FINAL

NSRR CORRIDOR

SHARED-USE PATH CONCEPT STUDY

SEPTEMBER 2018

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City of Virginia Beach

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Executive Summary

The purpose of this study is to develop a plan for the design and construction of a shared-use path within the former Norfolk Southern railroad right-of-way in the City of Virginia Beach. This shared-use path would attract active transportation users such as bicyclists, pedestrians, in-line skaters, skateboarders, wheelchair users, strollers, runners, dog walkers, and more. This City owned right-of-way is generally 66-feet wide and runs east/west for a length of approximately 10.5 miles. This right-of-way connects the western city limits, at Newtown Road, to Birdneck Road near the oceanfront. The original rail track and ties remain in most portions of the corridor, but in some locations, they have been removed.

The approach to this study was to locate the path on the original track alignment to minimize impacts and construction cost. There were three path widths considered: an 8-foot wide sidewalk, a 10-foot wide path, and a 15-foot wide path. The various widths were investigated to determine a comparison between costs, environmental impacts, constructability, and right-of-way impacts. For purposes of this study, no specific mass transit or other uses for the corridor were considered. If another use impacts the path in the future, FHWA's regulation Section 4(f) would require the path to be relocated/replaced in-kind.

In addition to the three width alternatives, two surface materials were studied. One alternative using an asphalt–paved surface, and the second alternative using a crushed stone surface. Costs were compared for the two surfaces for each of the three path width options.

The 10.5-mile corridor was divided into segments to identify smaller, fundable, constructible projects. The corridor was reviewed to locate logical places for each segment to begin and end. The existing uses that were considered include educational institutions, neighborhoods and businesses, major street connections, and existing active bicycle and pedestrian paths that would connect to this shared-use path. Ten segments of varying length were identified. These segments are the basis of the phasing and prioritization plan.

There are two phasing plans that have been developed as part of the study. **Option A** proposes to build the segments from east to west beginning at Birdneck Road, where the existing South Beach Trial goes eastward to the oceanfront. Building the path from east to west would create a continuous trail that builds a network the further west the segments are constructed.

The **Option B** sequence proposes to begin with two segments in Town Center, followed by two segments near the oceanfront at the eastern end, and then filling in the missing segments. This may seem like a haphazard approach, but this order prioritizes serving larger populations and destinations in the City first to create usage and excitement which will support continued expansion of the path.

High level probable costs were developed for each segment and include all three path widths and two surface types. These order of magnitude costs were compared to determine the recommendations for the typical section by segment, and to assist in the funding decisions.

Figure 1: Newtown Road to Town Center

Figure 2: Town Center to London Bridge Road

Figure 3: London Bridge Road to Birdneck Road

Recommendations

Typical section

A major consideration in the determination of the best typical section was the requirement of any potential future project to relocate or replace the path if it is determined to be a Section 4(f) recreational use. In the previous light rail extension study, it was determined that a 10-foot wide path with 2-foot shoulders would be the maximum path width that would fit in the 66-foot right-of-way adjacent to the light rail tracks. For this reason, the 10-foot wide path is recommended for all the segments except Segment 10, which is the eastern-most segment. Segment 10 crosses the Linkhorn Bay floodplain. An 8-foot wide path, with one-foot shoulders, can be built on the existing fill. If a 10-foot path and 2-foot shoulders were proposed, it would require additional fill in the floodplain. In addition to the costs, environmental and flooding concerns are a part of the decision to recommend an 8-foot path on Segment 10.

Surface Material

The recommendation for the shared-use path is to provide an asphalt paved surface. There is not a significant relative difference between the construction cost since the crushed stone and aggregate base material used for the asphalt section are similar in costs. The crushed stone path would require more frequent annual maintenance than asphalt. There is an initial cost savings of eliminating the asphalt surface but that cost savings would be outweighed by the maintenance cost of the crushed stone over time.

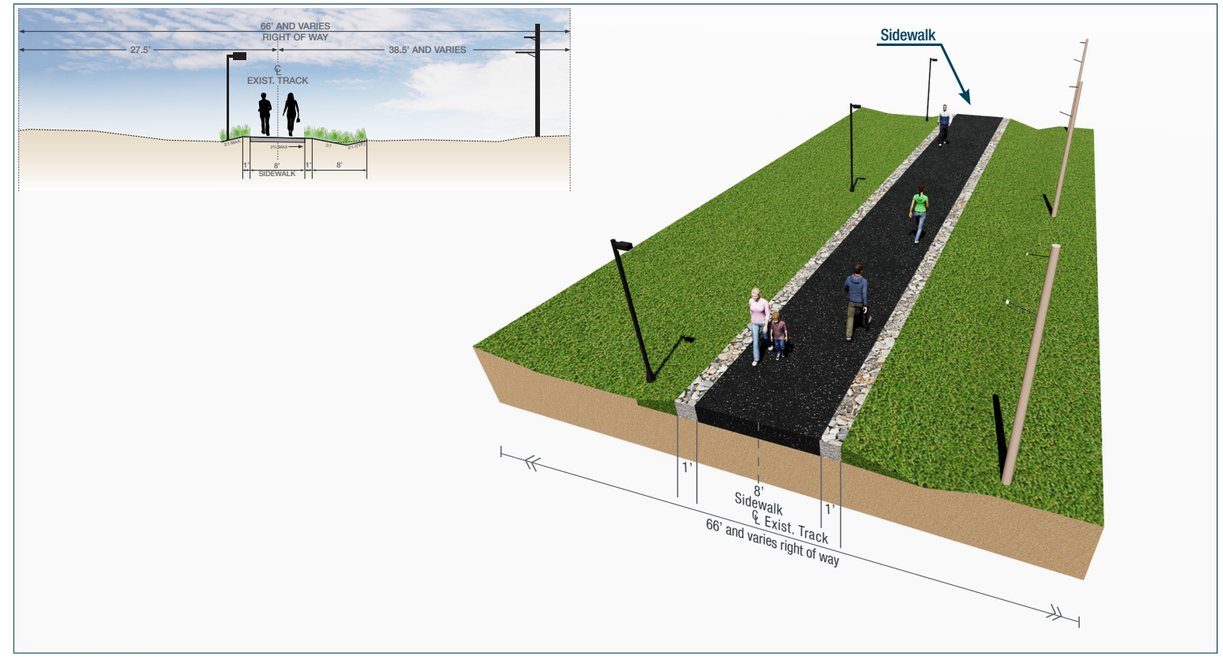


Figure 4: Typical 8' Sidewalk

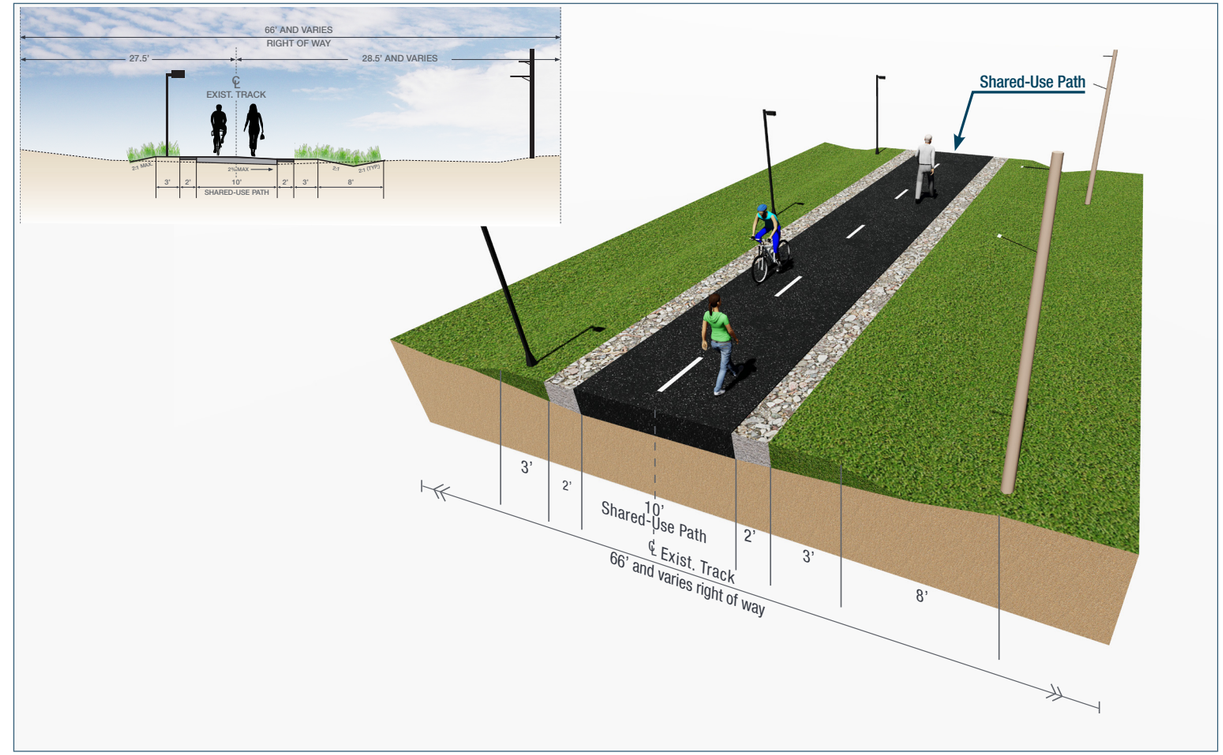


Figure 5: Typical 10' Shared-use Path

Phasing Plan

Option B is the recommended phasing plan. The order of segment construction will provide benefits to a higher volume of users initially, which will increase demand for the extension of the amenity. The first phase of construction will make connections to Town Center providing access to pedestrians that currently use the former railroad right-of-way for access to Town Center. It will also connect to the planned Thalia Creek Greenway. With the second phase of segments being at the east end of the corridor, and connecting to the South Beach Trail, there will be a network of trails between London Bridge Road and the oceanfront that will provide users miles of active transportation opportunities. The west end of the corridor (Phase 3) includes the connection to the Newtown Road Transit Station. Making the path connection at the west end provides residents of those neighborhoods and attendees at the educational institutions additional transportation options. Phase 4 of the segment construction will connect the eastern path at London Bridge Road to the Phase 1 segments at Town Center providing a continuous path between Kellam Road and Birdneck Road.

