



# FEC RAILROAD GRADE SEPARATION FEASIBILITY STUDY

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AUGUST 10, 2017

## EXECUTIVE SUMMARY

The Martin Metropolitan Planning Organization (MPO) initiated this feasibility study to identify, evaluate and plan for potential roadway and non-motorized pedestrian/bicycle grade separations along the Florida East Coast Rail Line (FEC) through Martin County. The study has been performed in phases including:

- **Tier 1:** Perform an initial assessment of all the mainline rail at grade crossings (25) in Martin County and identify 10 roadway candidate crossings for potential grade separation. Review adjacent land uses between crossings and known areas of pedestrian trespassing on the rail corridor to identify 5 candidate locations for non-motorized crossings.
- **Tier 2:** Perform detailed evaluation and rank the roadway and non-motorized candidates for the need and justification to implement grade separations.
- **Tier 3:** Prepare concepts and assess the feasibility and impacts of grade separations at 4 potential crossing locations:
  - Conceptual plans for up to 2 crossings for roadway grade separation, and
  - Conceptual plans for up to 2 crossings for non-motorized uses
- Assess the impacts and cost-benefit of the concepts developed for this study.

The final results include concepts, costs and benefits developed for an Indian Street/Dixie Highway elevated roadway crossing, a Monterey Road/Dixie Highway depressed roadway crossing, a Railroad Avenue to Commerce Boulevard elevated pedestrian/bicycle grade separation and a Downtown Stuart elevated pedestrian/bicycle grade crossing. Each concept is provided below from south to north by roadway and non-motorized category. Note 11x17 sheets are provided in Chapter 4, Figures 18 to 21.

### Potential Indian Street / Dixie Highway Elevated Roadway Grade Crossing over the FEC Railroad





Potential Monterey Rd/Dixie Highway Depressed Roadway Grade Crossing over the FEC RR

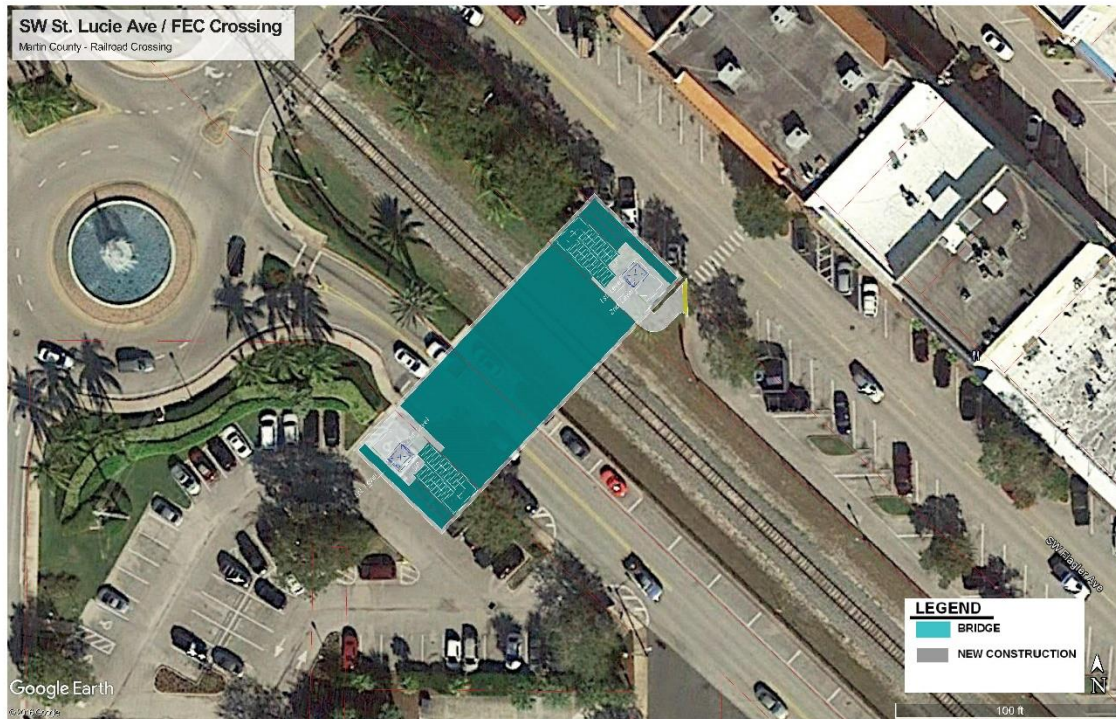


Potential Railroad Ave. to Commerce Ave. Non-Motorized Grade Crossing over the FEC Railroad





### Potential Downtown Stuart Non-Motorized Grade Crossing over FEC Railroad near St. Lucie Ave



Each of the concepts offered some consistent opportunities and challenges where they all provided for access to both sides of the tracks and a safety benefit and some level of community connectivity and all had challenges related to right of way and access.

### Indian Street/Dixie Highway Elevated Grade Crossing over the FEC Railroad Opportunities and Challenges

Indian Street is a 4 lane divided County Roadway west of Dixie Highway that tapers down to a 2 lane roadway east of Dixie Highway. The roadway currently operates well at Level of Service (LOS) C conditions and is expected to continue to operate under satisfactory conditions in 2040 at LOS D. The Indian Street/FEC Railroad crossing is provided with sidewalks, there are no bike lanes, it is served by Martin County Public Transit (MCPT) and there are currently 26 school buses per school day that traverse the crossing. The roadway experiences 12 railroad crossing closures a day, with 60 mile per hour trains at maximum speeds and has experienced 17 crashes in the vicinity of the crossing in the last 5 years including 5 non-motorized crashes and 7 serious injuries. None of the crashes included a train. The crossing is high on the Florida Department of Transportation Safety Needs Index ranking as it is the #113th crossing in a system of 3,682 crossings and may experience as many as 54 trains a day in the future with speeds between 70 and 110 mph.

**Opportunities** – the proposed concept developed for Indian Street includes elevating both Indian Street and Dixie Highway so that all turning movements would be separated from the railroad tracks. Opportunities include safety, a fixed evacuation route and access for emergency services. The proposal maintains the



current design of the intersection meeting community concerns on traffic management on the east side of Dixie Highway. The safety benefit analysis indicates that the proposed concept would reduce crashes by 44% per year, about 3 crashes per year, and the design allows for fixed access from the western communities to the Martin Memorial Medical Center. Note that fixed emergency access, separated from the crossings, to the Medical Center was heard often at outreach meetings as a high priority in reviewing the need for grade separations.

**Challenges** – the concept presents significant right-of-way challenges as the yellow highlighted areas shown on the concept exhibit represents properties that would lose access to both Indian Street and Dixie Highway and probably result in full property takes. In addition there would be roadway network and access impacts where access to properties on the west side of tracks would be prohibited as well as access to/from Alamo Drive east of Dixie Highway.

The concept cost estimate is \$83.6 Million with a cost/benefit ratio of 2.1.

### **Monterey Road/Dixie Depressed Highway Grade Crossing under the FEC Railroad Opportunities and Challenges**

Monterey Road is owned and maintained by FDOT as State Road 714 and the FEC Railroad is designated as a FDOT Strategic Intermodal System (SIS) railroad that is eligible for SIS funding. Monterey Road is a 4 lane divided roadway both east and west of Dixie Highway. The roadway currently operates under satisfactory conditions at LOS D and is expected to operate below satisfactory levels at LOS E in 2040. The Monterey Road/FEC Railroad crossing has sidewalks, there are no bike lanes, it is served by MCPT and there are currently 15 school buses per school day that traverse the crossing. The roadway experiences 12 railroad crossing closures a day, with 60 mile per hour train maximum speeds and has experienced 88 crashes in the vicinity of the crossing in the last 5 years including 1 non-motorized crash and 24 serious injuries. None of the crashes included a train. The crossing is also high on the Florida Department of Transportation Safety Needs Index ranking as it is the #267th crossing in a system of 3,682 crossings and may experience as many as 54 trains a day in the future with speeds between 70 and 110 mph.

**Opportunities** – This same crossing has been studied a couple of times by FDOT once in 2001 and again in 2015. The 2001 study identified 4 alternatives including at-grade, elevated grade separations and a tunnel option. The 2015 study indicated that an elevated grade separation was feasible however the post-2001 study extension of the Witham Field Runway would require engineering and design work to meet Federal Aviation Administration (FAA) requirements within the Runway Protection Zone (RPZ). In order to complement the previous studies a new concept was developed for Monterey Road that includes depressing Monterey Road under the FEC crossing and Dixie Highway. The concept provides east/west connectivity on Monterey Road and avoids constructing an elevated facility that may have conflicts with the Witham Field RPZ. Note that 3 Options are also identified on the Monterey Road exhibit. The options are



provided specifically for access to Palm Beach Road and the Martin Medical Health Center from Monterey Road.

- **Option A** – provides access for eastbound Monterey Road emergency services to travel under the railroad tracks and Dixie Highway and then take a U-Turn to head westbound on Monterey Road and use a new slip road onto Palm Beach Road northbound to the Medical Center.
- **Option B** – is similar to Option A under the tracks and Dixie Highway however it provides for a new road on the north side of Monterey Road where emergency services traffic can take a left turn after coming out of the depression back to at grade and travel on a new road to Palm Beach Road..
- **Option C** – would provide for a ramp that would begin at the depth of the depressed roadway and provide a cloverleaf style ramp out of the depression meeting Dixie Highway at grade to traverse the intersection and access Palm Beach Road. This alternative has the added option of providing additional traffic and emergency services access to Witham Field.

The safety benefit analysis indicates that the proposed concept would reduce crashes by 40% per year, almost 12 crashes per year, and the design would allow for fixed access from the western communities to the Martin Memorial Medical Center and potentially the airport.

Note the concept also provides the benefit of calming surface traffic. With Monterey Road through traffic removed, only local traffic will circulate on the conceptual frontage roads shown in the exhibit and the Dixie Highway intersection will experience much less traffic. This provides an opportunity to develop a better pedestrian and bicycle environment on the surface roads.

**Challenges** – the concept presents right-of-way and commercial property access challenges on the west side of the railroad tracks. It appears that the concept may encroach upon one building and although the frontage roads will allow for right-in right-out access it will prohibit full access to the properties to the north and south. Mitigation for the shopping center on the south will require redesigned access on US 1 south of Dixie Highway.

The concept cost estimate is \$68.5 Million with a cost/benefit ratio of 3.7. Note that the concept will require additional operating and maintenance costs for drainage as it is a depression and Florida's high water table presents issues.

#### **Railroad Ave. to Commerce Ave. Non-Motorized Grade Crossing over the FEC Railroad**

A non-motorized pedestrian bicycle crossing concept was developed to connect the Golden Gate Community to the commercial and employment uses on the west side of the FEC corridor. Observations and data collected at the site clearly showed that there are existing paths and users are crossing the tracks on a regular basis. A concept was developed to provide connectivity between the 2 sides of the tracks using both stairs and ramps. Note that the concept identified is portable and could work at a number of



locations between Indian Street and Monterey Road. The location selected however have a canal to the south that stretches down to Indian Street and this provides an opportunity to channel users to the bridge.

**Opportunities** – providing a bridge at any location brings a safety benefit by providing an option to trespassing on the tracks and also provides a safe route to meet the shopping and employment needs of the community. A camera was placed on Commerce Avenue for one day at the concept location focused on a worn path that leads directly to/from the railroad tracks. On April 1, 2017, 8 pedestrians and 26 bicyclists were observed using the path and tracks. The team also heard that the community prefers that a wall be built to block trespassing onto the railroad tracks. The ramping system on the east side of the tracks meets that desire to a certain extent where the ramping infrastructure will also act as a de facto wall for a segment of the corridor.

**Challenges** – exist in general just getting people to use non-motorized pedestrian/bicycle bridges. Observations of pedestrians in this area showed the same traits that are experienced in many studies - that persons tend to follow desire lines and cross streets at the nearest opportunity and they are not inclined to walk to a traffic signal or an overpass to go directly across the street. Mitigation of this challenge requires channelization of pedestrians and development of a safe environment. The concept presented here includes both ramps and stairs on each side allowing persons to feel safe having options to exit the overpass and the location provides a certain level of channelization because of the canal to the south.

Note that this concept has right of way issues where it requires reuse of the Railroad Avenue right of way and coordination with a private property owner either for an easement or a right of way purchase. A lane of traffic or a row of parking will have to be repurposed on the east side to accommodate ramps and on the west side of the FEC tracks the property is all privately owned.

The concept cost estimate is \$3.7 Million with a cost/benefit ratio of 42.9. Note that there were challenges in calculating the safety benefit for the non-motorized locations. There is no history of a train/pedestrian trespassing crash or fatality in Martin County in the last 10 years. Considering that rail activity may increase 5 fold it was not practical to assume the same conditions will exist in the future. Crash data from the South Florida Rail Corridor (TriRail) in northern Palm Beach County was researched and 2 fatal crashes and 1 suicide were recorded occurring in the last 5 years. In order to maintain a conservative analysis it was assumed that 1 fatality every 5 years would occur under the future conditions in Martin County without a pedestrian/bicycle bridge.

