternatives:

1. Barrier separated walkway,
2. Aluminum cantilever walkway, and
3. Walkway with curb.

The study recommended the barrier separated walkway as the preferred alternative and performed preliminary ADA-compliance and structural analyses. The preferred alternative was deemed feasible but required design exceptions and variations. In 2020, FDOT prepared a DRAFT Scoping Report which evaluated the environmental impacts of two additional alternatives including No Build and Bridge Widening. This scoping report also recommended the barrier separated walkway as the preferred alternative. **Appendix D** includes a copy of the aforementioned feasibility and scoping studies.

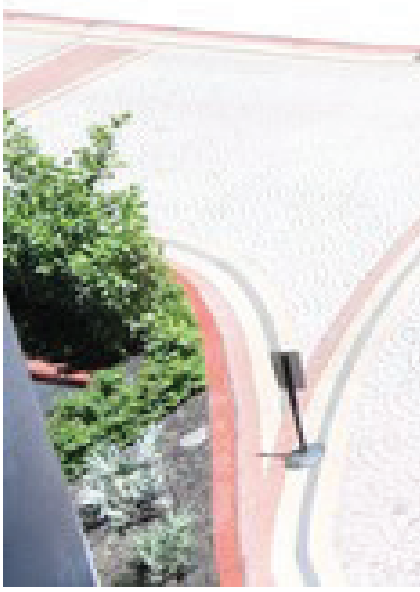
SR 856/Lehman Causeway and surrounding portions of Aventura and Sunny Isles Beach contain a substantial Jewish population. As evidenced by observations of those walking through the study area on Saturdays, the Jewish Sabbath, and on holidays, many of these residents are observant, strictly following Jewish laws. Under these laws, certain activities are prohibited on the Sabbath and major holidays (approximately 22 days per year). Among the prohibited activities relevant to this study are:

- Prohibition against travel by motor vehicle as either a driver or passenger,
- Prohibition against travel by bicycle or similar device (conventional scooters are generally not prohibited),
- Prohibition against carrying objects from private to public property and vice versa outside of a demarcated area called an ***eruv*** (the study area is encompassed by several *eruvs*, therefore generally obviating this restriction), and
- Closing of a circuit as would occur for either a pedestrian activated signal push button or motion detector activation for a traffic signal.

The Jewish calendar is based on a lunar calendar and, as a result, Jewish holidays fall on the same Hebrew date but not the same secular date. Holidays can fall on any day of the week including Saturdays, which is why the actual number of days in any given year in which the previously cited prohibitions apply may vary.

The four synagogues closest to the Causeway strictly adhere to these restrictions and tend to attract an observant population. Each synagogue has unique characteristics that appeal to a broad range of practices within Judaism. As such, persons may use SR 856/William Lehman Causeway to cross the Intracoastal Waterway to reach the synagogue with which they most closely align. The synagogues serve both as a place of worship and as a community center. Communal meals and other events frequently take place and attract a substantial market. Religious services are held three times a day (although sometimes the afternoon and evening services are combined). To accommodate different schedules, services are also held in multiple sessions (e.g., an early and late morning). As a result, pedestrian traffic to these synagogues may occur throughout the day.

It is important to note that the pedestrian population includes vulnerable road users such as elderly and children of all ages that travel accompanied by other family members. The travel to the synagogues is considered part of daily life and not a matter of choice, exercise, or recreation. This population has no other means of travel on the Sabbath or holidays and is obligated to attend services and other events that occur at the synagogues. Home worship and celebrations may complement synagogue activities but do not replace them, which is why pedestrian traffic remains high even on inclement days.



Purpose & Need

The purpose of the study is to evaluate the feasibility of providing barrier-separated shared-use paths on or parallel to SR 856/William Lehman Causeway between SR 5/US-1/Biscayne Boulevard and SR A1A/Collins Avenue. The objectives of this study are to:

1. increase the mobility options of residents,
2. encourage the utilization of public transportation to increase the throughput capacity of existing roadways by improving first-last-mile connections to existing bus stops and future Aventura Station for Brightline Intercity Passenger Rail and the Northeast Corridor Commuter Rail,
3. connect existing shared-use paths and bicycle facilities, and
4. ensure the safety of vulnerable road users through physical separation of any proposed bicycle and pedestrian facility or facilities, especially on high-speed roadways (i.e., design speeds of 50 mph or greater per Florida Design Manual Chapter 210) such as SR 856/William Lehman Causeway.

The improvements evaluated in this study fulfill the need for system linkage, social demands and economic development, modal interrelationships, and safety.

Planning Consistency

The improvements evaluated in this study are not included in the **2045 Long Range Transportation Plan (LRTP)** or the **2045 Bicycle and Pedestrian Master Plan.**

System Linkage

The study area has a very limited roadway network due to the natural geography of the area. SR 856/William Lehman Causeway is one of only seven roadways in Miami Dade County that connect the mainland to the barrier islands across the Intercoastal Waterway. The closest alternate connections between the mainland and barrier islands are SR 858/Hallandale Beach Boulevard and SR 826/ NE 163 Street located 2.2 miles south and 2.1 miles north of SR 856/William Lehman Causeway, respectively. Of these alternate connections, SR 856/William Lehman Causeway is the least continuous roadway since the causeway has two T-intersections on the west and east. The short configuration of the causeway limits accessibility and mobility of users since both termini are physically constrained by turn lanes and metered by traffic signals. While the causeway has one intermediate access point at W Country Club Drive, this roadway leads to a network of local roads that are limited due to land use (i.e., Town Center Aventura, Aventura Mall and Turnberry Isle Country Club) and waterways.

The study area also has a disconnected bicycle and pedestrian network. On the western terminus, US-1/Biscayne Boulevard has north-south bicycle lanes. North of the causeway, the Don Soffer Exercise Trail is a heavily utilized shared-use path that wraps around the Turnberry Isle Golf Course between W Country Club Drive and E Country Club Drive. On the eastern terminus, SR A1A/ Collins Avenue has shared bicycle lanes on the outside travel lanes except for south of the causeway where a dedicated southbound bicycle lane begins. From W Country Club Drive, the causeway has bicycle lanes on the north and south frontage roads that continue into shoulder bicycle lanes on the causeway's mainline across the Intercoastal Waterway and several free flow ramp movements and into SR A1A/Collins Avenue south of the causeway. A public beach access path exists west of SR A1A/Collins Avenue, at the level of the westbound access ramp to the causeway. There are very few alternate public beach access paths along SR A1A/Collins Avenue and this specific path attracts a significant number of users due to the surrounding land uses and connectivity to the causeway.

To maximize the utility of the SR 856/William Lehman Causeway, people throughput can be effectively increased by providing safe, continuous connections for alternative modes of transportation that require less space and capital than roadway widening. Alternate mode connections can also provide greater connectivity due to ease of constructability.

Social Demands and Economic Development

The study area has numerous high density residential buildings, religious institutions, and major commercial developments. The land use within the study area creates a suitable environment for walking and biking on primary and secondary trips. On the northwest corner of the study area lies Aventura Mall, a regional commercial development that attracts tourist, commuters, and regular shoppers. North of the causeway and in the center of the study area is the Edmond J. Safra Synagogue and on the eastern terminus is the Chabad of Golden Beach, two Jewish religious institutions with large congregations. The study area also has two public parks, Founders Park in the south-central area and Heritage Park in the northeastern area, and a City of Sunny Isles Beach playground in the south-east area. The City of Aventura Government Center and City Hall, including Police Department, are located south of the causeway and west of W Country Club Drive.

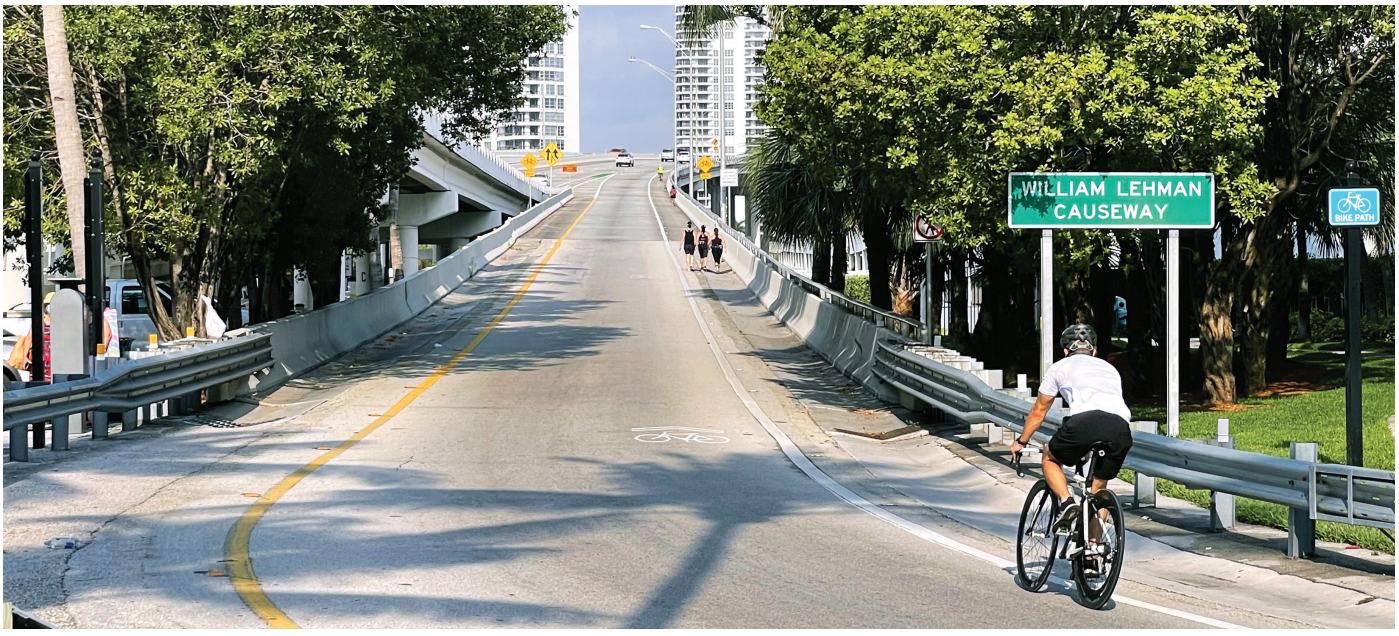
As evident in the observations resulting from field reviews, the land use and social fabric of the study area create a prime environment for robust walking and cycling infrastructure. Two field reviews were conducted at the intersection of SR 856/William Lehman Causeway and SR A1A/Collins Avenue. The first review occurred on Saturday, April 17, 2021 between 7:30 and 9:10 AM. The second review occurred on Wednesday, September 22, 2021 between 8:00 and 11:00 AM. The second review coincided with the Jewish holiday of Sukkot. The field reviews consisted of observing bicycle and pedestrian behavior and interactions with vehicular traffic, especially on the ramps to/from the causeway.

