STRATEGIES FOR REDUCING RAILROAD TRESPASSING

Florida East Coast Railway Corridor - Cocoa to Miami

August 6, 2021

FDOT

FMO
FREIGHT & MULTIMODAL OPERATIONS

Table of Contents

Acronyms and Abbreviations

Ave	Avenue
Blvd	Boulevard
CFRC	Central Florida Rail Corridor
CPTED	Crime Prevention Through Environmental Design
Cswy	Causeway
Ct	Court
Dr	Drive
FDOT	Florida Department of Transportation
FECR	Florida East Coast Railway
FMO	Freight and Multimodal Operations
FRA	Federal Railroad Administration
ft	Foot/Feet
GIS	Geographic Information System
Hwy	Highway
Ln	Lane
MOW	Maintenance-of-Way
MP	Milepost
MUTCD	Manual on Uniform Traffic Control Devices
Pl	Place
RWIC	Roadway Worker in Charge
SRRT	Strategies for Reducing Railroad Trespassing
St	Street
Ter	Terrace
TRB	Transportation Research Board

Executive Summary

Trespassing on railroad property is the leading cause of all rail-related deaths in the United States. In 2019, Florida ranked the third highest state for railway trespassing casualties in the nation and the second highest for casualties per track mile. In Florida, while other studies and projects have focused on grade crossings, 65% of all trespassing casualties are not a rail grade crossings. In response to this pressing need, the Florida Department of Transportation's Freight and Multimodal Operations (FDOT FMO) Manager took the initiative to work towards practical corrective actions to curtail trespassing. The FDOT FMO Office implemented a program in 2019 entitled: "Strategies for Reducing Railroad Trespassing (SRRT)" and completed a successful pilot program in Central Florida.

Since 2018 casualties on the Florida East Coast Railway (FECR) corridor have almost doubled. This trend, coupled with the pilot program's success in Central Florida, led the FDOT FMO Office to expand the SRRT program to include a study of FECR corridor with joint FECR and Brightline train operations. The intent of the evaluation is to study the prevalence, popular indifference and social acceptability of trespassing by instituting a wide range of efforts, primarily focusing on engineering design, recording of historically and regularly used trespass locations and innovative public outreach ideas to change the social perception of trespassing on a railroad corridor. The study undertook the following evaluations:

1. Analyzed historical trespassing casualties and evaluated the causal factors of trespassing by location, such as trespassing origin-destination pairs and demographics.
2. Conducted a comprehensive field review, focusing on trespassing areas of concern to determine evidence of trespassing, sources of trespassing, and potential mitigation methods. This review found 69 zones or locations for the development of mitigation design.
3. Developed conceptual designs and cost estimates for each of the 69 locations. Trespassing mitigation design methods included cameras and smart technology, at-grade pedestrian crossings, barriers, signage, and right-of-way maintenance.

Due to the changing nature of trespassing, the selected locations should not be considered an exhaustive list. The projects combined have an estimated total cost of $9.6 million; however, each location, or individual project, can be selected for further design and construction.

01

Introduction and Background

Purpose and Need

Trespassing on railroad property accounts for 94% of all rail-related deaths in the United States[1]. While the number of fatalities has been reduced by 60% over the last few decades, in 2019, 1,131 trespassing casualties (fatalities and injuries)[2] occurred nationwide, averaging over three per day.

In 2019, Florida ranked the third highest for the number of railway trespassing casualties in the nation and the second-highest for casualties per track mile (Table 1).

Table 1: State Number of Casualties and Rankings[3]

State	2019 Total Casualties		2019 Casualties per 100 Miles	
	Value	Rank	Value	Rank
California	239	1	4.83	1
Texas	101	2	0.94	14
Florida	**77**	**3**	2.46	**2**
Illinois	52	4	0.66	21
Pennsylvania	49	5	0.96	13

Trespasser casualties in Florida have trended upward since 2011 (Figure 1). The addition of SunRail service in Central Florida in 2014 and Brightline service in South Florida in 2017 correlate to the increase in fatalities and injuries in the following years.

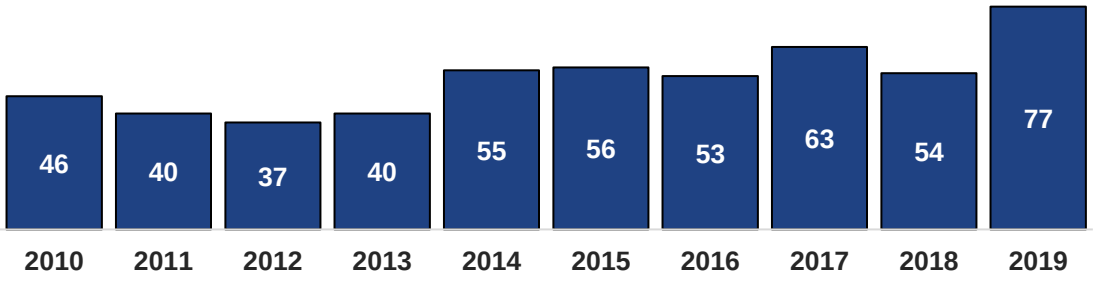


Figure 1: Number of Trespasser Casualties not at Highway-Rail Crossings in Florida[4]

Project Overview

The Florida Department of Transportation (FDOT) Freight & Multimodal Operations (FMO) Office is investigating engineering solutions that contribute to its culture-of-safety, as well as education and enforcement strategies (the Three E's: Engineering, Education, and Enforcement). The Three

[1] FRA (2018) FRA Report to Congress: National Strategy to Prevent Trespassing on Railroad Property and FRA Crossing Safety & Trespass Prevention https://www.fra.dot.gov/Page/P0841
[2] Per FRA, Casualties are fatalities and injuries.
[3] FRA Office of Safety Analysis [https://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx]
[4] Ibid

E's safety components have helped FDOT reduce highway-rail grade crossing fatalities; however, incidents resulting from rail trespassing are a constant challenge.

An initial pilot program[5] was completed to assess different evaluation and mitigation methods while investigating four hotspots on the Central Florida Rail Corridor (CFRC). Depending on the location, an appropriate mitigation method was selected based on its ability to prevent trespassing and cost-effectiveness.

Due to the increased number of casualties in South Florida, the FDOT FMO Office expanded the program to include a study of the Florida East Coast Railway (FECR) corridor with joint FECR freight and Brightline passenger train operations. While other efforts have focused on grade crossing safety, this study focuses on trespassing at locations not at grade crossings along the corridor. The study undertook the following evaluations:

1. An analysis of historical trespassing casualties was performed that evaluated potential trespassing origin-destination pairs, and demographics. Potential trespassing areas of concern were identified for further field investigation.
2. A field review of the trespassing areas of concern was conducted to determine evidence of trespassing, determine sources of trespassing, and identify potential mitigation methods.
3. Using the findings from the field investigation, conceptual designs and cost estimates were developed for each hot spot to reduce the frequency of trespassing.

Figure 2: Study Corridor Overview

[5] Strategies for Reducing Railroad Trespassing: Pilot Program, January 2020.

FECR & Brightline Corridor Characteristics

Figure 3: FECR Freight and Brightline Passenger Trains

The study corridor is owned by FECR and extends 195 miles from Cocoa (Milepost (MP) 170) to Miami (MP 365). In addition to FECR freight trains, Brightline operated on the 65 miles between West Palm Beach (MP 300) and Miami from May 19th, 2018 until suspending operations on March 25th, 2020 due to COVID-19 with operations anticipated to resume in the fourth quarter of 2021. Construction is currently underway to extend Brightline's operation 130 miles north to Cocoa, where the FECR freight traffic to Jacksonville and Brightline passenger traffic to Orlando will split. From West Palm Beach to Miami, Brightline operates up to 17 trains per day with a top speed of 79 mph, with FECR operating on average 14 trains per day[6] with a top speed of 60 mph. The extension to Cocoa, projected to be completed in 2022, will have a top passenger speed of 110 mph.

FECR & Brightline Trespassing and Suicide Trends

Non-Suicide trespassing casualties not at grade crossings, and suicides along the study corridor have increased over recent years (Figure 4 and Figure 5). The increase in non-suicide trespassing casualties corresponds to the increased number of trains between Miami and West Palm Beach.

[6] Average obtained from volumes in FRA Grade Crossing Database.

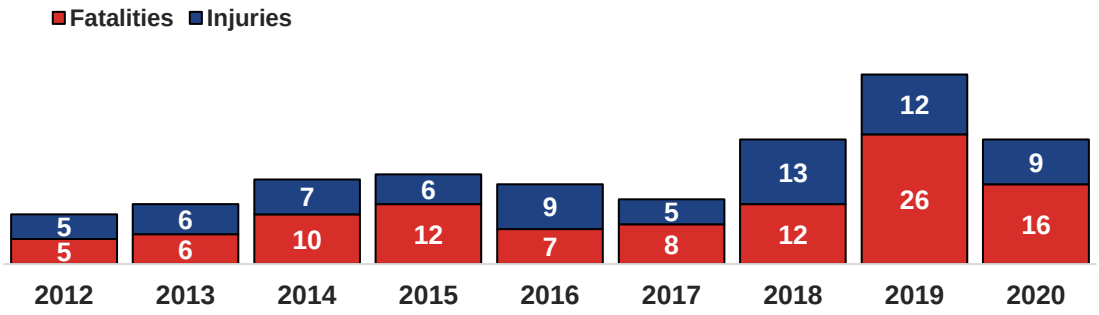


Figure 4: FECR and Brightline Non-Suicide Trespasser Casualties[7]

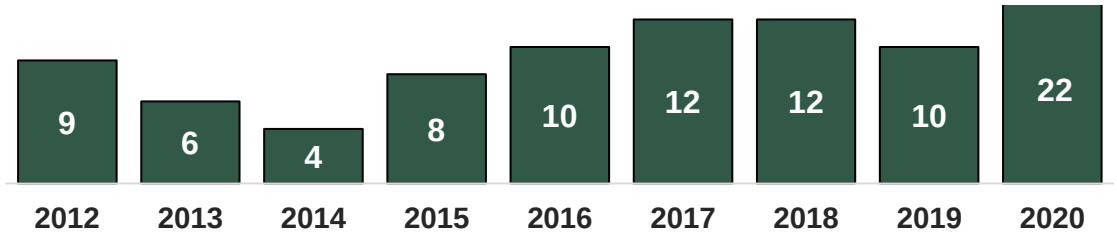


Figure 5: FECR and Brightline Suicides Trespassing Casualties[8]

While incidents at grade crossings often receive the most publicity, they account for only 35% of the total casualties (Figure 6). The remaining 65% of casualties occur at locations other than grade crossing. Bridges make up less than 1% of the corridor but disproportionally account for 4% of the casualties.

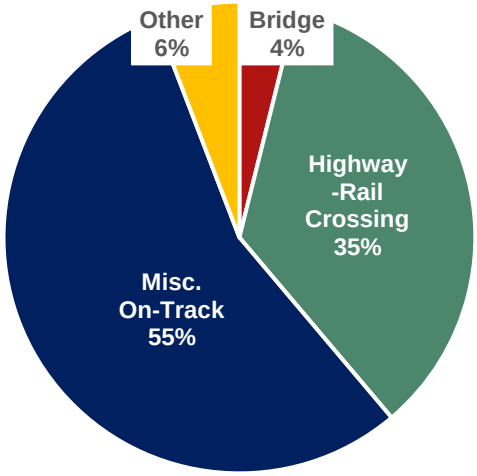


Figure 6: Trespassing casualties by location[9]

[7] From FRA Casualty Database, events not at highway rail crossing, in Brevard, Broward, Miami-Date, Indian River, Martin, Palm Beach and St. Lucie counties
[8] From FRA Suicide Dashboard, https://explore.dot.gov/#/site/FRA/views/TrespassandSuicideDashboard/TrespassOverview, FECR and Brightline in Brevard, Broward, Miami-Date, Indian River, Martin, Palm Beach and St. Lucie counties. Location not specified.
[9] FRA Office of Safety Analysis [https://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx]

Root Causes of Trespassing

A Trespasser, according to the Federal Railroad Administration's (FRA) Guide for Preparing Accident/Incident Reports, is someone "who is on the part of railroad property used in railroad operation and whose presence is prohibited, forbidden, or unlawful"[10]. This can occur at any location along the right-of-way. No matter the location, the root cause of the trespassing depends on the motivation of the individual and can generally be summarized into one of the following:

- Convenience
- Recreation
- Loitering
- Criminal activity
- Crisis (suicide)
- Lack of understanding or appreciation of dangerous conditions

It is commonly thought that children or transients are the primary groups at risk of trespassing along a railroad. However, according to a study done by Ian Savage in 20011, only 2.2% of casualties are under the age of 10, and only 10% of all victims are transients. The most common victim is in an urban area, living within 1 mile, of lower socioeconomic status, unmarried, and between the ages of 20 to 49. It has also been found that most of the victims had drugs or alcohol in their system.[12]

It has also been found that improper media coverage of railroad-related suicides can lead to "copycat" incidents[13]. A Transportation Research Board (TRB) Circular states: "*Media reporting can negatively impact the occurrence of incidents and can lead to copycat occurrences when misreported"*. Improper coverage includes: using the term "suicide" in the headline, including detailed information on the location and nature of the event while showcasing a photo of a train in the article. Additionally, media sensationalizing tragic events on the railroad corridor may give rise to additional unfortunate incidents.

Changes in train operations can also result in increased casualties. Higher volumes result in a greater likelihood of an incident. High trains speeds can cause a trespassers familiar with the existing traffic, to not react in sufficient time to leave the tracks.

[10] United States. Federal Railroad Administration. *FRA Guide for Preparing Accident/Incident Reports.* Office of Railroad Safety, 2011.
[11] Savage, I. Research in Transportation Economics: Railroad Economics. Volume 20(1), pages 199-224. Amsterdam: Elsevier Science, 2007.
[12] Topel, Kurt, et al. A Literature Review of Rail Trespassing and Suicide Prevention Research. Transportation Research Circular E-C242, TRB, National Research Council, Washington, D.C., 2019.
[13] FRA Report Reporting of Suicide and Trespassing Incidents by Online Media, dated March 2017

Trespassing Mitigation Methods

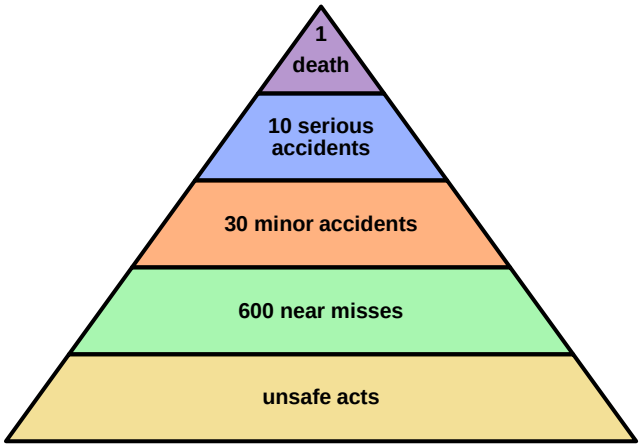


Figure 7: Heinrich's Accident Triangle

Trespassing incidents that result in a fatality are not isolated events. As depicted in Heinrich's Accident Triangle[14] (Figure 7), a relationship exists between the number of serious and minor incidents. For every fatality, there are hundreds of unreported incidents. Accordingly, it is likely that efforts to reduce the number of minor trespassing violations will reduce the number of fatalities.

Local law enforcement may routinely patrol areas around the railroad tracks, but limited access and resources constrain their anti-trespassing efforts. Addressing trespassing issues not only reduces the loss of life but also has the potential to decrease crime and unintended consequences such as derailments and property damage. Criminal behavior along the railroad corridor includes graffiti, vandalism, breaking into a stopped freight train's shipping containers and trailers, or even damaging track infrastructure, which could lead to a train derailment.

When determining the best mitigation method, the root causes or motivations need to be identified to implement the most effective mitigation strategy appropriate to the situation. For example, the mitigation for a case where someone unintentionally enters the corridor in a public setting may be as simple as providing a vegetative barrier or low fence. Alternatively, this solution may prove to be counterproductive in some situations as it may further shield the tracks from public view, enabling more illegal behavior. In conditions where someone intentionally enters the corridor with a strong motivational 'pull' (shortest route to a destination, vandalism, and loitering) and little or no observation from other neighborhoods or people, potential mitigation may require a more robust solution to mitigate the trespass (hardened fencing and video surveillance).

Crime Prevention Through Environmental Design (CPTED) techniques must also be considered for trespassing mitigation. Instead of focusing on the offender, CPTED focuses on how the physical environment may influence behavior and how the physical location may enable or deter criminal acts. This design process has four main design concepts[15]:

> Natural Access Control: Guides how people enter and leave a space through the placement of entrances, exits, fences, landscaping, and lighting. Natural Access Control can decrease criminal activity by denying criminals access to potential targets and creating a perception of risk for would-be offenders.

14 Herbert W. Heinrich and Frank E. Bird - Accident Ratio Triangle

15 Apache Junction Arizona, CPTED - Design Out Crime, https://www.ajcity.net/DocumentCenter/View/12693/CPTEDDesignOutCrime?bidId=,accessed 12/16/2020

Natural Surveillance: Guides the placement of physical features such as lighting and landscaping. These features affect how much can be seen by occupants and passersby. Potential criminals are unlikely to attempt a crime if they are at risk of being observed. Similarly, we are likely to feel safer when we can see and be seen.

Territorial Reinforcement: Physical design can create an area of territorial influence that can be perceived by and may deter potential offenders. Examples include defined property lines and clear distinctions between private and public spaces. Territorial reinforcement can be created using landscaping, pavement designs, gateway treatments, signs, and fences.

Maintenance: A well-maintained bridge, right-of-way, building, or community park creates a sense of guardianship and helps deter criminals.

Figure 8: Channelization and Decorative Hardened Fencing on the CFRC

An application of a CPTED concept is channelization: directing pedestrian traffic from current trespassing paths to safer crossing points. This concept realizes the necessity of persons requiring access to and from specific locations on either side of the tracks. This type of engineering control consists of constructing a footpath or sidewalk parallel to the railroad right-of-way with a barrier or fence between the sidewalk and the tracks to guide the pedestrians to a protected crossing. This method can also create a visually appealing urban sidewalk (Figure 8) that discourages trespassing and enhances the railroad corridor and surrounding metropolitan area.

Channelization can also be used to reduce the risk of suicides. Evidence suggests that fencing of the right-of-way might relocate suicide attempts to station platforms and other places of public access such as highway-rail grade crossings[16]. This channelization can better focus resources to support individuals in need once they are identified.

16 Savage, I. Research in Transportation Economics: Railroad Economics. Volume 20(1), pages 199-224. Amsterdam: Elsevier Science, 2007.

02

Trespassing Analysis

Trespassing Data Analytics

Analysis of current trends is critical to reducing railroad trespassing incidents and provides insight into when and where more frequent trespassing events occur. Incidents are also mapped to look for clusters and nearby landmarks. Surrounding areas may have schools, stadiums, shopping centers, hospitals, and outdoor routes, as likely sources, or motivators for trespassing behavior.

Trespassing Data Sources

The best historical data for the study area is from the FRA casualty database[17]. All trespassing incidents resulting in a casualty are required to be reported to the FRA. If the casualty is due to suicide "as determined by a coroner, public police officer or other public authority," it must be noted in the data. Unfortunately, not all suicides are documented as such, as not all suicides are apparent as intentional acts.

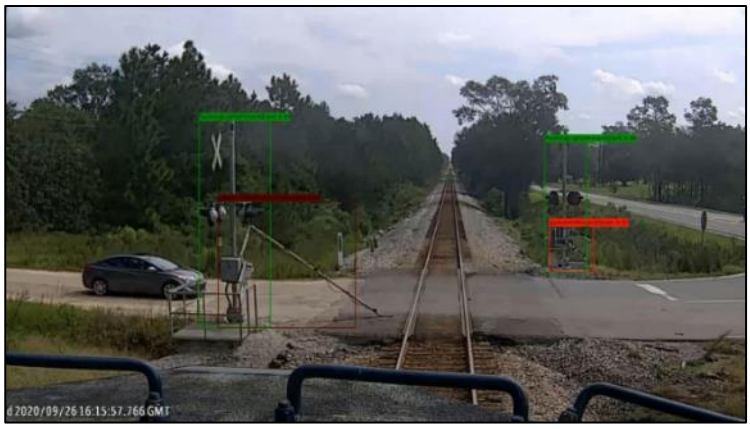


Figure 9: Video Detection Algorithm - Wi-Tronix using Locomotive Camera

This data is limiting, since, as seen in Heinrich's Accident Triangle, there are many more trespassing actions and near misses for every one of the casualties. A location may have a large amount of trespassing but never have had a casualty. Accurate data is critical to determining the best method to reduce trespassing. Several vendors have developed cameras with automated detection algorithms to identify trespassing along a rail corridor. These cameras can be installed at grade crossings, along the corridor, or utilizing a forward-facing camera on a locomotive as shown in Figure 9. These systems will enable more accurate data collection at all hours. This technology will allow better detection of areas with high amounts of trespassing and help determine the root causes at each location.

Historical Data Analysis

This data was used for trend analyses, and the incident locations were used to help identify potential trespassing hot spots. Data was evaluated for two years from June 2018 to May 2020, corresponding with the beginning of Brightline operations. The data comes from the counties between Cocoa and Miami: Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade. Incomplete records in the source FRA data results in different totals for various analyses.

[17] FRA Office of Safety Analysis [https://safetydata.fra.dot.gov/OfficeofSafety/Default.aspx]

Casualty Trend Analyses

Trespassing casualties not at highway-rail crossings were analyzed by age, time of day, day of the week, and month, looking for key trends and insight into each reported incident.

When analyzed by age, there is a strong trend towards people between 30 and 59 (Figure 10). In contrast, there was only one minor (less than 19 years old).