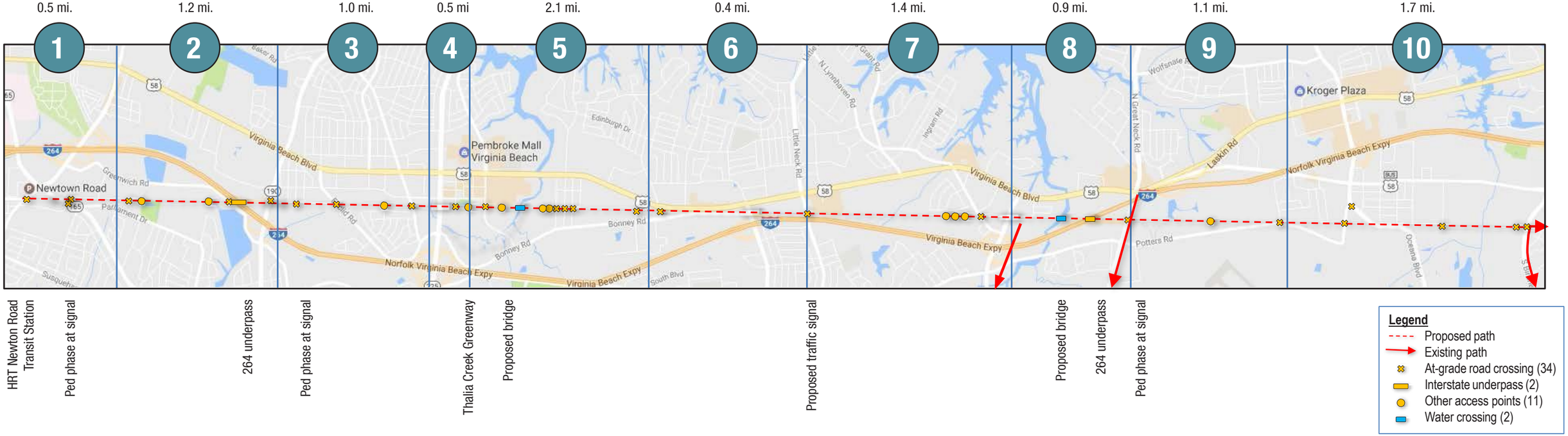
The lowest priority segment has parallel accommodations planned for pedestrians and bicyclists within a block of the former NSRR right-of-way.

Next Steps

The shared-use plan will continue to be developed to the 15% design stage. This additional level of design will provide more detailed information on the stormwater management requirements, environmental impacts, right-of-way needs, construction requirements, and a better-defined opinion of probable costs.

Phase Priority	Segment Number	From	To	Approx. Length (mi)	Path Width (ft)	Material	Construction Cost	Right-of-Way Cost	Total Segment Cost
1	4	Kellam Road	Market Street	0.5	Sidewalk & Signal Improvements		$1,357,000	$42,000	$1,399,000
	5	Market Street	Lynn Shores Drive	2.1	10	Asphalt	$8,053,000		$8,053,000
2	10	Air Station Drive	Birdneck Road	1.7	8	Asphalt	$4,980,000		$4,980,000
	9	London Bridge Road	Air Station Drive	1.1	10	Asphalt	$4,428,000		$4,428,000
3	1	Newtown Road	Ivy Court	0.5	10	Asphalt	$1,789,000	$127,500	$1,916,500
	2	Ivy Court	Witchduck Road	1.2	10	Asphalt	$4,452,000		$4,452,000
4	8	Lynnhaven Road	London Bridge Road	0.9	10	Asphalt	$4,581,000	$560,000	$5,141,000
	7	Plaza Trail	Lynnhaven Road	1.4	10	Asphalt	$5,551,000		$5,551,000
	6	Lynn Shores Drive	Plaza Trail	0.4	10	Asphalt	$2,388,000		$2,388,000
5	3	Witchduck Road	Kellam Road	1.0	10	Asphalt	$4,005,000		$4,005,000
TOTAL ALL SEGMENTS									$42,313,500

Potential Segments



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Introduction

Active transportation options are an attractive feature of a thriving city. Pedestrian and bicycle accommodations enhance recreational opportunities, provide accessibility to jobs and businesses, spur trail-oriented development, and improve safety. The City of Virginia Beach is dedicated to providing bikeways and trails in logical locations throughout the City. In Virginia Beach, a shared-use path can provide much more than a recreational amenity; it can redefine the livability and interconnectivity of the surrounding communities that will be connected with the proposed trail. For these reasons, the City of Virginia Beach is investigating the former NSRR corridor as a potential candidate for a shared-use path.

This study outlines the viability of a shared-use path along an approximate 10.5-mile former NSRR corridor, extending between the existing Newtown Road light rail station at the west end, and the existing South Beach Trail on Norfolk Avenue at the east end. The anticipated trail would be primarily located within former NSRR right-of-way, with a few exceptions at critical roadway crossings. This shared-use path has been identified as a top-priority infrastructure project by the City Council-adopted Bikeways and Trails Plan for decades.

The implementation of this pedestrian and bicycle facility would provide a much-needed east-west connection through the City of Virginia Beach. The proposed shared-use path system is anticipated to become a catalyst for both new development and redevelopment along the corridor and become a popular amenity for both residents and visitors of the City. Six of the City's eight Strategic Growth Areas (SGAs) would be connected by this proposed shared-use path, encouraging interaction as they continue to develop.

This study presents alternative typical sections of the proposed shared-use path, while considering various critical planning criteria including stormwater management options, anticipated construction phasing, environmental permitting, vehicular crossings, and associated planning-level costs. Defining these items will allow the City to develop a scope for the proposed shared-use path improvements, and subsequently progress the design of the facility through the preliminary engineering and construction phases.

Study Area

The study area for the NSRR Corridor Shared-Use Path, commonly referred to herein as the "path," generally follows the former NSRR right-of-way. The path will extend from the existing light rail station at Newtown Road toward the oceanfront, terminating at the South Beach Trail where Birdneck Road and Norfolk Avenue intersect. The NSRR corridor is generally 66 feet wide, and spans approximately 10.5 miles from Newtown Road to Birdneck Road.

An ALTA survey was completed in 2013 as a part of a previous project in this corridor. This survey information, which includes property boundaries and topographic features, was referenced for this study.

The proposed shared-use path corridor would connect six of the City's eight SGAs. Virginia Beach's SGAs were first identified in the 2003 Comprehensive Plan and later refined in the 2009 Comprehensive Plan as areas intended to accommodate growth at higher densities, thereby providing an alternative to continued suburban sprawl. Each SGA has a long-range master plan that describes the future vision and guides policy decisions for growth and development in each area. The proposed shared-use corridor is discussed on a segment-by-segment basis below, with specific SGAs and their corresponding visions presented in more detail.

Plan Objective

A shared-use path operates as an off-road transportation facility that complements both a roadway and transit network. The NSRR Corridor Shared-Use Path will utilize the existing former NSRR right-of-way to transform an abandoned railroad corridor into a usable, community asset, and ultimately a catalyst for surrounding development. This will create a more-inviting environment for pedestrians and bicyclists, as well as an additional amenity to stimulate future trail-oriented development. The objective of this study is to present potential alternatives for the typical section and alignment of a shared-use path within the constraints of existing conditions and proposed developments. The study also will lay out a phasing plan that will divide the 10.5-mile corridor into smaller, fundable, and constructible segments.

Figure 6: Newtown Road to Town Center

Figure 7: Town Center to London Bridge Road

Figure 8: London Bridge Road to Birdneck Road

Goals

The primary goals driving the implementation of a shared-use path in this corridor are to:

- Provide a continuous east-west corridor that accommodates active transportation (bicyclists, pedestrians, in-line skaters, skateboarders, wheelchair users, strollers, runners, dog walkers, etc.) between Newtown Road and the oceanfront
- Create a facility to connect SGAs
- Supplement urban development with modes of transportation that serve pedestrian and bicycle traffic

The primary intent of this study is to:

- Develop at-grade crossing alternatives at major street crossings
- Investigate typical section alternatives
- Understand general stormwater management requirements
- Create a feasible phasing plan with logical termini
- Note potential right-of-way impacts
- Determine expected environmental permitting required
- Identify conceptual planning-level opinion of probable costs for each alternative

History

The City has previously investigated the implementation of light rail or other high-capacity transit uses in this corridor. The design process for a multimodal option that included light rail in this corridor was halted based on the November 2016 referendum indicating that there was not a majority of citizen support for the project. However, the public involvement processes conducted prior to the November 2016 referendum indicated a citizen-supported desire for pedestrian and bicycle accommodations within the corridor.