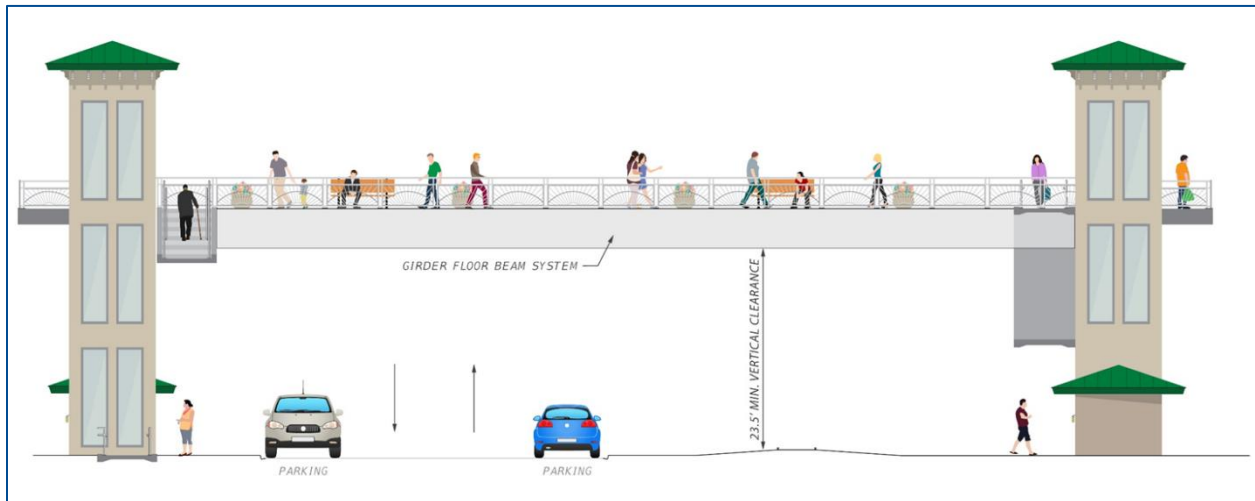
### **Downtown Stuart Non-Motorized Grade Crossing over the FEC Railroad**

A non-motorized pedestrian bicycle crossing concept was developed to connect the east and west sides of the FEC corridor in Downtown Stuart. The concept was proposed to potentially increase economic activity on both sides of the roadway and to better connect parking on the west side of the downtown to the east side attractions.

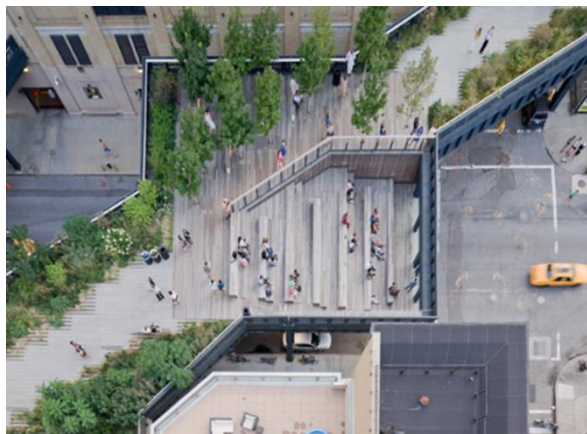


**Opportunities** – exist along the corridor in this area. Cameras were placed at the St. Lucie Avenue/Joan Jefferson Way and the Colorado Avenue crossings for a Thursday, Friday and Saturday from March 30 through April 1, 2017 and a very significant amount of non-motorized activity was observed. More than 300 cyclists and 1,500 pedestrians were observed in that period at Joan Jefferson Way/St. Lucie Avenue crossing the railroad tracks and more than 120 bikes and 2,100 pedestrians at the Colorado Avenue crossing. A concept was developed just south of the Joan Jefferson Way/St. Lucie Avenue roundabout adjacent to the FEC crossing. Similar to the Railroad Avenue to Commerce Avenue connection this proposal could be portable and placed at other locations along the corridor in downtown. This location was selected to take advantage of the public parking and right of way on the west side of Dixie Highway. The concept is proposed to traverse both Dixie Highway and the FEC corridor using elevators on both the east and west sides and the concept includes additional width on the bridge platform to develop more public space. The concept shows a 50 foot wide platform that could serve multiple purposes as well as pedestrian/bicycle and parking connectivity. A sample profile and some pictures of other grade separations that have been made into public places are provided below.

**Potential Profile of a Downtown Stuart Non-Motorized Crossing**



**High Line, New York City Grade Separation**



**Birmingham, Alabama Multiple Use of Underpass**



**Challenges** – exist with right of way at this location where the utilization of ramps was not feasible and elevators are needed. Ramps on the east side would require the taking of a large portion of the on-street parking and is prohibitive on the west side as it would require significant right of way from multiple properties. The concept includes elevators that will impact 4 parking spaces on the west side and require right of way from the parking lot.

The concept cost estimate is \$4.7 Million with a cost/benefit ratio of 34.0. Note that the same process to calculate the safety benefit was used as with the Railroad Avenue to Commerce Avenue grade separation and also note that the cost estimate does not include the cost of maintaining and operating the elevators.

In summary, this study identified 11 different roadway locations for grade separation along the FEC and 5 locations for potential non-motorized separations that have the potential need and justification for consideration in future planning and programming efforts by the MPO Board. Four (4) locations were selected for concept development for the purposes of analyzing and better understanding the impacts and benefits of implementing grade separations in Martin County. This does not mean that the concepts presented in this report are a priority of the Board or that the other Tier 2 locations should not be further vetted for planning and programming.



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## 1. INTRODUCTION



# 1. Introduction

The Martin Metropolitan Planning Organization (MPO) initiated this feasibility study to identify, evaluate and plan for potential roadway and non-motorized pedestrian/bicycle grade separations along the Florida East Coast Rail Line (FEC) through Martin County. The study has been performed in phases including:

- **Tier 1:** Perform an initial assessment of all the mainline rail at grade crossings (25) in Martin County and identify 10 roadway candidate crossings for potential grade separation. Review adjacent land uses between crossings and known areas of pedestrian trespassing on the rail corridor to identify 5 candidate locations for non-motorized crossings.
- **Tier 2:** Perform detailed evaluation and rank the roadway and non-motorized candidates for the need and justification to implement grade separations.
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  - Conceptual plans for up to 2 crossings for roadway grade separation, and
  - Conceptual plans for up to 2 crossings for non-motorized uses
- Assess the impacts and cost-benefit of the concepts developed for this study.

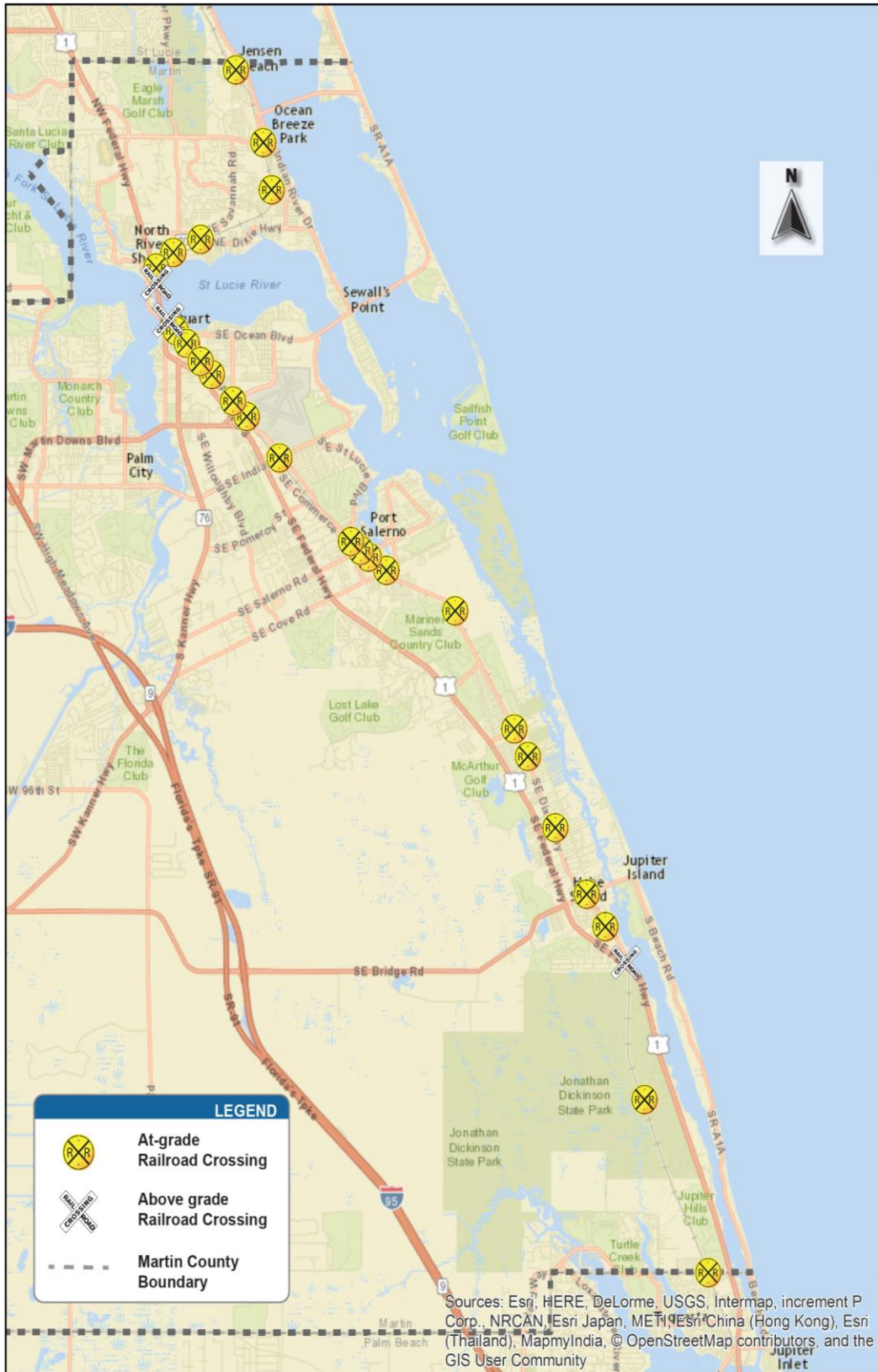
Note that 4 locations were selected for concept development for this effort for the purposes of analyzing and better understanding the impacts of implementing grade separations in Martin County. This was considered fiscally responsible as part of the scoping effort as opposed to developing concepts for all of the Tier 2 alternatives. For each concept documented herein there are multiple variations and detailed considerations that could be vetted in further engineering analyses. The Project Team identified a concept for the four locations that was considered appropriate to analyze anticipated community, right of way, access, safety and emergency impacts and does not represent a preferred alternative.

Finally note that moving these concepts, or other locations identified in Tier 2, to project development would require further action by the MPO Board.

## 1.1 Background

The FEC corridor runs north-south, parallel to, and generally adjacent to Dixie Highway through the County and there are 28 total roadway crossings in Martin County between Southeast and Northeast County Line Roads. Of the 28 crossings there are 3 that are already grade separated including US 1 over the tracks in Hobe Sound and 2 more crossings of US 1 (Roosevelt Bridge) over the tracks in Stuart, one on the north and south sides of the St. Lucie River. Figure 1 shows the study area and railroad/roadway grade crossings.

Figure 1 – Study Location Map



Increasing roadway congestion, and the number, frequency, speeds and lengths of trains are impacting traffic operations that could create safety issues. Many of the crossings are in close proximity to signalized intersections on Dixie Highway and at some locations the crossings are impacted by downstream signals and turning movements on both sides of the crossings including signals on US 1, Dixie Highway and/or local streets and driveways. This situation is creating congestion issues, particularly during peak traffic periods, where traffic backs up and stacks over the crossings or across downstream intersections when a freight train passes through and the crossing gates are down for several minutes.

At the same time that there are traffic safety and congestion concerns at roadway/railroad crossings, there are also concerns about pedestrians on the tracks at, and in-between, the roadway crossings. Many of the crossings do not have sidewalks or bicycle facilities and there have been community observations and physical evidence of pedestrians crossing the main-line tracks. These trips probably follow significant desire lines between neighborhood and work, shopping and recreational destinations. It was observed in both Port Salerno and Stuart that fencing has been installed, most likely as a deterrent to pedestrian accessing the tracks. As Martin County continues to grow so will this pedestrian activity and this is happening at the same time freight train traffic is increasing and high speed passenger trains are potentially introduced. This study investigated evidence, and the potential for this activity to occur and developed a list of potential locations and 2 concepts to separate them from rail traffic with non-motorized grade separations.