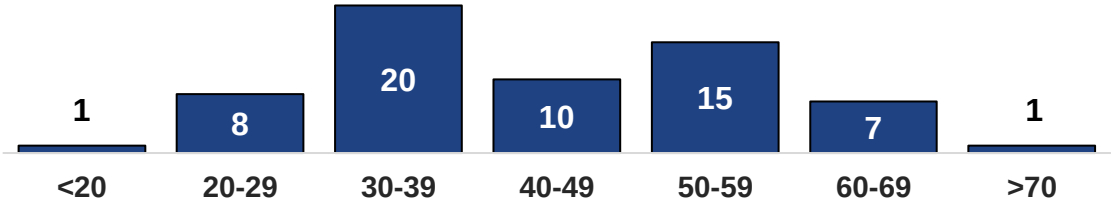


Figure 10: Casualties by age

When analyzed by hour of day (Figure 11), the highest number of cases happen during daylight hours. Brightline incidents peak in the afternoon rush hours (3:00 pm to 8:00 pm).

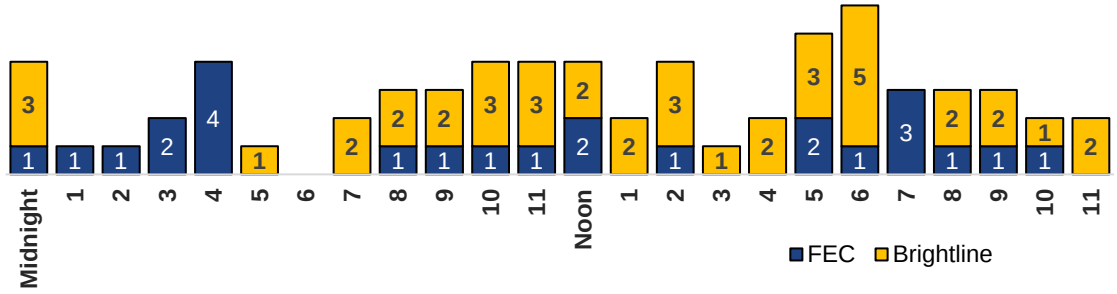


Figure 11: Casualties by hour of day

When analyzed by month, a slightly higher number of incidents occur in the winter months of December through March (Figure 12). The data is consistent with the incidents on the CFRC. Temperatures more enjoyable in winter months, allowing more pedestrians to be outside throughout the day.

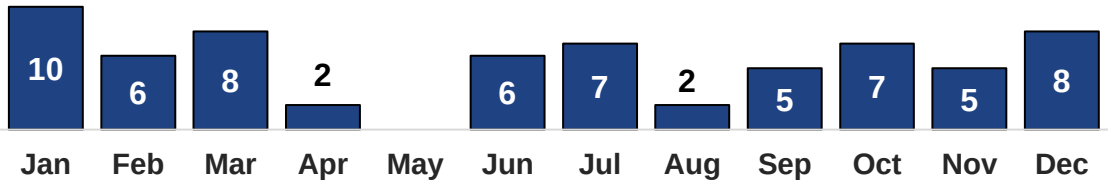


Figure 12: Casualties by month

When analyzed by day of the week (Figure 13), Tuesday has the highest number of incidents, nearly twice as many as any other day.

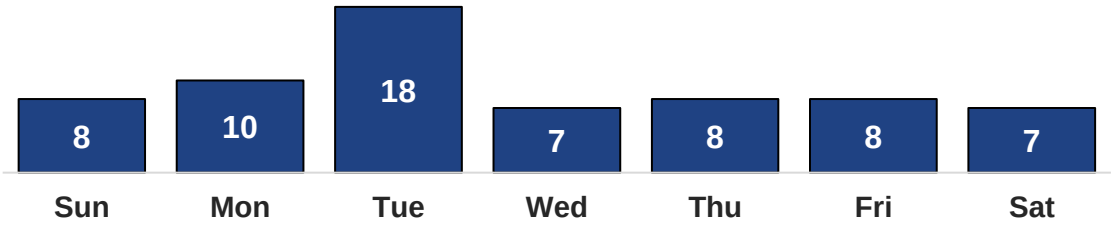


Figure 13: Casualties by day of week

Spatial Analysis

Spatial analysis was completed to analyze historical incidents and potential origin-destination pairs to identify potential trespassing areas of concern. The mapping identified schools, homeless shelters, parks, and historical casualty locations. The maps were reviewed to identify trespassing areas of concern that warranted a field review. The analysis looked for the following characteristics:

1. Visible evidence of well-used trespassing trails.
2. Clear origin-destination pairs that would lead to frequent trespassing. Origins and destinations that would draw trespassing include homes, parking lots, parks, stores, bars, and restaurants.
3. Railroad bridges are often used as shortcuts or as fishing locations.
4. Repeated historical casualties.
5. Draws for illicit behavior, including wooded areas and underpasses.

Additional locations were identified based on observations during the field review and interviews with people along the corridor. Over 54 miles, were identified for further investigation. An example of these sheets can be seen in Figure 14. The complete set can be found in Appendix A.

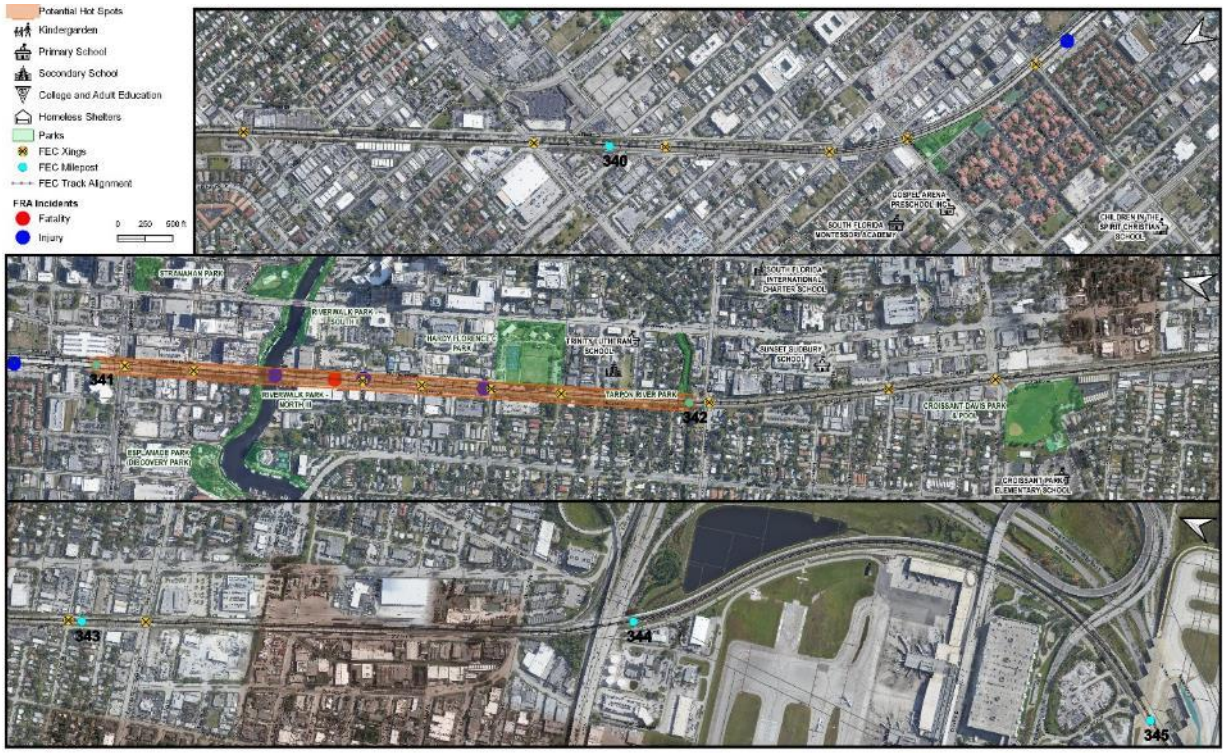


Figure 14: Example Overview Maps

Neighborhood Design

Neighborhood design has an impact on trespassing. Roadway configuration can encourage trespassing across the railroad as homes and neighborhoods have been built along the corridor without access points to destination nodes such as shopping centers, schools, and recreation facilities. Most of the housing along the corridor is either configured in cul-de-sacs or has grid patterns with dead-end streets. Both of these designs encourage trespassing.

The northern portion of the study corridor, with newer housing developments, tends to be configured in cul-de-sacs. For example, in Palm Beach Gardens (Figure 15), if someone lives at a house at the red star and wants to walk to the mall, to avoid trespassing on the railroad, they must walk to the entrance of the subdivision and along several major roads (blue line). It is more convenient for the person to trespass and walk directly across the railroad (red line).

It is common for neighborhoods to be laid out in a traditional grid pattern on the southern end of the corridor. This design was popular in older developments. Over time, grade crossings have been closed. Some of the roads, which used to be through routes for vehicles and pedestrians, are now blocked to cars, but pedestrians continue to use the route and trespass across the rail corridor. Over time, as seen in Lake Worth (Figure 16), well established trespassing trails have developed. While reducing the number of crossings reduces vehicle traffic risk, if no mitigation

measures are created for pedestrians, they will generate trespassing trails and continue to cross the tracks at that location.

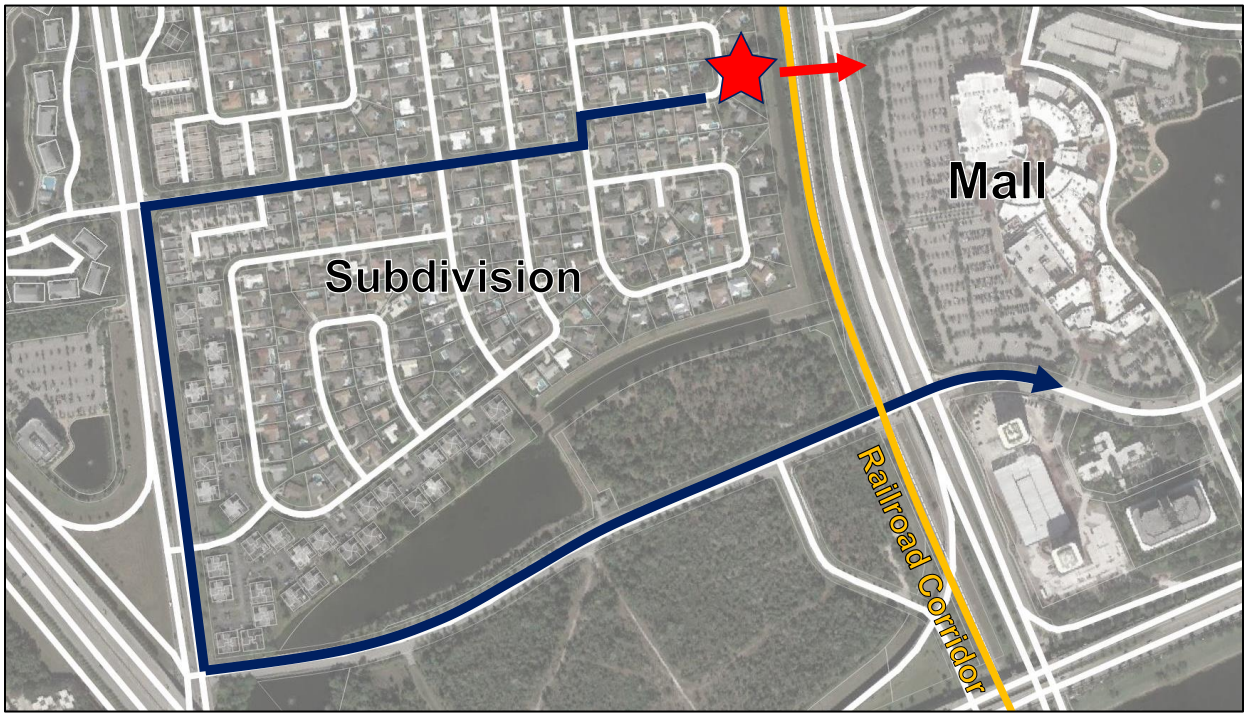


Figure 15: Trespassing Encouraged by Cul-de-Sac Road Design

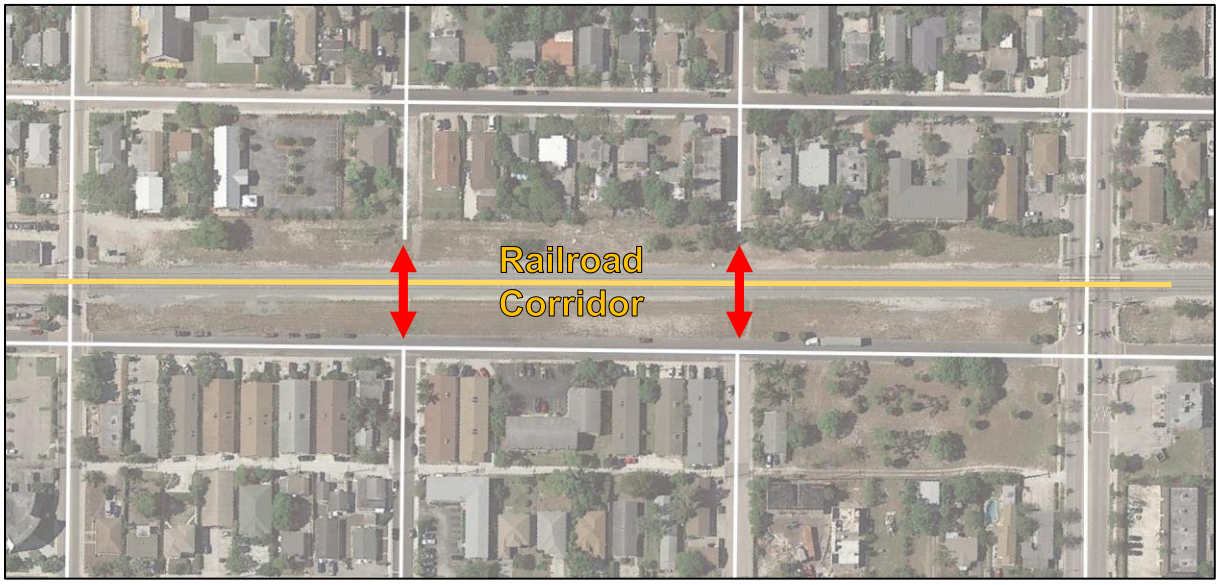


Figure 16: Trespassing Encouraged by Grid Pattern Road Design

Field Investigation

A six-week field investigation was conducted along the FECR corridor from Cocoa to Brightline's MiamiCentral Station, after the spatial analysis was completed. The field review focused on identifying and evaluating specific trespassing locations. Extensive photos and notes were taken at each location to provide evidence and analytical support. This information provides both the field investigator and the office designers with the knowledge to propose a trespass mitigation design for the area of concern. The investigation identified:

- Evidence of trespassing including:
  - Well-defined trails or footpaths carved out by trespassers
  - Vegetation clearings, trash and other items indicating homeless encampments and general loitering
  - Vandalism, including graffiti and broken fences
- Locations and condition of existing fencing
- Changes in the corridor due to the Brightline project that may influence trespassing
- Observed trespassing
- Dead-end streets and cul-de-sacs
- Potential origin-destination pairs

03

Project Evaluation Methodology

Determination of Mitigation Methods

After completing the field investigation, a team consisting of a transportation safety and security civil designer, landscape architect, and civil engineers reviewed the trespassing evidence. For each trespassing location, the following criteria were incorporated into the design of each mitigation strategy:

- Evaluates the root causes of trespassing to develop designs that resolve, not move, the issue.
- Provides low impact to nearby property owners.
- Has devices that are concealed, and tamper and theft resistant.

Where possible, the least disruptive and lower-cost options were selected. Some locations where weaker deterrents are recommended may develop new trespassing trails. These locations should be reevaluated with more robust barriers and impediments installed.

Proposed Engineering Mitigation Methods

Mitigation methods proposed in this project include;

Sidewalks

Sidewalks provide a clear, defined path for pedestrians. Sidewalks coupled with other mitigation methods or a grade crossing will channelize pedestrians from trespassing trails to safe crossings locations along the railroad corridor.

Pedestrian Grade Crossings

Pedestrian grade crossings can be at-grade with a fully automatic pedestrian crossing consisting of pedestrian gates, bells, and flashing lights, or grade-separated. Pedestrian crossings are safer alternatives that allow for crossing at a location while informing pedestrians of oncoming trains. Pedestrian crossings must follow the Manual on Uniform Traffic Control Devices (MUTCD) and host railroad standards. It is recommended that new pedestrian grade crossings be used when there is evidence of a well-established trespassing path, long distances to any existing crossings, and robust origin-destination pairs.

Figure 17: Pedestrian Crossing on SunRail[18]

Physical Barriers

Physical barriers are the primary method that physically restrict access to the railroad corridor. The deterrents can be fences, walls, or other barriers that limit access or channelize pedestrians to safer pedestrian crossings. When used correctly, one study found that fencing or landscaping

[18] Image sourced from wiki commons

reduced trespassing by over 90%[19]. Fences can be placed along the right-of-way to limit access onto or across the corridor or on bridges to discourage loitering.

Barrier types that are harder to cut and climb, or have better aesthetics, tend to have a higher cost to design and construct. The selection of the cost-effective physical deterrents depends on the location and frequency of the trespassing.

Any obstruction must be placed far enough from the centerline of the track so that it does not interfere with train operations and set back from at-grade crossings to prevent any reduction in vehicle sight distance. The conceptual designs placed the barriers, where possible, along the railroad property line minimizing impacts to FECR. However, in some locations this would require the removal of existing vegetation that provides a privacy and trespassing barrier. If designs advance, the fencing locations should be reevaluated to, when possible, ensure minimum impacts to adjacent property owners.

For this study, the different types of physical barriers proposed are:

Vehicle Barriers: Vehicle barriers include guardail, bollards or curbs used to deter vehicle encroachment along the corridor. While they do not provide an effective barrier to pedestrian trespassing, it is effective at the end of dead-end streets and prevents vehicles from parking on the right-of-way. These barriers should only be used when there is no evidence of pedestrian trespassing or a clear origin-destination pair.

Figure 18: Guardrail and Bollard Barriers

Vegetation: A solid barrier of vegetation provides a low-cost, easy to maintain, aesthetically pleasing method to deter trespassing. The vegetation should remain below eye level as not to create visible barriers that would hide criminal behavior or trespassing. While the species of vegetation will need to be determined at each location based on existing vegetation and soil type, a common vegetation barrier is Viburnum Suspensum (Figure 19). Viburnum is a shrub type common in South Florida, follows CPTED principles, and provides the characteristics required for a barrier.

Figure 19:
Viburnum Suspensum

When first planted, there will be gaps between the plants that trespassers can create a trail through. Combining the vegetation with low-cost fencing will discourage trespassing during the initial installation, and once the foliage is fully established, the vegetation will block the fencing from being vandalized. In this study, except where noted, a “vegetation

[19] Silla, A. and Luoma, J., 2011. Effect of three countermeasures against the illegal crossing of railway tracks. Accident Analysis & Prevention, 43(3), pp.1089-1094.

barrier" combines vegetation with FDOT Type A fencing. While vegetation requires some ongoing maintenance, due to the low cost and aesthetics, a vegetation barrier is the preferred trespassing barrier for this study.

Decorative Fencing: Decorative fencing provides a visibly appealing barrier to the railroad corridor. This type of fencing, often found around homes, tends to be shorter so that it does not block sightlines. While this type of fence can easily be climbed over, it can be placed in urban areas where there is a short distance to an existing at-grade crossing, populated areas, and insufficient space for vegetation. This study's preferred decorative fencing is residential grade 4 ft. aluminum fencing (Figure 20).

Figure 20:
4 ft. Aluminum Fencing

Chain Link Fencing: Chain link fencing provides a common barrier to properties and along the railroad corridor. While chain link fencing is one of the cheaper fencing types to install, it is also the easiest to cut and climb over and is not visibly appealing. Chain link fencing can either be 6 ft. (FDOT Type B) or 3 ft. tall fencing. The higher fencing makes it more challenging to climb, while the lower fence is a lower cost and less visibly intrusive barrier in more public areas. Chain link fencing should be placed where a deterrent is needed, and the risk of being cut is low (Figure 21).

Figure 21:
Chain Link Fencing

Hardened Fencing: Hardened fencing is designed to be difficult to climb or cut. This fencing is best utilized in high-traffic trespassing areas where there are visible signs of repeated trespassing or evidence that existing fencing has been cut or climbed over. Hardened fencing can look similar to chain link fencing (Figure 22), or can have decorative steel with masonry posts (Figure 8). While hardened fencing is the most effective barrier type, it is the most expensive.

Figure 22:
Hardened Fencing

Bridge Fencing: Bridge fencing provides deterrant to trespassers loitering on bridges.

Vehicle or Pedestrian Gates: Gates provide railroad corridor access for authorized railroad personel while deterring trespassing. Gates can be less secure than fencing and should be used only when necessary. The gates aestheics should match the neighbooring fencing or barriers installed along the corridor.

Camera Monitoring

This system uses video monitoring paired with additional messaging to provide a deterrent. Multiple variations are proposed for use with this project:

Standalone Camera: A camera installed to gather data about existing trespassing. The cameras are supported by artificial intelligence (AI) algorithms that can detect trespassing and provide useful data and metrics that include recording the quantity and type of incidents. The system can be integrated with local law enforcement if desired to provide real-time observation of the corridor, stations, at-grade crossings, or other vital areas.

Motion Actuated Camera with Speakers: A camera installed that integrates the camera detection algorithms with speakers. When trespassers are detected, speakers project a prerecorded message. The camera and integrated AI algorithms can more accurately detect trespassers than basic motion sensors to make the location feel more surveilled by reducing false positive triggers. Using cameras also allows for data collected or transmission of live video feed to local law enforcement. This system is best used on railroad bridges to discourage trespassing or loitering.