First Field Review

(Saturday, April 17, 2021 from 7:30 AM to 9:10 AM)

The field review was performed under clear conditions and included review of the Edmond J. Safra Synagogue from the entrance to the causeway. The following observations were recorded.

1. A pedestrian traveling eastbound on the westbound on-ramp to the causeway was headed to the Chabad of Golden Beach. Many other pedestrians were observed coming from north and south SR A1A/Collins Avenue.
2. No pedestrians were seen traveling westbound onto the causeway or eastbound from the causeway to the Edmond J. Safra Synagogue. Several pedestrians were observed arriving from the east and north to the synagogue.
3. Many joggers, runners, walkers, and cyclists were observed traveling in both directions on both shoulders (inside and outside including ramps) across the Intracoastal Waterway.
4. High speed bicycle riders were observed using the causeway ramps and traveling in platoons.
5. Many illegal street crossings were observed at the left-turn median opening to the Ocean Two Condominium on SR A1A/ Colling Avenue. Pedestrians making this illegal street crossing included Ramada Plaza hotel valet workers, hospitality workers, and beach attendees.
6. The existing public beach access path was observed being used by a diverse (i.e., age, type, and ability) mix of users.



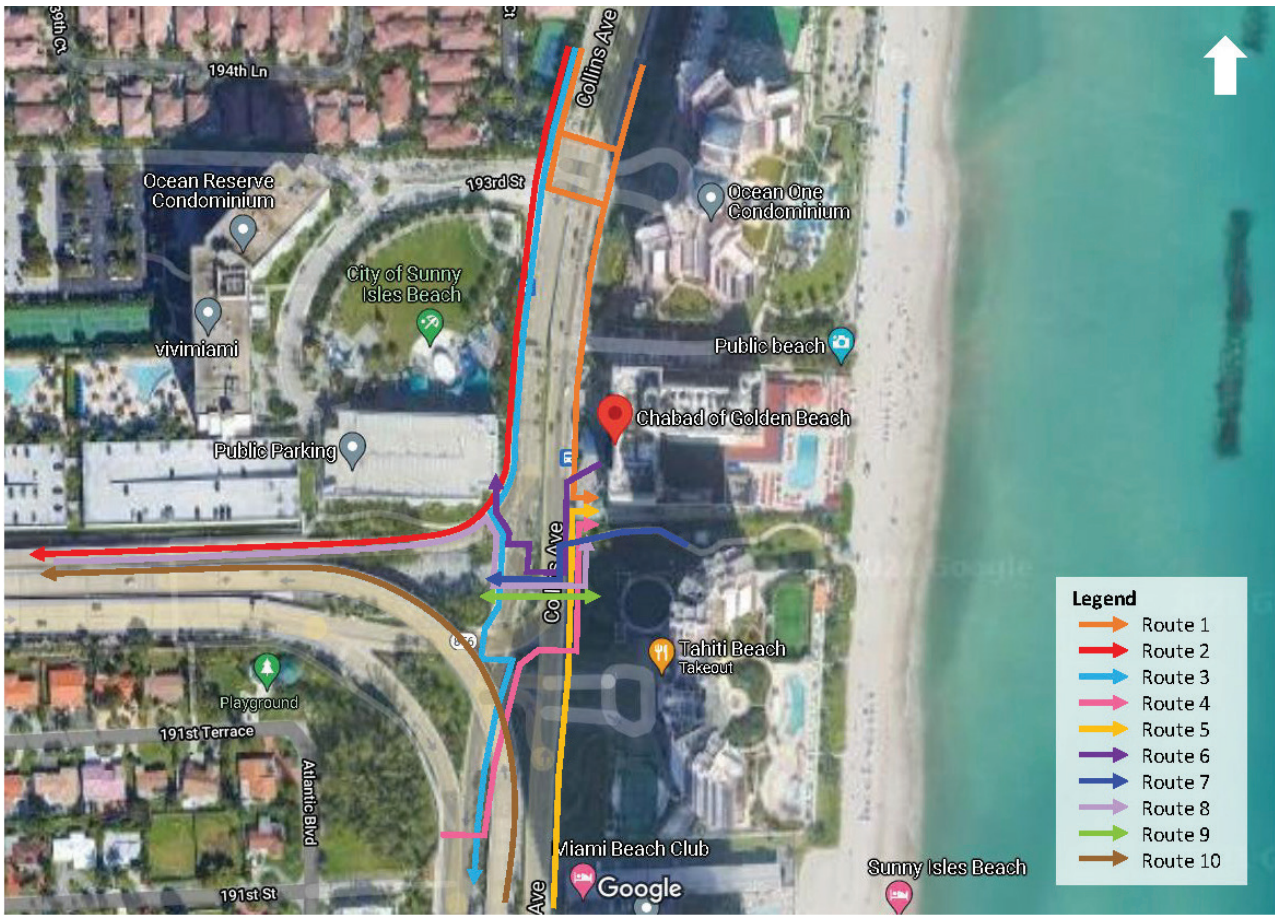
Second Field Review

(Wednesday, September 22, 2021 from 8:00 AM to 11:00 AM)

The second field review began at 8:00 AM under rainy conditions and ended at 11:00 AM under partially cloudy conditions. **Figure 3** illustrates the main routes used by pedestrians during the field review. Route 1, Route 4, Route 5, and Route 8 depict movements of pedestrians attending the Chabad of Golden Beach. Most pedestrians using Route 1 used the intersection of SW 193 Street and SR A1A/Collins Avenue where a police patrol car was stationed from 8:00 AM to 10:00 AM. This intersection has pedestrian signal heads and push buttons for all movements on the north, south, and west legs.

Route 2 uses the westbound on-ramp to SR 856/William Lehman Causeway from southbound SR A1A/Collins Avenue and Route 10 uses the westbound overpass from northbound SR A1A/Collins Avenue to westbound SR 856/ William Lehman Causeway. Route 3 shows the path of pedestrians going to Jewish religious institutions south of 191 Street along SR A1A/Collins Avenue.

Figure 3: Field Review Pedestrian Travel Observations

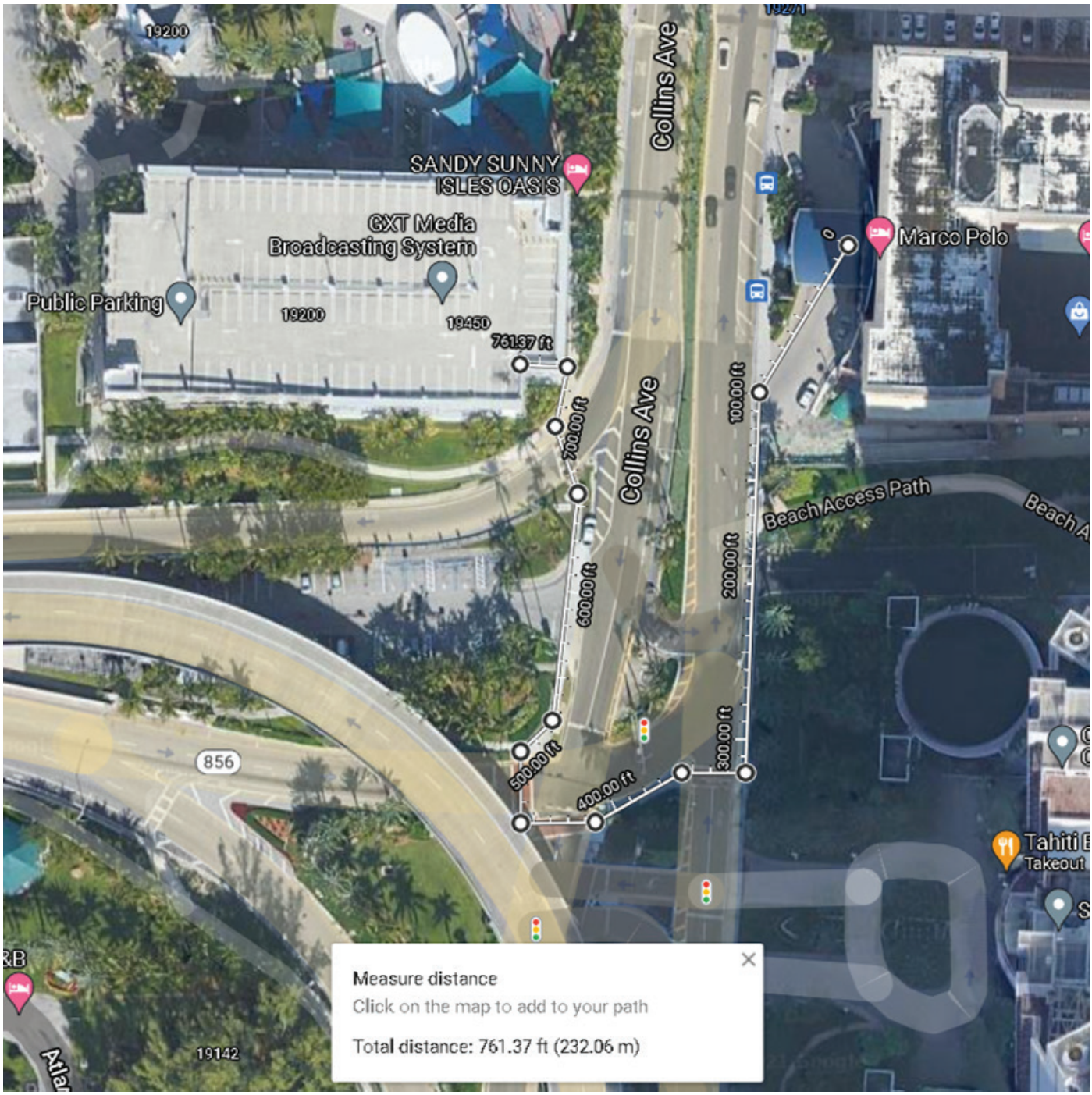


Route 6 illustrates the activity of car valets for the Ramada Plaza by Wyndham Marco Polo Beach Resort (19201 Collins Ave, Sunny Isles Beach, FL 33160). The valets park vehicles at the P8 Municipal Parking Garage (19370 Collins Ave, Sunny Isles Beach, FL 33160) and pick-up the vehicles by walking across SR A1A/Collins Avenue. Since the nearest crosswalk is approximately 308 feet south of the hotel entrance, valet and other hotel staff prefer to cross approximately 100 feet north of the crosswalk at the southbound SR A1A/Collins Avenue left-turn bay into the Ocean Two Condominium (19111 Collins Ave, Sunny Isles Beach, FL 33160). **Figure 4** shows the difference in route length if staff where to use the marked crosswalks versus the observed behavior. Route 7 and 9 depict similar observed behavior by construction workers, tourists, and regular beach visitors that prefer to cross at the left-turn bay instead of using the marked crosswalks. Table 1 summarizes pedestrian and bicycle observations and counts from the field review.