Note that candidate roadway/railroad grade separations were evaluated based on Complete Streets principles where all modes will be accommodated including pedestrian, bicycle, automobiles and trucks. The identification and evaluation of potential non-motorized railroad grade separations will be based on developing new crossing locations between existing at-grade railroad crossings for pedestrians, bicyclists and other non-motorized users.

## 1.2 Methodology

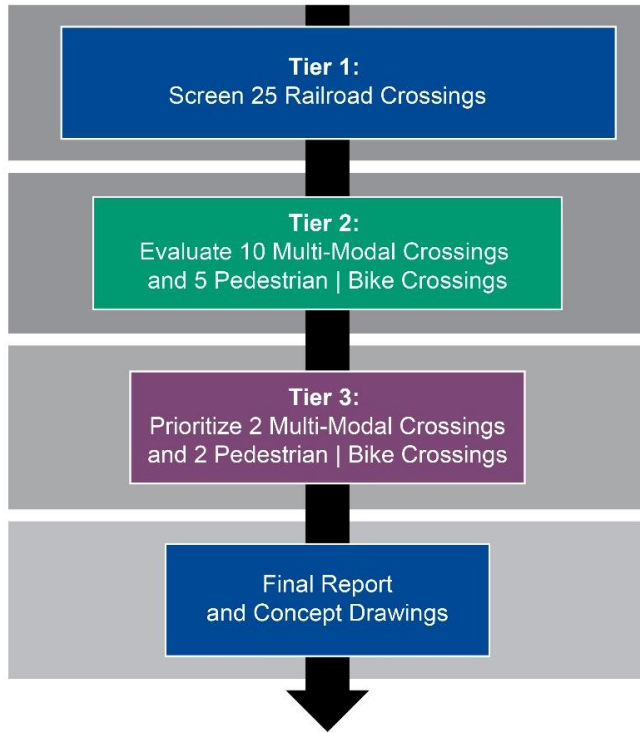
A detailed methodology for the study process was developed based on The United States Department of Transportation Federal Railroad Administration (FRA) and Florida Department of Transportation (FDOT) guidelines and best practices from the State of California.



The research indicates that there are no established thresholds for when a grade separation is recommended. In general railroad/transit agencies and private Railroads agree that the best crossing is no at-grade crossing. The process for this study includes 4 steps, a Tier 1, 2 and 3 analysis and the development of concept plans and cost benefit/analysis for 2 of the roadway and non-motorized

pedestrian/bicycle. Please note that the process of developing 4 concepts does not mean that the MPO will move forward with the 4 nor does it mean that only those selected are worthy of further analysis and potential programming.

Research performed for this study found 4 factors in common when considering a grade separation including Safety, Traffic, Community impacts and Costs. The Tier 1 screening of the Martin County crossings and mid-crossing opportunities has been performed and is described in detail in the next chapter. As part of this effort, the Project Team sought out and obtained information and concepts from previous studies that included traffic counts, train observations, crash reports, previous studies for the Monterey Road/SR 714 crossing and any information available from the 2040 Long Range Transportation Plan that is currently underway.



The Tier 2 analysis, is documented in Chapter 3 and includes field reviews of all the candidate roadway locations, an effort to seek out and observe evidence of pedestrian activities on the tracks, coordination with locals and detailed data and information gathering and analyses. The Team will also coordinate with locals on the placement of MIOVision Cameras to observe pedestrian and bicycle activity for 48 hours at up to five locations.

Data and analysis were performed to assess the feasibility of implementing a grade separation for each crossing on the Tier 2 candidate location list. Activities within this task involved: identification of existing physical and operational characteristics and safety issues; review of property lines for access and right-of-way information; traffic data analysis and field observations. The collected information includes all data necessary to assess potential grade separation crossing at each candidate location. All conceptual options were reviewed for each location including: elevated and/or depressed roadway or non-motorized crossings and/or a mix of both raised and depressed roadway and rail. Note that depressing or elevating the railroad has very significant physical issues where the slopes require an extraordinary length of track to be raised or lowered typically impacting additional roads or crossings up- and down-stream. This type of proposal is not feasible in Martin County because of the number and proximity of crossings.



The result of the Tier 2 analysis ranked the roadway grade separation candidate locations and the Tier 3 effort includes coordination with the community and the MPO to recommend 2 roadway and 2 non-motorized grade separation locations for development of concept plans.

In Tier 3 more detailed analysis will be performed in order to recommend the final list of 4 potential candidate crossings for concept development including the collection of traffic data including turning movement and approach counts for cars, heavy trucks, pedestrians and bicycles; field observations of traffic operations and traffic analyses will be performed based on existing and future conditions (where available). In the Final phase grade separation concept drawings were developed using FDOT and FRA Standards and a cost benefit analysis performed. Cost estimates for the concepts are estimated using FDOT unit costs and benefits will be estimated based on traffic delay and crash reductions at the roadway crossings and based on community and safety impacts for the non-motorized proposals.



## 2. TIER 1 ANALYSIS

## 2 Tier 1 Analysis

### 2.1 Roadway Crossings

The Tier 1 screening of the 25 at-grade crossings was performed based on Safety, Traffic and Community Impact criteria. A summary of the metrics is provided in the following text and all of the data are shown on Table 1. Note that as a result of our review of opportunities a proposed grade separation was added where there is not an existing crossing. This proposal is shown as “New Crossing – Airport Access” on Table 1 and could generally follow an alignment connecting Grumman Boulevard east over the FEC and Dixie Highway into Witham Field.

#### 2.1.1 Safety Criteria

Safety criteria were taken from several resources and all data are from the years 2011 to 2015. Train data was provided from the FRA website including the 2016 Accident Prediction Report. The Accident Prediction system generates reports listing public roadway/rail crossings ranked by predicted collisions per year and provides a 5 and 10 year history of available crash information by geographic location. Appendix A provides the 2016 accident prediction report for the crossings in Martin County. The results show the Colorado Avenue crossing as having the highest rate predicting that .083 crashes with a train will occur this year. Based on existing conditions this could be extrapolated to indicate that there will be 1.66 crashes with a train involved at this location in 20 years. The report also shows that there has only been 1 train/vehicle crash in the last 5 years in Martin County which was at the Colorado Road crossing in 2012. Note that the last page of the report provides a 10 year history of crashes showing that there were 4 other incidents between 2006 and 2010. These include another train/vehicle crash at Colorado Avenue and crashes at SR A1A/Stuart, Monterey Road and the Seaward Street crossings.

Roadway crash data was collected within 250' east and west of the crossings using Signal 4 Analytics. The results shown on Table 1 indicate that the Monterey Road crossing had the most vehicular crashes with 88 including 24 Serious Injuries. Non-motorized crash data was collected from the MPO Bicycle/Pedestrian Safety Plan Technical Memorandum Number 1. The data on Table 1 shows that the Indian Street crossing experienced the most pedestrian/bicycle crashes with 5 occurring that resulted in 7 serious injuries.

Table 1 – Tier 1 Level Data for Consideration of Roadway Railroad Crossing Grade Separation

Rail Road Crossings				Safety							Traffic													Community								
Street Crossing at FEC	Crossing #	Mile Post	Position	Crash History (5 Years)					FRA Rail Crossing Crash Prediction Index	FDOT Ranking	Exist Rail Speed Max (mph)	Proposed Rail Speed (mph) Freight/Passenger	No. of Trains	Proposed No. of Trains	Bike Lanes	Sidewalks	Transit Routes	School Buses on Xing/day	2015 AADT	2040 AADT	2015 LOS	2040 LOS	2015 Trains X 2015 AADT	2040 Trains X 2040 AADT	Adjacent Land Use <sup>1</sup>	Evac. Route	Fire Response	Police Response	Ambulance/Hospital Access	FEMA SFHA <sup>2</sup>	Community Driveway and Property Impacts	
				Rail	Roadway	Non-Motorized	Total Fatalities	Total Serious Injuries																								
SE Monterey Road	272353M	263.15	At Grade	0	88	1	0	24	0.024	267	60	70/110	12	54	No	Yes	Yes	15	22,500	34,689	D	>E	270,000	1,873,206	Comm/Public	Yes	No	No	No	No	Significant	
NE Jensen Beach Blvd.	272340L	256.77	At Grade	0	38	4	0	7	0.038	280	60	50/60	14	58	No	Yes	Yes	11	20,534	28,191	D	D	287,476	1,635,051	Comm	Yes	Yes	Yes	Yes	No	Major	
S Colorado Avenue	272347J	261.63	At Grade	1	65	3	1	17	0.083	222	30	70/80	12	54	No	Yes	Yes	1	9,100	23,439	C	D	109,200	1,265,706	Comm	Yes	No	No	No	No	Major	
SE Indian Street	272354U	264.39	At Grade	0	17	5	0	7	0.033	113	60	70/110	12	54	No	Yes	Yes	26	11,800	23,391	C	D	141,600	1,263,114	Comm	Yes	Yes	Yes	Yes	No	Significant	
SW 2nd Street	272953P	261.43	At Grade	0	15	2	0	5	0.023	1663	45	70/80	18	66	No	Yes	No	0	9,000	11,542	C	C	162,000	761,765	Comm	No	No	No	No	No	Major	
A1A/Rio	272343G	259.33	At Grade	0	5	2	0	6	0.030	718	65	60/60	12	54	No	No	Yes	9	3,600	13,888	C	D	43,200	749,952	Res/Ind	Yes	Yes	Yes	Yes	SFHA	Significant	
SE Cove Road	272359D	267.09	At Grade	0	17	1	0	7	0.017	532	65	70/110	12	54	No	1 Side	Yes	12	11,908	13,254	D	D	142,896	715,716	Res/Comm/Rec	No	Yes	Yes	Yes	No	Moderate	
SE Salerno Road	272357P	266.56	At Grade	0	33	2	0	8	0.027	630	65	70/110	12	54	No	No	No	6	9,113	12,257	C	C	109,356	661,878	Comm	Yes	Yes	Yes	Yes	SFHA	Major	
New Crossing - Airport Access	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	70/110	N/A	54	No	No	No	N/A	472	12,000	C	D	N/A	648,000	Ind/Airport	N/A	Yes	Yes	Yes	Yes	No	Moderate
A1A/Preserve	272360X	268.64	At Grade	0	0	1	2	9	0.020	769	65	70/100	12	54	No	No	No	21	6,368	11,973	C	D	76,416	646,542	Res/Rec	Yes	Yes	Yes	Yes	No	Moderate	
SE MLK Blvd.	272348R	261.96	At Grade	0	6	1	0	4	0.020	894	30	70/110	12	54	No	Yes	No	10	2,651	9,753	C	D	31,812	526,662	Comm/Ind/Rec	No	No	No	No	SFHA	Significant	
SE Bridge Road	272366N	274.06	At Grade	0	2	0	0	0	0.023	680	65	70/100	12	54	No	1 Side	Yes	24	8,636	9,180	D	D	103,632	495,720	Res/Ind	Yes	Yes	Yes	Yes	No	Moderate	
A1A/Stuart	272350S	262.51	At Grade	0	8	1	0	7	0.026	694	30	70/110	12	54	No	No	No	6	6,000	7,026	C	C	72,000	379,404	Ind	Yes	No	No	No	No	Moderate	
Fern Street	272345V	260.61	At Grade	0	0	0	0	0	0.023	2607	65	70/80	12	54	No	No	No	0	4,452	5,709	C	C	53,424	308,307	Res/Comm	No	No	No	No	SFHA	Major	
SE Osprey Road	272934K	270.89	At Grade	0	19	0	0	4	0.028	1277	60	70/110	12	54	No	No	No	0	4,743	5,576	C	D	56,916	301,104	Res	No	Yes	Yes	Yes	No	Significant	
SE Pettway Street	272365G	272.65	At Grade	0	0	0	0	0	0.013	917	65	70/110	12	54	No	No	No	15	3,600	4,181	C	D	43,200	225,774	Res	No	Yes	Yes	Yes	No	Major	
SE Florida Street	272349X	262.25	At Grade	0	10	0	0	3	0.012	924	30	70/110	13	56	No	No	Yes	19	301	3,320	C	C	3,913	185,920	Res/Ind	No	No	No	No	No	Significant	
SE Crossrip Street	272362L	271.40	At Grade	0	15	0	1	13	0.018	2042	65	70/110	12	54	No	No	No	3	2,697	3,459	C	C	32,364	186,771	Res	No	Yes	Yes	Yes	No	Major	
Skyline Drive	272337D	255.51	At Grade	0	0	1	0	1	0.018	3434	65	70/110	12	54	No	1 Side	No	0	1,595	2,045	C	C	19,140	110,456	Res	No	Yes	Yes	Yes	No	Major	
Alice Street	272344N	260.03	At Grade	0	2	0	0	0	0.016	1292	65	40/40	12	54	No	No	No	4	917	1,176	C	C	11,004	63,503	Comm/Ind	No	Yes	Yes	Yes	SFHA	Significant	
NE 1st Street	272338K	256.21	At Grade	0	0	1	0	1	N/A	N/A	65	70/110	12	54	No	No	No	N/A	650	834	C	C	7,800	45,013	Res	No	Yes	Yes	Yes	No	Major	
SE Gleason Street	272367V	274.57	At Grade	0	0	0	0	0	0.014	2134	65	70/100	12	54	No	No	No	0	588	754	C	C	7,056	40,720	Res/Ind	No	Yes	Yes	Yes	SFHA	Major	
Jonathan Dickinson Way	272370D	277.82	At Grade	0	0	0	0	0	0.012	2699	65	70/110	12	54	No	No	No	0	355	455	C	C	4,260	24,584	Conservation	No	No	No	No	No	Significant	
SE Seaward Street	272356H	266.46	At Grade	0	48	1	0	11	0.013	729	65	70/110	12	54	No	No	No	12	266	341	C	C	3,192	18,421	Comm	No	Yes	Yes	Yes	No	Significant	
SE Broward Street	272358W	266.76	At Grade	0	10	0	0	2	0.010	1688	65	70/110	12	54	No	No	No	6	139	178	C	C	1,668	9,626	Res	No	Yes	Yes	Yes	SFHA	Significant	
NE Palmetto Drive S	272342A	257.34	At Grade	0	0	0	0	0	0.005	3002	55	70/110	12	54	No	No	No	0	13	17	C	C	156	900	Res	No	Yes	Yes	Yes	No	Significant	