After the defeat of the November 2016 referendum on the light rail extension, the City held a series of public meetings to discuss other transportation options within the City including bicycle and pedestrian facilities and additional bus routes. There was strong public support for the construction of this shared-use path communicated during those meetings.

Therefore, for purposes of this study, it was assumed that alignments of high-capacity transit options would not be considered within the corridor, and the horizontal alignment of the proposed shared-use path was based solely on optimal placement to limit impacts for the construction of the path only. It is understood that, in the future, if mass transit options are considered within this right-of-way, the path may need to be moved/replaced. The amount of space within the right-of-way necessary for the relocation of the path will be an element of consideration in the recommended shared-use path width.

Existing Conditions

Opportunities

The City of Virginia Beach purchased the right-of-way previously owned by NSRR. Therefore, the implementation of a shared-use path in this corridor is almost exclusively in City right-of-way and will have minimal right-of-way impacts.

The location of this existing corridor is ideal since it provides a straight east-west connection through the entire City. The corridor is a critical piece of the City's future redevelopment plans, connecting six of the City's eight SGAs, all of which promote improved pedestrian and bicycle accommodations and enhanced connectivity. The existing layout lends itself well to a converted use from rail to trail. The former freight rail corridor is generally clear of obstructions that could increase cost and/or limit the feasibility of constructing the path in its place.

Another significant benefit provided by the former NSRR right-of-way is the safe environment it creates by separating active transportation users from vehicular traffic. At proposed crossings of major vehicular facilities, managed street crossings will be provided. Lighting is another important safety feature along the path. In this corridor, the ability to easily light the path with pedestrian-level lighting also is enhanced due to its close proximity to existing Dominion Energy (DE) electrical facilities. The presence of distribution lines in a portion of the corridor presents an advantage since it increases the feasibility of installing lighting and emergency call-boxes with a nearby power source.

Currently, there is a shared-use path adjacent to Norfolk Avenue (South Beach Trail) that extends eastward to Pacific Avenue at the oceanfront. The location of this existing path provides a logical eastern connection to the vibrant oceanfront. At the western limit of the corridor, there is an existing transit station accommodating both light rail and bus services. This provides a great opportunity for the proposed NSRR Corridor Shared-Use Path to connect users to/from downtown Norfolk and other destinations via multimodal transportation.

Constraints

The existing DE transmission poles, located along the corridor and within the former NSRR right-of-way, are not considered a horizontal constraint for this project. Although relocating these transmission structures would be cost-prohibitive, the path is proposed to be centered on the existing centerline of the freight rail track, and will therefore not interfere with existing pole locations. However, if an alternative is selected that requires an elevated grade-separated crossing over Independence Boulevard, vertical offset requirements with respect to DE facilities will need to be considered.

Other utilities exist within the proposed corridor including DE aerial distribution lines and poles, a City water main, and a Hampton Roads Sanitary District (HRSD) force main. It is not anticipated that significant underground improvements will be needed as a part of the shared-use path construction; therefore, impacts to underground existing utilities are not anticipated. There could be an exception if an alternative requiring an elevated grade-separated crossing over Independence Boulevard is considered. In such a case, the placement of proposed structural foundations would need to consider locations of existing underground utilities, and utility relocations could be required.

Figure 9: W&OD in Northern Virginia

Depending on the preferred typical section, stormwater management could become a project constraint. Although it is anticipated that the proposed drainage patterns will mimic existing drainage patterns, stormwater management requires strict water quality and water quantity considerations. Depending on the width of the proposed path, an increase in impervious area will require the removal of phosphorus and detention of peak flows. It is anticipated that stormwater management solutions can be designed and implemented within the existing right-of-way without additional acquisition being required.

Gathering Information

Constructed Examples

There are multiple examples of shared-use paths throughout the country that have been successfully implemented and are being actively used as an amenity for the community. These success stories have been studied to help develop an approach for the proposed NSRR Corridor Shared-Use Path.

Existing Data Collection

The following existing data sources were used as references for this study:

- ALTA survey collected as part of the previous light rail study performed for this corridor
- Currently available geographic information system (GIS) information
- Currently published traffic volume data from the City of Virginia Beach and the Virginia Department of Transportation (VDOT)
- Available site plans for properties planned for development adjacent to corridor
- Previously completed multimodal study (Light Rail Corridor Shared-Use Path Study, dated January 2016)
- Draft Environmental Impact Statement for the Virginia Beach Transit Extension Study, dated February 2015

Figure 10: Burlington, WA

Figure 11: American River Trail Sacramento, CA

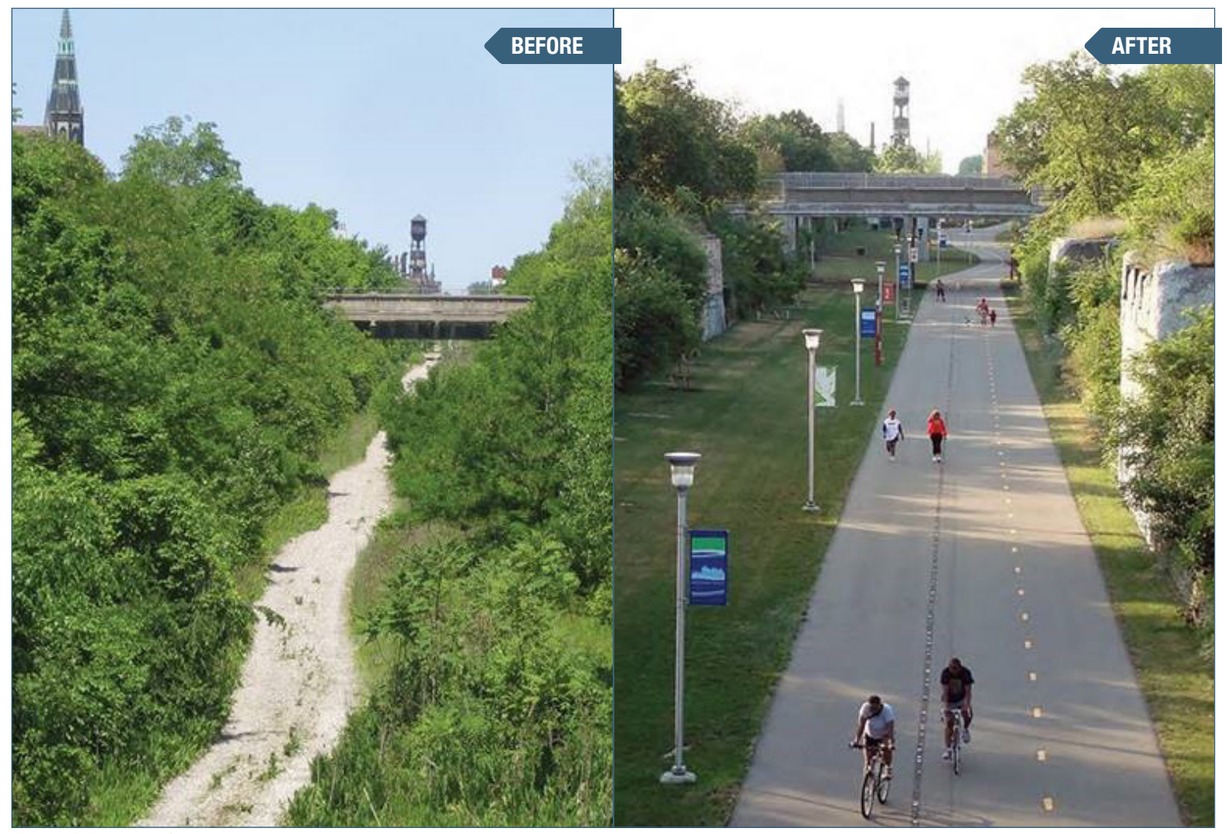


Figure 12: Dequindre Cut in Detroit, MI

Alternatives Development

Typical Section Alternatives

Meetings with the project team were held to define the design parameters and gain an understanding of the City's desires and objectives. As a part of this study, the team analyzed the following parameters to develop the initial concepts:

- Varied-width sidewalk (5-foot absolute minimum, 8-foot desired width) with 1-foot shoulders per American Association of State Highway and Transportation Officials (AASHTO) sidewalk standards
- 10-foot shared-use path with 2-foot shoulders per AASHTO shared-use path standards
- 15-foot shared-use path with 2-foot shoulders per AASHTO shared-use path standards
- Path constructed of asphalt or compacted crushed stone to minimize cost
- Continued use of existing railside ditch to convey runoff

Throughout the majority of the corridor, the former NSRR right-of-way is 66 feet wide. Therefore, it is anticipated that the shared-use path will not deviate outside of the right-of-way except in locations where a deviation is required to safely cross streets.Since the desire was to reduce impacts (environmental, stormwater management, right-of-way, etc.), the proposed shared-use path alignment is located horizontally where the current freight rail centerline exists.