Table 1: Field Review Pedestrian Travel Observations

Route	Pedestrian Count
1	64 adults + 16 children headed to the Chabad of Golden Beach Other pedestrians used this crosswalk, especially transit users of Miami-Dade and Broward County Transit (BCT) routes 28, E, and S
2	2 adults assumed to be headed to the Edmond J. Safra Synagogue (i.e., westbound) 3 runners (2 headed westbound and one eastbound) 1 jogger (westbound) Multiple cyclists (westbound) and 1 motorized scooter (eastbound)
3	3 adults headed to Jewish religious institutions south of 191 Street along SR A1A/Collins Avenue Multiple other pedestrians and athletes 3 cyclists southbound on SR A1A/Collins Avenue outer travel lane
4	1 child headed to the Chabad of Golden Beach
5	20 adults + 2 children headed to the Chabad of Golden Beach
6	5 adults + 1 child parked at P8 Municipal Parking Garage and headed to the Chabad of Golden Beach. Multiple hotel car valet, maids, hotel staff, and other workers.
7	7 adults parked at the P2 Municipal Parking Lot and headed to the Chabad of Golden Beach. Early morning group of elderly women finishing exercise class and other pedestrians parked at the P2 Municipal Parking Lot.
8	1 adult headed to the Chabad of Golden Beach
9	Multiple construction workers and other beachgoers. Most leisure-oriented pedestrians used the marked crosswalk while those assumed to be regulars did not use the marked crosswalk.
10	1 runner on the westbound overpass from northbound SR A1A/Collins Avenue to westbound SR 856/ William Lehman Causeway

Figure 4: Ramada Plaza Car Valet Marked Pedestrian Path vs Observed Behavior



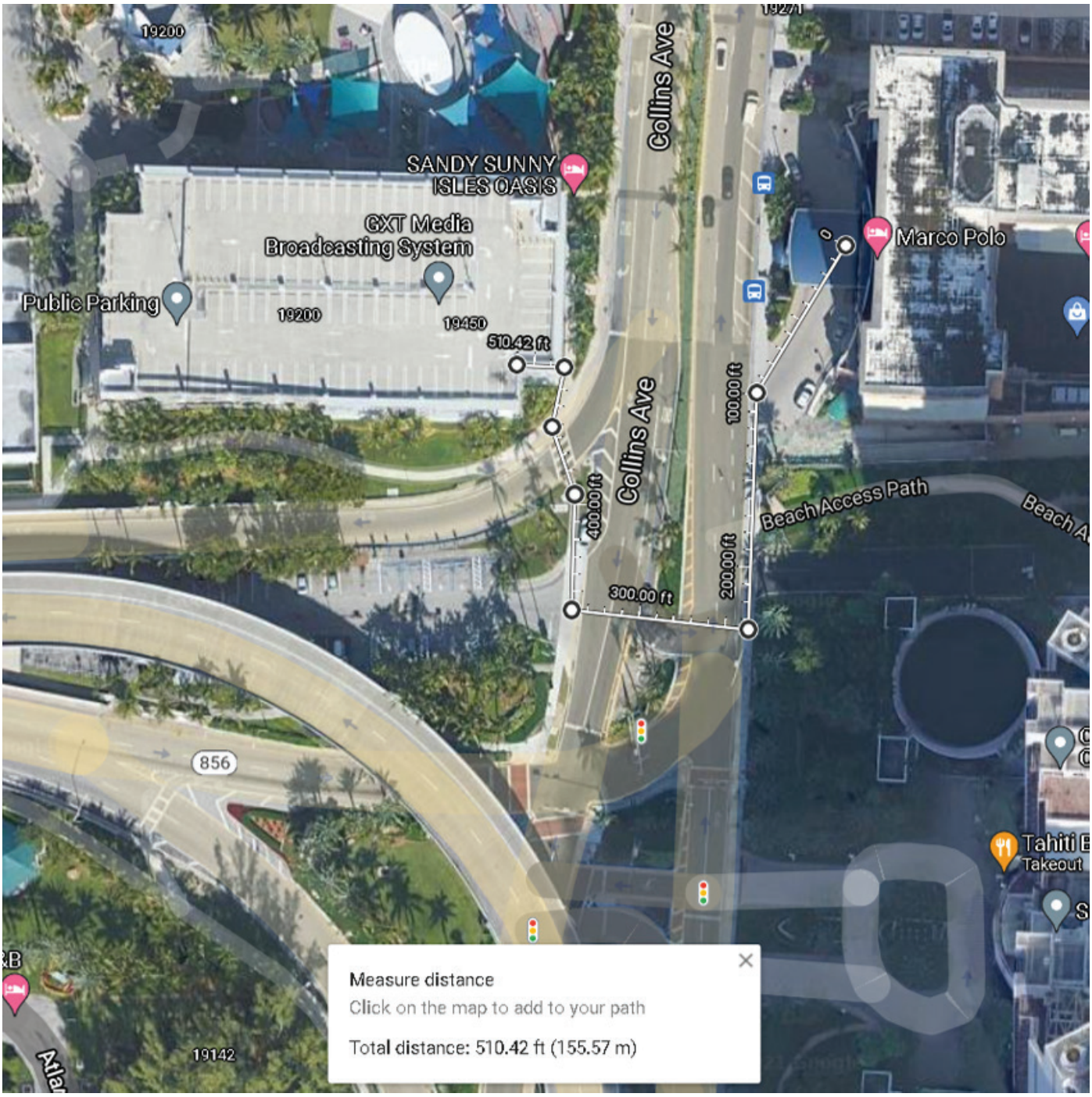
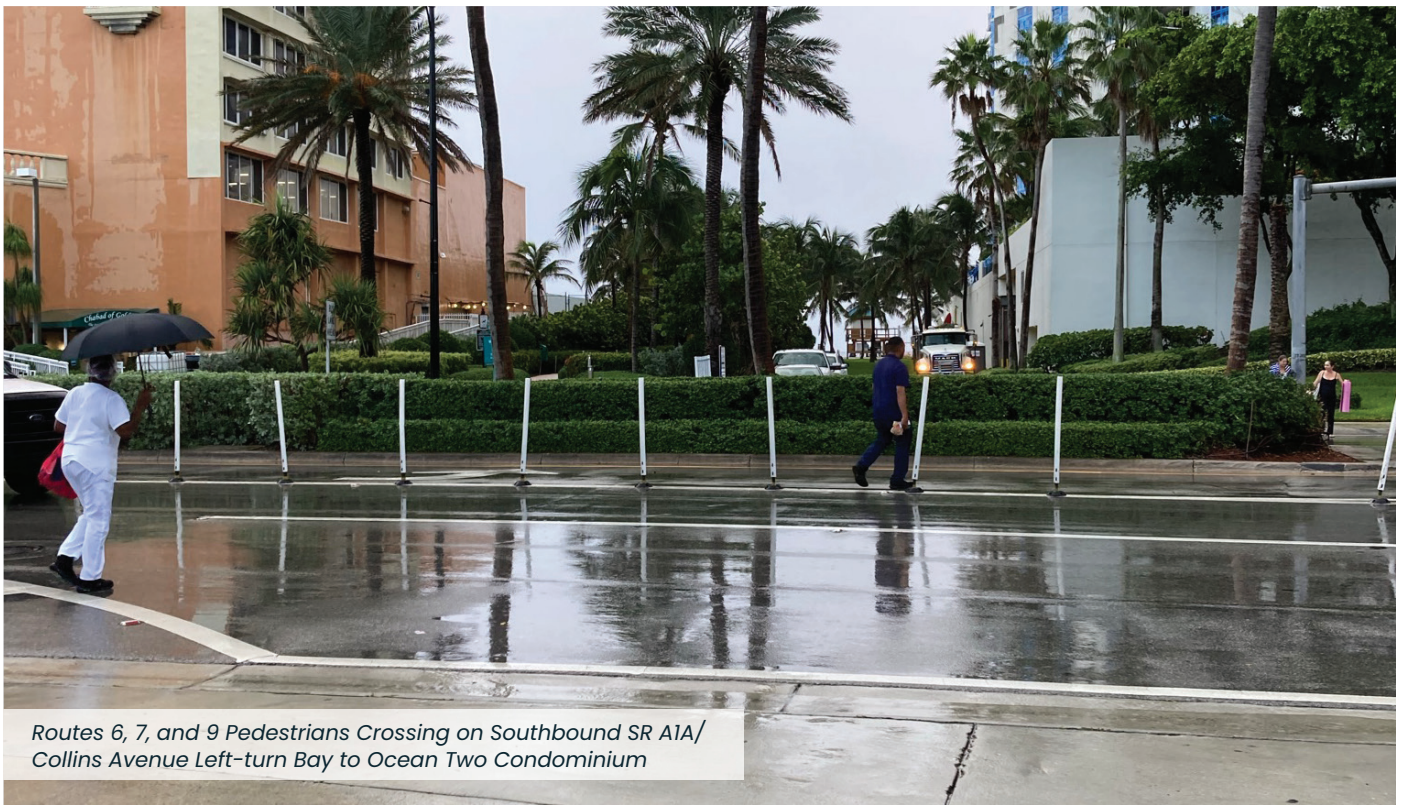

19200
SANDY SUNNY ISLES OASIS
Collins Ave
GXT Media Broadcasting System
Marco Polo
Public Parking
19200
19450
510.42 ft
100.00 ft
Collins Ave
400.00 ft
Beach Access Path
200.00 ft
300.00 ft
856
Takeout
Measure distance
Click on the map to add to your path
Total distance: 510.42 ft (155.57 m)
19142

Figure 5: Field Review Pictures

Route 1 Pedestrians crossing SW 193 Street on Southbound SR A1A/Collins Avenue headed to Chabad of Golden Beach

Route 2 Pedestrians on Westbound SR 856/William Lehman Causeway On-Ramp assumed to be headed to the Edmond J. Safra Synagogue

Route 2 Cyclists on Westbound SR 856/William Lehman Causeway On-Ramp



Routes 6, 7, and 9 Pedestrians Crossing on Southbound SR A1A/ Collins Avenue Left-turn Bay to Ocean Two Condominium