- 1 Land Use Legend
- Airport - Airport
- Comm - Commercial
- Conservation - Conservation
- Ind - Industrial
- Rec - Recreational
- Res - Residential

2 Federal Emergency Management Administration Special Flood Hazard Area designation at or in close proximity to Crossing



Finally, the safety data criteria section also includes the FDOT Railroad Crossing Safety Ranking for each crossing in Martin County. The rankings are based on the level of need at each crossing from the most need- #1 to the least need- #3,682 (which represents the total number of public roadway railway crossings in the State of Florida). Table 1 shows that the crossing ranked with the most need in Martin County is Indian Street ranked as #113 in the State and that 14 of the Martin County crossings are in top 1/3 (higher than #11227) of need for improvement in comparison to all crossings in the State.

## 2.1.2 Traffic Criteria

Existing and future traffic and train data were collected from numerous resources. The US DOT FRA Crossing Inventory Reports for each individual crossing shown on Table 1 are provided in Appendix B. These reports proved useful in providing specific information on the location of each crossing, traffic control devices, physical characteristics and public highway information. Existing maximum train speeds and the number of existing trains was taken from these reports for the Tier 1 screening and that data are shown on Table 1.

Information for future trains was calculated based on information for both freight and passenger rail. The Southeast Florida Transportation Council (SEFTC) Regional Freight Plan and the Palm Beach County 2040 Long Range Transportation Plan (LRTP) were used to develop future freight rail estimates. The regional freight plan provided existing and 20 year projections for Port Miami and Port Everglades container activity and the Palm Beach LRTP indicated that the Port of Palm Beach would reach capacity in the interim with 30% growth. Information from the plans indicates the 3 Ports currently move 2.162 million Twenty Equivalent Units (TEUs) and, based on the medium growth scenarios at Port Miami and Port Everglades and the Port of Palm Beach reaching their capacity, the 3 Ports are estimated to move 4.04 million TEUs in 2040. Assuming a consistent percent of containers would move by rail as reported in the plans, the same rate of growth, 87%, was applied to existing freight trains in order to project future train traffic. Passenger rail traffic and speed was assumed at 32 trains per day per the ALL ABOARD FLORIDA proposals. Table 1 was populated with the existing and future train data and because most of the traffic passes through the entire County it shows little to no difference from crossing to crossing. The ALL ABOARD FLORIDA Track Chart Draft Update is provided in Appendix C.

2015 vehicular traffic data was collected from a couple of resources. The Martin County 2015 Roadway Level of Service Inventory Report was used to collect data for most of the locations and the FDOT Traffic Information System website and the previously mentioned FRA 2016 Accident Prediction Report was used to obtain traffic count information for the remaining crossings. Future AADT data were collected for each of the crossings utilizing the 2040 Treasure Coast Regional Model for most of the crossings. The Treasure Coast Delay Analysis is provided in Appendix D. Where there was no information on future traffic, or where

the 2040 projection was less than the 2015 AADT, future traffic was calculated based on the growth factor provided on the Martin County Report or using a default 1.0% growth per year rate from 2015 to 2040.

In order to determine the magnitude of conflicts at each crossings the existing number of trains were multiplied by 2015 traffic and future trains were multiplied by future traffic. Table 1 shows that it is anticipated that the Monterey Road crossing has the most conflict opportunities between vehicles and trains.

Other data in this section includes Bike Lanes and Sidewalks which were collected using Google Maps, transit information which was collected using Martin County Transit System maps and the number of school buses per day which came from the FDOT Railroad Highway Characteristics Inventory (RHCI). The RHCI information for crossings in Martin County is provided in Appendix E.

### 2.1.3 Community Criteria

Community criteria data were collected from several sources and field reviews. The data and reviews were based on the knowledge that the beginning and ending points of a roadway flyover would need to be about 1900' apart based on railroad clearance requirements and a 6% slope. Note that a 6% foot slope exceeds American with Disabilities Act (ADA) outdoor thresholds (5%) and would require special pedestrian design to include landings. This was done with the purpose of being inclusive at this time in the study. Google Maps was utilized to determine adjacent land use for each of the crossings. Note that there are many locations that will have residential and commercial/business impacts.

The University of Florida - Florida Geographic Data Library was used to identify the location of schools, police stations and hospitals in the study area. A visual inspection was performed of each of the mapped graphics provided in Appendix F and a determination of "Yes" or "No" was made if a grade separation would have a net positive impact. A "Yes" was coded on Table 1 where emergency services are located on one side of the track, not on another and there were limited opportunities to divert to another crossing. A "No" was coded where there were services provided on both sides of the track and/or there are multiple crossings in close proximity to each other.

Finally, the assessment of impacts to the community was performed based on available right of way as shown in Appendix G and impacts to driveways and land uses as shown in Appendix H. This information was reviewed in concert with each other to conceptually assess driveway and property impacts.

Three designations were developed to describe the community impacts of a grade separation. This effort required the application of planning judgement as to whether the conceptual grade separation would benefit the community in relation to the localized impacts. The designations included:

- **Major** – impacts would severely limit access to adjacent property, could require whole property takes from active business and/or homes and/or there isn't enough room to fit a 1900' long roadway grade crossing
- **Significant** - impacts where there would be some significant right-of-way impacts and partial takes but at this point in the study the concept should still move forward for detailed analysis
- **Moderate** – impacts where right of way appears to be available and/or have minimal impact and a crossing would fit well with adjacent land uses

Table 1 shows 5 locations where right-of-way impacts would be moderate including Cove Road, SR A1A at the Seabranche Preserve, SE Bridge Road, SR A1A in Stuart and at a proposed new crossing that connects Grumman Boulevard and the Airport.

## 2.1.4 Roadway Recommendations

Table 2 presents the results of a gaming exercise to identify the 10 best candidates to forward onto Tier 2 in the roadway category. After much review of impacts with the SAT it became clear that the crossings with Major Community Driveway and Property Impacts should not move forward in this study as the impacts far exceed any potential or perceived benefit. These are shown on Table 2 with a strike-through. The table was then sorted first by projected annual train crashes as predicted by the FRA reports and then by the number of future conflicts shown by multiplying future train traffic by future AADT. The results show that Monterey Road exhibits the most need which supports the previous FDOT analysis at this crossing.

Table 2 – Tier 1 Ranking of Need and Feasibility for Roadway Railway Crossing Grade Separation

Rail Road Crossings				Safety							Traffic												Community									
Street Crossing at FEC	Crossing #	Mile Post	Position	Crash History (5 Years)					FRA Rail Crossing Crash Prediction Index	FDOT Ranking	Exist Rail Speed Max (mph)	Proposed Rail Speed (mph) Freight/Passenger	No. of Trains	Proposed No. of Trains	Bike Lanes	Sidewalks	Transit Routes	School Buses on Xing/day	2015 AADT	2040 AADT	2015 LOS	2040 LOS	2015 Trains X 2015 AADT	2040 Trains X 2040 AADT	Adjacent Land Use <sup>1</sup>	Evac. Route	Fire Response	Police Response	Ambulance/Hospital Access	FEMA SFHA <sup>2</sup>	Community Driveway and Property Impacts	
				Rail	Roadway	Non-Motorized	Total Fatalities	Total Serious Injuries																								
SE Monterey Road	272353M	263.15	At Grade	0	88	1	0	24	0.024	267	60	70/110	12	54	No	Yes	Yes	15	22,500	34,689	D	>E	270,000	1,873,206	Comm/Public	Yes	No	No	No	No	No	Significant
NE Jensen Beach Blvd.	272349L	266.77	At Grade	0	38	4	0	7	0.038	280	60	70/110	44	68	No	Yes	Yes	44	20,634	28,191	D	D	287,476	1,635,964	Comm	Yes	Yes	Yes	Yes	No	Major	
S Colorado Avenue	272347J	264.63	At Grade	4	66	3	4	47	0.063	222	30	70/80	42	54	No	Yes	Yes	4	9,400	23,439	G	D	109,200	1,265,706	Comm	Yes	No	No	No	No	Major	
SE Indian Street	272354U	264.39	At Grade	0	17	5	0	7	0.033	113	60	70/110	12	54	No	Yes	Yes	26	11,800	23,391	C	D	141,600	1,263,114	Comm	Yes	Yes	Yes	Yes	No	Significant	
SW 2nd Street	272963P	264.43	At Grade	0	48	2	0	6	0.023	4663	45	70/80	48	66	No	Yes	No	0	9,000	11,542	G	G	462,000	761,768	Comm	No	No	No	No	No	Major	
A1A/Rio	272343G	259.33	At Grade	0	5	2	0	6	0.030	718	60	60/60	12	54	No	No	Yes	9	3,600	13,888	C	D	43,200	749,952	Res/Ind	Yes	Yes	Yes	Yes	SFHA	Significant	
SE Cove Road	272359D	267.09	At Grade	0	17	1	0	7	0.017	532	60	70/110	12	54	No	1 Side	Yes	12	11,908	13,254	D	D	142,896	715,716	Res/Comm/Rec	No	Yes	Yes	Yes	No	Moderate	
SE Salem Road	272367P	266.56	At Grade	0	33	2	0	8	0.027	630	60	70/110	42	54	No	No	No	6	9,143	12,267	G	G	109,366	661,878	Comm	Yes	Yes	Yes	Yes	SFHA	Major	
New Crossing - Airport Access	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	54	No	No	No	N/A	472	12,000	C	D	N/A	648,000	Ind/Airport	N/A	Yes	Yes	Yes	No	Moderate		
A1A/Preserve	272360X	268.64	At Grade	0	0	1	2	9	0.020	769	60	70/100	12	54	No	No	No	21	6,368	11,973	C	D	76,416	646,542	Res/Rec	Yes	Yes	Yes	Yes	No	Moderate	
SE MLK Blvd.	272348R	261.96	At Grade	0	6	1	0	4	0.020	894	45	70/110	12	54	No	Yes	No	10	2,651	9,753	C	D	31,812	526,662	Comm/Ind/Rec	No	No	No	No	SFHA	Significant	
SE Bridge Road	272366N	274.06	At Grade	0	2	0	0	0	0.023	680	60	70/100	12	54	No	1 Side	Yes	24	8,636	9,180	D	D	103,632	495,720	Res/Ind	Yes	Yes	Yes	Yes	No	Moderate	
A1A/Stuart	272350S	262.51	At Grade	0	8	1	0	7	0.026	694	60	70/110	12	54	No	No	No	6	6,000	7,026	C	C	72,000	379,404	Ind	Yes	No	No	No	No	Moderate	
Fern Street	272345V	260.64	At Grade	0	0	0	0	0	0.023	2607	60	40/40	42	54	No	No	No	0	4,452	5,709	G	G	53,424	308,307	Res/Comm	No	No	No	No	SFHA	Major	
SE Osprey Road	272934K	270.89	At Grade	0	19	0	0	4	0.028	1277	60	70/110	12	54	No	No	No	0	4,743	5,576	C	D	56,916	301,104	Res	No	Yes	Yes	Yes	No	Significant	
SE Pettway Street	272366G	272.65	At Grade	0	0	0	0	0	0.043	947	60	70/110	42	54	No	No	No	15	3,600	4,181	G	D	43,200	225,774	Res	No	Yes	Yes	Yes	No	Major	
SE Florida Street	272349X	262.25	At Grade	0	10	0	0	3	0.012	924	45	70/110	13	56	No	No	Yes	19	301	3,320	C	C	3,913	185,920	Res/Ind	No	No	No	No	No	Significant	
SE Crossrip Street	272362L	271.40	At Grade	0	15	0	4	13	0.048	2042	60	70/110	42	54	No	No	No	3	2,697	3,459	G	G	32,364	186,774	Res	No	Yes	Yes	Yes	No	Major	
Skyline Drive	272337D	255.54	At Grade	0	0	1	0	1	0.048	3434	55	70/110	42	54	No	1 Side	No	0	1,595	2,045	G	G	49,140	110,456	Res	No	Yes	Yes	Yes	No	Major	
Alice Street	272344N	260.03	At Grade	0	2	0	0	0	0.016	1292	30	40/40	12	54	No	No	No	4	917	1,176	C	C	11,004	63,503	Comm/Ind	No	Yes	Yes	Yes	SFHA	Significant	
NE 1st Street	272338K	256.21	At Grade	0	0	1	0	1	N/A	N/A	60	70/110	42	54	No	No	No	N/A	650	834	G	G	7,800	45,013	Res	No	Yes	Yes	Yes	No	Major	
SE Gleason Street	272367V	274.57	At Grade	0	0	0	0	0	0.044	2134	60	70/100	42	54	No	No	No	0	588	754	C	C	7,066	40,720	Res/Ind	No	Yes	Yes	Yes	SFHA	Major	
Jonathan Dickinson Way	272370D	277.82	At Grade	0	0	0	0	0	0.012	2699	60	70/110	12	54	No	No	No	0	355	455	C	C	4,260	24,584	Conservation	No	No	No	No	No	Significant	
SE Seaward Street	272356H	266.46	At Grade	0	48	1	0	11	0.013	729	60	70/110	12	54	No	No	No	12	266	341	C	C	3,192	18,421	Comm	No	Yes	Yes	Yes	No	Significant	
SE Broward Street	272358W	266.76	At Grade	0	10	0	0	2	0.010	1688	60	70/110	12	54	No	No	No	6	139	178	C	C	1,668	9,626	Res	No	Yes	Yes	Yes	SFHA	Significant	
NE Palmetto Drive S	272342A	257.34	At Grade	0	0	0	0	0	0.005	3002	60	70/110	12	54	No	No	No	0	13	17	C	C	156	900	Res	No	Yes	Yes	Yes	No	Significant	