Motion Actuated Camera with Speakers and Lights: A camera installed that integrates camera detection algorithms with lighting and speakers. When trespassers are detected, speakers project a prerecorded message. At night, lights are activated to reveal the trespassing activity to deter any congregating and support law enforcement. The camera and integrated AI algorithms can more accurately detect trespassers than basic motion sensors. Using cameras also allows for data collected or transmission of live video feed to local law enforcement. This system is best installed at underpasses to discourage loitering and trespassing.

This study does not provide plans for integration of the AI cameras into a back-office or supervisory system. Each installation might have a different responsible party, including FECR dispatching, Brightline operations, or local law enforcement. Supervisory and back-office monitoring and alerts improve trespassing detection effectiveness as the system allows for real-time response to potentially dangerous situations. However, even without a supervisory system, the AI cameras are superior to current camera data collection methods.

Signage

Anti-trespassing signs or suicide crisis signage installed at strategic locations provide a passive method to reduce trespassing or collisions with trains. Anti-trespassing signage was shown in one study to reduce trespassing by 30%[20], and crisis signage has been shown to be effective on bridges and other locations. End of roadway object markers (MUTCD OM4-1) warn against someone accidentally driving onto the tracks and are

Figure 23:
Anti-Trespass Signage

20 Savage, I. Research in Transportation Economics: Railroad Economics. Volume 20(1), pages 199-224. Amsterdam: Elsevier Science, 2007.

used extensively in Central Florida. However, signs only lessen the actions of those who abide by rules and are not aware that trespassing is prohibited.

Right-of-Way Maintenance

FECR Maintenance-of-Way (MOW) personnel maintain the corridor and the track structure. Keeping the railroad right-of-way well maintained provides a deterrent to repeated trespassing events and increases the rail system's desirability. The following should be done to deter trespassing:

- Graffiti Removal – dissuades taggers from entering the right-of-way and tagging the columns or abutments of overpasses because of the prompt removal of graffiti.
- Debris Removal – address the homeless encampments with area social services and regularly remove trash and debris after conferring with law enforcement.
- Vegetation Management – keeps trees, grass, and other vegetation trimmed to increase visibility for law enforcement while deterring loitering and encampments.

Other engineering control methods that are not proposed in this report but may prove effective at deterring trespassing include;

Rail Lighting Warning System

This warning system proposed initially in the CFRC SRRT study is an innovative lighting arrangement installed on the outside web of the rail (on the field side), alerting trespassers that a train is approaching. It is not an automatic trespasser detection system but rather a warning system installed in areas where origin-destination trespassing occurs. An audible system can also accompany it. The system is non-vital, independent of the track signal system, and does not identify or prevent trespasser entry to the corridor.

Anti-Trespass Panels

Anti-trespass panels make walking almost impossible because of the panel's surface profile. The panels prevent access where fencing is infeasible or ineffective, including at the ends of at-grade crossings and station platforms[21]. However, the panels make it more difficult for authorized personnel to access the corridor.

Figure 24: Anti-Trespass Panels

Non-Engineering Mitigation Methods (Education and Enforcement)

Engineering solutions alone cannot solve trespassing. While outside the scope of this report, non-engineering methods that include the other two "E's (education and enforcement) of FDOT and Operation Lifesaver's Three-E's program also reduce the risk of trespassing and suicides along

[21] http://restrail.eu/toolbox/spip.php?article106

a railroad corridor. Several methods that discourage trespassing by altering public perception on the danger of trespassing include;

Public Outreach

Public outreach is a critical part of any effort to reduce trespassing. Engaging property owners, nearby businesses, and other potential origin and destination draws along the corridor can increase awareness of risks. Any action needs to be undertaken with care so that the outreach is not encouraging the behavior it is seeking to reduce.

Suicide Prevention Training

Railroad personnel and local law enforcement should undergo training to manage potential suicidal contacts. Recently, training programs have been enhanced to specifically assist law enforcement with recognizing and managing potential suicidal behavior.

Develop Homeless Encampment Control Plan

Homeless encampments can put the individuals at risk of being hit and killed by trains, and their encampments present aesthetic, environmental, and health concerns. However, often barriers and other engineering controls cannot reduce the risk. The homeless encampments are sometimes found on the trackside of existing walls and vegetation.

The most effective means of removing homeless encampments and the trespassing risk is a multistep approach, starting with outreach and, ultimately, removing any trespassing individuals. A plan should be developed to outline the procedure taken when there is an encampment or individual on the right-of-way. The plans result from the cooperation of the railroad, local law enforcement, and mental health professionals providing solutions that treat the individuals who are homeless with dignity.

A plan should include the following:

- Outreach
- Collaboration with local social services to remove personal property
- Relocation and health services for people experiencing homelessness
- Maintenance program for grubbing and vegetation removal
- Continued enforcement

Examples of Effective Mitigation

Stuart (MP 261.2 to MP 261.8)

The City of Stuart has installed several methods that reduce trespassing across the railroad. The city has built a path and boardwalk that goes under the railroad (Figure 25, photo 1), providing access to the park from the west side and a pleasant path along the St. Lucie River. The deterrent (fencing) and channelization (path) discourage individuals from crossing the tracks at an unsafe location. Further south, there is the 4 ft. aluminum fencing on one or both sides of the track through downtown Stuart (Figure 25, photo 2). This design discourages pedestrians from taking shortcuts and encourages using the many existing at-grade crossings in the area.

Figure 25: Trespassing Mitigation in Stuart, FL

Figure 26: Map of Trespassing Mitigation in Stuart, FL

Boca Raton (MP 321.5 to MP 321.9)

The Boca Business Center in Boca Raton planted hedges between the parking lot and the railroad corridor south of Yamato Rd. This location has industrial and warehouse buildings on both sides of the railroad with no strong origin-destination pairs. The area makes trespassing less likely and is an excellent example of vegetation used as a trespassing barrier (Figure 27).

Figure 27: Vegetation in Boca Raton, FL

Deerfield Beach (MP 327.0 to MP 328.0)

In 2020, Deerfield Beach installed hardened fencing between Hillsboro Blvd. and 10th St., where two prior trespassing fatalities occurred. The decorative hardened fencing provides a barrier to trespassing. A parallel sidewalk channelizes pedestrians to the existing grade crossings (Figure 28).

Figure 28: Decorative Hardened Fencing in Deerfield Beach, FL

Aventura (MP 352.1 to MP 353.5)

Vegetation has been used to provide a trespassing and visual barrier between the roadway and railroad corridor along Biscayne Blvd. in Aventura. A mix of vegetation is used that grows to different heights to provide a complete barrier while not creating hidden locations that could draw loitering or homeless activity (Figure 29). The tall bushes in the back provide visual barriers, but others are trimmed near the ground to prevent hidden spaces. Shorter vegetation is used to prevent anyone from moving through the gaps. The vegetation is a lower height as it approaches at-grade crossings to avoid line-of-sight issues.

Figure 29: Vegetation in Aventura, FL[22]

Project Cost Estimation

An estimate was developed for each location. Unit costs were collected using the following preferred order:

1. FDOT 12 Month Moving Market Area Averages (Jan 2020 to Jan 2021)
2. FDOT Annual Statewide Averages
3. Industry Estimates

[22] Image sourced from wiki commons

Unit costs by FDOT location is included in Appendix B.

When any construction is being performed within 25 ft. of the railroad tracks a roadway worker in charge (RWIC) or flagman is required. The RWIC is a railroad employee that communicates with the train crews. When a train approaches a project location, the train crew must obtain permission from the RWIC to pass through the area. This procedure protects both the workers from the train traffic, and the passing trains from any damage to the tracks that could occur during construction. For this project, it is assumed that an RWIC costs $1,000 per day. The required flagging duration is estimated based on the project elements. It is assumed that a construction crew requires one day of flagging per 200 ft. of fencing, two days per camera installation, and three days per pedestrian grade crossing.

A lump sum of $25,000 was included for each proposed camera installation for back office integration. This includes the cost for each location to calibrate the AI algorithms and integrate into the back office host for video retention. The initial set up of the back office is estimated to be a one-time cost of $125,000, independent of the number of installations. This cost was not included in the individual project estimates.

Three cost multipliers were assumed: maintenance of traffic (MOT), mobilization, and contingency (Table 2). MOT was determined based on the potential impact to nearby roadways.

Table 2: Additional Cost Estimation Factors

Cost	Amount
Maintenance of Traffic	5% to 15% of base cost
Mobilization	10% of base cost
Contingency	20% of base cost

Designs and cost estimates do not include operating and maintenance costs, or anti-trespassing signs and red retroreflective signs. Detailed estimates are in Appendix C.

04

Summary of Findings and Recommendations

Summary of Findings

A description of each project's findings and proposed mitigations can be found in Section 05. Projects are named based on the milepost limits of the project. These mileposts are based on the publicly available FRA's GIS data and may deviate slightly from official FECR railroad mileposts. The selected projects at each location were determined based on the field review and observed trespassing in Fall 2020. Trespassing patterns can change over time due to many factors, including construction, road closures, and local enforcement. As such, the trespassing locations and projects selected should not be considered as an exhaustive list.

The field investigation and analysis found 69 locations along the FECR corridor where engineering controls could deter trespassing. A total of 32 locations are between Cocoa and the current northern terminus of Brightline in West Palm Beach, with the remaining 37 to the south between West Palm Beach to Miami. Traveling from north to south, amount of development and population along the rail corridor and the density of locations increased. Palm Beach County, ranging from Tequesta to Boca Raton, has the highest number of locations, approximately one every 1.6 miles.

Table 3: Project Summary Statistics by County

County	# of Projects	Length of Corridor (mi)	Barrier[1] (LF)	Pedestrian Crossings	Camera Installations	Estimated Cost
Brevard	13	42.2	15,652	1	4	$1,645,000
Indian River	2	21.3	1,600	-	1	$162,000
St. Lucie	2	21.8	3,761	-	-	$219,000
Martin	8	25.6	11,288	1	-	$841,000
Palm Beach	30	45.8	48,148	1	6	$3,741,000
Broward	11	24.6	33,904	3	1	$2,579,000
Miami-Dade	3	13.7	3,543	-	1	$386,000
TOTAL	**69**	**195.0**	**117,836**	**6**	**13**	$9,573,000

1 Total length of proposed fencing and vegetation. Some locations have fencing on both sides of the corridor.

Projects were placed on either FECR or public property, with any exceptions noted in the designs. The proposed projects have not been reviewed by FECR, Brightline, or local municipalities. As projects progress to final design, local stakeholders should be consulted to ensure the most effective mitigation.

Projects in this study are not prioritized and are independent of one another. Any, or all, of the projects can be selected for final design based on the willingness of local partners, frequency of trespassing, and project cost.

Proposed Trespassing Mitigation Projects

Projects and proposed mitigation solutions are listed below:

Table 4: Trespassing Mitigation Project Summary

#	Project Name	Mitigation Description	City	County	Cost Estimate
1	MP 171.3 to MP 171.5	Hardened Fencing	Cocoa	Brevard	$233,000
2	MP 171.8 to MP 172.1	Hardened Fencing	Cocoa	Brevard	$121,000
3	MP 173.1 to MP 173.2	Aluminum Fencing	Cocoa	Brevard	$30,000
4	MP 174.2 to MP 174.7	Chain Link Fencing	Cocoa	Brevard	$53,000
5	MP 184.5	Motion Actuated Camera with Speakers and Lights	Palm Shores	Brevard	$82,000
6	MP 186.3 to MP 186.6	Vegetation Barrier	Melbourne	Brevard	$48,000
7	MP 187.0 to MP 187.4	Vegetation Barrier	Melbourne	Brevard	$57,000
8	MP 187.9 to MP 188.3	Vegetation Barrier	Melbourne	Brevard	$52,000
9	MP 194.0 to MP 194.5	Aluminum Fencing and Motion Actuated Camera with Speakers	Melbourne	Brevard	$238,000
10	MP 196.2 to MP 196.3	Chain Link Fencing	Palm Bay	Brevard	$19,000
11	MP 197.5 to MP 198.2	Pedestrian Crossing, Chain Link Fencing, Bridge Fencing, Motion Actuated Camera with Speakers	Palm Bay	Brevard	$518,000
12	MP 208.4 to MP 208.6	Vegetation Barrier	Micco	Brevard	$23,000
13	MP 212.0	Motion Actuated Camera with Speakers	Micco	Brevard	$171,000
14	MP 212.4	Motion Actuated Camera with Speakers	Sebastian	Indian River	$111,000
15	MP 230.9 to MP 231.2	Vegetation Barrier, Vehicle Gate	Florida Ridge	Indian River	$51,000
16	MP 238.8 to MP 239.0	Guardrail	St. Lucie Village	St. Lucie	$23,000
17	MP 241.1 to MP 241.8	Chain Link Fencing and Aluminum Fencing	Fort Pierce	St. Lucie	$196,000
18	MP 256.1 to MP 256.3	Aluminum Fencing	Jensen Beach	Martin	$61,000
19	MP 256.8 to MP 257.0	Chain Link Fencing	Jensen Beach	Martin	$41,000
20	MP 260.9	Vehicle Gate	Stuart	Martin	$18,000
21	MP 261.7 to MP 261.9	Aluminum Fencing	Stuart	Martin	$36,000
22	MP 264.8 to MP 264.9	Pedestrian Crossing, Hardened Fencing and Chain Link Fencing	Stuart	Martin	$272,000
23	MP 271.4 to MP 272.0	Vegetation Barrier	Hobe Sound	Martin	$81,000
24	MP 272.1 to MP 272.6	Chain Link Fencing	Hobe Sound	Martin	$99,000

#	Project Name	Mitigation Description	City	County	Cost Estimate
25	MP 273.4 to MP 273.7	Pedestrian Crossing and Chain Link Fencing	Hobe Sound	Martin	$233,000
26	MP 281.0 to MP 281.6	Vegetation	Tequesta	Palm Beach	$78,000
27	MP 282.5 to MP 282.9	Hardened Fencing and Motion Actuated Camera with Speakers	Jupiter	Palm Beach	$183,000
28	MP 283.7 to MP 283.8	Chain Link Fencing	Jupiter	Palm Beach	$17,000
29	MP 292.8 to MP 292.9	Chain Link Fencing	Lake Park	Palm Beach	$12,000
30	MP 293.8 to MP 294.3	Hardened Fencing	Riviera Beach	Palm Beach	$173,000
31	MP 294.5 to MP 294.8	Hardened Fencing and Chain Link Fencing	Riviera Beach	Palm Beach	$26,000
32	MP 296.5 to MP 297.1	Hardened Fencing	West Palm Beach	Palm Beach	$143,000
33	MP 298.5 to MP 298.7	Hardened Fencing and Motion Actuated Camera with Speakers and Lights	West Palm Beach	Palm Beach	$187,000
34	MP 301.4 to MP 301.6	Hardened Fencing, Guardrail and Vehicle Gate	West Palm Beach	Palm Beach	$30,000
35	MP 301.7 to MP 302.0	Hardened Fencing, Chain Link Fencing, and Motion Actuated Camera with Speakers and Lights	West Palm Beach	Palm Beach	$158,000
36	MP 302.7 to MP 303.2	Vegetation Barrier and Guardrail	West Palm Beach	Palm Beach	$102,000
37	MP 304.0 to MP 304.1	Bridge Fencing and Motion Actuated Camera with Speakers	West Palm Beach	Palm Beach	$146,000
38	MP 304.5 to MP 305.0	Hardened Fencing and Guardrail	Lake Worth	Palm Beach	$191,000
39	MP 305.0 to MP 305.5	Hardened Fencing, Vegetation, and Guardrail	Lake Worth	Palm Beach	$479,000
40	MP 305.7 to MP 306.1	Hardened Fencing and Aluminum Fencing	Lake Worth	Palm Beach	$24,000
41	MP 306.5 to MP 307.1	Hardened Fencing	Lake Worth	Palm Beach	$247,000
42	MP 307.1 to MP 307.6	Vegetation Barrier	Lake Worth	Palm Beach	$97,000
43	MP 307.6 to MP 309.2	Vegetation Barrier and Sidewalk	Lantana	Palm Beach	$364,000
44	MP 311.5 to MP 311.8	Guardrail	Boynton Beach	Palm Beach	$41,000
45	MP 312.2 to MP 312.6	Chain Link Fencing and Aluminum Fencing	Boynton Beach	Palm Beach	$93,000
46	MP 312.6 to MP 312.9	Hardened Fencing, Chain Link Fencing, Vegetation, and Sidewalk	Boynton Beach	Palm Beach	$71,000
47	MP 313.1 to MP 313.3	Vegetation Barrier	Boynton Beach	Palm Beach	$23,000

#	Project Name	Mitigation Description	City	County	Cost Estimate
48	MP 313.5 to MP 313.7	Chain Link Fencing and Camera	Boynton Beach	Palm Beach	$153,000
49	MP 315.1 to MP 315.4	Hardened Fencing	Delray Beach	Palm Beach	$20,000
50	MP 315.6 to MP 316.0	Vegetation Barrier	Delray Beach	Palm Beach	$74,000
51	MP 316.3 to MP 316.7	Pedestrian Crossings and Decorative Fencing	Delray Beach	Palm Beach	$282,000
52	MP 317.1 to MP 317.3	Chain Link Fencing and Sidewalk	Delray Beach	Palm Beach	$53,000
53	MP 317.4 to MP 317.8	Hardened Fencing and Chain Link Fencing	Delray Beach	Palm Beach	$206,000
54	MP 317.9 to MP 318.0	Vegetation and Sidewalk	Delray Beach	Palm Beach	$44,000
55	MP 325.4 to MP 325.6	Vegetation Barrier	Boca Raton	Palm Beach	$24,000
56	MP 328.0 to MP 328.5	Decorative Fencing	Deerfield Beach	Broward	$351,000
57	MP 332.4 to MP 332.8	Aluminum Fencing	Pompano Beach	Broward	$89,000
58	MP 334.1 to MP 334.7	Pedestrian Crossings, Hardened Fencing, and Sidewalk	Pompano Beach	Broward	$623,000
59	MP 334.9	Bridge Fencing and Motion Actuated Camera with Speakers	Fort Lauderdale	Broward	$147,000
60	MP 339.5 to MP 339.6	Hardened Fencing	Fort Lauderdale	Broward	$44,000
61	MP 341.3 to MP 342.0	Chain Link Fencing and Vegetation Barrier	Fort Lauderdale	Broward	$128,000
62	MP 342.8 to MP 343.1	Hardened Fencing and Vegetation Barrier	Fort Lauderdale	Broward	$26,000
63	MP 345.5 to MP 345.9	Vegetation Barrier	Dania Beach	Broward	$65,000
64	MP 346.2 to MP 346.9	Pedestrian Crossing and Hardened Fencing	Dania Beach	Broward	$367,000
65	MP 347.1 to MP 349.8	Aluminum Fencing and Vegetation Barrier	Hollywood	Broward	$475,000
66	MP 349.8 to MP 351.3	Aluminum Fencing and Vegetation Barrier	Hallandale Beach	Broward	$264,000
67	MP 351.3 to MP 351.9	Aluminum Fencing and Vegetation Barrier	Aventura	Miami-Dade	$114,000
68	MP 356.1 to MP 356.2	Aluminum Fencing	North Miami	Miami-Dade	$154,000
69	MP 364.5 to MP 364.9	Hardened Fencing and Motion Actuated Camera with Speakers and Lights	Miami	Miami-Dade	$118,000

Bridge Fencing

Railroad bridges are inviting locations to trespassers. They are shortcuts across waterways and inviting places to loiter on for recreation including, sitting, fishing, or swimming. Fencing on both sides limits the ability to use the bridge for these purposes and reduces the trespassing threat (Figure 30). Bridges that would benefit from bridge fencing and are not incorporated in another project are listed in Table 5.

Figure 30: FDOT Standard Bridge Fencing

Table 5: Proposed Bridge Fencing Projects

Waterway	Milepost	Bridge Length (ft)
Taylor Creek	240.1	202
Earman River	291.9	174
Canal C15	319.6	166
North Fork Middle River	337.9	194
South Fork Middle River	338.6	188

Vehicle Encroachment Locations

In many locations, the only barrier between the FECR rail corridor and a parallel roadway is a grassy area. Additional barriers would protect the railroad corridor from vehicle access. This is likely to occur at the following locations;

Figure 31: Parked Vehicle Encroachment

- At dead-end streets, motorists may not know that they have reached the end of a roadway and could continue onto the railroad tracks.
- When a road is parallel to the tracks, and the road gets close to the tracks, it would be easy for a vehicle to end up on the tracks during a motor vehicle accident or unwittingly drive too close to the tracks.
- In parking lots, a vehicle or truck backing up could foul the tracks and be struck by a passing train.

Guardrail or other barriers should be considered to protect against any incursion from a vehicle. When the roadways or parking lots are close enough to be adjacent to the railroad ballast, a curb should be installed to provide a visual edge to the roadway.

When vehicles are parked on railroad property, FECR should contact the local owners informing them of this trespassing. FECR can either contact law enforcement to remove the motor vehicles, remove the vehicles themselves and then install a fence, a guardrail, bollards, or seek entering into a lease agreement with the owner with a requirement to build a barrier. Table 6 includes a list of the observed vehicle encroachment locations not included in the other projects. While there

are indications these locations have been used repeatedly, these locations are based on this study and may change over time.