Since the existing freight rail section is thoroughly compacted, it is considered impervious in existing conditions and would act as a stable subbase for the proposed path.

Once the path is constructed and being used as a recreational amenity, it may get classified as a Section 4(f) facility. With this status, the path would have to be replaced in-kind if another construction project conflicted with the path. There is the potential for this to occur since there may be public transit added in this corridor in the future. During the previous light rail study, it was determined that a 10-foot path could fit within the 66-foot right-of-way with dual-track light rail. This will likely be a deciding factor in the determination of the maximum width of the typical section.

Surface Materials

Using the analysis outlined in this study, the project team will need to determine whether the path will be constructed of asphalt or compacted crushed stone. The driving factors for this decision will include cost, aesthetics, rideability, Americans with Disabilities Act (ADA) accessibility, durability, and lifecycle maintenance factors of the two materials. A cost comparison of these two materials generally shows that compacted crushed stone is only slightly less expensive than asphalt pavement. A more detailed cost breakdown is shown in Appendix B.

Due to maintenance and cost concerns, the project team determined that a rubberized surface material will not be considered for the shared-use path (based on their experience on school running tracks). Therefore, it was not considered in the cost analysis.

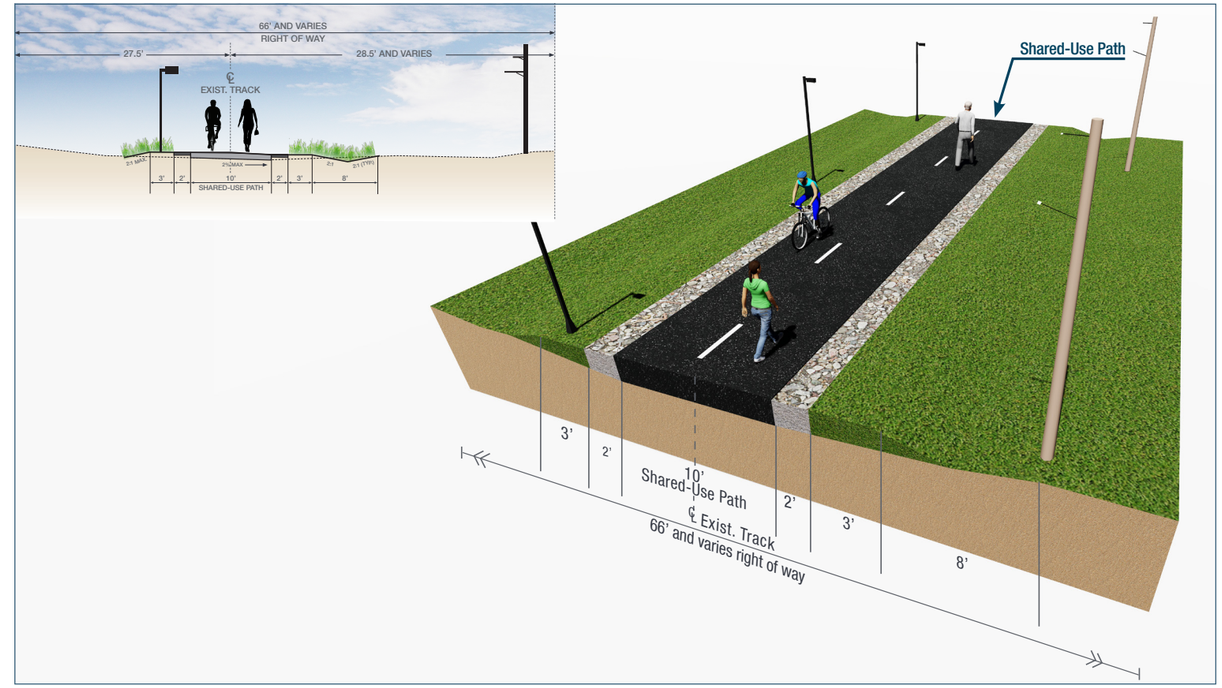


Figure 14: Typical 10' Shared-use Path

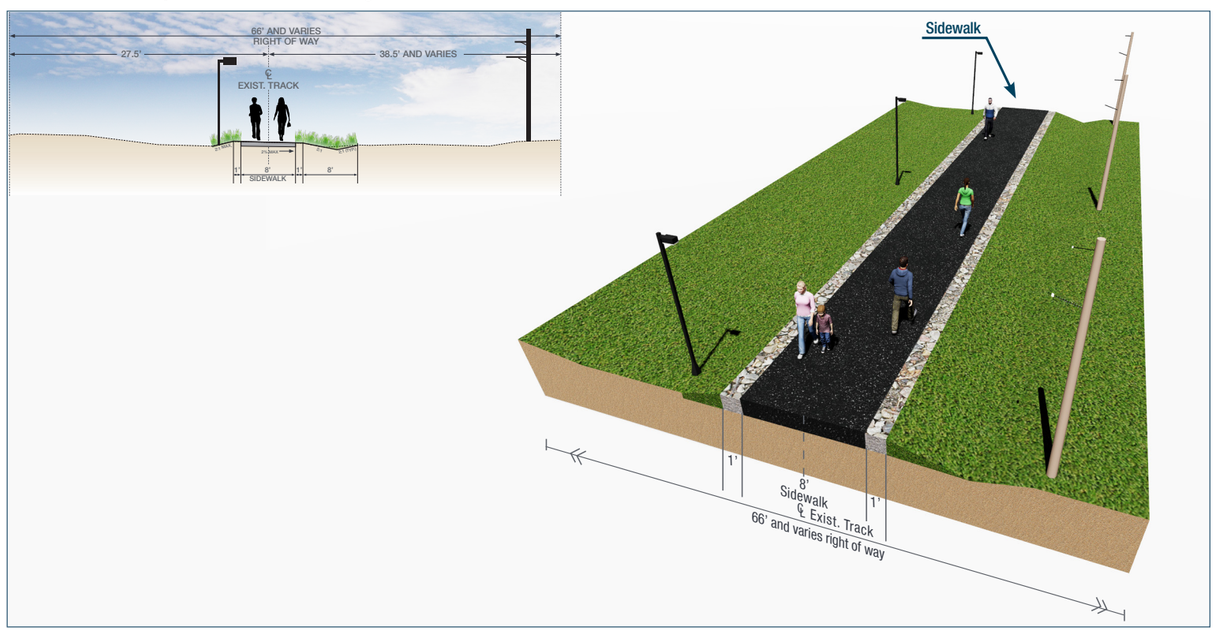


Figure 13: Typical 8' Sidewalk

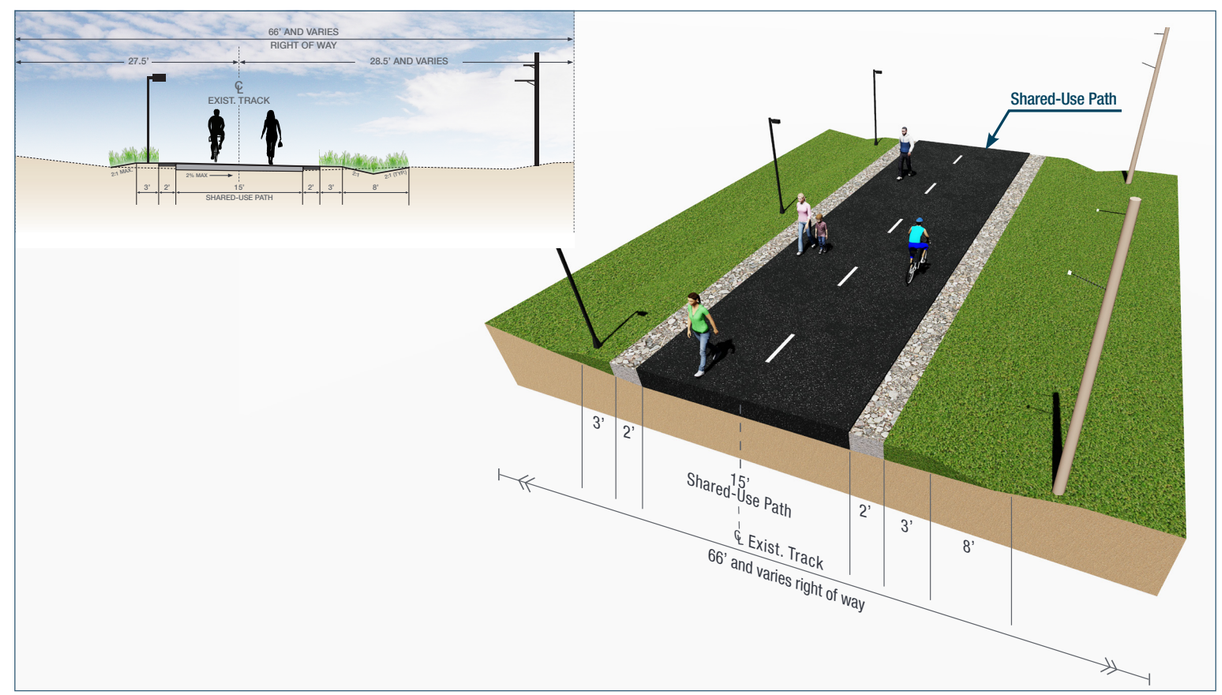


Figure 15: Typical 15' Shared-use Path

Stormwater Management Opportunities

The stormwater management design for this project will be required to comply with Virginia Stormwater Management Program Part IIB technical criteria. These criteria pertain to water quantity (channel protection and flood protection) and water quality (phosphorus removal). Depending on the alternative selected, the water quantity requirements could be the more challenging stormwater requirement for this project—especially if additional right-of-way is required to meet those requirements.