1 Land Use Legend  
 Airport - Airport  
 Comm - Commercial  
 Conservation - Conservation  
 Ind - Industrial  
 Rec - Recreational  
 Res - Residential

2 Federal Emergency Management Administration Special Flood Hazard Area designation at or in close proximity to Crossing



## 2.2 Non-Motorized Crossings

The Tier 1 screening of non-motorized crossings was performed also based on Safety, Traffic and Community criteria however a significant element in this exercise was coordination with the community on observed activity and field reviews of potential locations. Note again that cost impacts will be prepared in the final stage of the study. A summary of the metrics is provided in the following text and all of the data is shown on Table 3.

The first level of effort was to identify potential mid-crossing locations along the FEC corridor through the County. An exercise using aerials was performed looking for potential desire lines between compatible land uses, connectivity in the transportation network and/or physical evidence of activity e.g. worn paths in the grass. This effort resulted in the maps provided in Appendix I which were reviewed with the SAT at its December 1, 2016 Kick-Off meeting. The SAT reviewed the maps and aerials with the Project Team and made recommendations as to the potential for a crossing and if there had been visual observation of such activity. The result of this effort indicated that there were 10 locations/areas that could yield proposed non-motorized grade separations.

### 2.2.1 Safety Criteria

Pedestrian and bicycle crash data were taken from the Martin County Bicycle and Pedestrian Safety Plan Technical Memorandum #1. The maps from the Technical Memorandum used to summarize the data in Table 3 are provided in Appendix J. The data shows that the most crashes involving pedestrians and bicycles are located in the Golden Gate area on Dixie Highway with 13 total pedestrian and bicycle crashes.

The Bicycle Pedestrian Safety Plan also provided an analysis of significance of expected levels of crashes at certain locations. This analysis identified locations where the number of crashes occurring are at a level expected for the volumes of traffic and type of roadway, shown as “Med” on Table 3 and where the level of crashes exceeded expected levels, shown as “Very” on Table 3. The downtown Stuart area showed that crash levels were exceeding expected levels.

### 2.2.2 Traffic Criteria

Existing traffic data and Level of Service was collected for the closest roadway to the proposed location. Data sources and estimates for existing and future traffic were the same as those used/collected for the roadway crossings.

Table 3 – Tier 1 Data for Non-Motorized Railroad Crossing Grade Separation

Location  Description	Safety								Traffic				Community			
	Crash History 2011 to 2015								Exist AADT	Exist LOS	Future AADT	Future LOS	Land Use Connection <sup>2</sup>	Economic Develop- ment	Ped/Bike Connect- ivity	Right of Way Impacts
	Pedestrian				Bicycle											
	Fatal	Serious Injury	Prop Damage Only	High Signifi- cance <sup>1</sup>	Fatal	Serious Injury	Prop Damage Only	High Signifi- cance <sup>1</sup>								
Tequesta County Park Connector	0	0	0	No	0	0	0	No	2,500	C	9,179	C	Res/Rec	Status Quo	Greenway	Significant
South County: Dixie Hwy/Gomez Ave Connector	0	0	0	No	0	0	0	No	6,800	C	7,247	C	Res/Rec	Status Quo	Greenway	Moderate
Seabranh Preserve State Park: East/West Connector(s)	0	0	0	No	0	1	0	No	6,600	C	11,972	D	Rec/Rec	Status Quo	Greenway	Public
Port Salerno: East/West Connector(s)	0	3	0	No	0	3	0	No	14,400	D	18,155	>E	Comm/Comm	Potential	Greenway	Moderate
Golden Gate: East/West Connector(s)	0	3	0	No	0	10	0	Med	16,846	D	21,604	D	Res/Comm/Ind	Potential	Greenway	Moderate
Stuart: East/West Connector(s)	0	3	0	Very	0	3	1	Very	8,800	D	18,155	>E	Comm/Comm	Potential	Greenway	Moderate
Rio East/West Connector(s)	0	1	0	No	0	1	0	No	5,800	C	13,888	D	Res/Ind	Status Quo	Local	Redevelop
Jensen Beach: Pineapple Village to Arch Street Connector	0	0	0	No	0	0	0	No	9,400	C	13,482	D	Res/Res	Status Quo	Local	Significant
Jensen Beach: Connect Ocean Beeze Plaza to Ocean Breeze Resort	0	2	0	No	0	2	0	No	N/A	N/A	N/A	N/A	Res/Comm	Status Quo	Local	Significant
West of Jensen Beach Causeway over the FEC	0	1	0	No	1	1	0	Med	10,900	D	13,979	D	Comm/Comm	Potential	Trail	Redevelop

<sup>1</sup> Bicycle and Pedestrian Safety Master Plan Technical Memorandum #1: Random expectation of crash - Med = meets random expectation, Very = Exceeds random expectation

<sup>2</sup> Land Use Legend  
 Comm - Commercial  
 Ind - Industrial  
 Rec - Recreational  
 Res - Residential

Planning Model. Where future traffic was not available from the model, or was projected to be lower than existing traffic, a 1% per year growth rate was applied each year to the year 2040. Table 3 shows the results of a Level of Service analysis indicating that locations in Stuart and Port Salerno were the only links where overcapacity conditions are projected.

### 2.2.3 Community Criteria

Community impacts were assessed using information based on land use connections, the potential for economic development impacts, connectivity to the planned non-motorized network, and based on property impacts.

The land use connections data were taken by visually reviewing aerials for likely locations and performing field visits of each area. Economic development potential was performed using planning judgement and where a connection may have impact to increase property values and or generate economic activity. Conditions are shown on Table 3 as “Status Quo” where little to no impact is expected and “Potential” where some activity could be expected.

Finally, community impacts were reviewed for property and access impacts. The results shown on Table 3 indicate “Redevelop” where a crossing may be realized through development or redevelopment of private property, “Significant” where one or both sides of the grade separation would land on private residential property, “Moderate” where there may be some property impacts to non-residential locations and finally “Public” where the connection could be realized completely within publicly owned right-of-way.

### 2.2.4 Non-Motorized Recommendations

The analysis of recommendations for the non-motorized locations was based on sorting the data in Table 4 first by the locations that had a “Very” or “Med” significance indicator for non-motorized pedestrian and bicycle crashes and then by future LOS. Table 4 shows the order of priority. Each of the top locations were further reviewed in the field and on Google maps which revealed 5 areas proposed for more detailed analysis in Tier 2. Note that 2 locations were selected from the downtown Stuart area including the Downtown Core area and along Martin Luther King Jr. Boulevard.

Table 4 – Tier 1 Ranking of Need and Feasibility for Non-Motorized Railroad Crossing Grade Separation

Location  Description	Safety								Traffic				Community			
	Crash History 2011 to 2015								Exist AADT	Exist LOS	Future AADT	Future LOS	Land Use Connection <sup>2</sup>	Economic Develop- ment	Ped/Bike Connect- ivity	Right of Way Impacts
	Pedestrian				Bicycle											
	Fatal	Serious Injury	Prop Damage Only	High Signifi- cance <sup>1</sup>	Fatal	Serious Injury	Prop Damage Only	High Signifi- cance <sup>1</sup>								
Stuart: East/West Connector(s)	0	3	0	Very	0	3	1	Very	8,800	D	18,155	>E	Comm/Comm	Potential	Greenway	Moderate
Golden Gate: East/West Connector(s)	0	3	0	No	0	10	0	Med	16,846	D	21,604	D	Res/Comm/Ind	Potential	Greenway	Moderate
West of Jensen Beach Causeway over the FEC	0	1	0	No	1	1	0	Med	10,900	D	13,979	D	Comm/Comm	Potential	Trail	Redevelop
Port Salerno: East/West Connector(s)	0	3	0	No	0	3	0	No	14,400	D	18,155	>E	Comm/Comm	Potential	Greenway	Moderate
Rio East/West Connector(s)	0	1	0	No	0	1	0	No	5,800	C	13,888	D	Res/Ind	Status Quo	Local	Redevelop
South County: Dixie Hwy/Gomez Ave Connector	0	0	0	No	0	0	0	No	6,800	C	7,247	C	Res/Rec	Status Quo	Greenway	Moderate
Seabranh Preserve State Park: East/West Connector(s)	0	0	0	No	0	1	0	No	6,600	C	11,972	D	Rec/Rec	Status Quo	Greenway	Public
Tequesta County Park Connector	0	0	0	No	0	0	0	No	2,500	C	9,179	C	Res/Rec	Status Quo	Greenway	Significant
Jensen Beach: Pineapple Village to Arch Street Connector	0	0	0	No	0	0	0	No	9,400	C	13,482	D	Res/Res	Status Quo	Local	Significant
Jensen Beach: Connect Ocean Beeze Plaza to Ocean Breeze Resort	0	2	0	No	0	2	0	No	N/A	N/A	N/A	N/A	Res/Comm	Status Quo	Local	Significant

<sup>1</sup> Bicycle and Pedestrian Safety Master Plan Technical Memorandum #1: Random expectation of crash - Med = meets random expectation, Very = Exceeds random expectation

<sup>2</sup> Land Use Legend

Comm - Commercial

Ind - Industrial

Rec - Recreational

Res - Residential



## 2.2.5 Roadway Recommendations

The results of the Tier 1 analysis recommends 11 roadway locations as candidates for grade separation and 5 locations for non-motorized grade separation. Note that 2 non-motorized locations were parsed out of the Downtown Stuart Area including Martin Luther King Jr. Boulevard and Downtown Stuart between Colorado Ave and the St. Lucie River. Note the locations are listed from South to North and not in ranked order.

Tier 2 Roadway Railroad Crossing Grade Separation Candidates:

- SE Bridge Road at the FEC
- SE Osprey Street at the FEC
- A1A/Seabranh Preserve Access at the FEC
- SE Cove Road at the FEC
- SE Indian Street at the FEC
- New Crossing – Airport Access
- Monterey Road at the FEC
- A1A/Stuart at the FEC
- SE Martin Luther King Jr. Boulevard at the FEC
- A1A/Rio at the FEC
- NE Jensen Beach Boulevard at the FEC

Tier 2 Non-Motorized Railroad Crossing Grade Separation Candidates:

- Crossing over the FEC Main-Line at Port Salerno
- Crossing over the FEC Main-Line in the area of the Golden Gate Community
- Crossing over the FEC at the Martin Luther King Jr. Boulevard Railroad Crossing
- Crossing over the FEC Main-Line in Downtown Stuart
- Crossing over the FEC Main-Line west of Jensen Beach Causeway



### 3. TIER 2 ANALYSIS

## 3 Tier 2 Analysis

### 3.1 Roadway Crossings

The 11 candidate roadway crossings and 5 non-motorized crossings were vetted in the Tier 2 analysis by reviewing each of the locations in the field, assessing the impacts of the extent of a grade separation and through significant outreach and consensus building. The objective of this effort was to identify 2 roadway candidates and 2 non-motorized candidates for concept development.