Table 6: Observed Vehicle Encroachment Locations

City	County	Reason	Milepost	Length (ft)
Vero Beach	Indian River	Dead End Street	221.5	25
Vero Beach	Indian River	Parked Vehicles	225.0	110
Boca Raton	Palm Beach	Parked Vehicles	324.4	250
Boca Raton	Palm Beach	Parked Vehicles	324.8	200
Deerfield Beach	Broward	Parked Vehicles	327.7	50
Pompano Beach	Broward	Parallel Roadway	331.2	250
Oakland Park	Broward	Parked Vehicles	336.3	350
Fort Lauderdale	Broward	Parked Vehicles	342.2	400
El Portal	Miami-Dade	Parked Vehicles	360.1	140
Miami	Miami-Dade	Parked Vehicles	362.2	350
Miami	Miami-Dade	Parked Vehicles	363.1	250

Homeless Encampments

While homeless encampments create a risk of trespassing, often barriers and other engineering controls cannot reduce the risk. The homeless encampments are sometimes found on the trackside of a fence or wall. Clearing and preventing encampments is difficult. FECR should develop a clear Homeless Encampment Control Plan. The plan should outline how to clear and prevent loitering on the corridor. The following locations were identified as having encampments but no engineering control mitigation was identified (Table 7).

Table 7: Other Observed Homeless Encampments

City	Milepost Range
Cocoa	MP 170.5 to MP 170.8
Fort Lauderdale	MP 338.5 to MP 338.8

General Corridor Recommendations

In addition to individual projects, FECR should implement the following general best practices to discourage trespassing. These recommendations not only apply to the FECR corridor but all rail corridors in the State of Florida.

1. **New "No Trespassing" signs should be installed at the end of all bridges, dead-end streets, paths, and at each quadrant of a grade crossing.**

   Figure 32: Anti-Trespass Signage Along FECR Corridor

   The signs make it clear to the community that the corridor is not public property. While signs only reduce the actions of those who abide by the rules and are not aware that trespassing is prohibited, they provide a low-cost deterrent. Signs can be installed if other mitigation methods are not selected. Installing signs along the property line and at dead-end streets can define the corridor similar to a fence or vegetation.

   Existing signs that have become illegible or damaged should be replaced. New signs show active management and patrolling of the corridor.

2. **Streets that dead-end into the corridor should have guardrail and red diamond end of roadway object markers with reflectors (MUTCD OM4-1).**

   
   Figure 33: Dead-End Reflective Signs

   When a street has a dead-end onto the railroad corridor, there should be a clear delineation between the public street and the private railroad corridor. Guardrail and reflective signs provide a barrier for both vehicles and pedestrians. Trespassing trails often develop between dead-end streets, and where stronger deterrents are not needed, signs provide a passive method to discourage this trespassing (Figure 33).

3. **All property owners along the corridor should be contacted with clear requirements.**

   Many homes with backyards next to the railroad corridor have gates or gaps in vegetation that provide access to the corridor. Letters should be sent outlining existing laws, responsibilities as landowners, safety information, and requirements to keep any gates locked. The letters can help gain the support of the adjacent landowners to prevent trespassing.

   Numerous examples of vehicles were also observed parking on the right-of-way. The existence of legal agreements between the vehicle owners and FECR to permit use of FECR's property was not investigated as part of this study. If no agreement exists, letters should be sent to nearby property owners informing them of the violation, possible towing of the vehicles, and if it is a desirable option to the railroad provide information to lease access. Any agreement should include requirements for the installation of a barrier between vehicles and tracks.

4. **Advocate for local ordinances that require fences to be built and maintained with any new developments or walking paths along the corridor.**

   As new developments are built along the corridor, it increases the risk of trespassing. Local building codes should include the requirement for fencing or other barriers to be constructed as part of the new development adjacent to the railroad. The same codes should apply when sidewalks or pedestrian pathways are built adjacent to the railroad to provide a barrier between pedestrians and trains.

5. **Right-of-way environment should be maintained.**

   Any graffiti and vegetation overgrowth should be removed. Removing graffiti and adding other mitigation methods provide the image of a managed and patrolled area, reducing the area's desirability for trespassers. Overgrown vegetation provides shelter for the individuals who are homeless and space for illicit behaviors; removing it can remove those individuals from the dangers of the rail corridor.

Figure 34: Graffiti along Corridor

6. **Develop a process for railroad employees to notify officials of trespassing activity.**

   When inspectors and other railroad employees encounter evidence of trespassing, homeless encampments, or other concerns, there needs to be a process for reporting and documentation. The information then needs to be forwarded to the proper responsible authority for corrective action, such as track maintenance, railroad police, or local law enforcement, after being reported to the railroad's dispatching center.

05

Trespassing Findings, Proposed Projects, and Cost Estimates by Location

Project Findings and Narratives Overview

A short description of findings and recommended mitigation methods are provided for each project. The map for each project includes key landmarks, grade crossings, existing trespassing mitigation, and indications of trespassing (Figure 35). Any locations referred to in the narratives but not shown in the maps are referred to by milepost. Full limits of each project, and conceptual designs of the proposed mitigation projects can be found in the design sheets referenced in the header.

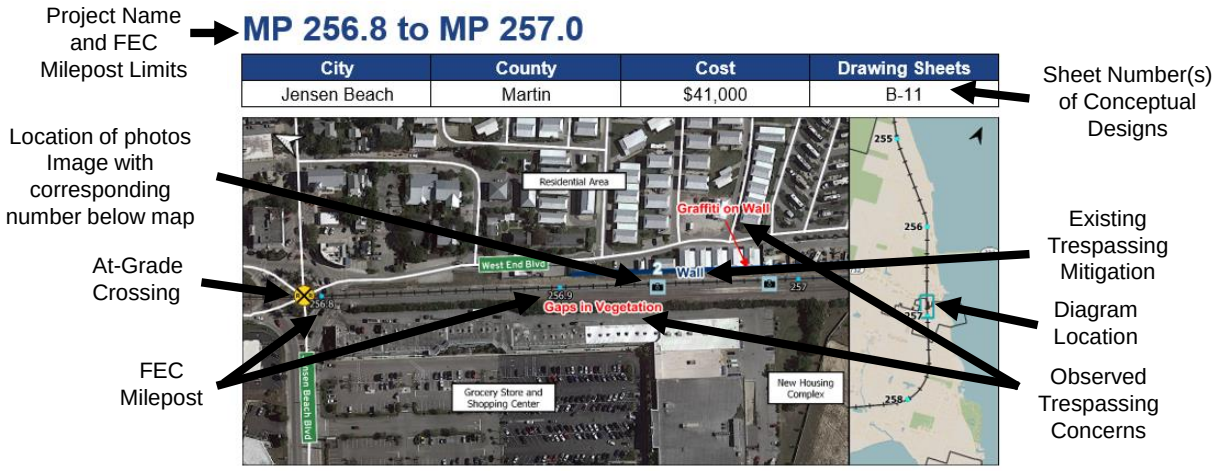


Figure 35: Information shown in Project Narratives Maps

MP 171.3 to MP 171.5

City	County	Cost	Drawing Sheets
Cocoa	Brevard	$233,000	A-3

In Cocoa, several signs of repeated trespassing exist just north of Dixon Blvd. A defined trespassing path connecting the Hillsdale Dr. dead end to the parking lot of a restaurant along Cocoa Blvd. (US 1) is well defined (photo 1). Additionally, between the path and Dixon Blvd., numerous gaps occur in the existing fencing and vegetation between the homes and right-of-way along the corridor (photo 2). There was a trespassing fatality at this location in February 2020.

Several restaurants are across the railroad tracks from this neighborhood. To reach the trespassing destinations, trespassers are taking the shortcut across the railroad tracks instead of walking to the front of the community and then along Dixon Blvd. Pedestrians are also walking along the right-of-way to Dixon Blvd. to reach various retail stores (e.g. Big Lots, Dollar General, and Tractor Supply) across the street.

Recommendation: Construct **8 ft. hardened fencing** along the west side of the right-of-way from just north of Hillsdale Dr. to Dixon Blvd. because of the strong draw from the large differences in travel distance and gaps in existing residential fencing.

MP 171.8 to MP 172.1

City	County	Cost	Drawing Sheets
Cocoa	Brevard	$121,000	A-4

In Cocoa, evidence of repeated trespassing exists along Plaza Pkwy. A defined trespassing path was found connecting the residential area to commercial buildings along Cocoa Blvd. (US 1) (photo 1). In the wooded area, an existing homeless encampment was identified (photo 2).

Evidence suggests trespassers are walking across the tracks to reach a gas station. Two fast-food restaurants now closed could become an additional draw to trespassing if they were to reopen. There is existing fencing on the east side of the right-of-way north and south of the path and encampment.

Recommendation: Construct **8 ft. hardened fencing** along the east side of the right-of-way, connecting the existing fencing across from Crestview Rd. (not shown, MP 171.83) to the fencing along the residential area. The fencing limits access across the corridor from the neighborhood and the homeless encampment.

MP 173.1 to MP 173.3

City	County	Cost	Drawing Sheets
Cocoa	Brevard	$30,000	A-5

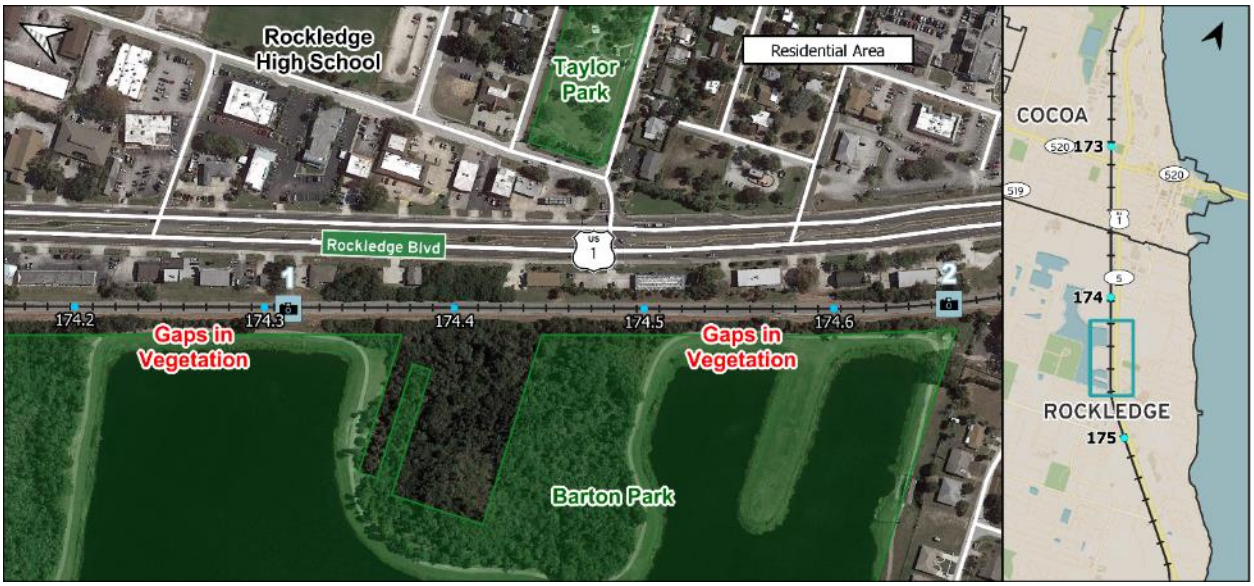
In Cocoa, a well-defined footpath crosses the tracks at the dead end street, Stone St. In 2007, the grade crossing was closed, and the crossing panels and sidewalks were removed. However, a trespassing trail developed in its place between the remaining sidewalks on either side of the crossing (photos 1 and 2).

Like many closed crossings along the corridor, pedestrian movements are unaffected by the grade crossing's closure, and trespassers continue to use the area for crossing the tracks. Since Stone St. does not have a crosswalk at Cocoa Blvd. (US 1), any trespasser coming from across Cocoa Blvd. is either jaywalking or has to walk to King St.

Recommendation: Construct **4 ft. aluminum fencing** from King St. to Lemon St. The barrier will divert trespassing away from Stone St. to King St. Since there is an available crossing location nearby, 4 ft. fencing can provide sufficient deterrence without the adverse visual effects of a less appealing chain link fence.

MP 174.2 to MP 174.7

City	County	Cost	Drawing Sheets
Rockledge	Brevard	$53,000	A-6 & A-7



In Rockledge, the railroad runs along Barton Park. A gravel path was constructed that runs along the perimeter of the pond and approaches the railroad right-of-way. Along the right-of-way, multiple gaps were discovered in the vegetation (photos 1 and 2).

It is unclear if the gravel path is used to maintain the retention pond or for recreational use. If runners and bikers use the path, an individual may enter the railroad property. The park provides an inviting destination for trespassers, and the gaps in the vegetation provide easy access to the park from the residential area and Rockledge High School.

While no entrenched trespassing paths were found, improvements are planned for Barton Park that includes a boat ramp and picnic shelters. These new additions to the park increase the desire to trespass.

Recommendation: Construct **6 ft. chain link fencing** between the railroad and the park. The barrier will block access to the right-of-way by trespassers traveling to or from the park.

MP 184.5

City	County	Cost	Drawing Sheets
Palm Shores	Brevard	$82,000	A-8

In Palm Shores, a bridge has recently been completed at the Pineda Cswy. to replace the previous grade crossing. Currently, no evidence of trespassing was observed, possibly because the construction has just been completed.

Despite lack of trespassing evidence, underpasses are draws for loitering and illegal activities. The darkness under the causeway is out of sight from observers and encourages potential illicit behavior.

Recommendation: Install **motion actuated cameras with speakers and lights** under the bridge to discourage congregating and use of the location as a trespassing destination.

MP 186.3 to MP 186.6

City	County	Cost	Drawing Sheets
Melbourne	Brevard	$48,000	A-9

The neighborhood in Melbourne has access to the railroad right-of-way. During the field investigation, the area between the corridor and homes was found to have standing water and tall grass that temporarily discourages access to the corridor.

In addition to random access or encroachment on the tracks, the forested area on the west side of the tracks is a potential destination for trespassers. This forested area, just to the south of the stream, is currently being developed by the City of Melbourne into a water retention pond. It is unknown what impact this will have on trespassing.

Recommendation: Install a **vegetation barrier** between the backside of the homes and the right-of-way. Vegetation is a sufficient barrier due to the weak origin-destination pairs and potential homeowners' aesthetic concerns. Due to the construction underway for the future retention pond, no project is recommended for the trespassing trail.

MP 187.0 to MP 187.4

City	County	Cost	Drawing Sheets
Melbourne	Brevard	$57,000	A-10 & A-11

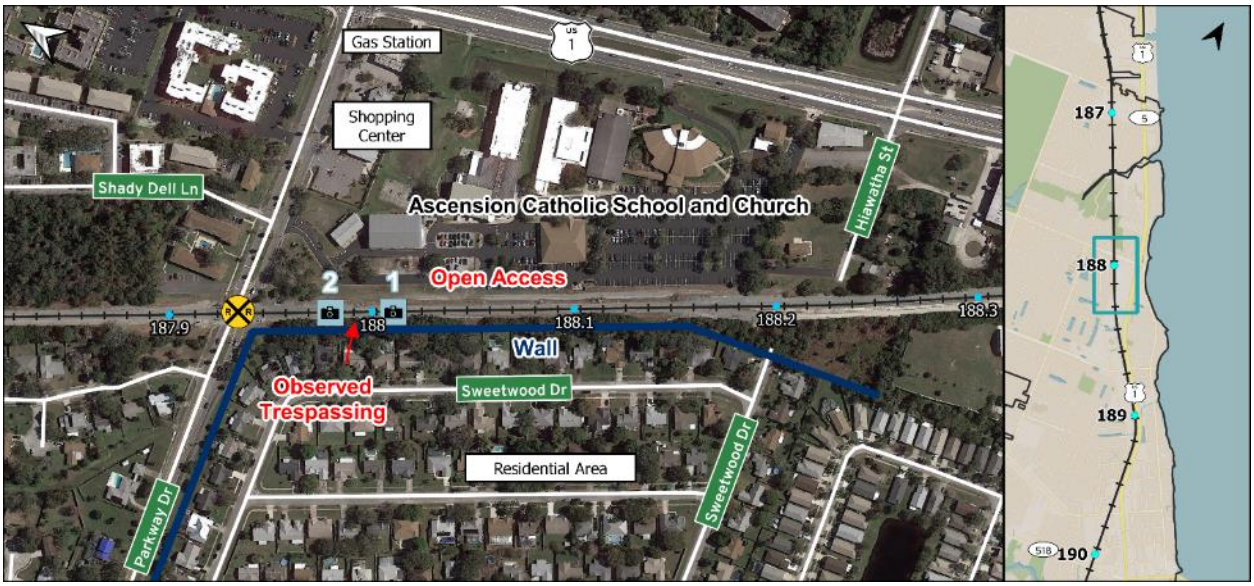
A residential neighborhood in Melbourne has open access to the railroad right-of-way (photo 1). A playground was identified that is fenced from the rail corridor; however, the remaining area is a grassy field that provides no barrier between the housing development and the railroad.

The field review found no evidence of trespassers, but it is essential to define the railroad corridor to deter accidental access or encroachment on the tracks.

Recommendation: Install a **vegetation barrier** along the right-of-way to discourage access to the corridor. The proposed vegetation would stay below eye level, not disturbing the maintained visual look that the neighborhood has created.

MP 187.9 to MP 188.3

City	County	Cost	Drawing Sheets
Melbourne	Brevard	$52,000	A-12 & A-13



Just south of Parkway Dr. in Melbourne is a housing development and Ascension Catholic School and Church. A trespasser was observed climbing over the wall separating the neighborhood from the railroad right-of-way. Disregard for staying out of the right-of-way was found and photographed in the form of a ladder to make it easy for someone to climb over the wall (photo 1).

To the east on Parkway Dr. are a several retail stores. These retail establishments are a draw for trespassers as the entrance to their neighborhood is farther to the west and requires a much longer walk. Ascension Catholic School located on the east side of the corridor, is open to the railroad right-of-way with no barriers allowing for eastern access from the rail corridor to the school.

Recommendation: Install a **vegetation barrier** to separate the school and railroad tracks. Considering the existing wall is already in place and actively by-passed between the neighborhood and the right-of-way, it is further recommended that letters be sent to all landowners along the right-of-way providing information about trespassing and requiring the removal of the ladder.

MP 194.0 to MP 194.5

City	County	Cost	Drawing Sheets
Melbourne	Brevard	$238,000	A-14 & A-15

Like other downtown areas along the corridor, downtown Melbourne has open access across the tracks with five at-grade crossings, shopping, bars, and restaurants on both sides. There are designated parking spots along Depot Dr., which runs parallel to the railroad. Construction workers at the Crane Creek Bridge reported of repeated trespassing over the bridge.

Since research has shown that intoxication is a leading cause of trespassing casualties, the local restaurants and bars are an area of concern. While there is a high density of at-grade crossings for people to cross safely, there is parking on the along the tracks, and people can be drawn to take shortcuts across the right-of-way.

Recommendation: Construct **4 ft. aluminum fencing** on west side of the corridor from Strawbridge Ave. to New Haven Ave, and on both sides from New Haven to the bridge. Since there is a high density of grade crossings, trespassers can be channelized to existing crossings without the need for substantial barriers. To discourage trespassing across the Crane Creek bridge, it is recommended that **motion actuated cameras with speakers** be installed on both sides of the bridge.

MP 196.2 to MP 196.3

City	County	Cost	Drawing Sheets
Palm Bay	Brevard	$19,000	A-16

In Palm Bay, Robert J. Conlan Blvd. is grade-separated from the FECR corridor (photo 1). Graffiti was observed on the support columns (photo 2). A new apartment complex was also identified in the southwest quadrant. Both a wall and fence separate the property from the railroad. In 2018, a trespasser used the underpass to try and jump aboard to moving train. Underpasses are draws for loitering and illegal activities. The darkness, out of sight from observers, encourages potential illicit behavior.

Recommendation: Construct **6 ft. chain link fencing** on the west side of the corridor to limit access to the underpass. The fencing provides a stronger deterrent than a camera as it physically blocks access to the bridge. It is also recommended that any graffiti should be painted over, and the surrounding area be cleared of any debris and vegetation overgrowth.

MP 197.5 to MP 198.2

City	County	Cost	Drawing Sheets
Palm Bay	Brevard	$518,000	A-17 – A-19

Multiple areas of trespassing concern were identified on either side of the Turkey Creek bridge in Palm Bay. Pollack Park is located on the north side of the creek and has a playground and pavilion separated from the railroad by only sparse vegetation (photo 1). Easy access to the bridge was also found over Turkey Creek. On the south side of the creek is Goode Park, which has dense vegetation between the railroad and the park; however, there are gaps with clear trespassing evidence (photo 2). There is also evidence of a homeless encampment in a wooded area at the south end of Goode Park (photo 3). Fordham Rd., on the west side of the railroad corridor, dead ends with a sidewalk that leads to a trespassing trail across the tracks (photo 4).

The nearest existing grade crossing to Fordham Rd. is Port Malabar Rd. (not shown, MP 198.4), 0.3 miles to the south. Due to the road configuration a pedestrian traveling from Goode Park saves nearly 0.7 miles by cutting across the tracks at Fordham Rd. This trespassing has multiple potential origin-destination pairs, including Goode park and shopping destinations along Dixie Hwy. (US 1).

Recommendation: Construct **6 ft. chain link fencing** on the west side of the corridor along Pollak Park and from the south end of the bridge to just south of Fordham Rd. to divide the parks from the railroad. The fencing on the south bank will channelize trespasses to a new **pedestrian crossing** at Fordham Rd. Adding **motion actuated cameras and speakers**, and **bridge fencing** can discourage illegal trespassing on and across the bridge.

MP 208.4 to MP 208.6

City	County	Cost	Drawing Sheets
Micco	Brevard	$23,000	A-20

The backyards of homes on the west side of the corridor have open access to the railroad tracks in Micco.

While the field review found no evidence of trespassers crossing the corridor; it is essential to define the railroad corridor to deter accidental access or encroachment on the tracks.

Recommendation: Install a **vegetation barrier** along the west side of the right-of-way to discourage access to the corridor. The vegetation defines the corridor and limits access to the tracks. Since there are no visible signs of trespassing, no strong deterrent is required.