Preliminary layouts and typical sections assume the runoff will be directed to the south and be conveyed through the existing ditches, mimicking existing drainage patterns. Depending on the selected path width and resulting impervious area, this open conveyance system is expected to be adequate to convey the flow without overtopping the bank, since the flow is not expected to greatly increase in proposed conditions.

BMP Selection

It is anticipated that best management practice (BMP) types feasible for this project include:

- **Linear Wet Swales**
  Linear wet swales can be designed to treat and transport water to outfall locations. Wet swales can provide runoff filtering and treatment within the conveyance system and are a cross between a wetland and a swale. These linear features often intercept shallow groundwater to maintain a wetland plant community, and can therefore be used in locations where there is not adequate separation from the groundwater table. The saturated soil and wetland vegetation provide an ideal environment for gravitational settling, biological uptake, and microbial activity. On-line or off-line cells are formed within the channel to create saturated soil or shallow standing water conditions (typically less than 6 inches deep).

- **Linear Dry Swales**
  Dry swales are configured as linear channels that treat and transport water to outfall locations. The dry swale is a soil filter system that temporarily stores and then filters the runoff. Dry swales rely on a pre-mixed soil media filter below the channel. Depending on soil conditions, dry swales may include a perforated underdrain to help convey flow to its outfall.

- **Linear Grass Channels**
  Grass channels can provide a modest amount of runoff filtering and volume attenuation within the stormwater conveyance system. The performance of grass channels will vary depending on the underlying soil permeability. Grass channels, however, are not capable of providing the same quantity (runoff reduction) functions as dry swales as they lack the storage volume associated with the engineered soil media. Their runoff reduction performance can be boosted when compost amendments are added to the bottom of the swale if additional runoff reduction benefits are needed to meet requirements.

When selecting the BMP that best fits the project site, it will be important to understand the design requirements of each respective BMP and how each would integrate with the proposed improvements. Also, the construction phasing must be considered when developing the stormwater management plan as there needs to be management facilities to accommodate each constructed phase.

Water Quality

Preliminary water quality requirements were calculated using the Virginia Runoff Reduction Method (VRRM). These calculations were used to determine feasible BMP type options. The calculations were based on the path length along the rail corridor, alternative typical sections, and offsite routes. The assumptions made for the VRRM calculations were:

- **Path Route**
  The preferred path alignment was used for all calculations (disturbed area, pre-development land cover, and post-development land cover). This included large sections of the existing rail corridor that are proposed to be redeveloped with the path, as well as a few locations where the path deviates slightly from the former NSRR corridor to safely cross vehicular traffic where improvements would be proposed to accommodate bike and pedestrian traffic.

- **Offsite Areas and Right-of-Way**
  In select locations with vehicular crossings, the path deviates from the NSRR corridor. Existing sidewalk conditions were considered for each offsite area along the preferred path location. The average sidewalk width was estimated using a combination of the City of Virginia Beach GIS information, Google Maps, and available survey. Additionally, proposed sidewalk widths in these locations were based on the apparent available right-of-way from available GIS data.

- **Existing Impervious Area**
  The existing impervious area along the rail corridor was estimated to be 17 feet wide. This was based on an average field measurement along the rail corridor. Since the existing freight rail section has been significantly compacted over time, the existing section from toe of fill to toe of fill is considered impervious in its pre-redeveloped condition.

- **Tie-In Distance**
  To tie back to existing grade, it was assumed that an additional 3 feet would need to be added to either side of the path. This is a general assumption, which will need to be verified and optimized when detailed survey is gathered in future phases of design.

- **Soils**
  To make the most conservative assumption, all soils were assumed to be HSG class D.

The disturbed area and removal requirements are displayed in Table 1 below.

TABLE 1: Water Quality Calculation Summary

Typical Section Alternative (Width)	Disturbed area (acres)	Removal Requirement (lb/year)
8 ft sidewalk (1 ft shoulders)	29	0
10 ft path (2 ft shoulders)	37	7
15 ft path (2 ft shoulders)	46	17

Based on these results, no quality measures would be required if the corridor was redeveloped as an 8-foot sidewalk. This is because the impervious area along the path is being reduced significantly, from 17 feet to 8 feet. This decrease in impervious area is adequate to satisfy water quality requirements. However, if a typical section is selected that includes a 10-foot path or 15-foot path, a water quality BMP will be required. These BMPs would likely be linear in geometry, and could be located to the south of the path as a pathside conveyance feature. The removal requirements for the 10-foot path could be satisfied with wet swales, dry swales, or linear grass channels. The removal requirements for a 15-foot path could likely be satisfied with dry swales or off-line wet swales. These BMPs would be designed in accordance with Virginia Department of Environmental Quality (VDEQ) Clearinghouse Standards.

Safety Features

To create a shared-use path that is a safe route for all users, it is important to incorporate safety features into the design. These will include proper lighting, signage, pavement markings, street crossings, and emergency call-boxes.

At each street crossing, there will be a typical trailhead. Although the majority of the path will be constructed of asphalt, all trailheads will be concrete. This gives the trailhead a distinctly different look to differentiate from the asphalt paved road, and to indicate to path users that they are approaching a changed condition. At the trailhead, the striping will shift from a dashed yellow line down the center of the path to a solid yellow line, also alerting the path user that they are approaching a changed condition. Stop signs will face the path users, a stop bar will be striped, and truncated domes will be placed at the interface of the path and the roadway—all signaling the path user that they should stop for oncoming traffic. At the major street crossings, additional safety measures like the installation of fencing will be implemented to direct path users to the appropriate and safe crossing location. These specific locations are discussed in sections below.

It also is proposed that emergency "blue light" call-boxes be located at appropriate places along the shared-use path. At this preliminary level, it is recommended that one emergency call-box be placed every 0.5 miles. With this spacing, the maximum distance a user would have to travel to reach a call box in case of emergency would be 0.25 miles.

The path will be designed to accommodate smaller emergency vehicles. While not intended to be a primary corridor for emergency vehicles or serve fire trucks, emergency medical services (EMS) vehicles will be able use the path to gain access to a user who may be in distress. Due to the limited right-of-way and the linear nature of the path, larger vehicles may not be able to turn around and would have to drive to the next street crossing in the direction of original travel.

Vehicular Roadway Crossing Alternatives

The general alignment of the shared-use path will be on the location of the existing railroad tracks. The intention is for the contractor to remove the rail and ties, and construct the shared-use path within the footprint of the impervious ballast section. The horizontal alignment investigated as a part of this study is in accordance with those assumptions. However, the shared-use path will cross several existing vehicular roadways. There are 29 anticipated crossings along the corridor.

Minor Street Crossings

There are 18 crossings of minor streets along the 10.5-mile corridor. Pavement markings will be especially important as the path approaches, and crosses, vehicular roadways. Similar pavement marking treatments will be used at locations where the proposed path will cross a minor vehicular roadway:

- Continental-style crosswalks crossing vehicular roadways
- Stop sign for pedestrian and bicycle traffic
- Stop bar, "STOP" marking, and truncated domes for path users
- Solid yellow centerline stripe in path to the Stop bar
- Double yellow centerline striping on the approaching minor street