#### 3.1.1 Roadway Grade Separation Initial Concepts and Impact

Each of the locations were reviewed for initial concepts and impacts. The first level review was based on the potential impacts of the height and length of an elevated grade separation. The height was based on meeting a clearance of 23 feet 5 inches from the top of the railroad tracks to bottom of an overpass per FRA regulations and the length was established based on a 6% slope which would require a variance or specialized pedestrian ramps to meet the Americans with Disability Act (ADA) requirements (5%) but was considered more inclusive at this point in the vetting process. The result of these dimensions is the need for a grade separation that would extend between 800 to 1000 feet from the grade crossing on either side. Each of the 11 roadway locations are shown in Figures 2 through 12 B with a red line showing the potential extent of each leg of a potential grade separation. Planning and engineering judgement were used to determine whether a separation would be 2, 3 or 4 legged based on community and right of way impacts. If the leg of a grade separation were to have major impact to neighborhoods and/or result in complete removal of a string of commercial businesses it was not considered in the preliminary concept.

#### 3.1.2 Non-Motorized Grade Separation Initial Concepts and Impact

A technical analysis was not performed to vet the Tier 2 non-motorized candidates because they have a much smaller foot print, and will require far less right of way and have minimal, to no, access impacts compared to a roadway grade separation. Selection of candidates to move the concept development phase has been performed based on a planning review of land use connectivity with the SAT, public and elected officials. The candidate areas for the non-motorized grade separation candidates are shown on Figures 13 through 17.



Figure 2 – Bridge Road Limits of Potential Grade Separation



Figure 3 – Osprey Street Limits of Potential Grade Separation





Figure 4 – A1A Seabbranch Preserve Limits of Grade Separation



Figure 5 – Cove Road Limits of Potential Grade Separation





Figure 6 – Indian Street Limit of Grade Separation



Figure 7 – US-1/Airport Access Limits of a Potential Grade Separation





Figure 8 – Monterey Road Limits of a Potential Grade Separation

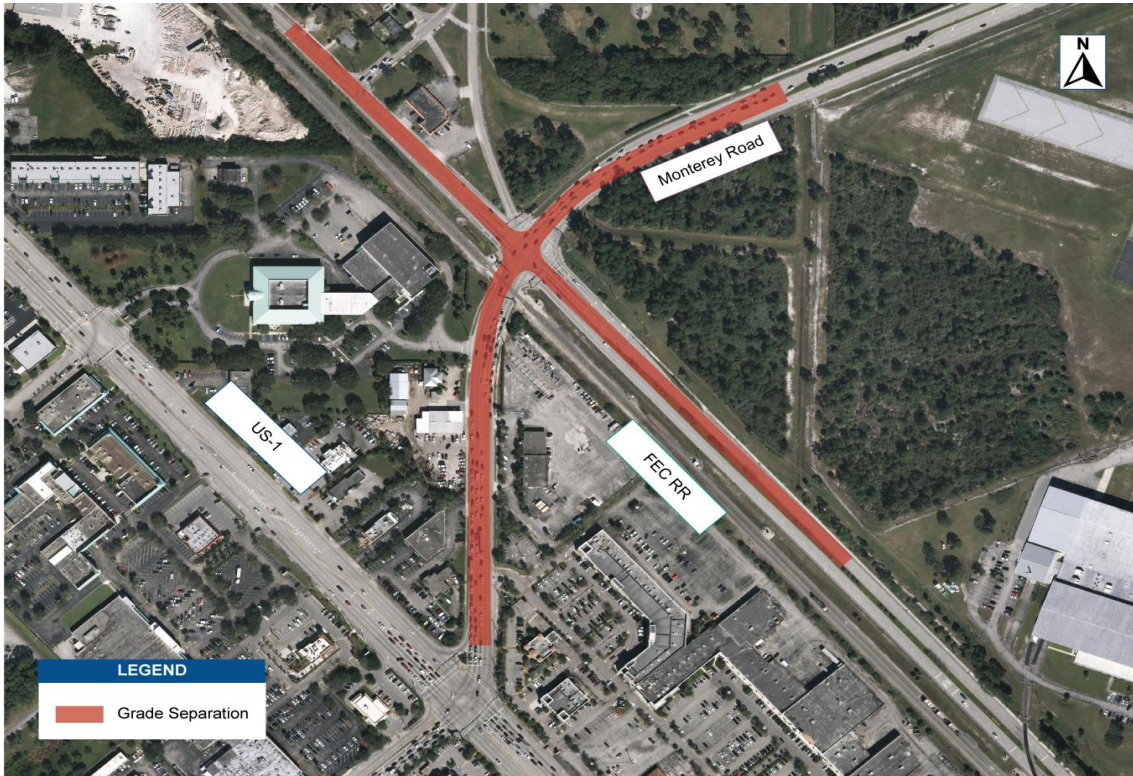


Figure 9 – A1A/Stuart Limits of a Potential Grade Separation





Figure 10 – Florida Street Limits of a Potential Grade Separation

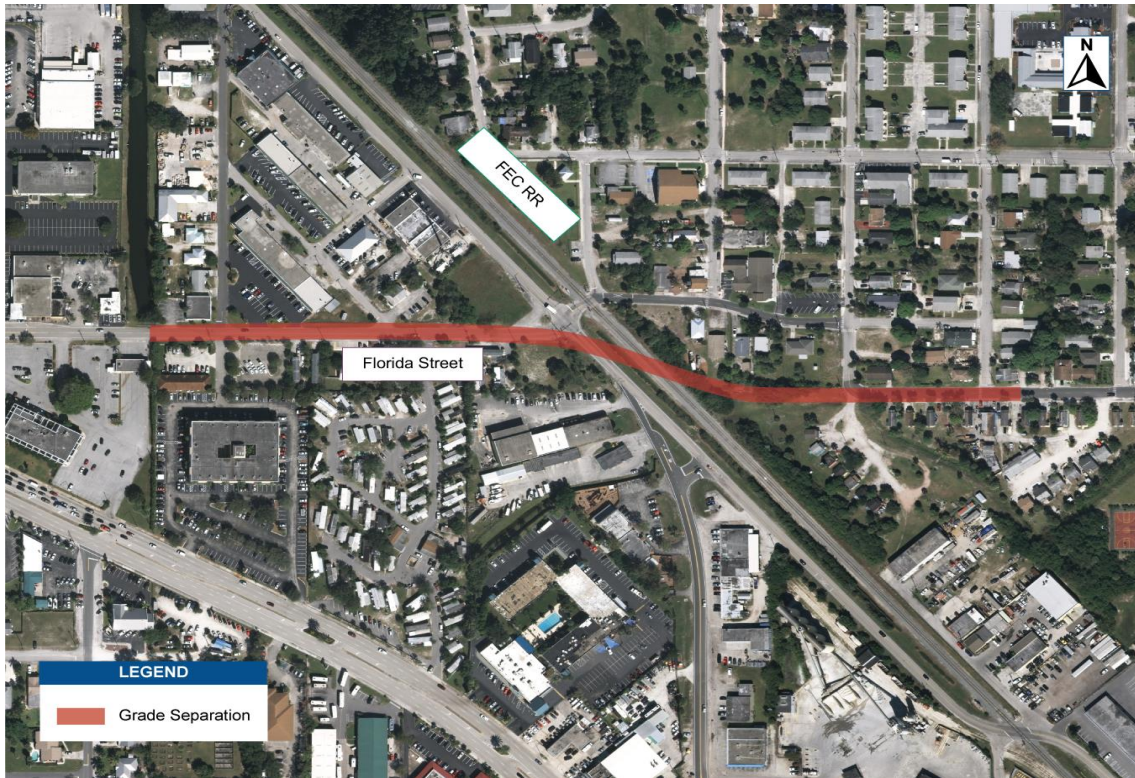


Figure 11 – Martin Luther King Jr. Boulevard Limits of a Potential Grade Separation





Figure 12a – Dixie Highway/Rio (Option 1) Limits of a Potential Grade Separation



Figure 12b – Dixie Highway/Rio (Option 2) Limits of a Potential Grade Separation





Figure 13 – Potential Area for Non-Motorized Grade Separation in Port Salerno

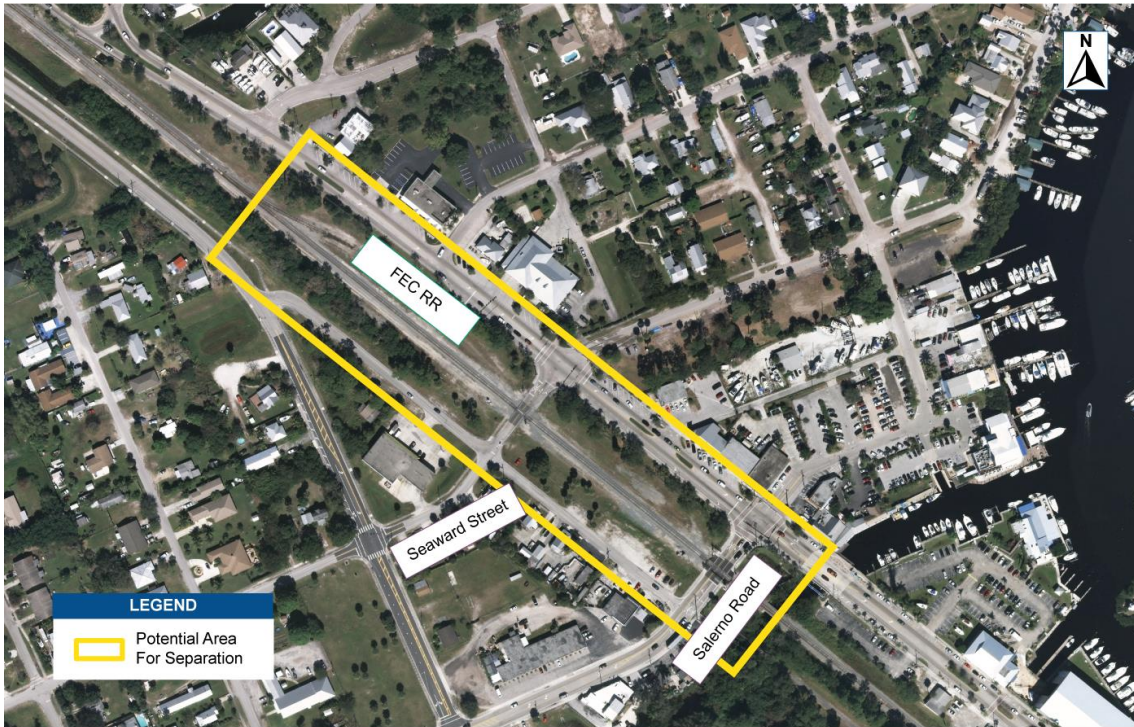


Figure 14 – Potential Area for Non-Motorized Grade Separation in Golden Gate

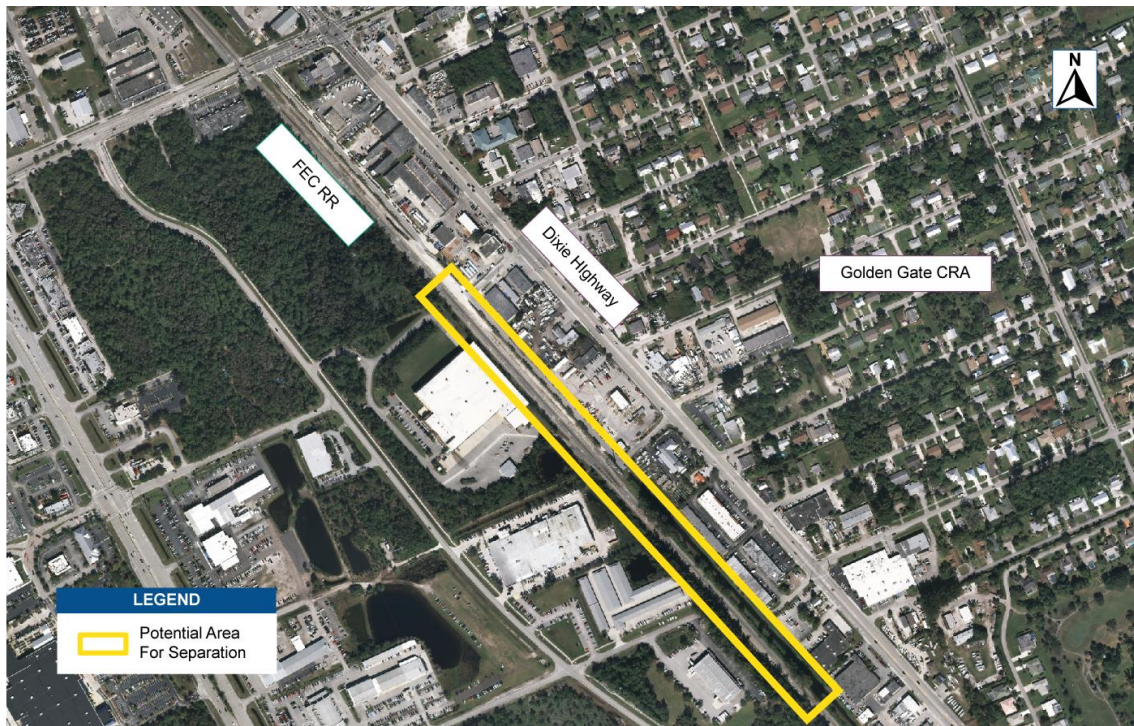




Figure 15 – Potential Area for Non-Motorized Grade Separation along M LK Blvd.