MP 212.0

City	County	Cost	Drawing Sheets
Micco	Brevard	$171,000	A-21

MP 212.4

City	County	Cost	Drawing Sheets
Sebastian	Indian River	$111,000	B-3

The railroad bridge across the Saint Sebastian River is a means for trespassers to cross the river. The only other bridge in the area is at US 1, which is 0.5 miles away from the south end of the bridge and 1.3 miles away from the bridge's north side. The US 1 bridge has a pedestrian walkway but no sidewalks on either side.

FECR's bridges are a location for high-frequency trespassing and trespassing casualties since trespassers use the bridges to cross or loiter. If a train approaches when someone is on the bridge, there is often no place of safety for the person to reach. The Saint Sebastian River bridge is over 1,500 ft. long, making it a high risk for trespassers.

Recommendation: Install **motion actuated cameras with speakers** at each end of the bridge to discourage trespassing over the bridge.

MP 230.9 to MP 231.2

City	County	Cost	Drawing Sheets
Florida Ridge	Indian River	$51,000	B-4 & B-5

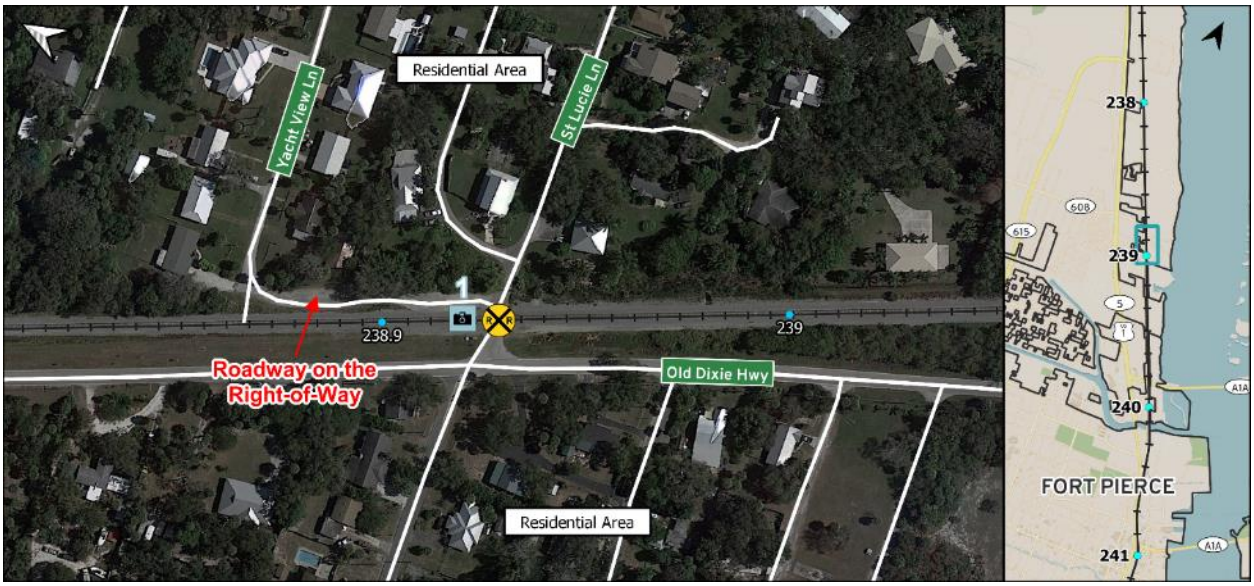
Dense vegetation at this location limits access to the corridor north of 9th St. in Florida Ridge, but gaps have been made that lead to clear trespassing trails across the tracks and through an industrial property (photo 1). Potential trespassing destinations include a shopping center with a grocery store on the east side of US 1 and a gas station along Old Dixie Hwy. Residential areas exist east and west of the corridor. The industrial property has doorways leading directly onto the railroad right-of-way.

The trespassing trails have clear origin-destination pairs. One trespassing trail leads from a residential area located to the west of the tracks to US 1 , a shopping center, and grocery store on the east side. The second trespassing trail connects a gas station and shopping center on the west side of the corridor with a residential area across US 1 on the east side (photo 1).

Recommendation: Install a **vegetation barrier** along the west side of the right-of-way to supplement the existing vegetation. Except for the gaps, the existing vegetation provides a barrier against trespassing. The additional mitigation will discourage trespassing across the tracks and channelize pedestrians to the existing at-grade crossing at 9th St.

MP 238.8 to MP 239.0

City	County	Cost	Drawing Sheets
St. Lucie Village	St. Lucie	$23,000	B-6



In St. Lucie Village, on the east side of the corridor, a dirt road connecting St. Lucie Ln. and Yacht View Ln. has been established on the railroad right-of-way. The only other access to Yacht View Ln. is from Indian River Dr. (not shown), 0.2 miles to the east of the rail corridor, adding 0.4 miles to the trip of the home nearest to the tracks.

Recommendation: **Guardrail** is recommended along the right-of-way line to prevent vehicle access to the corridor. It is unknown if there is an existing lease between FECR and the property owners north of St. Lucie Ln. Due to the extra distance that a vehicle would have to take if the route was blocked, a lease of the roadway area should be considered with guardrail installed between the road and the tracks.

MP 241.1 to MP 241.8

City	County	Cost	Drawing Sheets
Fort Pierce	St. Lucie	$196,000	B-7 – B-9

Like other downtown areas along the corridor, Downtown Fort Piece has open access across the tracks with three at-grade crossings, shopping, bars, and restaurants on both sides (photo 1). A cinder block structure with evidence of trespassing is present north of the downtown area (photo 2). Additionally, south of Orange Ave. is a sidewalk with open access to the railroad corridor. In 2019, there was a trespassing fatality in this area.

Since research has shown that intoxication is a leading cause of trespassing casualties, the local restaurants and bars are an area of concern. While there is a high density of at-grade crossings for people to cross safely, there is parking on the east side of the tracks, and people can be drawn to take shortcuts across the right-of-way.

Recommendation: Construct **4 ft. aluminum fencing** along both sides of the corridor from Moore's Creek to just south of Citrus Ave. (not shown, MP 241.8) between crossings. North of Moore's Creek to Avenue D (not shown, MP 241.1), **6 ft. chain link fencing** is recommended along the west side of the corridor. Demolishing the cinder block structure will eliminate a location for trespassers to loiter.

MP 256.1 to MP 256.3

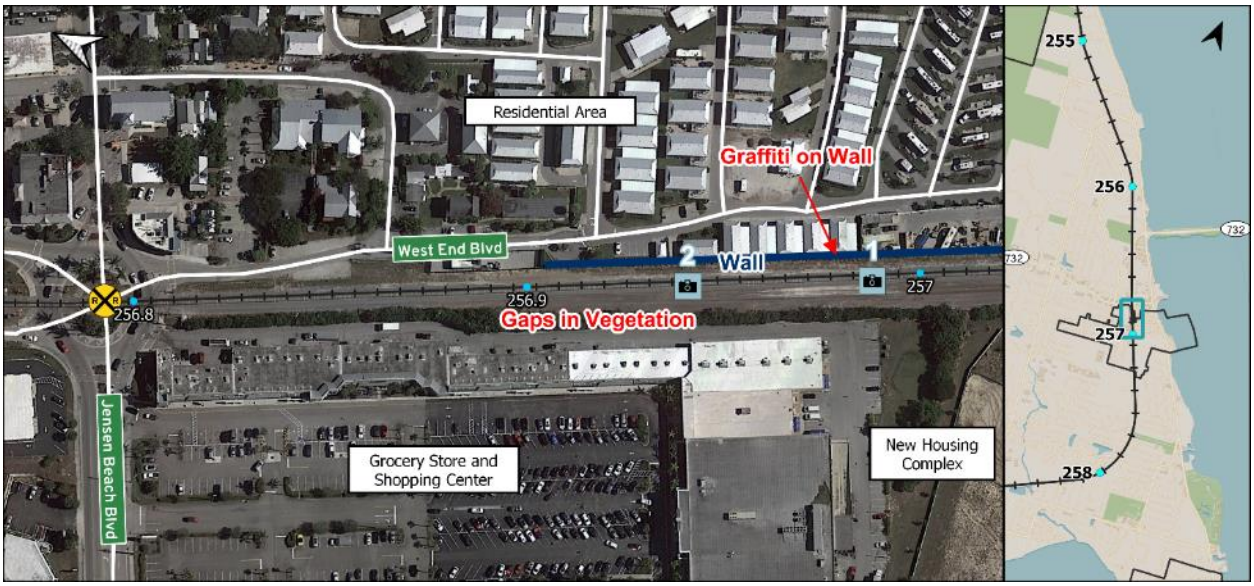
City	County	Cost	Drawing Sheets
Jensen Beach	Martin	$61,000	B-10

An RV park straddles both sides of the corridor in Jensen Beach. Several parked vehicles are encroaching the railroad right-of-way. Dense vegetation exists on both sides of the corridor on the properties adjacent to the RV Park. Historical observations have identified this location as a trespassing hot spot.

Recommendation: Construct **4 ft. aluminum fencing** on both sides of the corridor next to the RV park. The fencing will channelize trespassing to the existing grade crossing and prevent vehicles encroaching on the right-of-way. The local property owner should be contacted to inform them of the current encroachment and warn them of potential enforcement.

MP 256.8 to MP 257.0

City	County	Cost	Drawing Sheets
Jensen Beach	Martin	$41,000	B-11



In Jensen Beach, graffiti was found on a wall separating the FECR corridor from a mobile home / RV park (photo 1). A shopping center is on the other side of the tracks and is a draw for trespassing. There are two gaps in the wall but are blocked by vegetation and a gate. The barrier between the shopping center and railroad consists of small trees and vegetation, but there are many gaps in the foliage (photo 2). Just to the south is a new housing complex under construction and more residential areas within walking distance of the shopping center.

The grocery store in the shopping center is also a destination for trespassing, especially from residential areas to the south. The graffiti is evidence that the shopping center area is a place of loitering.

Recommendation: Construct **4 ft. chain link fencing** from Jensen Beach Blvd. to the end of the shopping center to reduce the trespassing to the shopping center. It is recommended that the new housing development be responsible for installing their own fencing. If the fencing is not installed, the proposed fencing should be extended past the development. The graffiti should be removed promptly to discourage loitering in this area.

MP 260.9

City	County	Cost	Drawing Sheets
Stuart	Martin	$18,000	B-12

At the north bank of the St. Lucie River in Stuart, the corridor is open to Flagler Ave. allowing vehicles to access the right-of-way (photo 1). The location has a potential for loitering, but unauthorized vehicle access is the most likely form of trespassing.

Recommendation: Construct **4 ft. chain link fencing** from Flagler Ave. to the waterfront to limit access for vehicles and define the corridor. Since this location may be used by the railroad to access the corridor and bridge, a **vehicle gate** is suggested to discourage access to the railroad corridor by unauthorized vehicles.

MP 261.7 to MP 261.9

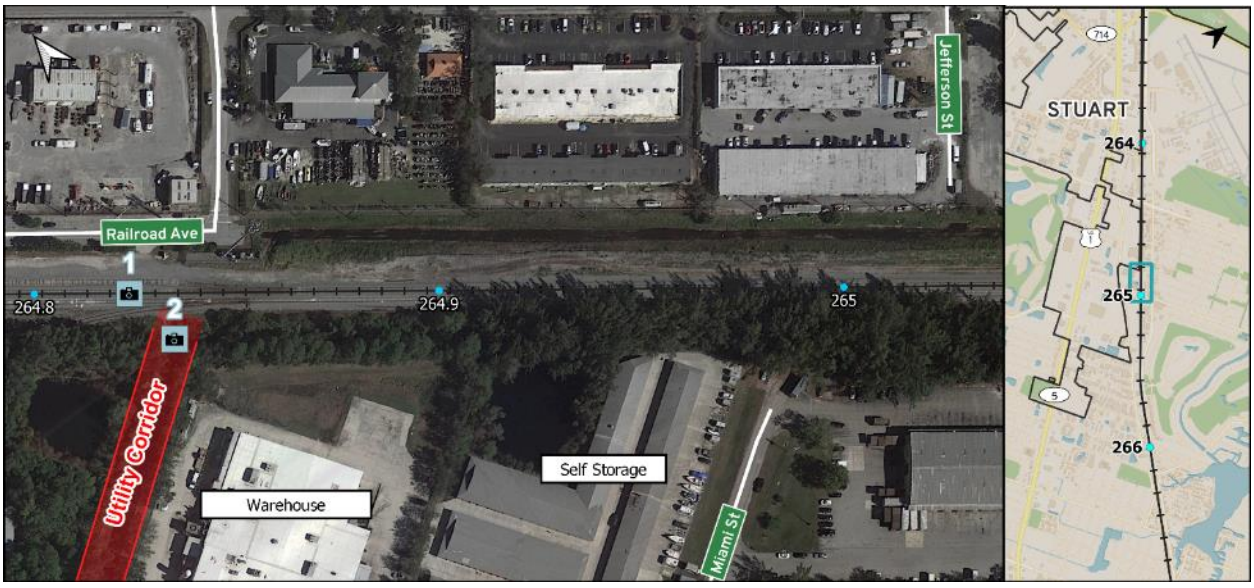
City	County	Cost	Drawing Sheets
Stuart	Martin	$36,000	B-13

In Downtown Stuart, a gap exists in the existing fencing allowing for open access to the railroad tracks (photo 1). Further north of the city, Stuart has provided a 4 ft. aluminum fence on both sides of the corridor that ends just to the south end of Kiwanis Park at 5th St. From 6th St. to 7th St., a 4 ft. chain link fence was installed, leaving a gap between 5th St. and 6th St.

Recommendation: Construct **4 ft. aluminum fencing** between 5th St. and 6th St. The proposed fencing will complete the barrier through downtown, discouraging people walking from the parking lot on the east side of the corridor to the commercial buildings on the west side.

MP 264.8 to MP 264.9

City	County	Cost	Drawing Sheets
Stuart	Martin	$272,000	B-14



Trespassing was observed, and a well-established trail was found along a utility corridor at Railroad Ave. in Stuart (photos 1 and 2). The path provides access from a neighborhood on the east side of the tracks to stores and places of employment along Federal Hwy. to the west (not shown).

The nearest crossings are Indian St .0.5 miles to the north and Seaward St. 1.6 miles to the south (not shown). Due to the large distances required to cross the railroad safely, it will be difficult to discourage trespassing at this location entirely. It is not feasible to install a pedestrian crossing across from Railroad Ave. in the existing trail location. There are four tracks and turnouts to non-signaled track, making it a high-risk area for traversing at-grade over the tracks.

Recommendation: Construct **8 ft. hardened fencing** at the end of the utility corridor is recommended to deter use of the exiting trespassing route. Add a new **pedestrian crossing** at Miami St. Trespassers will be channelized to the new crossing using a new **sidewalk** on Miami St. and along the corridor along with a **6 ft. chain link fence** from Railroad Ave. to Jefferson St.

MP 271.4 to MP 272.0

City	County	Cost	Drawing Sheets
Hobe Sound	Martin	$81,000	B-15 & B-16

The second main track construction has removed the vegetation between the residential neighborhood and the railroad tracks south of Crossrip Rd. (not shown, MP 271.4) in Hobe Sound. The construction disturbed any potential trespassing evidence (photo 1).

Without this vegetation, there is no barrier between the homes and the corridor. It is essential to define the railroad corridor to deter accidental access or encroachment on the tracks.

Recommendation: Install a **vegetation barrier** along the right-of-way from Crossrip Rd. to dense vegetation across from James Rd. (not shown, MP 272.0) to discourage access to the corridor. The proposed vegetation would stay below eye level so to create a maintained visual aesthetic and deter trespassing.

MP 272.1 to MP 272.6

City	County	Cost	Drawing Sheets
Hobe Sound	Martin	$99,000	B-17 & B-18

The second main track construction has removed the vegetation between the residential neighborhood and the railroad tracks across from William G. “Doc” Myers Park in Hobe Sound. The construction disturbed any potential trespassing evidence (photo 2).

The park is a potential location for trespassers crossing the railroad track. Without this buffer, there is no barrier between the homes and the corridor. It is essential to define the railroad corridor to deter accidental access or encroachment on the tracks.

Recommendation: Construct **6 ft. chain link fencing** along the east side of the corridor from the dense vegetation across from Highpoint Way to Pettway St. (not shown, MP 272.6). Since the park is a potential trespassing destination, vegetation is not considered a strong enough deterrent. The remaining vegetation will limit any aesthetic problems of the chain link fencing.

MP 273.4 to MP 273.7

City	County	Cost	Drawing Sheets
Hobe Sound	Martin	$233,000	B-19

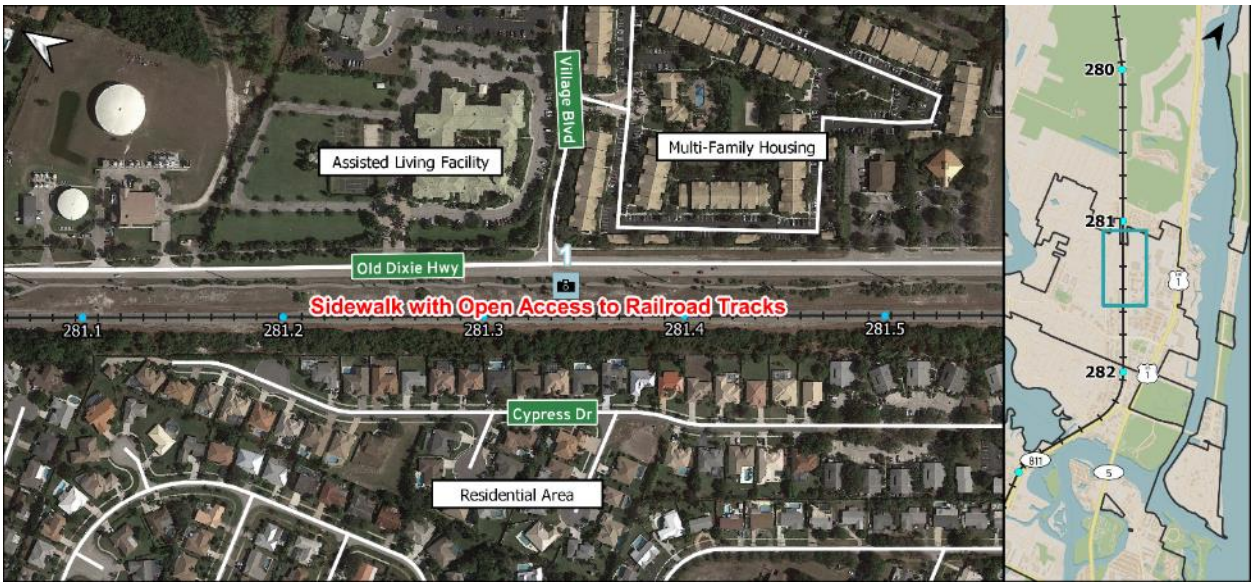
A trespasser was observed crossing the tracks on a well-defined trespassing trail (photo 1) near Kingsley St. in Hobe Sound. Further south, several gaps occur in the fencing along the east side of the corridor, but there is no other evidence of trespassing (photo 2). Open access also exists to the houses from the right-of-way. A Boys and Girls Club and a grocery store were identified on Lares Ave. south of Dixie Hwy. These establishments are trespassing destinations from the nearby neighborhoods.

The observed trespassing location is 0.9 miles from the nearest crossing to the north at Pettway St. and 0.5 miles from the nearest crossing to the south at Bridge Rd.

Recommendation: Construct **6 ft. chain link fencing** from Oleander St. to the dense vegetation south of Pine Cone Ln. (MP 273.7) to channelize trespassers to a new **pedestrian crossing** at Dixie Hwy. and Lares Ave.

MP 281.0 to MP 281.6

City	County	Cost	Drawing Sheets
Tequesta	Palm Beach	$78,000	B-20 – B-22



A walking trail has been built along Old Dixie Hwy. next to the railroad corridor in Tequesta. Mixed vegetation exists along the 0.6 of a mile-long trail, but does not discourage trespassing along the railroad.

Recommendation: Plant **vegetation**, matching the current style of plants along the trail to provide a barrier between the sidewalk and railroad tracks.

MP 282.5 to MP 282.9

City	County	Cost	Drawing Sheets
Jupiter	Palm Beach	$183,000	B-23

On the northside of the Old Dixie Highway bridge over the Loxahatchee River, a stairway provides access to the tracks from under the bridge (photo 1). The stairway was recently installed, and it is unknown if it provides access for railroad employees or was used during the construction of the second bridge track.

On the southside, trespassers are tagging the underpass. A clear path has also developed, leading from under the bridge to the tracks (photo 2). The underpass is accessible from Sawfish Bay Park on the south bank, providing access to the railroad as well.

Recommendation: Construct **8 ft. hardened fencing** to deter access between the tracks and the underpass on the south bank. Install **motion actuated cameras with speakers** at both end of the bridge to discourage trespassing on the bridge and accessing the track from under the roadway. It is further recommended that “No Trespassing” signage and chain be added at the ladder's base.