Figure 16: Minor Street Crossing Rendering

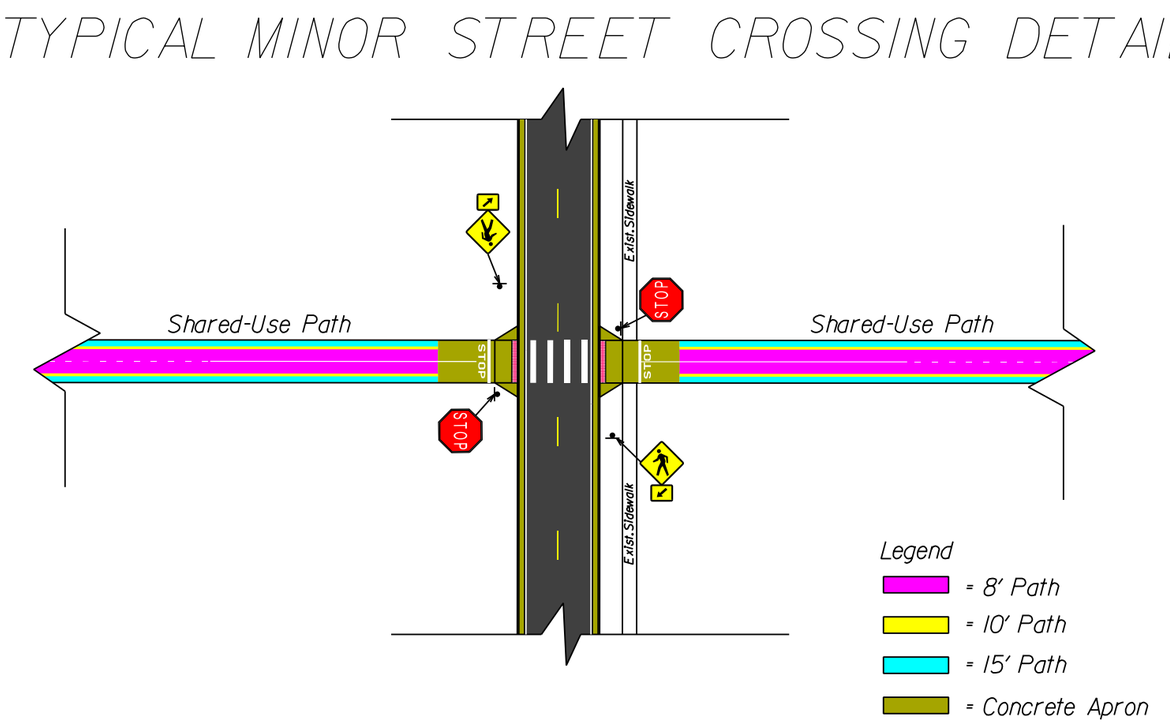


Figure 17: Minor Street Crossing Treatment

Major Street Crossings

In addition to the minor street crossings, there are 11 major street crossings. While three of these 11 crossings occur at an existing signalized intersection, the remaining eight do not and would require a more thorough evaluation of alternative crossings. These eight locations include crossings at:

- Princess Anne Road/Newtown Road Intersection
- Witchduck Road
- Independence Boulevard
- Rosemont Road
- Plaza Trail
- Lynnhaven Parkway
- London Bridge Road
- First Colonial Road/Oceana Boulevard

Each of these major street crossings was evaluated and alternatives were developed to determine the safest and best route for path users. Alternatives for each crossing primarily consisted of diverting path users off the proposed shared-use path corridor to adjacent signalized intersections where users make their crossing. Each alternative was presented and vetted with the City before a preferred crossing alternative was identified at each location. These preferred alternatives are represented in the alignment shown on the conceptual plan layout. In some locations, several alternatives were identified in case the preferred alternative is deemed infeasible once design progresses.

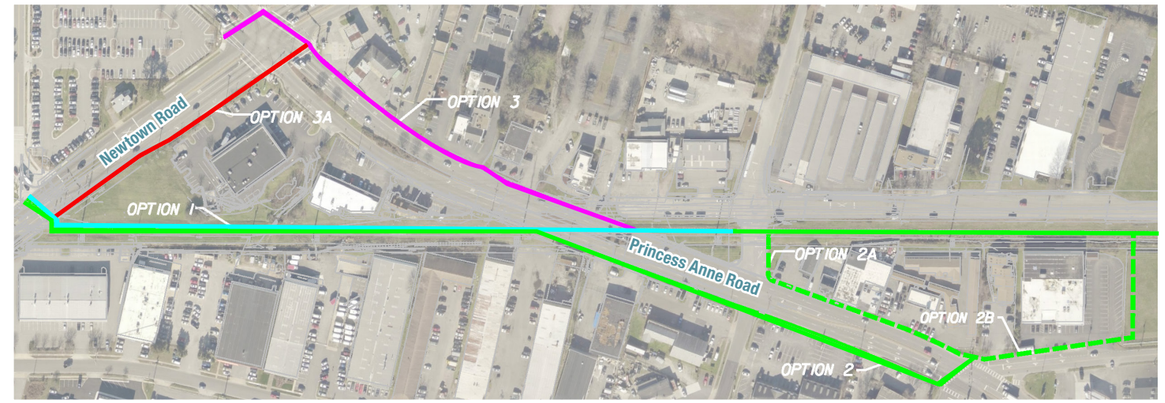
In evaluating each alternative crossing, the following criteria were considered:

- Safety of the users within the crossing (i.e., signal-protected crossings, presence of substandard existing sidewalk facilities, crossing of private driveways, and ADA compliance)
- Operational impacts to vehicular traffic (i.e., vehicle progression, and queueing impacts to adjacent interstate interchanges)
- Potential right-of-way impacts (i.e., path layout conflicts, and potential future impacts associated with bringing existing infrastructure up to standards)

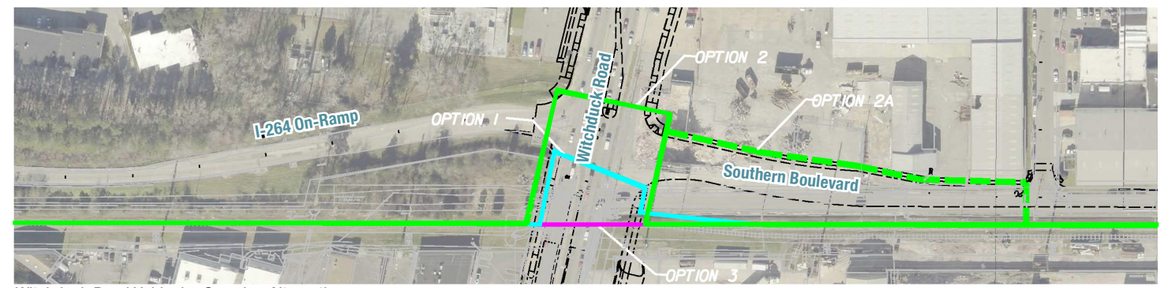
Each of the eight preferred alternatives will include a crossing at a signalized intersection that is either currently, or will be, equipped with pedestrian push buttons, pedestrian countdown signal heads, striped crosswalks, and ADA-compliant ramps and approaches.

Due to the strong anticipated use of the shared-use path, mid-block crossings were only considered where diverting path users would be deemed not feasible and there was a concern that users would cross a roadway in an unsafe condition. These assumptions resulted in preferred alternatives that will require users to divert off the shared-use path in most cases, and traverse existing sidewalk facilities for short distances before returning onto the proposed path corridor. The exception to this condition is at Constitution Drive, where the median will be modified to provide a refuge area, and a mid-block crossing installed.

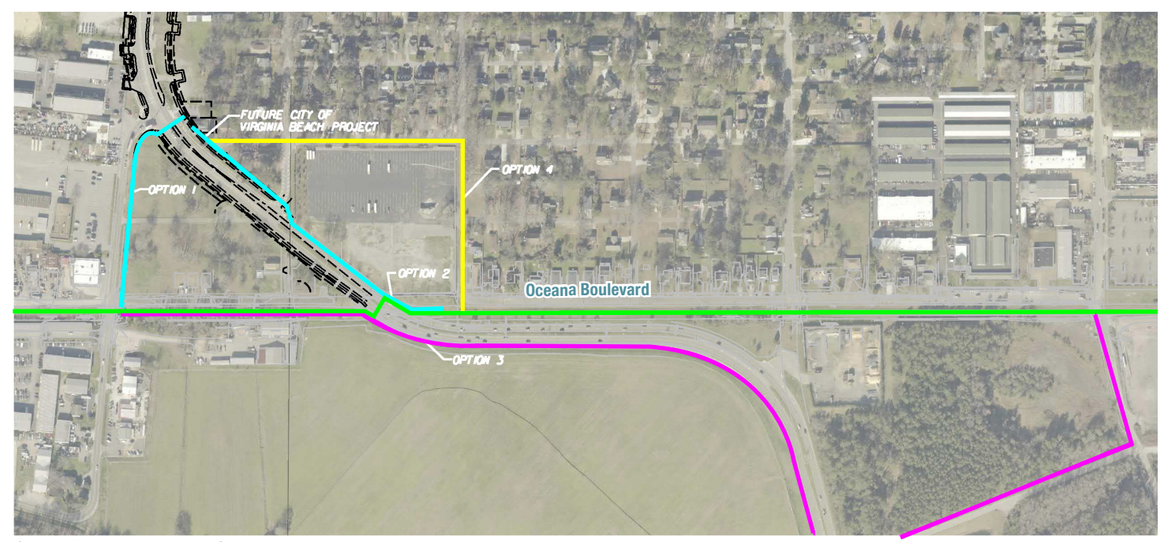
At the major intersections, providing a protected crossing and not increasing vehicular delays can be in direct conflict. In some cases, the conflict in timing can be mitigated by locating proposed shared-use path crossings such that a protected crossing phase can be provided to pedestrians and bicyclists while a non-conflicting vehicle movement also is being served. At locations where crossing times will exceed the amount of time being given to a non-conflicting vehicle movement, crossings can be performed in two stages by providing refuge areas in the medians. Existing traffic signal phasing and timings may need to be modified to accommodate the proposed shared-use path crossings.