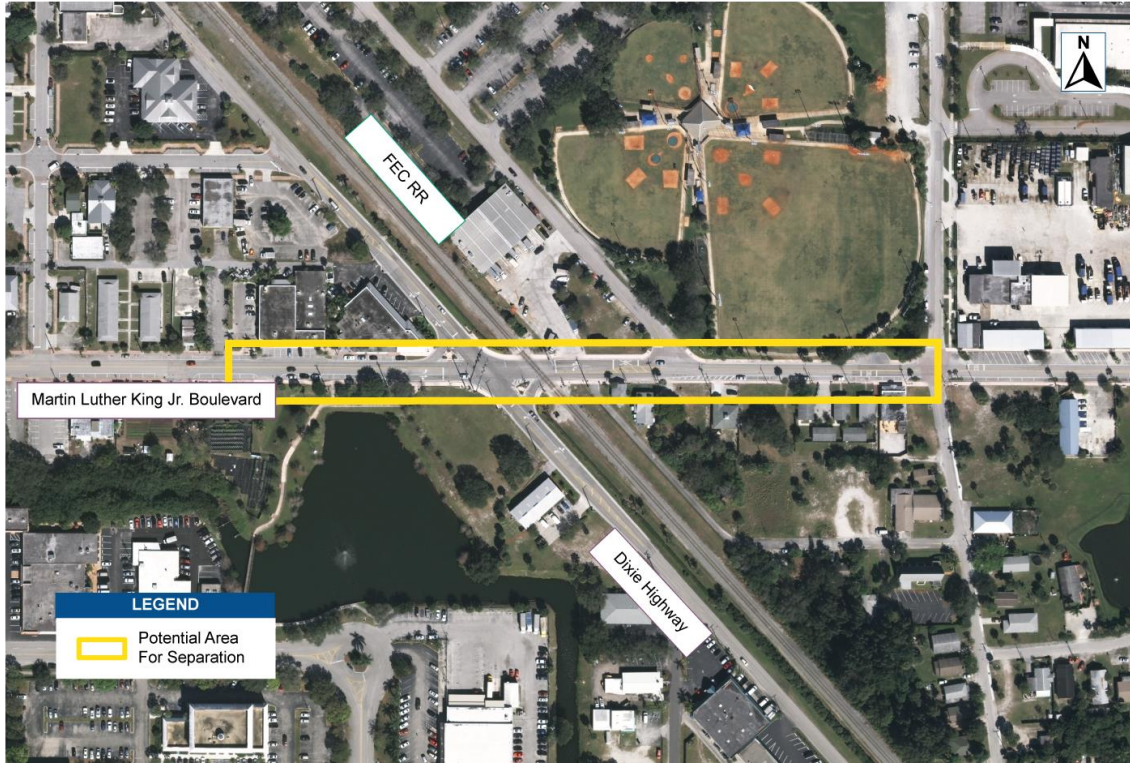


Figure 16 – Potential Area for Non-Motorized Grade Separation in Stuart Area





Figure 17 – Potential Area for Non-Motorized Grade Separation in Jensen Beach



### 3.1.3 Non-Motorized Grade Separation Initial Concepts and Impact

The project was supported by a Stakeholder Advisory Team throughout the process. A Kick-Off meeting was held to present the scope, schedule and purpose of the overall effort as well as to identify the role of the SAT to attend meetings, provide input and share information with their respective agencies. The kick-off meeting also included a workshop to review the FEC corridor and identify potential areas where known pedestrian and bicycle activity was occurring within the rail corridor. The SAT was further engaged in the review of Technical Memorandum 1 Existing Conditions and for a briefing and review on the Tier 2 and Concept Designs and cost benefit results. At all meetings there was a high level of interest and robust discussion that added significant value to the results of this study

#### Stakeholder Advisory Team Kick-Off Meeting



The members of the SAT included the following agencies:

- City of Stuart
- City of Sewall's Point
- Martin County
- Martin County Public Transit
- Martin County School Board
- Martin County Sheriff's Office
- Martin County/Stuart Chamber of Commerce
- Town of Sewall's Point
- Martin Metropolitan Planning Organization

There was significant outreach throughout the study where 19 meetings were held from September 2016 through June 19, 2017. The team reached out to share findings as the study progressed particularly once the Tier 2 candidates were identified. The process included a 3 hour Public Open House where all of the candidate projects and preliminary concepts identified in Section 2 of this report



**Golden Gate NAC Members and Attendees Discuss Issues**

were shared in detail. The list of all the meetings is provided below and the sign in sheets and the comment cards from the Public Meeting are provided in Appendix K. A voting exercise was undertaken at the Public Open House and people were allowed to identify 2 crossings that they preferred for the roadway and non-motorized candidates. The results indicated that there was a preference for concepts to be developed for roadway crossings at Monterey Road (39%) and Rio Option 2 (21%) and that non-motorized concepts should be prepared for the Golden Gate Area (37%) and for the Downtown Stuart Area north of Colorado Ave (37%).

A list of all publically advertised meetings for this study are provided below.

- September, 2016 - Met with the TAC/CAC/BPAC and Board approve the scope
- December 1, 2016 - Strategic Advisory Team (SAT) kick-off meeting
- January, 2017 - Submitted Technical Memorandum Number 1
- February 9, 2017 – SAT Meeting Tier 2 Recommendations
- February 22, 2017 –recommendations and feedback from Martin County/Stuart Chamber of Commerce
- February 27, 2017 –recommendations and feedback from Martin County CRA Board
- February 27, 2017 –recommendations and feedback from Stuart City Commission
- February 28, 2017 –Open House at Stuart Town Hall
- April 3, 2017 TAC/CAC/BPAC Meeting
- April 3, 2017 Golden Gate NAC Meeting
- April 17, 2017 MPO Board Meeting
- April 25, 2017 SAT Meeting Concept Recommendations
- June 5, 2017 Technical Advisory Committee supports documentation of 4 concepts
- June 7, 2017 Citizen’s Advisory Committee supports documentation of 4 concepts
- June 12, 2017 Bicycle/Pedestrian Advisory Committee
- June 19, 2017 MPO Policy Board



## 4. CONCEPTS AND COST/BENEFIT ANALYSIS



## 4 Concepts and Cost/Benefit Analysis

### 4.1 Roadway and Non-Motorized Concepts

Throughout the technical and outreach process the Monterey Road crossing and the Downtown Stuart and Golden Gate Area non-motorized locations had consistent support to move forward to the concept phase. There was a significant amount of debate on what the second roadway alternative should be. Rio Option 2, Indian Street and the New Crossing for Airport access were vetted in very constructive public debate at the SAT Meeting, the Joint CAC/TAC/BPAC Meeting and at the MPO Board meeting. The final decision was to move forward with an Indian Street/Dixie Highway elevated roadway crossing, a Monterey Road/Dixie Highway depressed roadway crossing, a Railroad Avenue to Commerce Boulevard elevated pedestrian/bicycle grade separation and a Downtown Stuart elevated pedestrian/bicycle grade crossing. Each concept is shown in Figures 18 through 21 from south to north by category.

#### 4.1.1 Opportunities and Challenges

Each of the concepts offer some consistent opportunities and challenges where they all provided for access to both sides of the tracks and a safety benefit and some level of community connectivity and all had challenges related to right of way and access.

##### **Indian Street/Dixie Highway Elevated Grade Crossing over the FEC Railroad Opportunities and Challenges**

Indian Street is a 4 lane divided County Roadway west of Dixie Highway that tapers down to a 2 lane roadway east of Dixie Highway. The roadway currently operates well at Level of Service (LOS) C conditions and is expected to continue to operate under satisfactory conditions in 2040 at LOS D. The Indian Street/FEC Railroad crossing is provided with sidewalks, there are no bike lanes, it is served by Martin County Public Transit (MCPT) and there are currently 26 school buses per school day that traverse the crossing. The roadway experiences 12 railroad closures a day, with 60 mile per hour trains at maximum speeds and has experienced 17 crashes in the vicinity of the crossing in the last 5 years including 5 non-motorized crashes and 7 serious injuries. None of the crashes included a train. The crossing is high on the Florida Department of Transportation Safety Needs Index ranking as it is the #113th crossing in a system of 3,682 crossings and may experience as many as 54 trains a day in the future with speeds between 70 and 110 mph.

**Opportunities** – the proposed concept developed for Indian Street includes elevating both Indian Street and Dixie Highway so that all turning movements would be separated from the railroad tracks. Opportunities

include safety, a fixed evacuation route, and access for emergency services. The proposal maintains the current design of the intersection meeting community concerns on traffic management on the east side of Dixie Highway. The safety benefit analysis indicates that the proposed concept would reduce crashes by 44% per year, about 3 crashes per year, and the design allows for fixed access from the western communities to the Martin Memorial Medical Center. Note that fixed emergency access, separated from the crossings, to the Medical Center was heard often at outreach meetings as a high priority in reviewing the need for grade separations.

**Challenges** – the concept presents significant right-of-way challenges as the yellow highlighted areas shown on the concept exhibit represents properties that would lose access to both Indian Street and Dixie Highway and probably result in full property takes. In addition there would be roadway network and access impacts where access to properties on the west side of tracks would be prohibited as well as access to/from Alamo Drive east of Dixie Highway.

The concept cost estimate is \$83.6 Million with a cost/benefit ratio of 2.1.