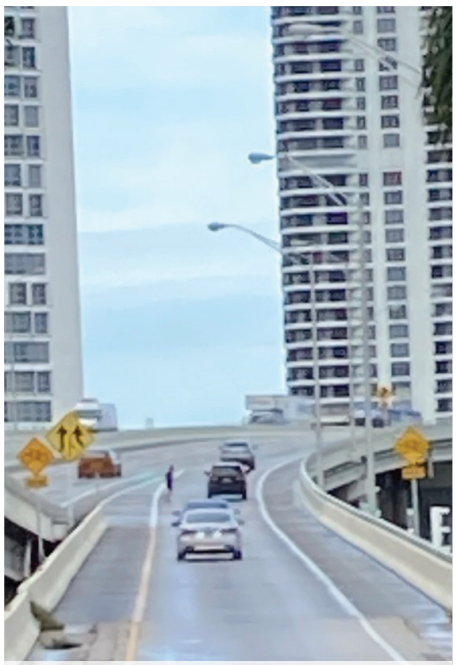
Route 2 Athlete on Westbound SR 856/William Lehman Causeway On-Ramp

Route 2 Athlete on Westbound SR 856/William Lehman Causeway On-Ramp

Route 10 Athlete on Westbound SR 856/William Lehman Causeway Overpass

Route 2 Athlete on Westbound SR 856/William Lehman Causeway On-Ramp

Route 2 Athlete on Westbound SR 856/William Lehman Causeway On-Ramp



Route 10 Athlete on Westbound SR 856/William Lehman Causeway Overpass

Modal Interrelationships

In the **2011 Final Policy Statement on Eligibility of Pedestrian and Bicycle Improvements under Federal Public Transportation Law (76 FR 52046)**, Federal Transit Administration (FTA) determined that all pedestrian improvements located within half-mile and all bicycle improvements located within three miles from a public transportation stop or station have a *de facto* physical and functional relationship to public transportation. In the study area, the bus terminal at Aventura Mall serves a major destination for multiple BCT and Miami-Dade Metrobus routes.

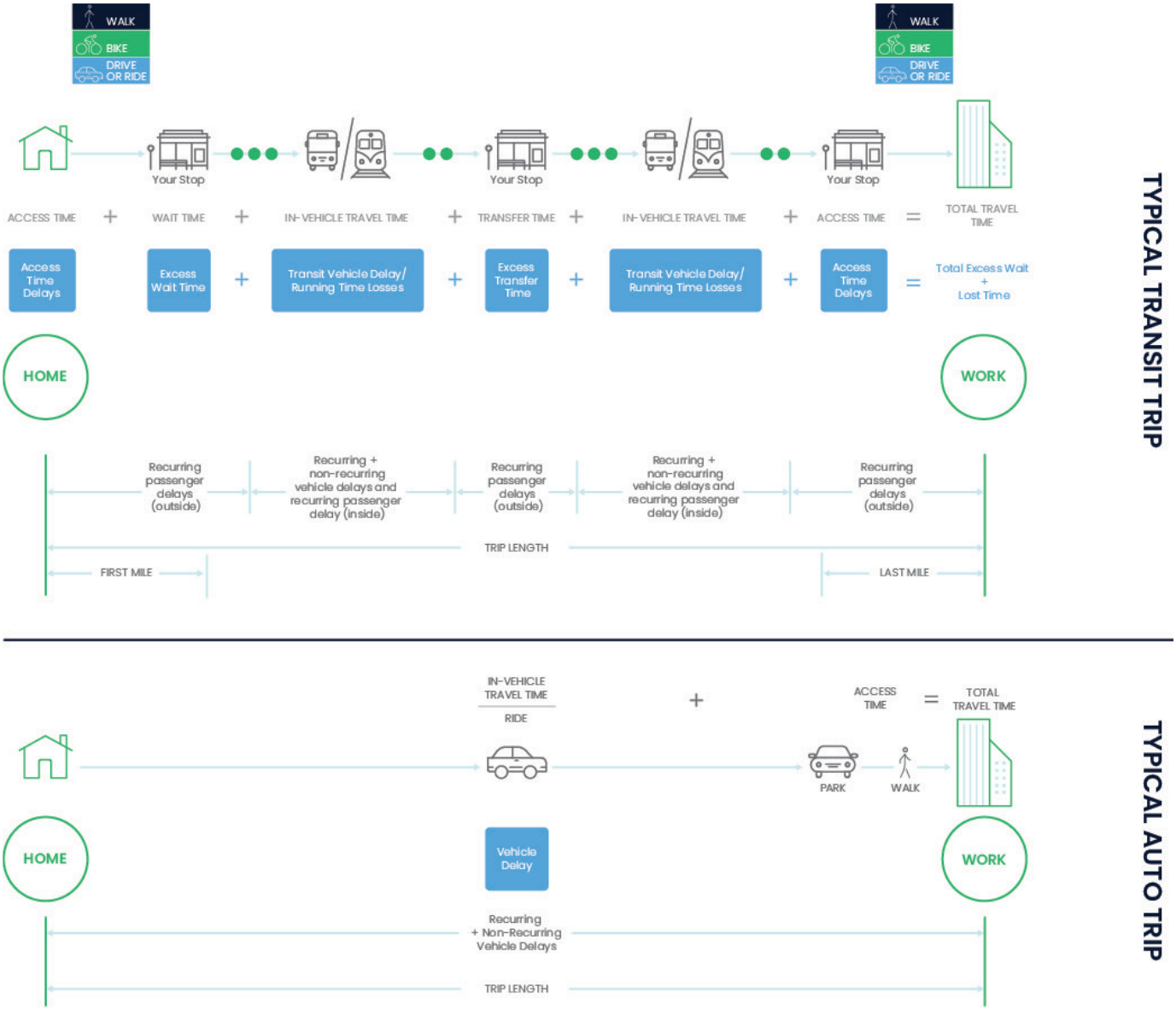
In June 2020, Brightline submitted a proposal to operate intercity passenger rail service on the Florida East Coast (FEC) Railway corridor from Aventura to the Downtown Miami Central Station. This proposal includes the construction of up to five stations along the corridor and is in negotiations as of June 2020. One proposed station is the Aventura Rail Station at 19700 West Dixie Highway, northwest of the study area. **Appendix E** includes the Aventura Rail Station agreement between Brightline and FEC and 40% design plans for the Aventura Rail Station.

This station is proposed to be served by the future Northeast Corridor commuter rail service. On February 16, 2016, the Miami-Dade TPO Governing Board unanimously approved a policy to set the advancement of rapid transit corridors and transit supportive projects as the County's highest priority. The Northeast Corridor is one of six rapid transit corridors in the Strategic Miami Area Rapid Transit (SMART) Plan. FDOT has completed Phases I and II of the ongoing Project Development and Planning (PD&E) Study for the future Northeast Corridor commuter rail service and is ready to submit this study into the Federal environmental review process.

Today, residents in the study area may use BCT routes 1, 28, and US-1 Breeze at Aventura Mall. BCT route 28 also runs east from Aventura Mall along the causeway frontage roads and SR A1A/Collins Avenue. Miami-Dade Metrobus routes 3, 9, E, S, 99, 183, 93, 95, and 120 are also accessible at the bus terminal in Aventura Mall. Routes E, S, and 120 travel along the entirety of the causeway and south on SR A1A/Collins Avenue. Moreover, the City of Aventura has six local trolley circulator routes, and the City of Sunny Isles Beach has three similar routes, that are all free to ride. All the Sunny Isles Beach trolleys cross the Intracoastal Waterway via the causeway and utilize the stops along the causeway frontage road. The Green and Silver routes of the Aventura Express trolley also utilize the stops along the causeway frontage road.

The propose improvements are expected to improve resident's convenience in accessing public transportation. Cycling and walking are the most time-efficient and affordable modes of transportation to transfer to/from public transportation. **Figure 6** illustrates the differences between a typical transit and automobile trip and highlights the many potential delays inherent to a typical transit trip. Without the ability to make low-cost and quick transfers, transit trips can easily become inconvenient and inaccessible.

Figure 6: Comparison of a Typical Transit and Auto Trip



Safety

The most recent five-year crash history was reviewed. From November 30, 2016 to November 30, 2021, the study area had a total of 505 documented crashes. Of the 505 crashes in the study area, 246 (49%) occurred on the causeway, the remaining crashes occurred approaching the causeway on US-1/Biscayne Boulevard or SR A1A/ Collins Avenue or on E/W Country Club Drive. Of the crashes within the causeway, 123 (i.e., 50% of crashes that occurred on the causeway) occurred within approximately 600 feet east of the intersection with US-1/Biscayne Boulevard. Over the years, the study area has had a decrease in crash occurrence with most crashes occurring between 2:00 and 6:00 PM. While most crashes occurred during daylight conditions, approximately 22% of crashes occurred during dark and lighted conditions.

Within the five-year period, the study area had 11 bicycle and pedestrian crashes. Six of these crashes occurred on the causeway, two on W Country Club Drive, and two on US-1/Biscayne Boulevard, and one on SR A1A/Collins Avenue. Ten of the bicycle and pedestrian crashes resulted in non-incapacitating injuries and one pedestrian crash resulted in no injuries. Only one bicycle crash resulted due to a same direction sideswipe under at 11:29 PM under lighted, clear skies, and dry surface condition. Five of these crashes occurred near the intersection of SR 856/William Lehman Causeway and W Country Club Drive and two others near the intersection with E Country Club Drive.

Most of the crashes within the study area were either rear end, sideswipe, or single vehicle crashes. Police reports were checked for the 51 crashes typed as other and unknown. Most of these crashes occurred due to improper lane changes and were either rear end or sideswipe crashes. Some of these crashes occurred in parking lots, were single vehicle/off road crashes, or involved collisions with active-duty police vehicles. The study area has a large amount of single vehicle, off road, and rollover crashes (i.e., total of 54 crashes).

Of the 88 sideswipe crashes, 41 occurred on the causeway and 32 (78%) of those 41 crashes occurred near US-1/Biscayne Boulevard. 60 of the 88 sideswipe crashes occurred in daylight conditions and 25 occurred in dark but lighted conditions. 59 of the 88 sideswipe crashes occurred during clear weather conditions with 8 crashes occurring during rain events. 72 of the 88 sideswipe crashes occurred during dry pavement conditions. 4 of the 88 sideswipe crashes resulted in non-incapacitating injuries or possible injuries; two of these crashes occurred on the causeway near US-1.