Princess Anne Road Vehicular Crossing Alternatives

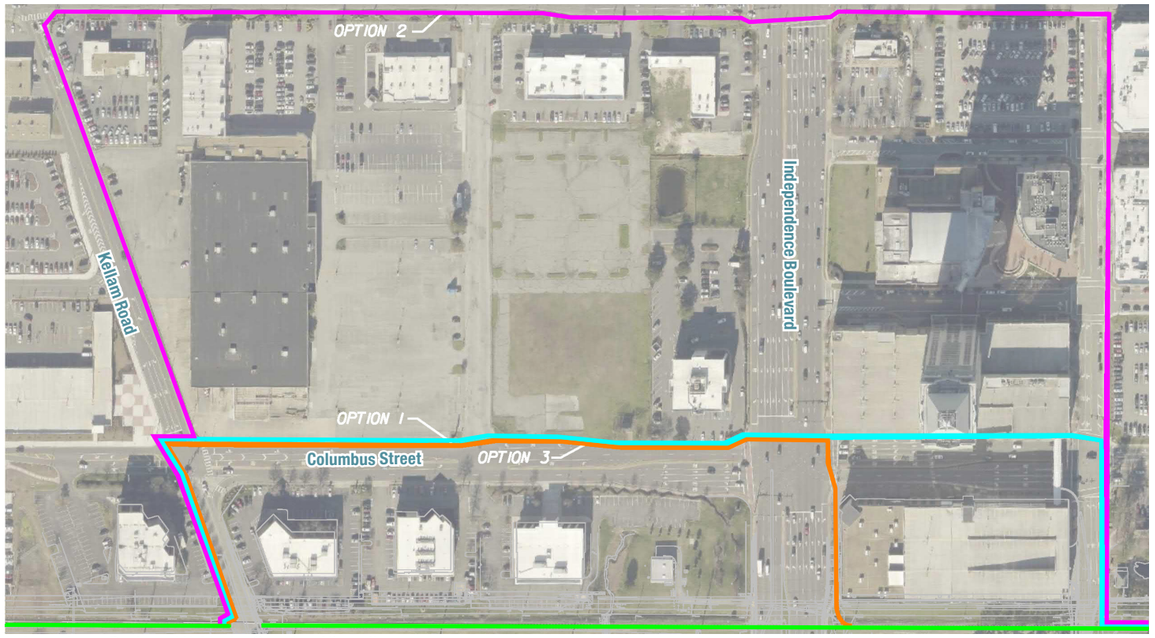


Witchduck Road Vehicular Crossing Alternatives

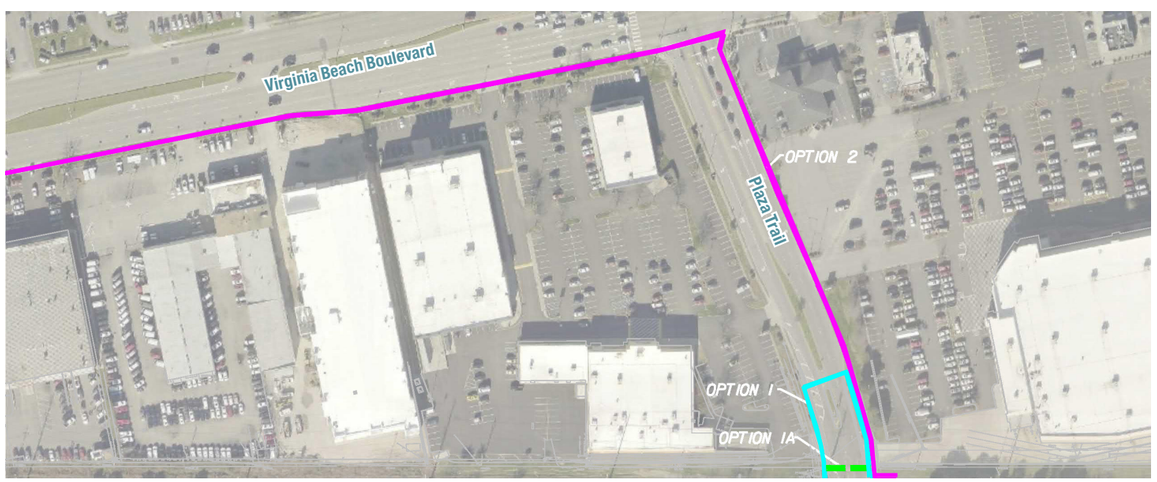


Oceana Boulevard Vehicular Crossing Alternatives

Figure 18: Traffic Exhibits with Multiple Alternatives

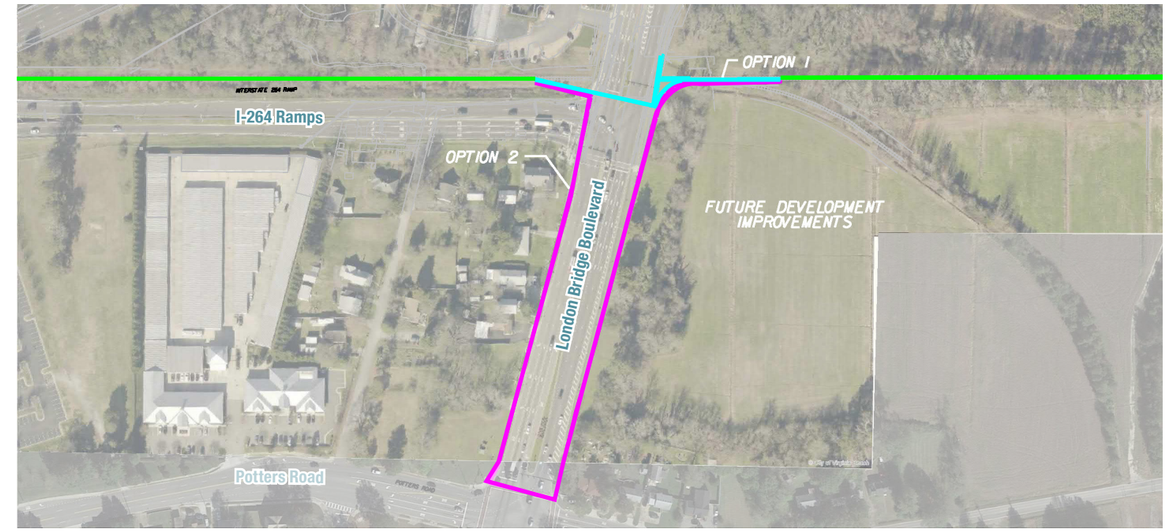


Independence Boulevard Vehicular Crossing Alternatives

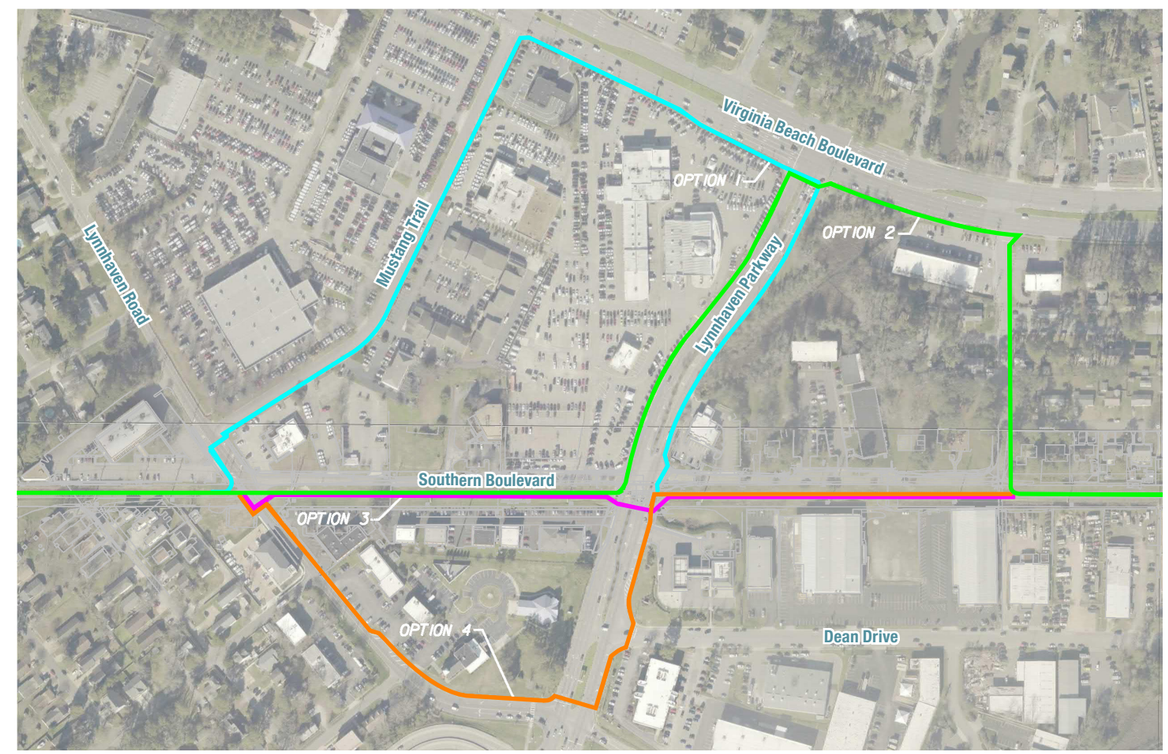


Plaza Trail Vehicular Crossing Alternatives

Rosemont Road Vehicular Crossing Alternatives



London Bridge Road Vehicular Crossing Alternatives



Lynnhaven Parkway Vehicular Crossing Alternatives

Figure 19: Traffic Exhibits with Multiple Alternatives

Right-of-Way Impacts

In some locations, the path will deviate from the rail corridor and onto existing sidewalks to provide a safe crossing of a major street. In these locations, right-of-way impacts need to be considered. Most locations will need to have right-of-way acquired if a 10-foot or 15-foot path is selected. When considering possible right-of-way acquisition, future planned (or under construction) improvements to these sections of roadway were considered. All additional right-of-way areas identified at this stage were based off the currently available ALTA survey, aerial photography, and GIS property data.