Figure 18 – Indian Street





Figure 19 – Monterey Road



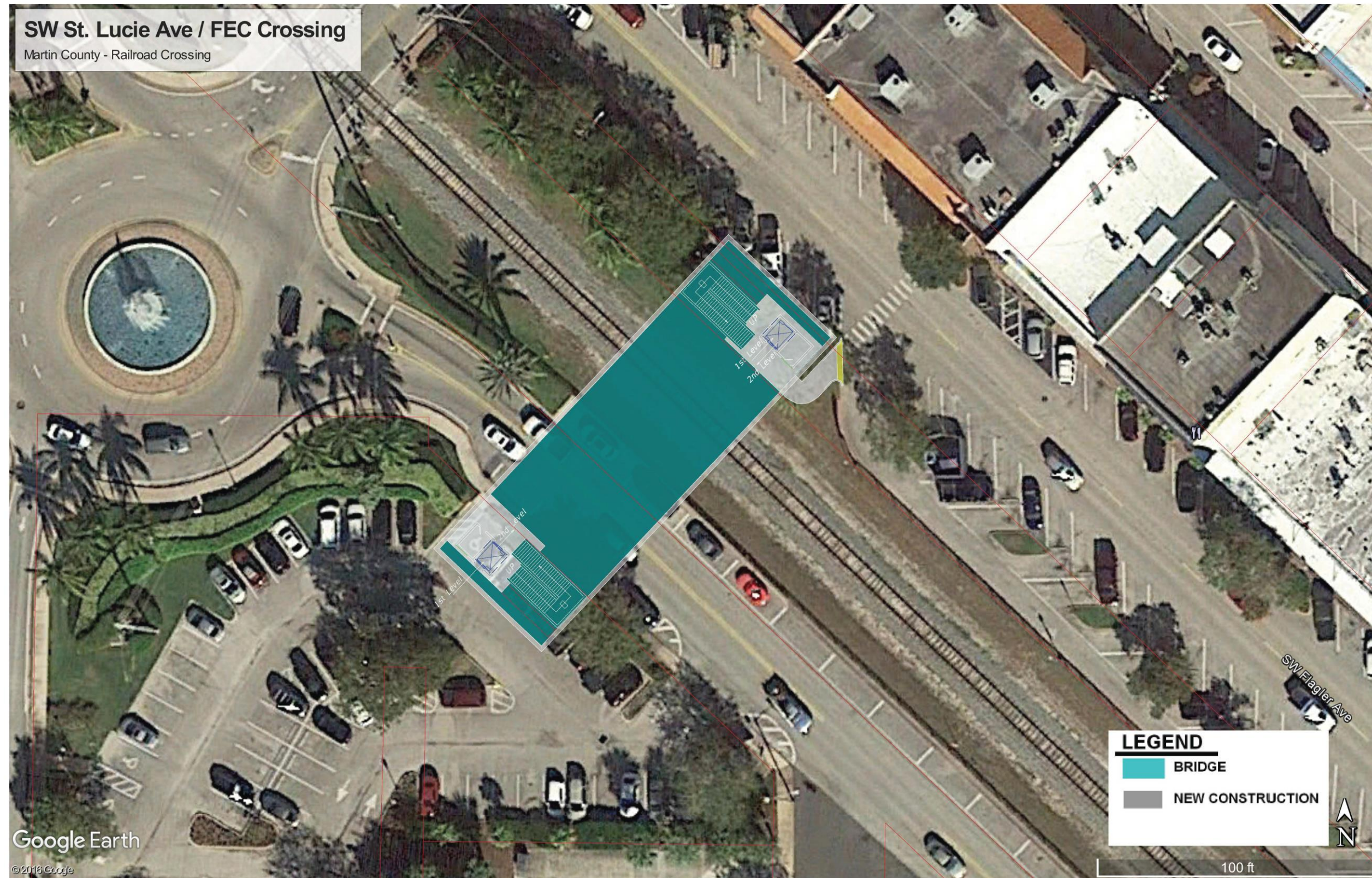


Figure 20 – Railroad Avenue to Commerce Avenue





Figure 21 – SW St. Lucie Ave





## Monterey Road/Dixie Depressed Highway Grade Crossing under the FEC Railroad Opportunities and Challenges

Monterey Road is owned and maintained by FDOT as State Road 714 and in addition the FEC Railroad is designated as a FDOT Strategic Intermodal System (SIS) railroad that is eligible for SIS funding. Monterey Road is a 4 lane divided roadway both east and west of Dixie Highway. The roadway currently operates under satisfactory conditions at LOS D and is expected to operate below satisfactory levels at LOS E in 2040. The Monterey Road/FEC Railroad crossing has sidewalks, there are no bike lanes, it is served by MCPT and there are currently 15 school buses per school day that traverse the crossing. The roadway experiences 12 railroad closures a day, with 60 mile per hour train maximum speeds and has experienced 88 crashes in the vicinity of the crossing in the last 5 years including 1 non-motorized crash and 24 serious injuries. None of the crashes included a train. The crossing is also high on the Florida Department of Transportation Safety Needs Index ranking as it is the #267th crossing in a system of 3,282 crossings and may experience as many as 54 trains a day in the future with speeds between 70 and 110 mph.

**Opportunities** – This same crossing has been studied a couple of times by FDOT once in 2001 and again in 2015. The 2001 study identified 4 alternatives including at-grade, elevated grade separations and a tunnel option and the 2015 study indicated that an elevated grade separation was feasible however the post-2001 study extension of the Witham Field Runway would require engineering and design work to meet Federal Aviation Administration (FAA) requirements within the Runway Protection Zone (RPZ). The 2001 study is provided in Appendix L. In order to complement the previous studies a new concept was developed for Monterey Road that includes depressing Monterey Road under the FEC crossing and Dixie Highway. The concept provides east/west connectivity on Monterey Road and avoids constructing an elevated facility that may have conflicts with the Witham Field RPZ. Note that 3 Options are also identified on the Monterey Road exhibit. The options are provided specifically for access to Palm Beach Road and the Martin Medical Health Center from Monterey Road.

- **Option A** – provides access for eastbound Monterey Road emergency services to travel under the railroad tracks and Dixie Highway and then take a U-Turn to head westbound on Monterey Road and use a new slip road onto Palm Beach Road northbound to the Medical Center.
- **Option B** – is similar to Option A under the tracks and Dixie Highway however it provides for a new road on the north side of Monterey Road where emergency services traffic can take a left turn after coming out of the depression back to at grade and travel on a new road to Palm Beach Road.
- **Option C** – would provide for a ramp that would begin at the depth of the depressed roadway and provide a cloverleaf style ramp out of the depression meeting Dixie Highway at grade to traverse the intersection and access Palm Beach Road. This alternative has the added option of providing additional traffic and emergency services access to Witham Field.

The safety benefit analysis indicates that the proposed concept would reduce crashes by 40% per year, almost 12 crashes per year, and the design would allow for fixed access from the western communities to the Martin Memorial Medical Center and potentially the airport.

Note the concept also provides the benefit of calming surface traffic. With Monterey Road through traffic removed, only local traffic will circulate on the conceptual frontage roads shown in the exhibit and the Dixie Highway intersection will experience much less traffic. This provides an opportunity to develop a better pedestrian and bicycle environment on the surface roads.

**Challenges** – the concept presents right-of-way and commercial property access challenges on the west side of the railroad tracks. It appears that the concept may encroach upon one building and although the frontage roads will allow for right-in right-out access it will prohibit full access to the properties to the north and south. Mitigation for the shopping center on the south will require redesigned access on US 1 south of Dixie Highway.

The concept cost estimate is \$68.5 Million with a cost/benefit ratio of 3.7. Note that the concept will require additional operating and maintenance costs for drainage as it is a depression and Florida's high water table presents issues.

### **Railroad Ave. to Commerce Ave. Non-Motorized Grade Crossing over the FEC Railroad**

A non-motorized pedestrian bicycle crossing concept was developed to connect the Golden Gate Community to the commercial and employment uses on the west side of the FEC corridor. Observations and data collected at the site clearly showed that there are existing paths and users are crossing the tracks on a regular basis. A concept was developed to provide connectivity between the 2 sides of the tracks using both stairs and ramps. Note that the concept identified could work at a number of locations between Indian Street and Monterey Road however this location has a canal to the south that stretches down to Indian Street and this provides an opportunity to channel users to the bridge.

**Opportunities** – providing a bridge at any location brings a safety benefit by providing an option to trespassing on the tracks and also provides a safe route to meet the shopping and employment needs of the community. A camera was placed on Commerce Avenue for one day at the concept location focused on a worn path that leads directly to/from the railroad tracks. On April 1, 2017 8 pedestrians and 26 bicyclists were observed using the path and tracks. The team also heard that the community prefers that a wall be built to block trespassing onto the railroad tracks. The ramping system on the east side of the tracks meets that desire to a certain extent where the ramping infrastructure will also act as a de facto wall for a segment of the corridor.

**Challenges** – exist in general just getting people to use non-motorized pedestrian/bicycle bridges. Observations of pedestrians in this area showed the same traits that are experienced in many studies - that persons tend to follow desire lines and cross streets at the nearest opportunity and they are not inclined to



walk to a traffic signal or an overpass to go directly across the street. Mitigation of this challenge requires channelization of pedestrians and development of a safe environment. The concept presented here includes both ramps and stairs on each side allowing persons to feel safe having options to exit the overpass and the location provides a certain level of channelization because of the canal to the south.

Note that this concept has right of way issues where it requires reuse of the Railroad Avenue right of way and coordination with a private property owner either for an easement or a right of way purchase. A lane of traffic or a row parking will have to be repurposed on the east side to accommodate ramps and on the west side of the FEC tracks the property is all privately owned.

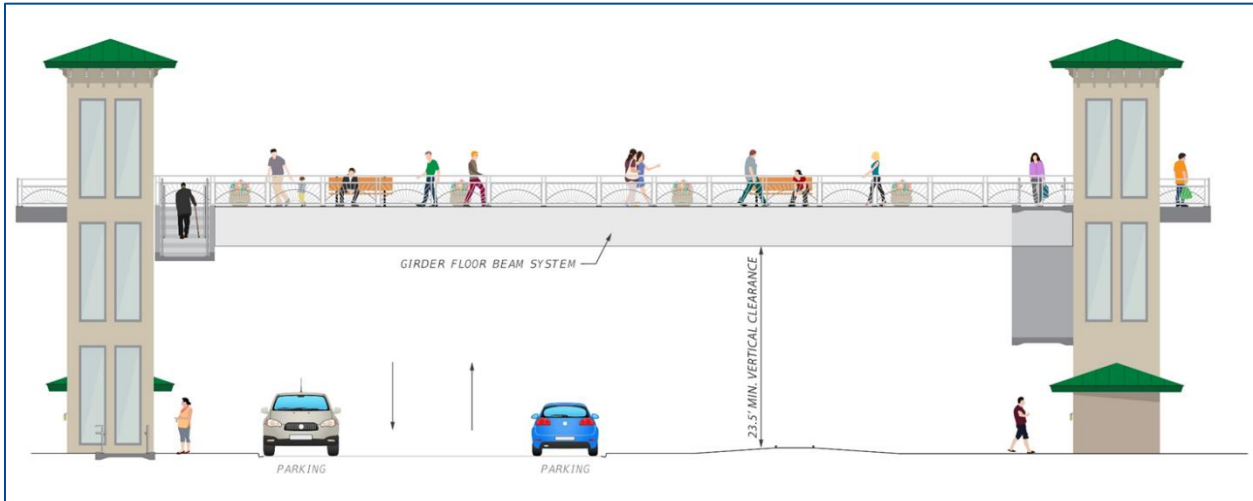
The concept cost estimate is \$3.7 Million with a cost/benefit ratio of 42.9. Note that there were challenges in calculating the safety benefit for the non-motorized locations. There is no history of a train/pedestrian trespassing crash or fatality in Martin County in the last 10 years. Considering that rail activity may increase 5 fold it was not practical to assume the same conditions will exist in the future. Crash data from the South Florida Rail Corridor (TriRail) in northern Palm Beach County was researched and 2 fatal crashes and 1 suicide were recorded occurring in the last 5 years. In order to maintain a conservative analysis it was assumed that 1 fatality every 5 years would occur under the future conditions in Martin County without a pedestrian/bicycle bridge.

### **Downtown Stuart Non-Motorized Grade Crossing over the FEC Railroad**

A non-motorized pedestrian bicycle crossing concept was developed to connect the east and west sides of the FEC corridor in Downtown Stuart. The concept was proposed to potentially increase economic activity on both sides of the roadway and to better connect parking on the west side of the downtown to the east side attractions.

**Opportunities** – exist along the corridor in this area. Cameras were placed at the St. Lucie Avenue/Joan Jefferson Way and the Colorado Avenue crossings for a Thursday, Friday and Saturday from March 30 through April 1, 2017 and a very significant amount of non-motorized activity was observed. More than 300 cyclists and 1,500 pedestrians were observed in that period at Joan Jefferson Way/St. Lucie Avenue crossing the railroad tracks and more than 120 bikes and 2,100 pedestrians at the Colorado Avenue crossing. A concept was developed just south of the Joan Jefferson Way/St. Lucie Avenue roundabout adjacent to the FEC crossing. Similar to the Railroad Avenue to Commerce Avenue connection this proposal could be portable and placed at other locations along the corridor in downtown. This location was selected for the concept to take advantage of the public parking and right of way on the west side of Dixie Highway. The concept is proposed to traverse both Dixie Highway and the FEC corridor using elevators on both the east and west sides and the concept includes additional width on the bridge platform to develop more public space. The concept shows a 50 foot wide platform that could serve multiple purposes as well as pedestrian/bicycle and parking connectivity. A sample profile and some pictures of other grade separations that have been made into public places are provided below.

**Potential Profile of a Downtown Stuart Non-Motorized Crossing**



**High Line, New York City Grade Separation**

**Birmingham, Alabama Multiple Use of Underpass**



**Challenges** – exist with right of way at this location where the utilization of ramps was not feasible. Ramps on the east side would require the taking of a large portion of the on-street parking and is prohibitive on the westside as it would require significant right of way. The concept includes elevators that will impact 4 parking spaces on the west side and require right of way from the parking lot.

The concept cost estimate is \$4.7 Million with a cost/benefit ratio of 34.0. Note that the same process to calculate the safety benefit was used as with the Railroad Avenue to Commerce Avenue grade separation and also note that the cost estimate does not include the cost of maintaining and operating the elevators. The cost estimates and benefit cost analysis is provided in Appendix M.

## 4.1.2 Final Recommendations

In summary, this study identified 11 different roadway locations for grade separation along the FEC and 5 locations for potential non-motorized separations that have the potential need and justification for consideration in future planning and programming efforts by the MPO Board. Four (4) locations were selected for concept development for the purposes of analyzing and better understanding the impacts and benefits of implementing grade separations in Martin County. This does not mean that the concepts presented in this report are a priority of the Board or that the other Tier 2 locations should not be further vetted for planning and programming.