Of the 27 off road and rollover crashes, 16 occurred on the causeway. One of these crashes resulted in possible injury and two resulted in non-incapacitating injuries while the rest resulted in no injuries. Half of these crashes occurred under dry road surface conditions and the other half under wet road surface conditions. 11 crashes occurred under cloudy and rain weather conditions. 11 crashes occurred during daylight. 11 crashes occurred near the intersection with US-1/Biscayne Boulevard.

The crash history of the study area suggests that cyclists and pedestrians are vulnerable when using the causeway given the amount of sideswipe and single vehicle/off road crashes. The number of crashes at the intersection of SR 856/William Lehman Causeway and US-1/Biscayne Boulevard also suggest this area could benefit from improved safety conditions.

Figure 7: Crashes by Time of Day

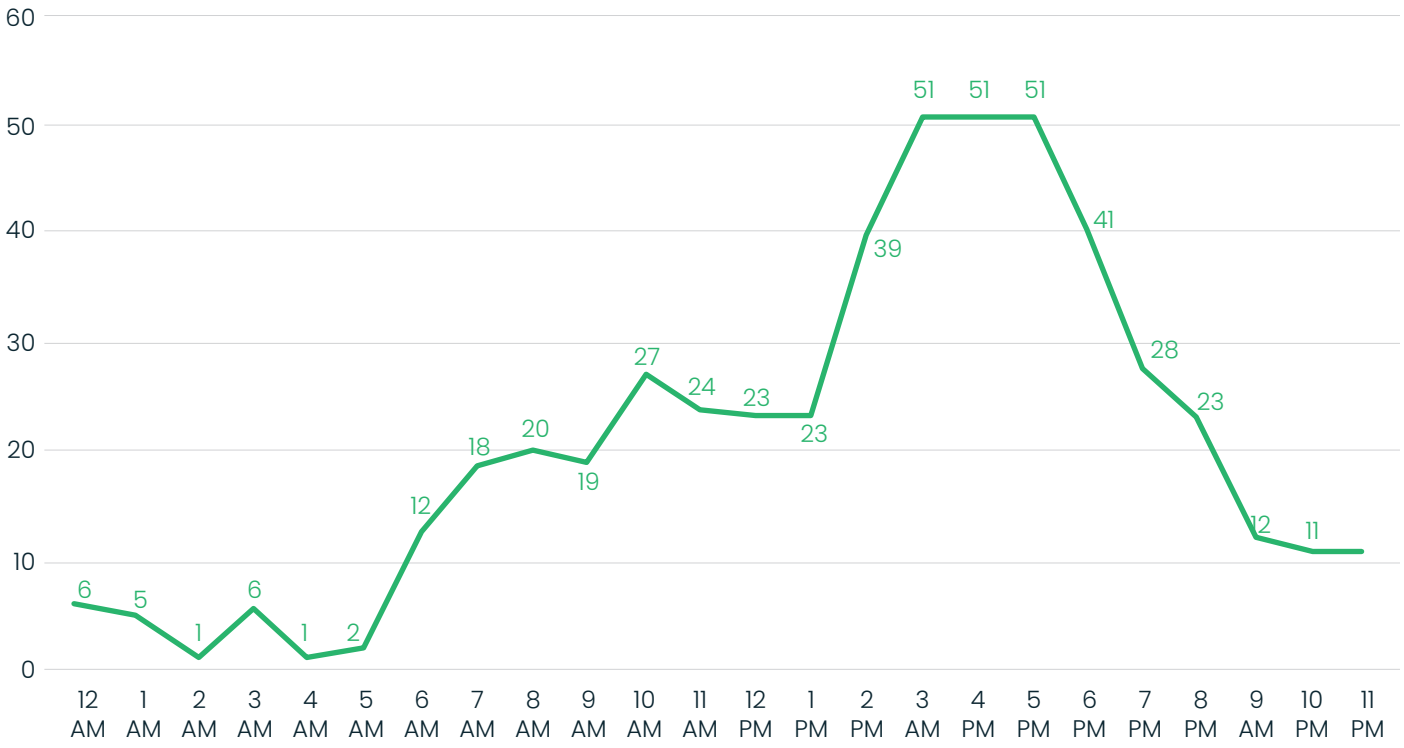


Figure 8: Crashes by Year

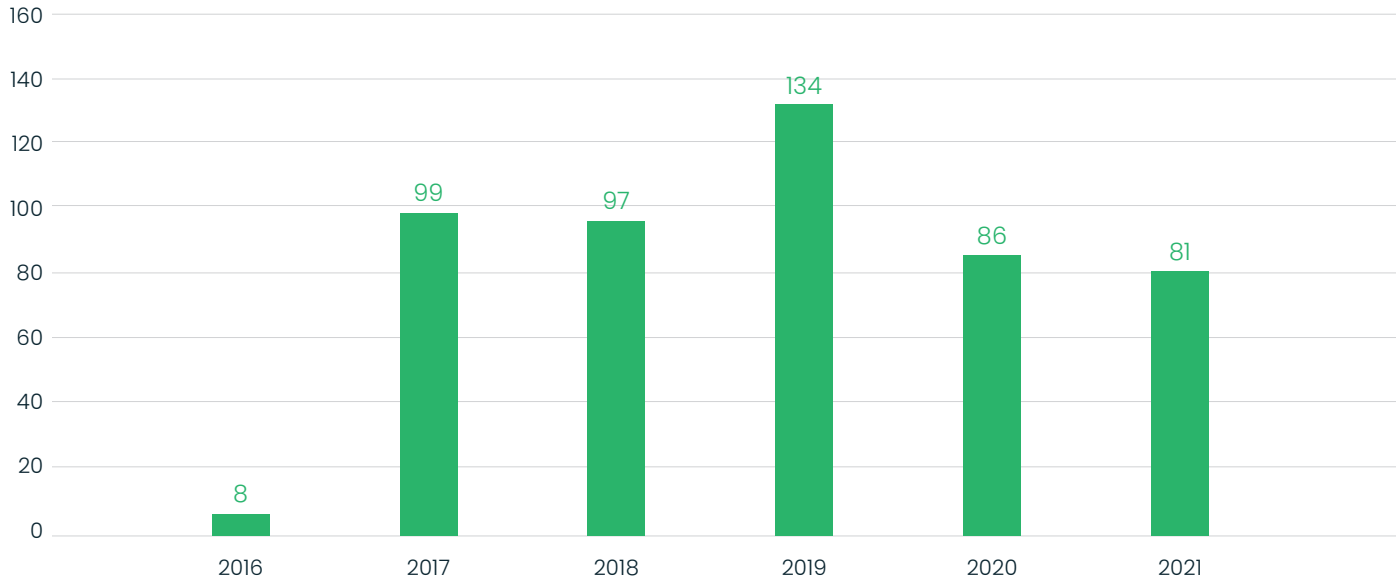


Figure 9: Crashes by Weather Condition

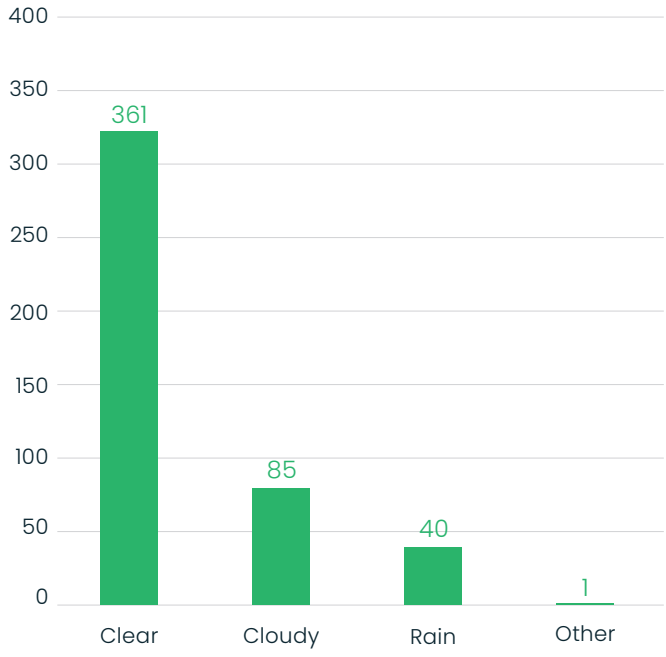


Figure 10: Crashes by Roadway Surface Condition

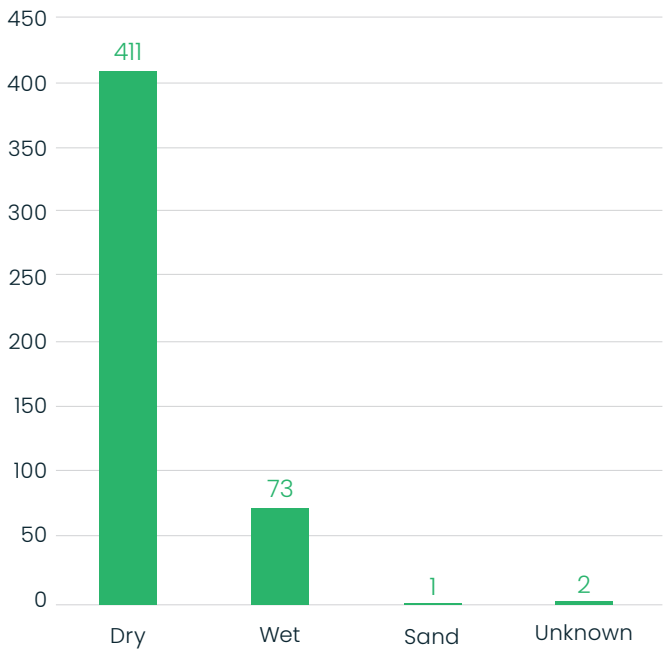


Figure 11: Crashes by Lighting Condition

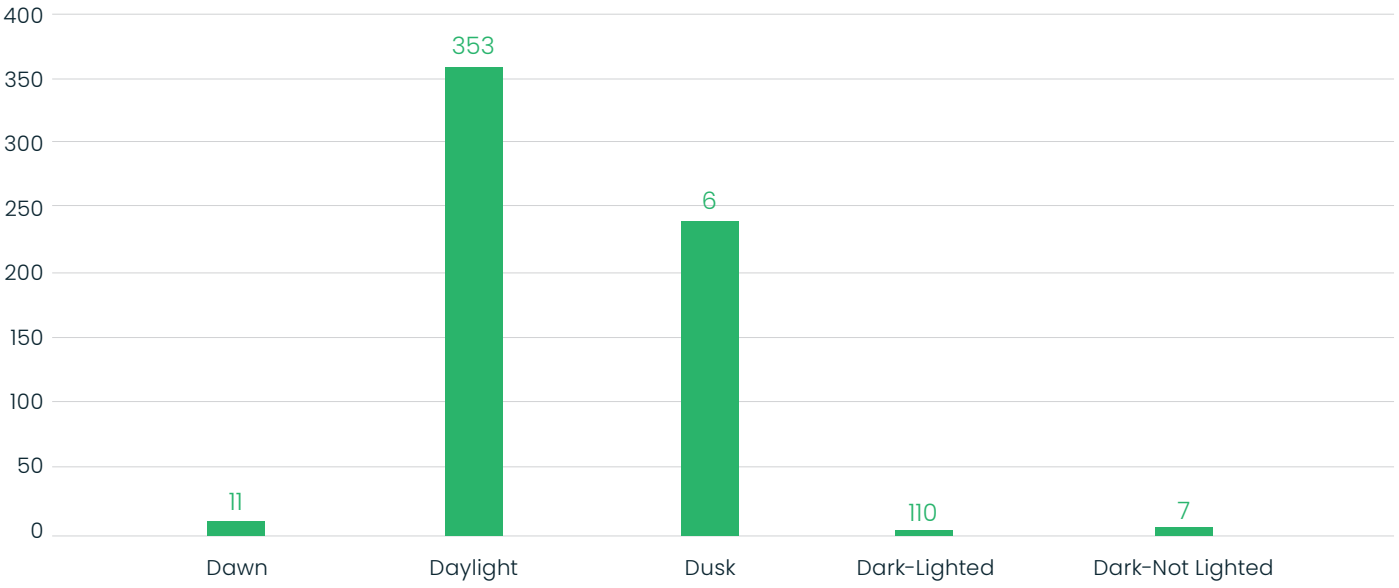


Figure 12: Crashes by Severity

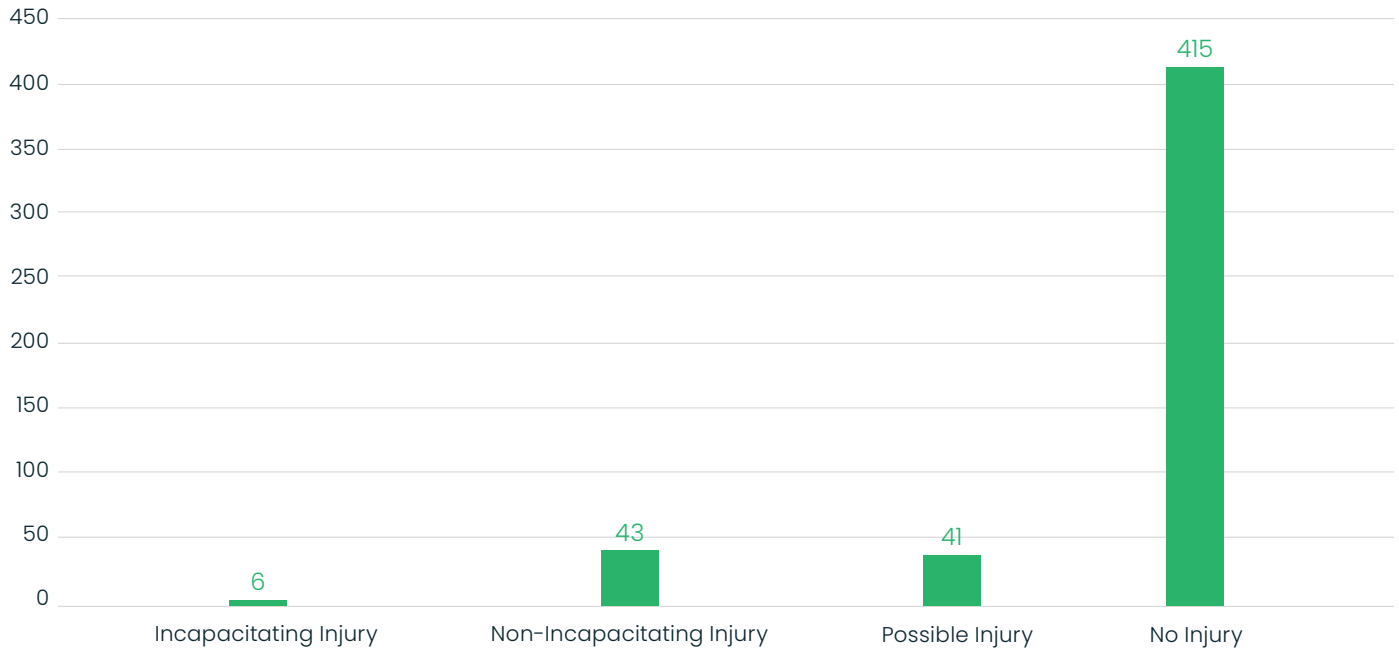


Figure 13: Crashes by Type

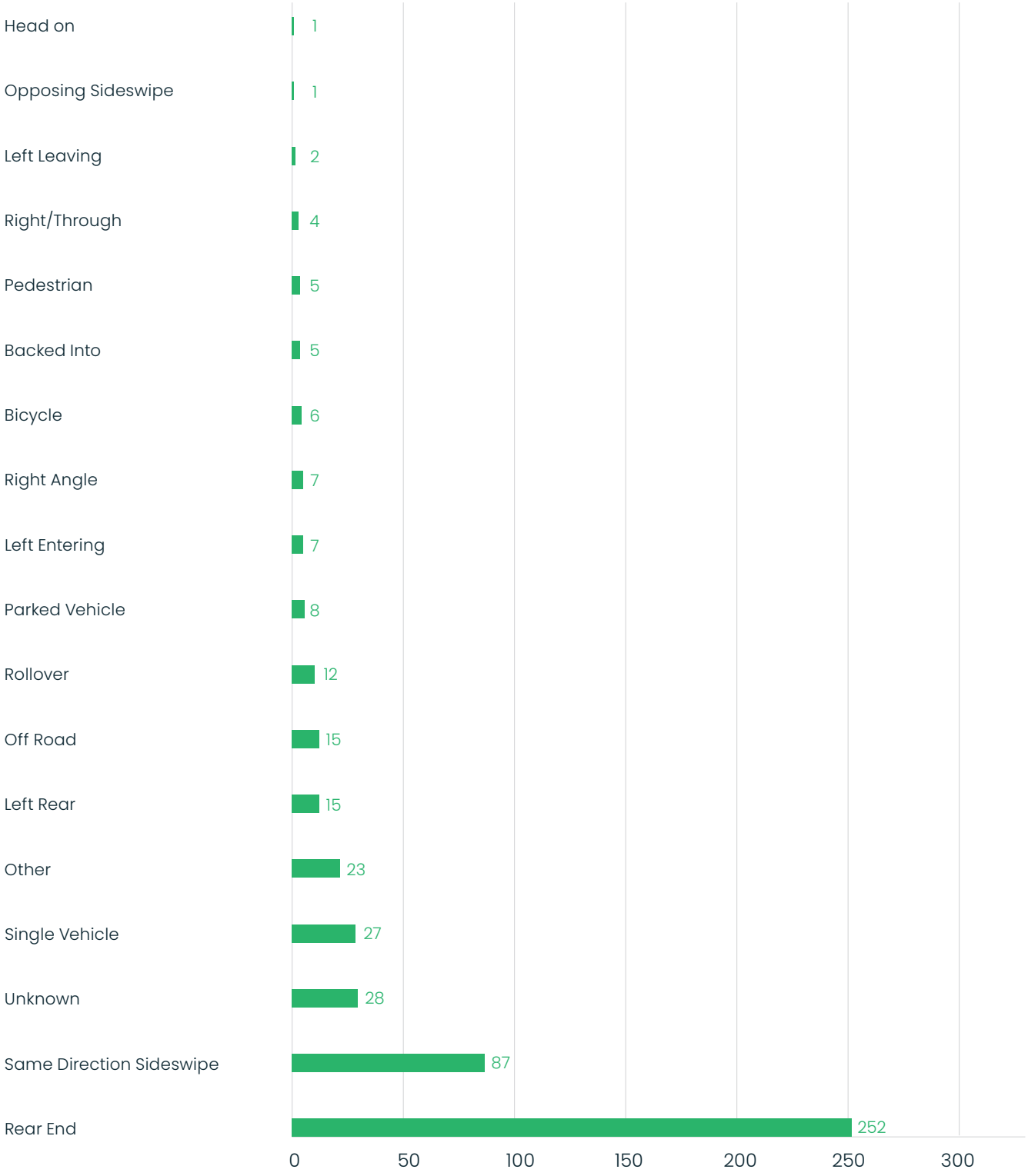
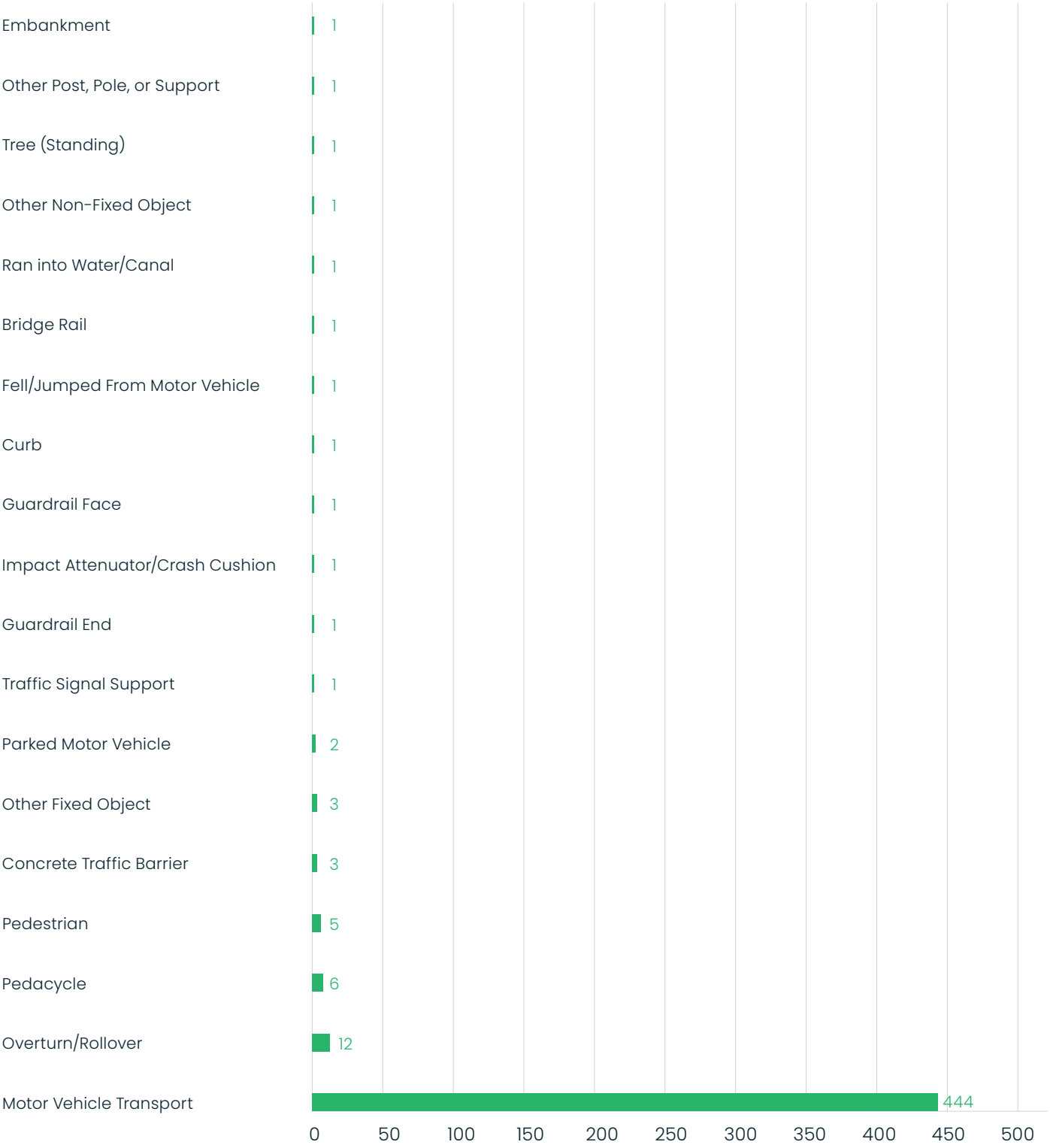