MP 283.7 to MP 283.8

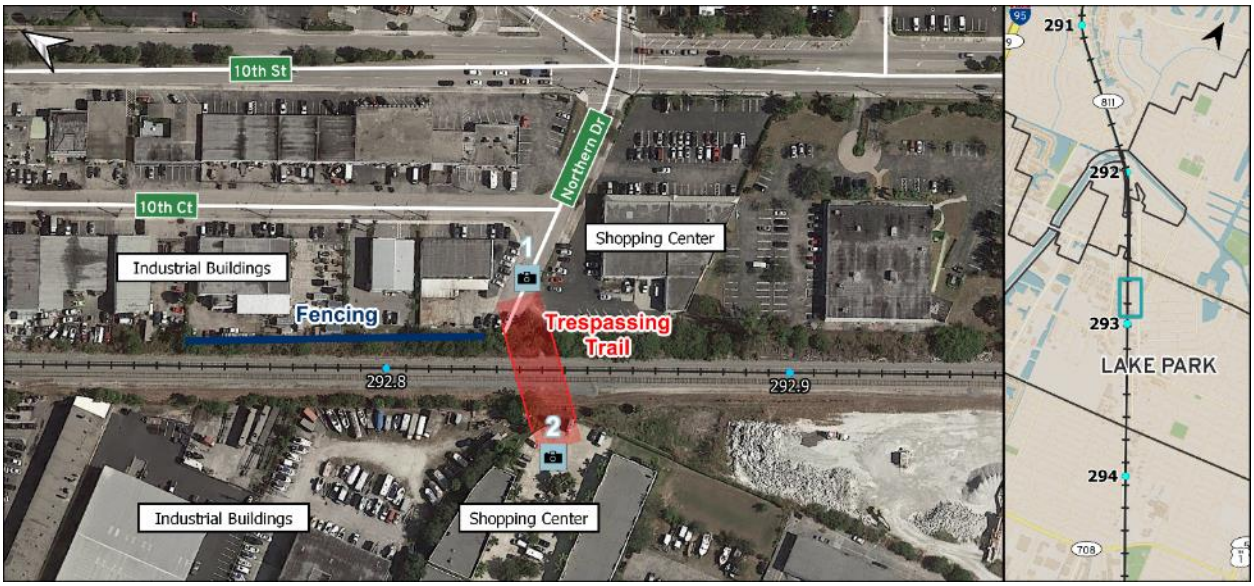
City	County	Cost	Drawing Sheets
Jupiter	Palm Beach	$17,000	B-24

A trespassing trail was found along Old Dixie Hwy. south of Indiantown Rd. in Jupiter. There are many trees and vegetation along the corridor blocking any access from Alt A1A. to the railroad tracks, but a gap exists where the trespassing trail has developed. A grocery store is located at the southeast corner of Indiantown Rd. and Alt A1A. The trespassing trail connects the residential area and the grocery store, shortening the walking distance by about 0.20 miles.

Recommendation: Construct **6 ft. chain link fencing** in the vegetation gap to channelize pedestrians to Indiantown Rd. where there is a grade crossing and crosswalk across Alt A1A.

MP 292.8 to MP 292.9

City	County	Cost	Drawing Sheets
Lake Park	Palm Beach	$12,000	B-26



A trespassing trail was found in Lake Park, connecting the dead-end of Northern Dr. to a shopping center.

The trespassing trail provides access to the industrial buildings and shopping centers on both sides of the tracks. The residential area on the east side of 10th St. is a potential origin for trespassing. The trail is 0.25 miles from the nearest existing grade crossing to the north at Northlake Blvd. (not shown, MP 292.6) and 0.4 miles from the nearest existing grade crossing to the south at Park Ave. (not shown, MP 293.3). The relatively short distance between grade crossings suggested minimal deterrent is required.

Recommendation: Construct **6 ft. chain link fencing** along the parking lot on the east side of the corridor south of Northern Dr. The fencing will block the gap in the vegetation and divert trespassers. Besides the trail, the right-of-way has dense vegetation that provides an effective barrier. The fencing will allow for the vegetation to grow, adding further deterrent.

MP 293.8 to MP 294.3

City	County	Cost	Drawing Sheets
Riviera Beach	Palm Beach	$173,000	B-27 & B-28

Multiple trespassing examples exist between Silver Beach Rd. (no shown, MP 293.7) and Blue Heron Blvd. (not shown, MP 294.5) in Riviera Beach, such as gaps in vegetation (photo 1), damaged fencing, (photo 2) and clear entrenched paths (photo 3).

There are strong origin-destination pairs from the residential area to the west of the tracks to a high school, public library, and small park on the east side. Well-defined paths and multiple cut fences make it clear that there has been a prolonged and repeated trespassing history.

Recommendation: Construct **8 ft. hardened fencing** on the east side of the corridor from Avenue K (not shown, MP 293.8) to the existing fencing at the industrial building near 29th St. The hardened fencing is recommended due to well-established trespassing trails, strong origin-destination pairs, and previously cut fencing. The trespassing will be channelized to Blue Heron Blvd. to the south.

The repeated trespassing and 0.75 miles between the grade crossings at Silver Beach Rd. and Blue Heron Blvd. make this location a candidate for a pedestrian crossing. However, there is no public access through the properties between Ave. J and the railroad. This location should be monitored, and if trespassing is not reduced, then property acquisition for an at-grade pedestrian crossing or pedestrian overpass is recommended.

MP 294.5 to MP 294.8

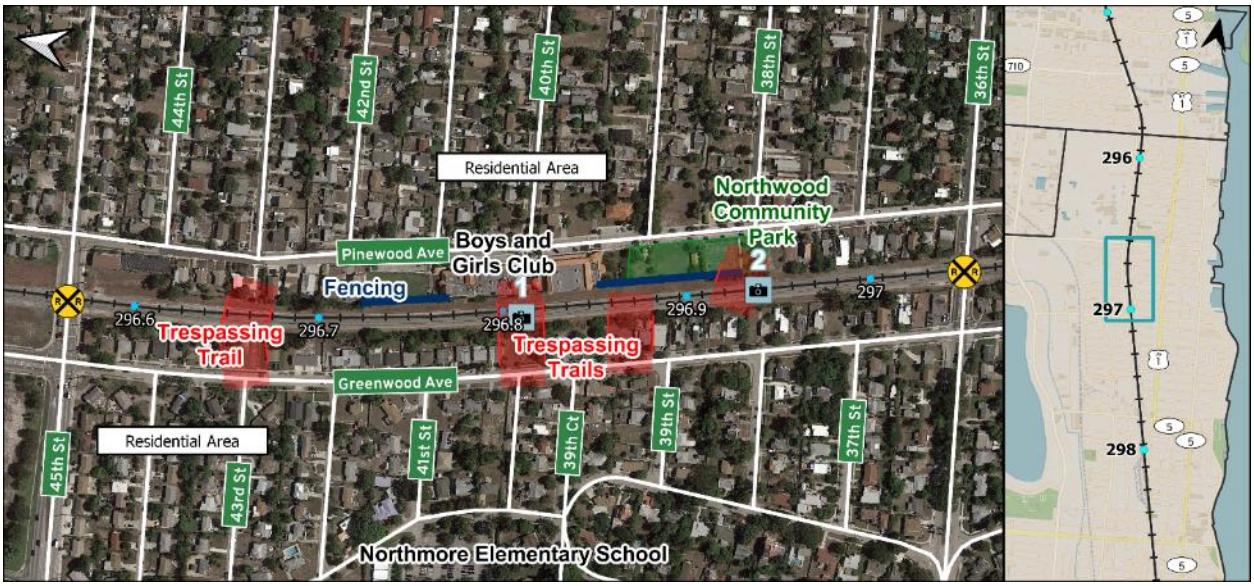
City	County	Cost	Drawing Sheets
Riviera Beach	Palm Beach	$26,000	B-29

The Wells Recreation Complex is directly adjacent to the railroad in Riviera Beach. The park is fenced along Blue Heron Blvd. and the railroad right-of-way except for the park's northwest corner (photo 1). At the south end of the park is a clear trespassing trail around the end of the fencing (photo 2).

Recommendation: Construct **6 ft. chain link fencing** at the corner of the park near the Blue Heron Blvd. grade crossing. The fencing should match the style around the rest of the park. This fencing will provide a separation between the park and the railroad. If access is needed, a gate can be added along Blue Heron Blvd. At the south end of the park, adding **8 ft. hardened fencing** connecting to the existing fence is recommended to stop trespassers from accessing the park via the railroad near 17th St.

MP 296.5 to MP 297.1

City	County	Cost	Drawing Sheets
West Palm Beach	Palm Beach	$143,000	B-30 & B-31



Multiple trespassing trails exist in this location between 45th St. and 36th St. in West Palm Beach. A Boys and Girls Club and Northwood Community Park were identified on the corridor's east side. Northmore Elementary School is west of the railroad corridor.

The trespassing trails are at dead-end streets or empty lots (photo 1). At the south end of Northwood Community Park is a sidewalk that ends at the corridor, encouraging pedestrians to trespass across it (photo 2). The Boys and Girls Club, park, and school are all clear destinations for trespassing across the tracks from origins such as the residential homes.

Recommendation: Construct **8 ft. hardened fencing** on the east side of the corridor between 45th St. and 36th St. The trespassing at this location is well established, making it likely that a chain link fence will be cut.

MP 298.5 to MP 298.7

City	County	Cost	Drawing Sheets
West Palm Beach	Palm Beach	$187,000	B-32

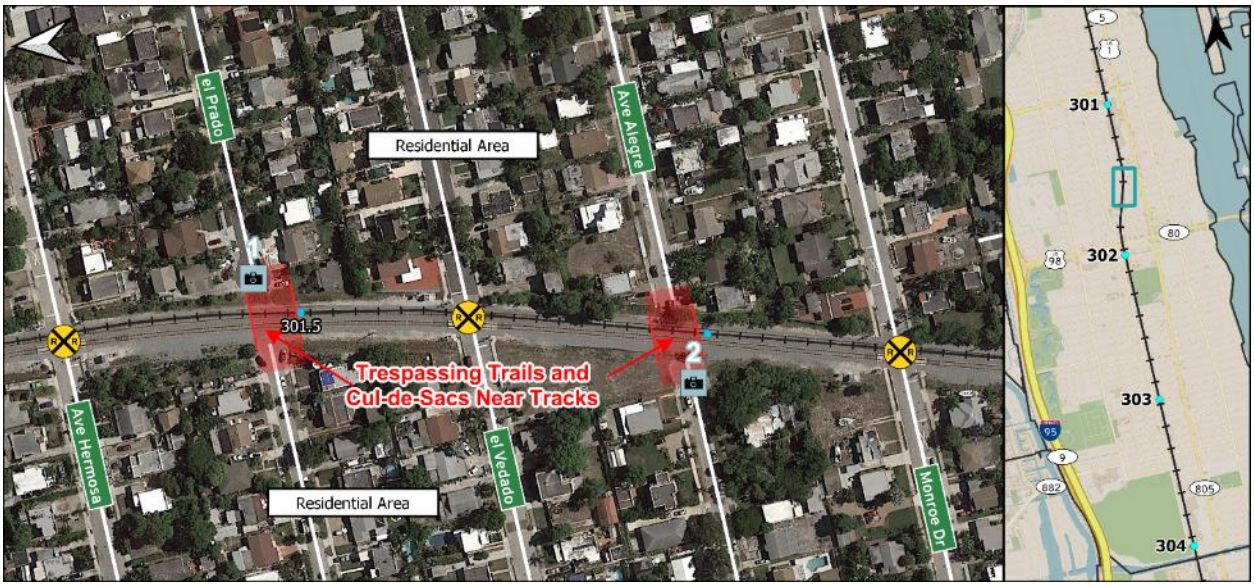
The Palm Beach Lakes Blvd. overpass in West Palm Beach has clear indications of trespassing. The east side of the corridor under the overpass has no barrier (photo 1). Graffiti was found on the walls under the overpass (photo 2). A block south of the overpass there are openings with clearly defined trails and observed trespassing (photo 3).

Palm Beach Lakes Blvd. has a pedestrian overpass to provide a safe alternative to trespassing. However, since access is not as direct as existing trespassing trail, the trespassing persists.

Recommendation: Construct **8 ft. hardened fencing** at the openings on the east and west side of the corridor to channelize pedestrians to the pedestrian overpass. The addition of **motion actuated cameras with lights** is recommended under the bridge to discourage loitering.

MP 301.4 to MP 301.6

City	County	Cost	Drawing Sheets
West Palm Beach	Palm Beach	$30,000	B-33



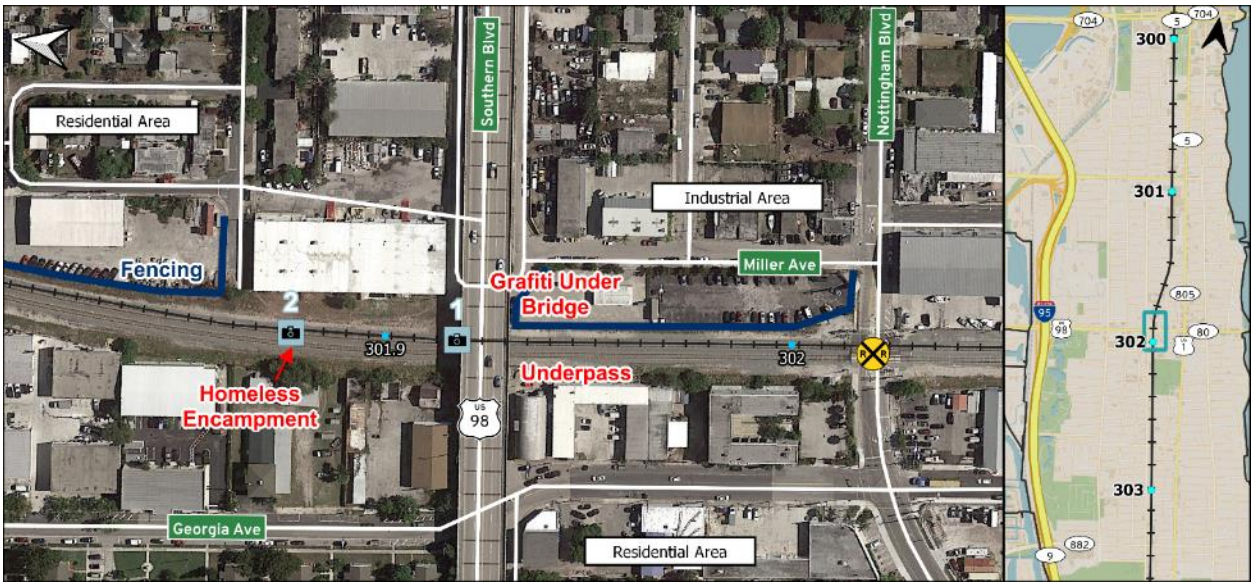
Ave. Alegre and el Prado in West Palm Beach have trespassing trails across the railroad from cul-de-sacs on the west side near the railroad tracks. The area on both sides of the tracks is residential, and every other road has a grade crossing.

The trespassing routes are well entrenched and the distance from the cul-de-sacs to the outside rail is less than 10 ft. Existing bollards were constructed at the end of the cul-de-sacs to prevent vehicles from driving directly onto the corridor but does not deter pedestrian trespassing.

Recommendation: Construct **8 ft. hardened fencing** on the east side of the corridor between existing fencing at the ends of El Prado and Ave. Alegre. **Guardrail** is recommended around the cul-de-sacs on the west side. If necessary, **vehicle gates** for FECR personnel should be added on the west side to preserve FECR vehicle access to the corridor.

MP 301.7 to MP 302.0

City	County	Cost	Drawing Sheets
West Palm Beach	Palm Beach	$158,000	B-34



The underpass at Southern Blvd. (US 98) in West Palm Beach is a trespassing source. These is evidence of homeless encampments (photo 2), graffiti on the bridge piers (photo 1), debris and trash. Between December 12, 2019, and Jan 28, 2020, three trespassing fatalities occurred within a tenth of a mile of the bridge.

The area under the bridge creates a location away from well-traveled areas for illicit activities. The vegetation is overgrown and the graffiti has was not removed when the field investigation was completed. This inattention encourages additional trespassing.

Recommendation: Construct **8 ft. hardened fencing** on the east side of the corridor under the bridge between the building to the north and the existing fencing to the south to remove access to this location. **6 ft. chain link fencing** should also be added along the west side of the right-of-way between Roseland Dr. (not shown, MP 301.7) and Nottingham Blvd. The graffiti, debris, and vegetation should be removed. Adding **motion actuated cameras with speakers and lights** is recommended to deter loitering.

MP 302.7 to MP 303.2

City	County	Cost	Drawing Sheets
West Palm Beach	Palm Beach	$102,000	B-35 & B-36

Between Bunker Rd. and Hunter St. (not shown, MP 303.2) in West Palm Beach is a section with open access to the corridor and encroachment on the right-of-way by local residences. A trespassing trail connects the two dead ends of Palmetto St. (photo 2). Trash was found in the overgrowth just south of Palmetto St. along the corridor. At Bunker Rd, a home has used the right-of-way as a secondary driveway (photo 1). The home's primary driveway is from Mayflower Rd., but the encroachment enables the vehicle to pull through from Bunker Rd.

Recommendation: Install a **vegetation barrier** along the east side of the corridor between Bunker Rd. and Hunter St. The corridor is open with few barriers to limit access; however, planting vegetation can define the corridor and discourage crossing. Adding **guardrail** is recommended along the right-of-way line to block use of the driveway at Bunker Rd. It is also suggested that any overgrown vegetation be trimmed that might be used to hide loitering within the existing right-of-way.

MP 304.0 to MP 304.1

City	County	Cost	Drawing Sheets
West Palm Beach	Palm Beach	$146,000	B-37

The bridge over the C-51 Canal in West Palm Beach (photo 2) has evidence of homeless encampments (photo 1 and 3). Possible trespassing origin-destination pairs also exist on either side of the canal. While no trespassing was observed or trails developed at either end of the bridge, trespassers likely use this bridge regularly. The nearest vehicle bridge that offers a safe pedestrian crossing is on Dixie Hwy. 0.2 miles to the east (not shown).

Recommendations: Install **bridge fencing** and a **motion actuated camera with speakers.** The fencing can prevent loitering on the bridge, and the camera will discourage trespassers from crossing the bridge. The overgrowth on the south side of the bridge should be trimmed that might hide loitering.

MP 304.5 to MP 305.0

City	County	Cost	Drawing Sheets
Lake Worth	Palm Beach	$191,000	B-38 & B-39

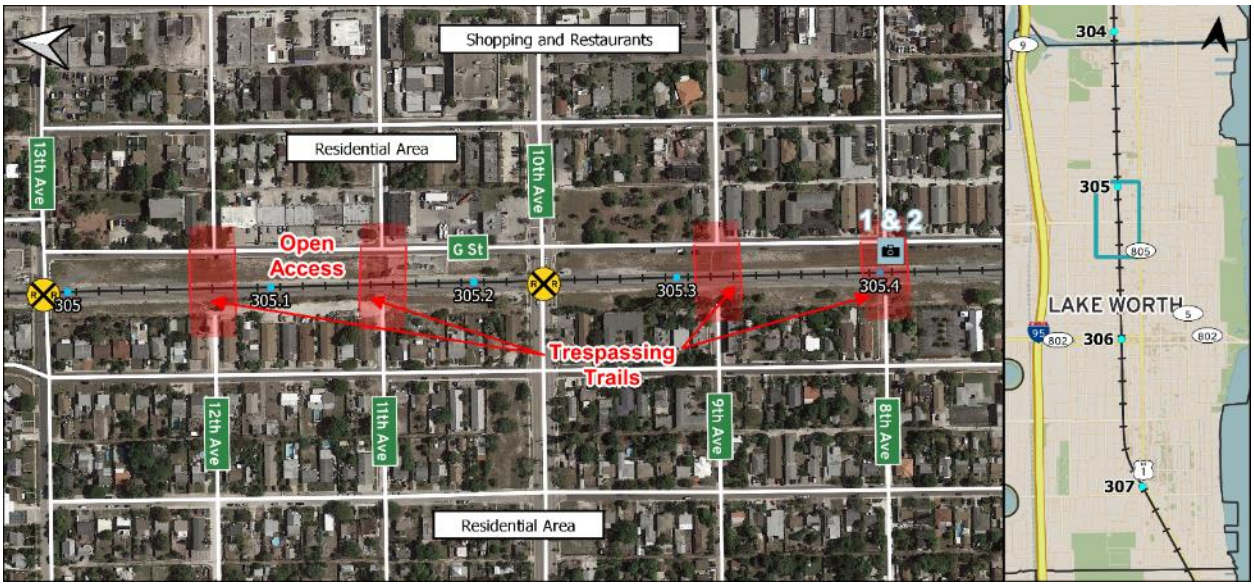
From 19th Ave. to 13th Ave. in Lake Worth, the right-of-way has open access and multiple streets dead-end at the corridor. In 2018 a trespasser was struck just south of 17th Ave.

South of 19th Ave, the houses are parallel to the corridor with dead-end streets at the railroad corridor. These streets have clearly developed trespassing trails (photos 1-3). The area is mostly residential, but there are commercial businesses along Dixie Hwy. (US 1), 0.1 miles east of the corridor (not shown).

Recommendation: Construct **8 ft. hardened fencing** between 15th Ave. and 19th Ave. due to the well-established trails. This section of the corridor is open with few barriers for crossing or walking along the corridor. At 15th St., **guardrail** and signage is recommended at each dead-end street to protect against vehicle encroachment.

MP 305.0 to MP 305.5

City	County	Cost	Drawing Sheets
Lake Worth	Palm Beach	$479,000	B-40 & B-41



Between 13th Ave. and 7th Ave. (not shown, MP 305.5) in Lake Worth, the right-of-way has open access with little to no vegetation or barriers between the parallel G St. (photo 1). Well-established paths cross the tracks to G St. from the dead-end streets on the west side of the corridor (photo 2).

The trails are well established and are the shortest route for a pedestrian. This area is mostly residential, but there are major destination points including retail stores and restaurants along Dixie Hwy. (US 1) (not shown), 0.1 miles east of the corridor.

Recommendations: Construct **8 ft. hardened fencing** on the west side between 13th Ave. and 7th Ave. due to the well-established trespassing trails. It is suggested that a **vegetation barrier** be constructed on the east side of the corridor to provide additional deterrent to the corridor access. **Guardrail** and signage are recommended at each dead-end street to protect against vehicle intrusion. At several locations in this project, the FECR right-of-way has insufficient width to add barriers or vegetation within the existing right-of-way without property acquisition.