Figure 14: Crashes by Harmful Event



FDOT Vital Few

In accomplishing the vision and mission of FDOT, Florida Transportation Secretary Kevin Thibault, P.E. instructed the department to focus on three components that make up the FDOT Vital Few. These components, Improve Safety, Enhance Mobility, and Inspire Innovation, aim to serve the people of Florida by creating and maintaining a transportation network that is well planned, supports economic growth, and strives to be congest and fatality free. The improvements evaluated under this study aim to enhance mobility and safety through innovative design that accommodates non-motorizes modes of transportation and users of all ages and abilities.

IMPROVE SAFETY

ENHANCE MOBILITY

INSPIRE INNOVATION

Lane Departures

Lane departures represent **33%** OF ALL **CRASHES**

YET RESULT IN **44%** OF ALL **DEATHS**

Intersections

Florida saw a **26%** **INCREASE** IN FATALITIES

& **3%** **DECREASE** IN SERIOUS INJURIES

at intersections between **2015** AND **2019**

Pedestrians & Bicyclists

Nationally, Florida had the **HIGHEST NUMBER OF BICYCLIST FATALITIES** IN 2018

pedestrians accounted for more than **22%** OF TRAFFIC FATALITIES **IN FLORIDA**

Alternative Designs Considered

This conceptual engineering feasibility study considered several alternatives for providing a physically separated bicycle/pedestrian path on the causeway. Alternatives considered but discarded include:

No Build

The No Build Alternative keeps the existing bicycle lanes on the eastbound and westbound outside shoulders of the causeway, and along the causeway frontage roads, from West Country Club Drive to SR A1A/Collins Avenue. This alternative does not create an integrated transportation system with existing and future bicycle, pedestrian, and transit facilities such as the Aventura Station, SR 5/US 1/Biscayne Boulevard bicycle lanes, Don Soffer Exercise Trail, Founders Park, and Heritage Park. This alternative does not satisfy safety concerns from the City of Aventura and Sunny Isles based on the growing number of diverse non-motorized users.

Lane Repurposing

FDOT's current lane repurposing guidance is not applicable to L/A facilities. Hence, in order to eliminate a lane on SR 856/William Lehman Causeway and repurpose the space for a median shared-use path and inside shoulders, the causeway must first be reclassified as an arterial roadway. Furthermore, this alternative requires analysis of traffic operations and safety impacts provided the reduced roadway capacity. This alternative does not provide a time-sensitive solution to solve the existing safety needs of cyclists and pedestrians using the causeway.

Road Widening

Widening SR 856/William Lehman Causeway has significant social and environmental impacts given the coastal setting of the study area. Anticipated impacts due to road widening include the Intracoastal Waterway, Section 4(f) resources, and community institutions in the causeway adjacent land use.. This alternative also does not provide a time-sensitive solution to solve the study area needs.

Recommended Alternative

In general, the recommended alternative includes the construction of two physically protected shared-use paths. The first path is recommended along the inside shoulder of eastbound SR 856/William Lehman Causeway from SR 5/US-1/Biscayne Boulevard to SR A1A/Collins Avenue. The second path is recommended parallel to the outside shoulder of westbound SR 856/William Lehman Causeway from SR 5/US-1/Biscayne Boulevard to the existing Don Soffer Exercise Trail (MP 0.529), and on the outside shoulder of westbound SR 856/William Lehman Causeway from just west of East Country Club Drive (MP 0.968) to SR A1A/Collins Avenue.

The recommended alternative also proposed elevating SR 856/William Lehman Causeway from approximately MP 0.742 to MP 0.960 to create a bicycle/pedestrian underpass connecting the Don Soffer Exercise Trail and north and south frontage roads to the recommended physically protected center shared-use path on the inside shoulder of eastbound SR 856.

This new connection also includes signalized raised bicycle/pedestrian crossings and upstream speed tables on the north and south frontage roads. Other recommended improvements include:

SR 856/William Lehman Causeway and SR 5/US-1/Biscayne Boulevard

- Bicycle/pedestrian marked crossings with green elephant markings connecting the proposed shared-use paths to the existing bicycle lanes and sidewalks along northbound and southbound SR 5/US-1/Biscayne Boulevard.

SR 856/William Lehman Causeway and West Country Club Drive

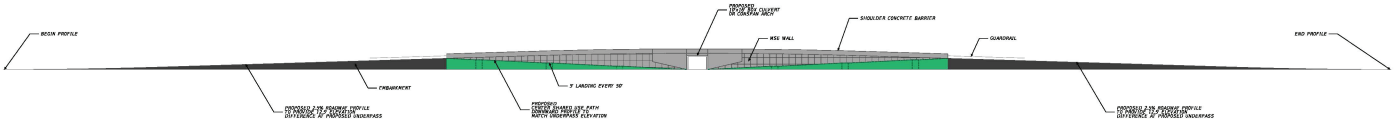
- Bicycle/pedestrian marked crossings with green elephant markings connecting the proposed shared-use path along westbound SR 856/William Lehman Causeway to the existing West Country Club Drive shared-use path.
- Extensions of the shared-use path along West Country Club Drive on the west and east side of the roadway and connecting across West Country Club Drive and the south Frontage Road via signalized bicycle/pedestrian marked crossings with green elephant markings.
- Providing green bicycle pavement markings at the conflict points of the existing bicycle lane along the north Frontage Road.

SR 856/William Lehman Causeway and SR A1A/Collins Avenue

- Signalized bicycle/pedestrian marked crossing with green elephant markings across SR A1A/Collins Avenue to connect the proposed shared-used paths to existing Beach access.
- Extending the shared-use path (from the above-mentioned proposed crossing) along SR A1A/Collins Avenue to connect the center shared-use path and the shared-use path along the westbound SR 856/William Lehman Causeway on-ramp to the intersection of NW 189 Street.

The recommended alternative proposes two separate shared-use paths along the causeway due to the existing high volume and varied mix of low-stress tolerance and high-stress tolerance vulnerable road users. Figure 21 explains the difference between low-stress tolerance and high-stress

Figure 20: Recommended SR 856/William Lehman Causeway Underpass from MP 0.742 to MP 0.960



tolerance bicyclists. This categorization also applies to pedestrians which can be classified from low-stress tolerance (i.e., children) to high-stress tolerance (i.e., marathon runners).

Per the FDOT's Florida Design Manual (FDM):

Section 224.1

"A shared-use path may not be the best solution for all conditions. Use a separated bike lane with a sidewalk per FDM 223 and FDM 222 in Context Classifications C2T, C4, C5, or C6 when: Non-motorist volumes are expected to be high, or there may be high numbers of more vulnerable users such as elderly or people with disabilities."

Section 224.1.1

"Exposing vulnerable road users to high-speed traffic is undesirable; therefore, shared-use paths located parallel to L/A Facility travel lanes are not permitted within L/A right-of-way. However, a shared use path on causeways or bridges that span navigable waterways may be considered when the path is shielded from the high-speed traffic using a barrier or traffic railing."

The logic behind providing two protected shared-use paths is to separate low-stress and high-stress tolerance vulnerable road users while also providing enough capacity for existing and future non-motorized demand on the causeway. Given that the Don Soffer Exercise Trail is heavily used by low-tolerance users, and that important bicycle and pedestrian attractors (i.e., Aventura Mall, Edmond J. Safra Synagogue, Heritage Park, public parking, and beach access) are located on the north side of the causeway, the north shared-use path is recommended to directly link these attractors while conforming with existing user expectancy. The median shared-use path is recommended as a dedicated facility for high-stress tolerance users given this path reduces the number of conflict points with driveways and vehicle turning movements. High-stress tolerance non-motorized users also require long uninterrupted distances for their higher riding speeds. The median shared-use path is also recommended to be barrier separated since SR 856/William Lehman Causeway has high-speed speed traffic (55 mph).

Appendix F includes a conceptual plot that depicts the recommended improvements from the feasibility study. The benefits of the recommended alternative include:

- A focus on fatal and serious injury crash reduction by channelizing, separating and physically protecting vulnerable road users (i.e., pedestrians and cyclists) on the causeway and the parallel frontage roadways.
- Separation of pedestrian and cyclist spaces via use of longitudinal barriers, both barrier wall and guardrail, thus eliminating their exposure to collisions by motor vehicles.
- Creation of slower and more uniform vehicle speeds particularly along the frontage roadways which have pedestrian and cyclist crossings and adjacent travelers

Impacts of Recommended Alternative

Based on compliance with relevant design standards, the recommended improvements for SR 856/William Lehman Causeway requires the approval of design exceptions for horizontal stopping sight distance, lane width, and shoulder width. The causeway is a high-speed limited access roadway (design speed ≥ 50 mph); thus, these elements are considered controlling design elements and a formal design exception is required per FDOT FDM 122.2.2. **Appendix G** documents the design exceptions that need to be approved in order for the recommended alternative to be viable.