MP 305.7 to MP 306.1

City	County	Cost	Drawing Sheets
Lake Worth	Palm Beach	$24,000	B-42 & B-43

Between 4th Ave. and 1st Ave. in Lake Worth, industrial buildings and parking lots are adjacent to the right-of-way. The east side of the corridor is composed of gravel with a curb between the railroad and G St. On the north and south side of Lucerne Ave. are two parking lots with no barriers between the parking lots and railroad tracks (photo 2). In February 2018, an injury to a trespasser occurred just north of Lucerne Ave.

Additionally, a trespassing trail has become established at the dead-end of 4th Ave. (photo 1). The area is mostly residential, but there are commercial businesses along Dixie Hwy. (US 1), 0.1 miles to the east of the corridor. While the corridor is open between 4th Ave. and 2nd Ave, the alignment of the homes and buildings limits potential trespassing.

Recommendation: Construct **8 ft. hardened fencing** on the west side of the corridor at 4th Ave. to block the existing trespassing trail and channelize pedestrians to 3rd Ave. **4 ft. aluminum fencing** is recommended between the parking lots at Lucerne Ave. and the tracks.

MP 306.5 to MP 307.1

City	County	Cost	Drawing Sheets
Lake Worth	Palm Beach	$247,000	B-44 & B45

In Lake Worth, the FECR track alignment begins a large S-curve to a north-south alignment to the east. The corridor is open with multiple clearly defined trespassing trails. In 2019 a fatality occurred near the 10th Ave. grade crossing.

The curves in the railroad increase the risk of trespassing casualties. Trespassers cannot see approaching trains and vice versa. The area is mostly residential, but commercial businesses along Dixie Hwy. (US 1) serve as potential trespassing destinations.

Recommendations: Construct **8 ft. hardened fencing** on the west side of the right-of-way between 6th Ave. (not shown, MP 306.5) and 12th Ave. due to the curvature and entrenched trespassing locations. The paths are near existing grade crossings with sufficient sidewalks. Therefore, additional channelization is not recommended.

MP 307.1 to MP 307.6

City	County	Cost	Drawing Sheets
Lake Worth	Palm Beach	$97,000	B-46 & B-47

MP 307.6 to MP 309.2

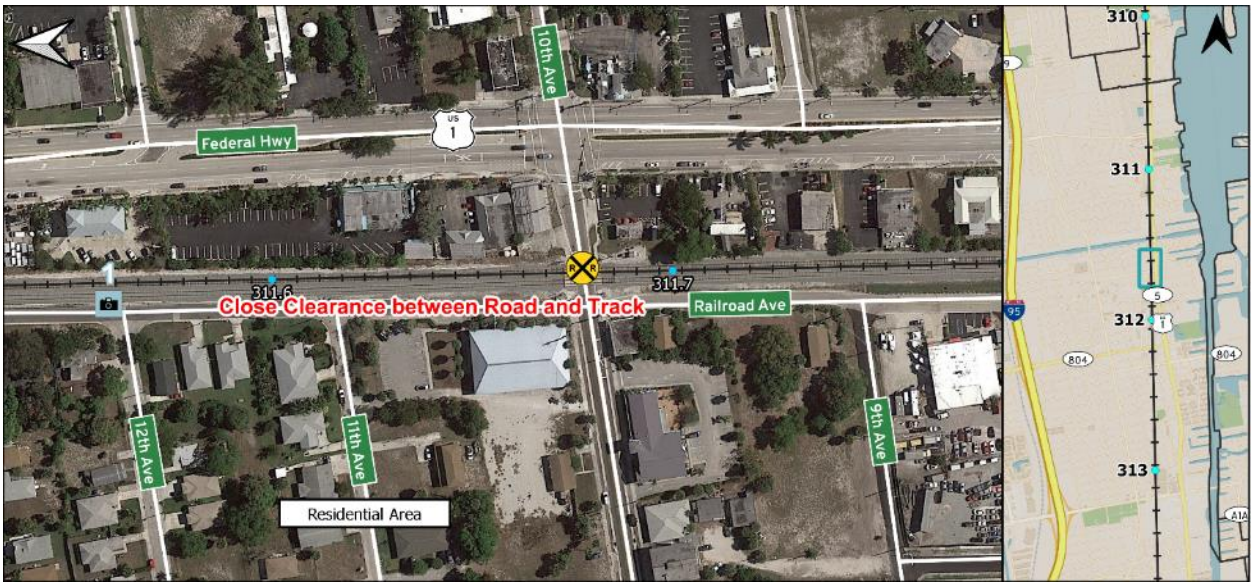
City	County	Cost	Drawing Sheets
Lantana	Palm Beach	$364,000	B-48 – B-53

Between 12th Ave. (not shown, MP 307.1) and Hypoluxo Rd. (not shown, MP 309.2). the FECR runs parallel to Dixie Hwy. (US 1) and Federal Hwy. (SR 5) in Lake Worth and Lantana. This section typically has 30 ft. of grass and trees lining the corridor between the edge of the railroad property and the track. A trespassing trail with evidence of recent and regular use is located at Mockingbird Ln. This section of the corridor has had five casualties (three fatalities, two injuries) between 2018 and 2020.

Recommendation: Install a **vegetation barrier** on the east side of the corridor for the entire length between 12th Ave. and Hypoluxo Rd. This section has shown to be a high risk for trespassing incidents, but the corridor is well-manicured, discouraging fencing. The vegetation will complement the existing trees while providing a barrier to the right-of-way. Between Mockingbird Ln. and Lantana Rd., installing a **sidewalk** with **vegetation** is recommended on the west side of the corridor to channelize pedestrians to the Lantana Rd. grade crossing.

MP 311.5 to MP 311.8

City	County	Cost	Drawing Sheets
Boynton Beach	Palm Beach	$41,000	B-54



Railroad Ave. runs parallel to the railroad corridor just south of the Boynton Canal (not shown, MP 311.5) in Boynton Beach. Between 12th Ave. and 9th Ave., the road's curb is less than 10 ft. from the outside rail.

Recommendation: Add **guardrail** along Railroad Ave. to protect the tracks from trespassing vehicles. The existing curb and gutter is mountable and provides minimal protection. A more robust barrier would protect the railroad from possible vehicle intrusion.

MP 312.2 to MP 312.6

City	County	Cost	Drawing Sheets
Boynton Beach	Palm Beach	$93,000	B-55 & B-56

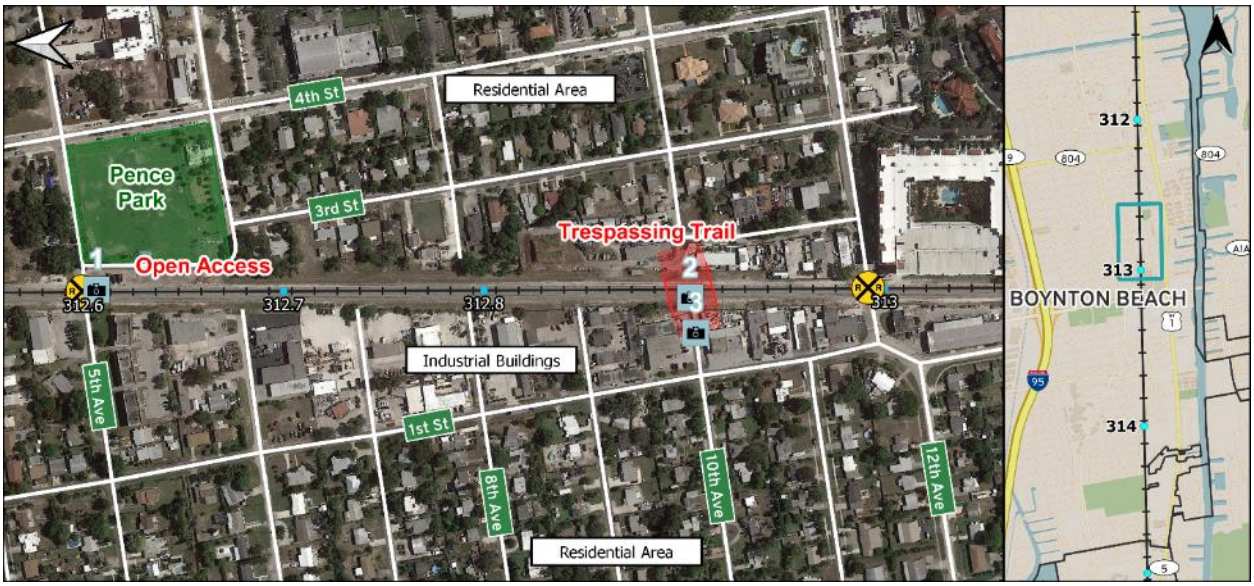
Open access and several trespassing trails exist at dead-end streets in Boynton Beach. Just south of Boynton Beach Blvd. it appears that cars are parked within the right-of-way (photo 1). 2nd Ave. and 4th Ave. (photo 2) are dead-end streets that have indications of trespassing.

In downtown Boynton Beach a new high-rise apartment building was constructed on the east side of the corridor in 2017. West of 1st St. the new Town Square development will include residential, restaurants, public library, amphitheater, and playgrounds. These draws are all trespassing origins and destinations. Trespassing mitigation is suggested before the completion of the of the Town Square project to prevent the development of unsafe pedestrian traffic patterns.

Recommendations: Construct **4 ft. aluminum fencing** on the west side of the corridor in the commercial area from Boynton Beach Blvd. to Ocean Ave. The aluminum fencing will limit trespassing and vehicle encroachment on the corridor while maintaining a more decorative style. From Ocean Ave. to 5th Ave, the construction of a **6 ft. chain link fencing** is suggested on the west side of the corridor. The existing vegetation will provide further protection and hide the fence.

MP 312.6 to MP 312.9

City	County	Cost	Drawing Sheets
Boynton Beach	Palm Beach	$71,000	B-57 & B-58



There is open access to the corridor next to Pence Park (photo 1), and a trespassing trail exists at the 10th St. dead-end (photo 2). The park has a fence that only encloses the baseball field. At 10th Ave, there is a maintained area on the west side of the railroad that provides access to the corridor from the industrial buildings (photos 2 and 3). Between 3rd St. and the railroad tracks, next to the park, is an open gravel field. The area, mostly on railroad property, is likely used for parking by visitors of the park.

The park and businesses along Federal Hwy. (not shown) to the east are a destination for trespassing from the residential area on the west side of the corridor.

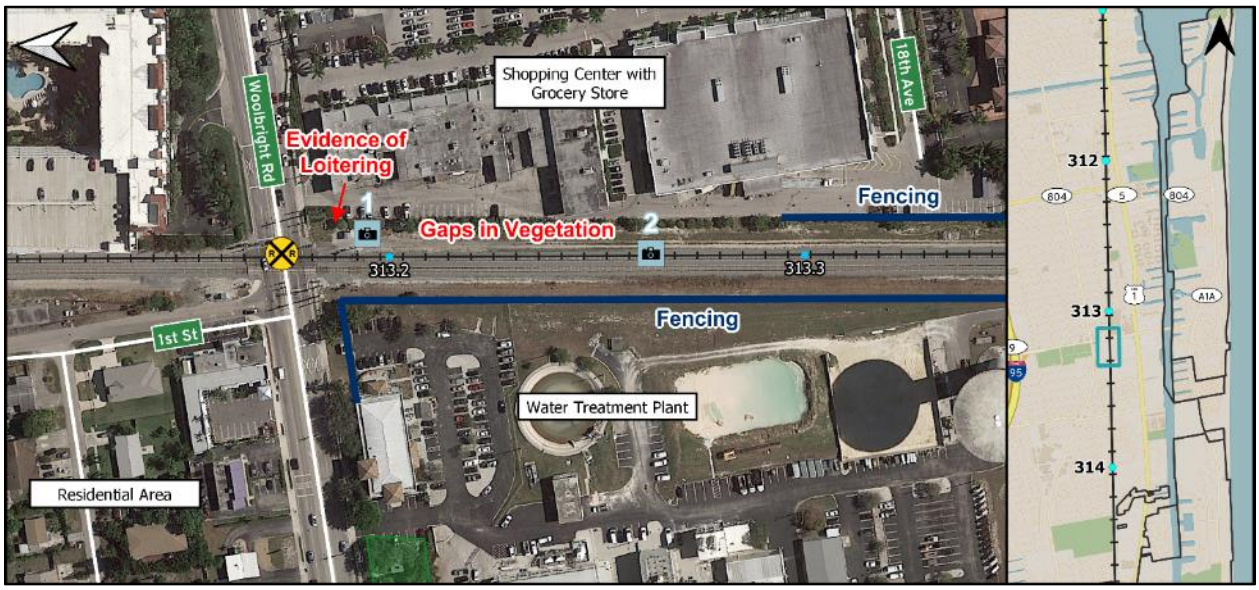
There is no sidewalk connectivity to the existing grade crossing at 5th Ave. The lack of safe, well defined walking areas and the existing grid network of roadways does not encourage the use of the existing grade crossing.

Recommendations: Construct **6 ft. chain link fencing** along the west side of the corridor where gaps in the fencing between businesses exist to create a continuous barrier between the 5th Ave. and 12th Ave. grade crossings. The fence channelizes pedestrians onto 5th Ave, where **sidewalks**

are recommended to encourage its use. Along the park, **vegetation** is suggested to delineate the railroad corridor. Most of the parking area is on the railroad right-of-way. If not already in place, an agreement can be sought between FECR and the city to lease the property for parking.

MP 313.1 to MP 313.3

City	County	Cost	Drawing Sheets
Boynton Beach	Palm Beach	$23,000	B-59



Evidence of loitering within the right-of-way exists in this area (photo 1). Open access to and from the corridor also exists from a shopping center containing a grocery store and several restaurants just south of Woolbright Rd. in Boynton Beach (photo 2).

The water treatment plant on the west side of the corridor has fencing that limits any trespassing across the corridor. However, trespassing was observed during the field review along the corridor from the south, with the grocery store being a potential destination.

Recommendations: Construct a **vegetation barrier** from Woolbright Rd. to 18th Ave. behind the shopping center to discourage the use of the corridor as a shortcut. Remove overgrowth to eliminate potential locations to loiter unseen along the corridor.

MP 313.5 to MP 313.7

City	County	Cost	Drawing Sheets
Boynton Beach	Palm Beach	$153,000	B-60

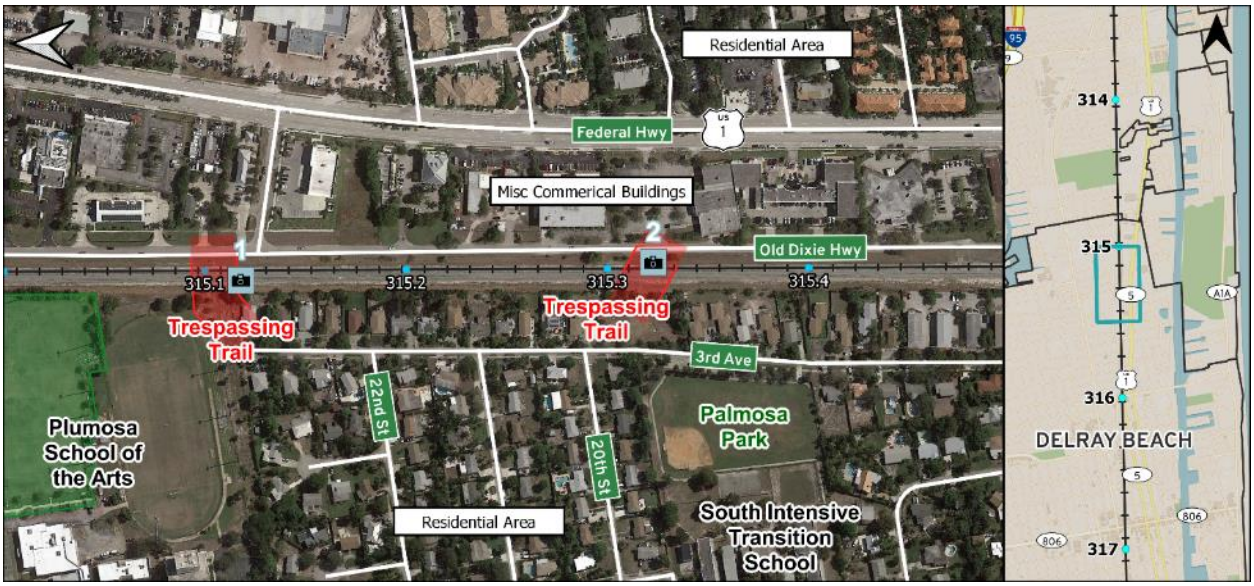
Trespassing trails and loitering exist north of 23rd Ave. in Boynton Beach. Bottles, cans, and other debris were also found in the vegetation at the grade crossing at the northeast corner of 23rd Ave. (photo 2).

On both sides of the railroad there are residential areas. There are no apparent origin-destination pairs directly across the corridor. Therefore, the most likely destinations are the convenience store on 23rd Ave. and a grocery store to the north along Woolbright Rd. (not shown, MP 313.2).To reach these destinations, it is believed that the trespassers are walking along the railroad.

Recommendations: Construct **6 ft. chain link fencing** on the east side of the corridor from 21st Ave. to 23rd Ave. The fencing will deter trespassing across the tracks. Installing a **standalone camera** at the dead-end of 21st St. will deter loitering, trespassing along the corridor, and allow for data collection to determine trespassing origins and destinations.

MP 315.1 to MP 315.4

City	County	Cost	Drawing Sheets
Delray Beach	Palm Beach	$20,000	B-61



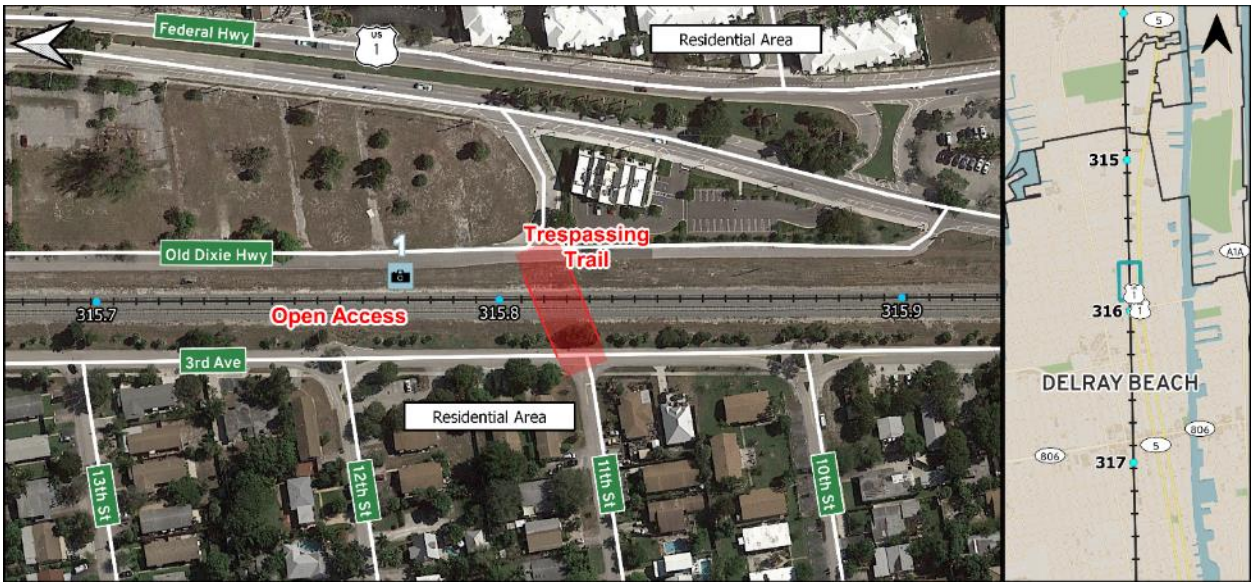
Two trespassing trails exist along Old Dixie Hwy. in Delray Beach. One trail connects Old Dixie Hwy. to an undeveloped strip of land next to the Plumosa School of the Arts (photo 1). The second trail used by trespassers, crosses the railroad from Old Dixie Hwy. through a vacant lot (photo 2). The path is near Palmosa Park and a school building. The school building has been vacant since 2010 but is currently undergoing renovations to house the South Intensive Transition School.

Recommendations: Construct **8 ft. hardened fencing** on the west side of the corridor in the existing openings to provide a complete barrier between 36th Ave./Gulfstream Blvd. (MP 314.8) and 14th St. (MP 315.6). The trespassing trails connect to the only two locations between 36th Ave. and 14th St. that do not currently have fencing. It is recommended that FECR work with the City of Delray Beach, which owns the vacant property, and Plumosa School of the Arts, which owns the undeveloped strip of land.

The distance between the existing grade crossings and strong origin-destination pairs make this area a candidate for a pedestrian crossing. However, there are no existing or good potential locations to add a crosswalk across Federal Hwy.

MP 315.6 to MP 316.0

City	County	Cost	Drawing Sheets
Delray Beach	Palm Beach	$74,000	B-62 & B-63



The railroad runs parallel to 3rd Ave. and Old Dixie Hwy. in Delray Beach. The right-of-way is open except for minor vegetation. A trespassing trail was identified between 11th St. and Old Dixie Hwy. A fatality occurred at this location in March 2018.

Recommendation: Install a **vegetation barrier** on the west side of the corridor between 14th St. (not shown, MP 315.6) and George Bush Blvd. (not shown, MP 316.0) to provide a barrier and define the right-of-way. The trespassing trail identified here was not well defined, and no clear origin-destination pairs exist suggesting minimal mitigation is sufficient.

MP 316.3 to MP 316.7

City	County	Cost	Drawing Sheets
Delray Beach	Palm Beach	$282,000	B-64 & B-65

A trespassing trail exists in this area, and the risk of trespassing is high due to the density of residents and shopping between 4th St. and 1st St. in downtown Delray Beach. At 3rd St, which dead-ends at the railroad, a trespassing trail is present (photo 1). The corridor is open with no barriers (photo 2). A fatality occurred in September 2019 and an injury in October 2018 have occurred at this location.

Over the past decade, multiple high-rise residential and shopping buildings built in downtown Delray Beach, likely increasing frequency of trespassing. The city has begun to protect the downtown area and enhance the corridor by adding a sidewalk and aluminum fencing between 1st St. and Atlantic Ave. (not shown, MP 316.9) in 2017.

Recommendation: Construct a **sidewalk** with **aluminum fencing** on the west side of the corridor between 4th St. and 1st St., matching the style south of 1st St. It is recommended that a **pedestrian crossing** be added at 3rd St. The high number of pedestrians and trespassers in this area and the well-worn trespassing trail at 3rd St. make fencing alone insufficient to deter the trespassing, suggesting the installation of a pedestrian crossing. An urban trail along the corridor prevents trespassing and enhances the aesthetic appeal of the area.

MP 317.1 to MP 317.3

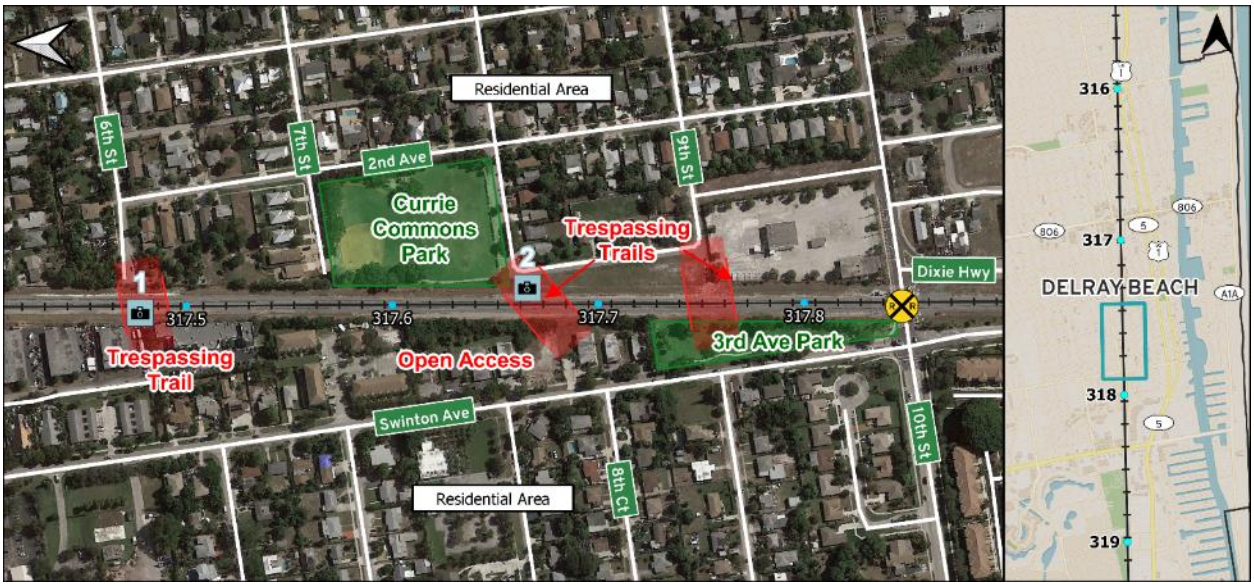
City	County	Cost	Drawing Sheets
Delray Beach	Palm Beach	$53,000	B-66

There is a clear trespassing trail between the dead ends of 3rd St. in Delray Beach. Chain link fencing was installed between 2nd St. and 3rd St. in early 2019. However, it did not block this existing trespassing trail (photo 2). From 3rd St. to 4th St. (not shown, MP 317.3) there is an open lot on the west side of the corridor with no barriers. While the area on both sides of the tracks is mostly residential with no clear trespassing destinations, the trespassing trail is clearly defined.

Recommendation: Construct **6 ft. chain link fencing** from the end of the existing fencing near 3rd St. to 4th St. Installing **sidewalks** is recommended along 2nd Ave. on the west side of the corridor to help channelize the trespassers currently crossing the railroad from 3rd St. to 2nd St.

MP 317.4 to MP 317.8

City	County	Cost	Drawing Sheets
Delray Beach	Palm Beach	$206,000	B-67 & B-68



There are multiple trespassing trails and open access along the corridor near Currie Commons Park in Delray Beach. The park is between grade crossings at 4th St. (not shown, MP 317.4) and 10th St. The trespassing trails are at the dead-end of 6th St. (photo 1), from empty lots to the park (photo 2) and from 3rd Ave. Park to the dead-end of 9th St. There was a trespassing fatality in this area in April 2018.

The railroad corridor has residential homes on both sides. There are two parks immediately adjacent to the corridor and four blocks to the east along US 1 restaurants and shopping are a destination draw. There is fencing adjacent to the Currie Commons Park, but access exists on either end of the park.

Recommendation: Construct **8 ft. hardened fencing**, where no existing fences or other barriers exist between 4th St. and 9th St. South of 9th St. construct **6 ft. chain link fencing**. Due to the visibility from 3rd Ave. Park the probability of someone cutting the fence is lower and hardened fencing is not required. Installing a **standalone camera** next to Currie Commons Park is suggested to monitor the area because of the trespassing frequency and the nearby parks.

MP 317.9 to MP 318.0

City	County	Cost	Drawing Sheets
Delray Beach	Palm Beach	$44,000	B-69

There are two trespassing trails crossing the tracks from Dixie Hwy. and Swinton Ave. The trails connect the intersection of Central Ave. and Dixie Hwy. to Reigle Ave. (photo 1) and to Swinton Ave. between Reigle and Sterling Ave. (photo 2). One block to the south of Central Ave. is a large shopping center that includes a grocery store, retail stores, and restaurants. Immediately to the south of the trails along Swinton Ave. is a fenced industrial area.

The origin for trespassing is likely the residential area on the west side of the corridor. The most likely destination for trespassers from the west side of the corridor is the shopping center. The residential area on the east side is limited in size and the only potential trespassing destination is an elementary school. The school is located to the west along 10th St. It is likely that pedestrians use the existing sidewalk and grade crossings along 10th St. instead of trespassing across the tracks.

Recommendation: Install a **vegetation barrier** on the west side of the corridor between 10th St. and Sterling Ave. Constructing **sidewalk** is recommended to connect existing sidewalks between Reigle Ave. and Sterling Ave. that channelize pedestrians to 10th St. Due to the well-established path, more substantial barriers may be needed. However, vegetation is recommended to not diminish the well maintained aesthetics of the corridor along Swindon Ave.

MP 325.4 to MP 325.6

City	County	Cost	Drawing Sheets
Boca Raton	Palm Beach	$24,000	B-70

Several gaps occur in the vegetation along the right-of-way providing access to the tracks in Boca Raton. Vegetation or fencing exists for most of this section of the corridor, but gaps, providing access to apartment buildings, are visible (photo 1). A lightly used trespassing trail was found connecting one of the openings to 15th St. (photo 2). Just to the south of the trespassing trail, the railroad enters a curve reducing the sight distance and increasing the risk of a casualty.

Recommendation: **Vegetation** should be planted to fill in the gaps in the existing vegetation. Stronger fencing may not be necessary at this location since the corridor's east side is mostly office buildings or housing, so there are no strong origin-destination pairs.

MP 328.0 to MP 328.5

City	County	Cost	Drawing Sheets
Deerfield Beach	Broward	$351,000	B-71 & B-72

There is no barrier between the sidewalk along Dixie Hwy. and railroad tracks in Deerfield Beach. North of 10th St., the City of Deerfield Beach has recently installed a decorative fence to deter trespassing after multiple incidents (photo 1).

At this location, the industrial area east of the tracks provides a barrier to trespassing across the tracks; however, sidewalk should not parallel the railroad corridor without a barrier.

Recommendation: Construct **decorative fencing** from 10th St. to 15th St. (not shown, MP 328.5), matching the existing style of fencing north of 10th St.

MP 332.4 to MP 332.8

City	County	Cost	Drawing Sheets
Pompano Beach	Broward	$89,000	B-73 & B-74

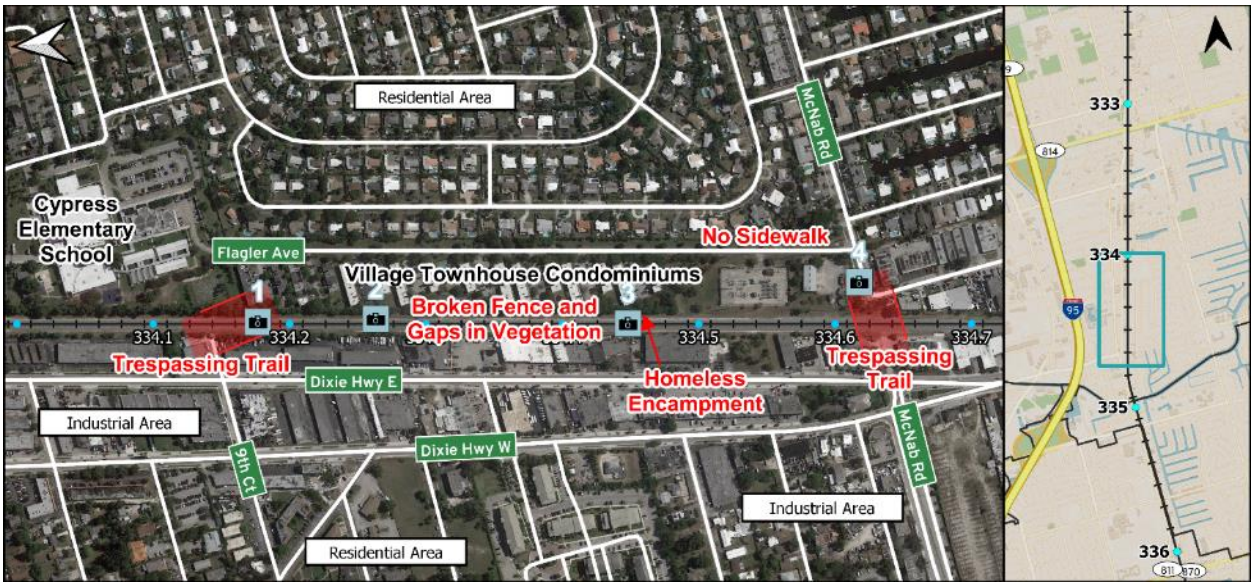
There was observed trespassing, a trespassing trail, and two fatalities since 2018 between 8th St. and 3rd St. in Pompano Beach. A trespasser was observed crossing the tracks west-to-east at 8th St. to get to the Dollar Store, located at the corner of 1st Ave. and 6th St. A trespassing trail connecting the dead end of 8th St. was found, as well as a dumping area on the corridor (photo 1). Limited vegetation along the railroad corridor (photo 2) is insufficient to deter trespassing. Immediately to the south between 3rd St. and Atlantic Blvd. (not shown, MP 333.2) there is fencing, vegetation, and a sidewalk.

The area is projected to see a large increase in residents and pedestrians. A new high-rise residential building was completed in early 2020 and the City of Pompano Beach has defined the area as the Downtown Pompano Innovation District. The district is envisioned as a high-density, core commercial area with new housing, retail, and commercial space on both sides of the tracks. The openness of the corridor combined with the anticipated destinations make it an area that could experience increased trespassing.

Recommendation: Construct **4 ft. aluminum fencing** on the east side of the corridor between 8th St. and 3rd St. to deter trespassing across the corridor and channelize the pedestrians to the existing grade crossings. The aluminum fencing will prevent the creation of entrenched trespassing trails while aligning with the proposed development.

MP 334.1 to MP 334.7

City	County	Cost	Drawing Sheets
Pompano Beach	Broward	$623,000	B-75 & B-76



Multiple instances of trespassing can be seen south of Cypress Elementary School in Pompano Beach. There are gaps in the fencing and vegetation between the railroad and the Village Townhouse Condominium complex (photos 1 & 2), located between the railroad and Flagler Ave. The exiting chain-link fence has been cut and the post knocked to the ground. Near Cypress Elementary School is a trespassing trail connecting 9th Ct. to the complex. Along the railroad corridor at the south end of the conodminium complex is evidence of a homeless encampment (photo 3). There is a trespassing trail at McNab Rd. The road has a dead end at the railroad tracks, but a sidewalk on the east side continues up to the railroad (photo 4).

West of the railroads along Dixie Hwy. is mostly industrial buildings, and two blocks of residential housing before reaching I-95. These are not strong trespassing destinations. Cypress Elementary School is the most substantial trespassing destination in the area, and it is likely children are crossing the tracks to reach the school. There are no grade crossings between 6th St. (not shown, MP 333.8) and the Cypress Creek Canal (not shown, MP 334.9), meaning that any pedestrian not trespassing is required to walk nearly triple the distance to reach the school.

Recommendation: Construct **8 ft. hardened fencing** between the Village Townhome Condominiums and the railroad. The barrier will channelize pedestrians to **two new pedestrian crossings**, one connecting 9th Ct. to Cypress Elementary School and another at McNab Rd. Adding a **sidewalk** is recommended along Flagler Ave. to provide a safer path for pedestrians coming from McNab Ave. to reach the school.

MP 334.9

City	County	Cost	Drawing Sheets
Pompano Beach	Broward	$147,000	B-77

The railroad crosses the Cypress Creek Canal in Pompano Beach with open access on either side of the bridge and a trespassing trail at the north end. Two trespassing casualties have occurred at the bridge since 2018.

Dixie Hwy. runs parallel to the railroad at the bridge and has a sidewalk. Trespassers can use the road and avoid trespassing on the bridge. People are likely loitering on the bridge, and an increased risk is apparent due to a curve to the north reducing sight distance.

Recommendation: Install **bridge fencing** to discourage any loitering on the bridge, and a **motion actuated camera with speakers** to deter trespassing across the bridge.

MP 339.5 to MP 339.6

City	County	Cost	Drawing Sheets
Fort Lauderdale	Broward	$44,000	B-78

A trespassing trail was found between Progresso Dr. and Flagler Dr. in Fort Lauderdale. Vegetation and an existing chain link fencing exist along Progresso Dr. between 9th Ave. and 12th St. However, a gap in the fencing is present at the corner of 12th St. and Progresso Dr.

The trespassing trail crosses the tracks in the middle of a railroad track crossover, a dangerous location with moving track components. This increases the potential harm to trespassers, the risk to train movements and the potential for vandalism.

Recommendation: Replace the chain link fencing with **8 ft. hardened fencing** to channelize pedestrians to nearby at-grade crossings at 13th St. (not sown, MP 339.4) and Sunrise Blvd. (not shown, MP 339.9).

MP 341.3 to MP 342.0

City	County	Cost	Drawing Sheets
Fort Lauderdale	Broward	$128,000	B-79 – B-81

Open access to the corridor exists (photo 1) with multiple examples of encroachment south of the New River (not shown, MP 341.3) in Fort Lauderdale. North of 7th St., vehicles are parked against the tracks (photo 2). Along Florence C. Hardy Park & Cultural Center, a gravel road was constructed on the railroad right-of-way (photo 3). South of the park is a residential area with a mix of open access and sporadic vegetation with trespassing trails at 10th St. (photo 4) and 11th St. Since 2018, three trespassing casualties have occurred in this area.

The gravel road alongside the park has become more developed in recent years due to repeated use by visitors to the park. The park is also a trespassing destination for houses to the south using the trespassing trail at 10th St.

Recommendation: Install a **vegetation barrier** on the corridor's east side between 4th St. (not shown, MP 341.3) and the Tarpon River (not shown, MP 342.0). The barrier will define the

corridor. Along the park (between 7th St. and 9th St) construct a **6 ft. chain link** to provide a trespassing barrier. Alternatively, FECR can seek entering into a lease agreement with the city for the road area, including a requirement to build a barrier to protect the railroad. Notices should be sent to vehicle owners and inform them of the encroachment. It is recommended that a **vehicle gate** at 7th St. be constructed to prevent vehicle access to the gravel road next to the park.

MP 342.8 to MP 343.1

City	County	Cost	Drawing Sheets
Fort Lauderdale	Broward	$26,000	B-82 & B-83

Vehicles are encroaching on the right-of-way between 20th St. and 22nd St., and trespassing trails are at 20th St. (photo 1) and 23rd St. (photo 2). Croissant Park Elementary School and Lauderdale Memorial Park are on the west side of the corridor and are major destination points.

While there are industrial buildings directly adjacent to the corridor, residential neighborhoods are present on both sides. Industrial buildings are not major trespassing destinations; therefore, trespassers mostly pass through them to reach destinations farther away. The school and park are two major expected destinations.

Recommendation: Construct **8 ft. hardened fencing** on the west side of the corridor from north of 20th St. to 24th St. (not shown, MP 343.1) The fencing will channelize the trespassing to the nearby grade crossings at 22nd St. and 24th St.

MP 345.5 to MP 345.9

City	County	Cost	Drawing Sheets
Dania Beach	Broward	$65,000	B-84 & B-85

The corridor is open with a trespassing trail just south of the Fort Lauderdale Hollywood International Airport in Dania Beach. A trespassing trail was found connecting the residential area to the mixed businesses on the east side of the tracks at 2nd St.

The majority of the buildings on the east side of the tracks are hotels serving the airport. There is a shopping center with a few shops and restaurants which could be a trespassing destination. The trespassing trail is not well defined and along with limited destinations, suggested trespassing is limited.

Recommendation: Install a **vegetation barrier** on the west side of the corridor from Old Griffin Rd. (not shown, MP 345.5) to 1st St. (not shown, MP 345.9) to define the corridor and to deter trespassing in this area.

MP 346.2 to MP 346.9

City	County	Cost	Drawing Sheets
Dania Beach	Broward	$367,000	B-86 – B-88

In Dania Beach, south of Stirling Rd., the corridor has open access and multiple trespassing trails. Trespassing trails are well established at 3rd St. (photo 1), 4th Ter. (photo 2), and 7th Ter. (photo 3). The area is mostly residential, but less than .25 miles west of the corridor is Attucks Middle School.

It is likely the school is the source of trespassing. There are nearly 0.9 miles between the at-grade crossings at Stirling Rd. and Dixie Hwy. Crossover (MP 347.1). Due to the distance to the nearest crossings and the well-established trails, traditional fencing will be insufficient to block the trespassing.

Recommendation: Construct **8 ft. hardened fencing** on the west side of the corridor between Stirling Rd. and 9th St. (not shown, MP 346.9) where there is no existing fencing. The fencing will channelize the trespassing to a proposed **pedestrian crossing** at 4th Ter.

MP 347.1 to MP 349.8

City	County	Cost	Drawing Sheets
Hollywood	Broward	$475,000	B-89 – B-98

MP 349.8 to MP 351.3

City	County	Cost	Drawing Sheets
Hallandale Beach	Broward	$264,000	B-99 – B-104

MP 351.3 to MP 351.9

City	County	Cost	Drawing Sheets
Aventura	Miami-Dade	$114,000	C-3 & C-4

In Hollywood, Hallandale Beach, and Aventura, the railroad corridor runs parallel to two roads. On the west side is Dixie Hwy. and on the east side is 21st Ave. which later turns into 1st Ave. and Dixie Hwy. There are residential neighborhoods on both sides of the tracks and commercial buildings for much of the area. At Pembroke Rd. is the Big East Casino, and between 5th St. and 7th St. is a new Boys and Girls Club. At multiple locations, parking lots and vehicles are encroaching on the railroad property. There have been four trespassing casualties in this area since 2018. No well-established trails were visible, it is likely the result of trespassing distributed across multiple locations along the corridor.

Recommendation: Construct a **vegetation barrier** between Dixie Hwy. Crossover (not shown, MP 347.1) and 206th St. (not shown, MP 351.9). The barrier should be installed on the side of the corridor closest to any encroachment or trespassing destination. Where there are right-of-way constraints, it is recommended that **4 ft. aluminum fencing** be used due to smaller width. Vegetation will define the corridor and can discourage trespassing, while not diminishing the aesthetics of the current corridor.

MP 356.1 to MP 356.2

City	County	Cost	Drawing Sheets
North Miami	Miami-Dade	$154,000	C-5

A trespassing trail and a lack of barriers exist between the roadway and tracks near 141st St. in North Miami. The trespassing trail continues across the tracks from the sidewalk that terminates at the intersections of 142nd and 141st St. (photo 1). There is no sidewalk at the existing at-grade crossing at 141st St.

When 141st St. runs parallel the tracks just to the northwest of the crossing, there is less than 30 ft. between the edge of the pavement and railroad track (photo 2). The area between the roadway and the tracks is crushed gravel with no clear delineation of the railroad corridor.

Recommendation: Construct **4 ft. aluminum fencing**, matching the style from the auto dealership to the north of 141st St. at the end of the sidewalk where the road turns. This mitigation will channelize any pedestrians to cross 142nd St. to the existing sidewalk and then to the proposed **pedestrian crossing** to be added to the existing vehicle crossing at 141st St. Where the gravel is against the roadway, installing a **curb** is recommended to provide delineation between the road and the railroad corridor.

MP 364.5 to MP 364.9

City	County	Cost	Drawing Sheets
Miami	Miami-Dade	$118,000	C-6 & C-7

There are multiple trespassing trails and historical homeless activity along the right-of-way just north of MiamiCentral Station in Miami. While fencing was constructed along various parts of the corridor, the dead ends of 17th St. (photo 1) and 15th St. (photo 2) have open access and trespassing trails. Historically, the area under I-395 has been a homeless encampment. Current construction on the interstate has disrupted this encampment, but once construction is complete, it will likely return. Additionally, a trespasser was struck in this area in 2019.

Recommendation: Construct **6 ft. chain link fencing** on both sides of the corridor at the dead ends of 17th St., 16th St. and between 15th St, and 14th St. The fencing will limit the access to the corridor. At 17th St. and 15th St. **Vehicle gates** should be added as necessary to maintain vehicle access for railroad personnel. **Motion actuated cameras with speakers and lights** are recommended under I-395 to discourage the return of a homeless encampment.