Safety Performance

Safety concerns associated with shorter horizontal stopping sight distance include reduced driver visibility and time to react and adjust to all elements of the downstream traffic and road conditions. Narrow traffic lanes, on the other hand, reduce the maneuvering space of drivers, which may increase the incidence of sideswipe crashes. Narrow lanes are also a type of traffic calming technique associated with reduced travel speeds. Safety concerns associated with narrow shoulder widths include reduced recovery areas and space for disabled vehicles, maintenance operations, law enforcement activities, and stormwater management.

Based on the available information of crashes that have occurred within the study area between November 30, 2016 and November 30, 2021, it is reasonable to conclude that the proposed design exceptions are not anticipated to mitigate vehicular crashes within the study area. However, the proposed physically protected bicycle and pedestrian improvements will provide increased safety and connectivity for vulnerable road users using the existing outside bicycle lane shoulder on SR 856/William Lehman Causeway and using the proposed shared-use paths.

Operational Performance

The recommended alternative maintains most of the existing pavement markings with the addition of improved bicycle and pedestrian facilities. At the intersection of SR 856/William Lehman Causeway and SR 5/US-1/Biscayne Boulevard, the proposed improvements include adding bicycle and pedestrian high emphasis crosswalks as well as dedicated bicycle and pedestrian actuation. These improvements are also proposed at the intersections of W. Country Club Drive and the causeway frontage roads, and at SR A1A/Collins Avenue and the westbound on-ramp to the causeway. Furthermore, the proposed improvements include two speed tables as well as a raised high emphasis bicycle/pedestrian signalized crossings across the north and south frontage roads. These design elements are proposed as traffic calming techniques to achieve a 25-MPH target speed on the frontage roads. These conceptual improvements will have operational performance impacts that require further evaluation.

Right-of-Way

The recommended improvements do not impact existing right-of-way conditions.

Community and Environment

SR 856/William Lehman Causeway is currently used by a diverse population of cyclists and pedestrians. From professional athletes to children and families, the causeway provides a unique connection across the Intercoastal Waterway for primary and secondary trips. The existing bicycle and pedestrian facilities within the study area are inadequate for the volume and type of vulnerable users utilizing the causeway. The recommended improvements aim to provide increased safety, mobility, and connectivity for users of all ages and abilities. By providing two shared-use paths, the recommended alternative allows for separation of low-stress and high-stress tolerance vulnerable road users. The proposed improvements also directly address concerns express by study area citizens.

Usability by all Modes of Transportation

The recommended alternative increases the usability of alternative modes of transportation by creating dedicated paths for cyclists and pedestrians that are physically protected from adjacent traffic. The recommended alternative also includes a proposed bicycle and pedestrian underpass that will further increase mobility and created improved transfer conditions between transit and non-motorized modes of travel. Moreover, the recommended alternative improves first-last mile connections to the planned Aventura Station, supplementing the premium transit services planned for the study area.

Conceptual Cost Estimate

A conceptual cost estimate for the recommended alternative was developed using FDOT's Long Range Estimates and Master Pay Item lists for Area 13 (Miami-Dade County) and reflecting costs from February 1, 2020 to January 31, 2021. Statewide averages were used were applicable. Table 9 presents a summary of the conceptual cost estimates. **Appendix H** includes a breakdown of the conceptual cost estimate.

Table 5: Summary of Conceptual Cost Estimate

Proposed Improvement	Total Cost
North Path (US-1 to West Country Club Drive)	$1,370,000
North Path (East Country Club Drive to A1A/Collins Ave)	$2,240,000
Center Path	$5,400,000
Underpass	$4,190,000
Collins Avenue	$90,000
Subtotal	$13,290,000
Mobilization (7%)	$940,000
Maintenance of Traffic (10%)	$1,330,000
Utilities (2%) Utility work within FDOT ROW is not reimbursable, however percentage has been added conservatively for any unknown reimbursable utilities	$270,000
Lighting (10%)	$1,330,000
Drainage (10%)	$1,330,000
Design (20%) Design percentage assumed conservatively based on the complexity of the project (i.e., structural and drainage analysis and design for pedestrian underpass, and structural analysis segment of causeway widening for shared-used path and additional barrier walls on existing bridges)	$2,660,000
Geotechnical (15% of Design)	$400,000
Survey (15% of Design)	$400,000
CEI (8%)	$1,070,000
Contingency (15%)	$2,000,000
TOTAL	**$25,020,000**

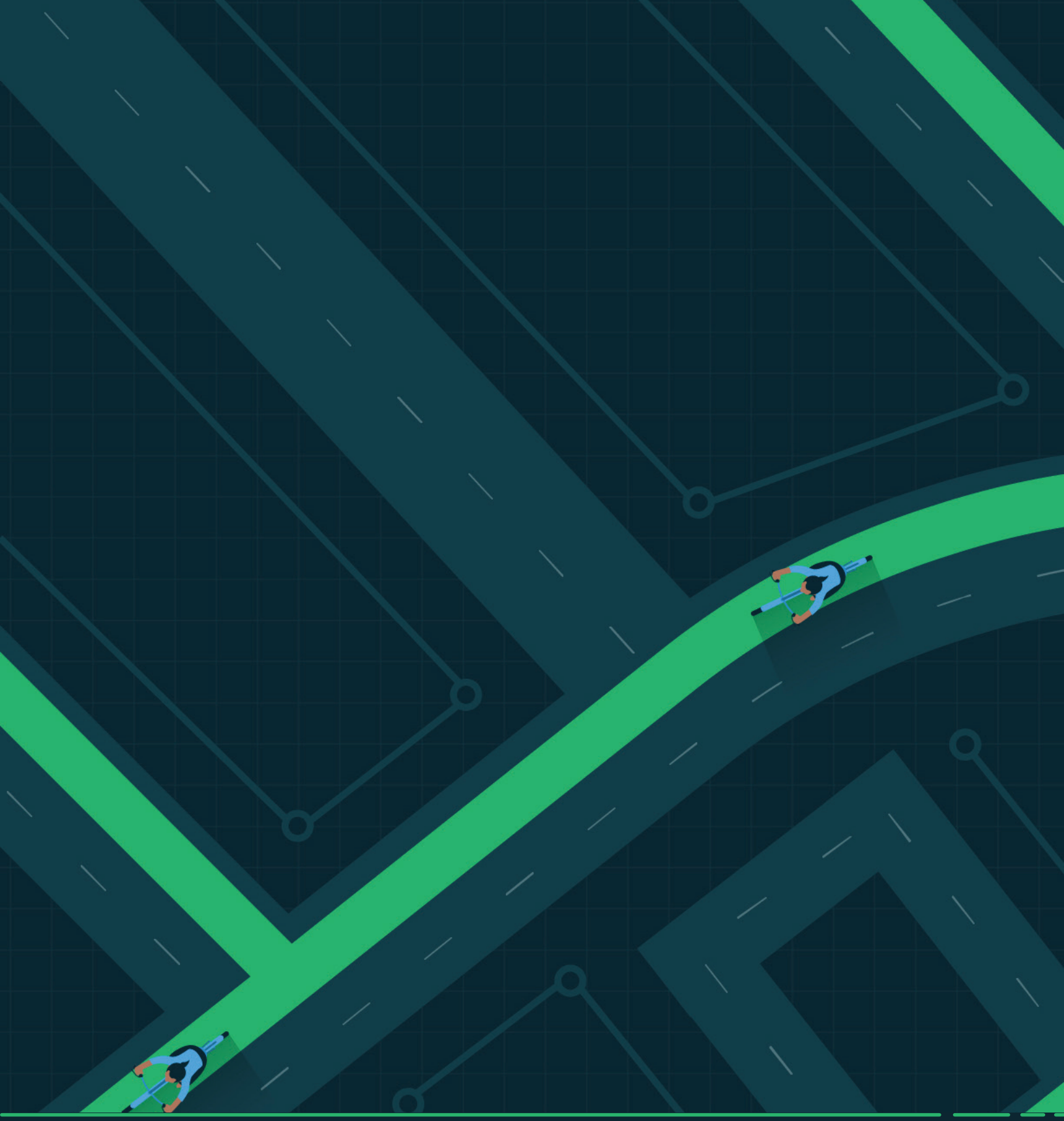

WILLIAM
LEHMAN
CAUSEWAY

Summary and Conclusion

This planning and conceptual engineering feasibility study of SR 856/William Lehman Causeway was initiated in response to a request from the City of Aventura and City of Sunny Isles Beach to perform a lane elimination and repurposing analysis of the causeway to accommodate a shared-use path for safer east-west non-motorize travel. Hence, this study evaluated the feasibility of providing physically separated (i.e., concrete barrier or guardrail) shared-use paths on, and parallel to, SR 856/William Lehman Causeway from SR 5/US-1/Biscayne Boulevard to SR A1A/Collins Avenue while maintaining the existing number of travel lanes given that FDOT's current lane repurposing guidance is not applicable to limited access facilities such as SR 856.

The objective of this memorandum is to document the purpose and need, alternatives considered, and recommended alternative resulting from the feasibility analysis. Through field reviews and engineering analysis of existing conditions, it was determined that the best alternative for the study area is to construct two protected shared-use paths. The first path is recommended along the inside shoulder of eastbound SR 856/William Lehman Causeway from SR5/US-1/Biscayne Boulevard to SR A1A/Collins Avenue. The second path is recommended parallel to the outside shoulder of westbound SR 856/ William Lehman Causeway from SR 5/US-1/Biscayne Boulevard to the existing Don Soffer Exercise Trail (MP 0.529), and on the outside shoulder of westbound SR 856/William Lehman Causeway from just west of East Country Club Drive (MP 0.968) to SR A1A/Collins Avenue. Field reviews confirmed the causeway is used by a wide variety of non-motorized users at all times of day. Given that the causeway attracts a significant amount of cyclists and pedestrians, providing two shared-use path allows for separation of low-stress and high-stress tolerance vulnerable road users.

The recommended improvements for SR 856/William Lehman Causeway require design exceptions for horizontal stopping sight distance, lane width, and shoulder width. Regardless of these adjustments, the recommended alternative balances safety, right-of-way, community, environmental, cost, mobility, and connectivity needs for all modes within the study area. Providing a physically protected bi-directional bicycle and pedestrian facilities directly linking two major north-south arterials (SR 5/US-1/Biscayne Boulevard to SR A1A/Collins Avenue) will substantially improve the safety, connectivity, and accessibility of vulnerable road users who already use the corridor for primary and secondary trips.



MIAMI-DADE
BICYCLE NETWORK

FDOT
DISTRICT 6