- **Princess Anne Road**
  There is approximately 8 feet of existing right-of-way along the east side of Princess Anne Road. The maximum path width this location can accommodate without significantly impacting properties is 8 feet. There are several commercial properties near the Newtown Road intersection that have parking abutting the existing right-of-way. Right-of-way would need to be acquired for a 10-foot or 15-foot path width to be maintained off-corridor. In this area, the construction of an 8-foot sidewalk within the existing right-of-way is recommended.

- **Witchduck Road**
  Based on the improvements that are currently under construction at Witchduck Road, no right-of-way will need to be acquired in this location.

- **Kellam Road**
  There is approximately 11 feet of existing right-of-way along the west side of Kellam Road between the NSRR corridor and Columbus Street. Therefore, this location can accommodate an 8- or 10-foot path without right-of-way impacts. However, if the 15-foot path is selected, additional right-of-way will be required. A 10-foot-wide path is recommended along the west side of Kellam Road to eliminate the need for additional right-of-way acquisition.

- **Columbus Street**
  There is a conceptual study underway to develop a typical cross section and alignment for improvements to Cleveland Street/ Columbus Street between Witchduck Road and Independence Boulevard (Cleveland Street turns into Columbus Street at Horace Avenue west of Kellam Road). Based on current planning documents, these improvements will include 6- to 8-foot sidewalks and on-road bike lanes on both sides of Columbus Street in this area. These improvements to Columbus Street will accommodate the pedestrian and bicycle users as part of the shared-use path. The detailed roadway geometry and right-of-way needs for Columbus Street will be further identified as the design progresses on the Cleveland Street, Phase 4, project.

- **Independence Boulevard**
  Right-of-way does not need to be obtained in this location, nor is there right-of-way available because the area is fully developed. Based on the proximity to existing buildings and the large existing sidewalks, there is adequate space to accommodate pedestrian traffic. In Town Center, bicycles are not allowed on sidewalks, so bicyclists will use the street network (Market Street and Columbus Street). No additional right-of way will be necessary for the pedestrian or bicycle routes.

- **South Lynnhaven Road**
  There is a limited amount of existing sidewalk along the east side of South Lynnhaven Road, and the width is inadequate for the shared-use path. To construct the path along this corridor, additional right-of-way will be required along the east side of South Lynnhaven Road. There are several parcels where the site parking lot will need to be modified to accommodate the alignment of the new path.

- **Lynnhaven Parkway**
  Along the east side of Lynnhaven Parkway, there is an existing sidewalk that will need to be widened. There is less than 8 feet of available existing right-of-way so additional right-of-way will be required to construct even the minimum 8-foot path.

- **South First Colonial Road and Oceana Boulevard**
  The preferred path alignment routes through property that the City does not currently own, but believes they can acquire. The property is south of the City bus storage facility between Louisa Avenue and West Lane. Acquiring this property (or a portion of it) will allow the path to be offset from Oceana Boulevard and prevent the need to construct retaining walls to provide the required width for the path. There is currently a project under design for improvements to Oceana Boulevard between Louisa Drive and Virginia Beach Boulevard. There is a 10-foot-wide sidewalk planned as part of that project, so no additional right-of-way will be required. Along the east side of South First Colonial Road, the path will require additional property in the form of right-of-way or utility easement. There is an existing power line that would need to be relocated to make enough room for the path. Since this section of South First Colonial Road has no curb and gutter, the path must be offset from the pavement.

Structural Investigations

There are two existing creek crossings in the NSRR corridor—one at Thalia Creek, and one at Wolfsnare Creek. To determine if these existing crossings could be modified for safe pedestrian and bicyclist use, the two abandoned structures were investigated through a field inspection. This inspection included a visual and tactile inspection of the portion of the structure above the mudline. Additionally, timber elements were cored as necessary to determine the condition of the internal portions. The structures also were evaluated to determine their capacity and suitability for supporting pedestrian and bicycle loading as well as maintenance vehicles.

Both the bridges are extremely deteriorated and not in suitable condition for rehabilitation. The bridge inspection revealed decaying timber piles, with between 25 and 100 percent loss of cross-sectional area. The steel beams have rust perforations in the webs that have resulted in lateral movement of the beams that has occurred with the settlement of the structure.

The recommendation of this study is to replace these bridges to provide structures that are suitable for the active transportation and emergency vehicles. The cost to replace these bridges is included in the projected construction costs.

A summary report of these findings, supplemented by repair and upgrade concepts and associated costs, is included as Appendix A.

Environmental Challenges

Hazardous Materials

A Phase I Environmental Site Assessment (ESA) was performed in 2009, which identified 26 properties that abut or are adjacent to the NSRR Corridor Shared-Use Path, and one property within the corridor, as Recognized Environmental Conditions (RECs). These properties included, but are not limited to, former gas stations and properties containing above- or below-ground storage tanks. Because of the findings of the Phase I ESA report, a Phase II Soil and Groundwater Sampling/Analysis assessment was performed in 2009 to evaluate the RECs previously identified within the path corridor. Of the soil samples collected, only four samples exhibited analyte concentrations above their respective detection limit, and exceeded their respective regulatory threshold and/or a risk-based screening level. If soil is excavated at these locations and transported from the path corridor, special handling may be required. The groundwater results were all found below their respective method detection limit, and therefore, no issues related to petroleum, solvent, or pesticide contamination are anticipated where groundwater was sampled.

In 2013, an Environmental Data Resources (EDR) database report indicated 93 properties mapped as hazardous materials sites within or adjacent to the NSRR Corridor Shared-Use Path, mostly because of petroleum- or auto-related contamination. Several of these sites have been listed as closed cases by VDEQ where mitigation or remediation has taken place.

There is a historical nature to the NSRR Shared-Use Path corridor since it was a railroad (aerial imagery dating back to 1949). Some of the track and ties are currently in place. Based on the common type of materials used (to include creosote treated lumber), the former railroad tracks may be considered an REC for the NSRR Shared-Use Path. All the remaining track and ties will be removed as part of the shared-use path construction and appropriate actions taken to resolve environmental concerns. However, it is not anticipated that the proposed pedestrian accommodations would release new hazardous materials into the environment. Therefore, impacts resulting from the use of the NSRR corridor as a shared-use path are unlikely.

Permitting

A Wetlands and Waters Technical Report, completed in 2016, documents the results of the waters of the U.S. (WOUS) natural resources evaluation along a portion of the proposed NSRR Shared-Use Path corridor between the Newtown Road transit station and the east side of Thalia Creek. The 2016 Report includes the June 22, 2016, Preliminary Jurisdictional Determination for the project as a result of the February 2, 2016, Jurisdictional Determination (JD) field review with the U.S. Army Corps of Engineers (USACE) and VDEQ. USACE determined that most areas were not wetlands or regulated waters; however, four areas were identified as wetlands/WOUS—two of which were verified to be isolated and jurisdictional under VDEQ regulations, one area was identified as a tidal wetland adjacent to Thalia Creek, and three areas were identified as jurisdictional streams. The basis of the determination for the non-wetland/ non-jurisdictional decisions are as follows:

- The areas were created specifically for the purpose of conveying stormwater
- The areas were originally excavated in uplands
- The areas are not draining wetland features

The 2016 Wetlands and Waters Technical Report and the 2016 Preliminary Jurisdictional Determination were limited to the section of the NSRR Shared-Use Path corridor between the Newtown Road transit station and the east side of Thalia Creek. Therefore, the remaining length of the corridor has not been reviewed for the presence of wetlands or WOUS. Based on a limited review of available aerial photography, most of the path is lined by drainage ditches that may not be jurisdictional to USACE or VDEQ. Additionally, the path appears to cross jurisdictional waters of Pinetree Branch, Wolfsnare Creek, and tributaries to Great Neck Creek. The impacts to wetlands/WOUS and resulting wetland/WOUS permitting requirements will be dependent on the activities proposed. Currently, the design parameters for development of the three initial concepts are as follows:

- Varied-width sidewalk (5-foot absolute minimum, 8-foot desired width) with 1-foot shoulders per AASHTO sidewalk standards
- 10-foot shared-use path with 2-foot shoulders per AASHTO shared-use path standards
- 15-foot shared-use path with 2-foot shoulders per AASHTO shared-use path standards
- Path constructed of asphalt or compacted crushed stone to minimize cost
- Continued use of existing railside ditch to convey runoff

The majority of the NSRR right-of-way is 66 feet wide. Therefore, it is anticipated that the shared-use path will not deviate outside of the right-of-way except in locations where a deviation is required to safely cross streets. Construction of the initial concepts would affect identified wetland areas along the path. If maintenance of the drainage ditches along the path, to include removal of accumulated sediment and mowing, is proposed, this activity may require permitting based on the jurisdictional determination of the drainage ditches by USACE and VDEQ. Additional temporary impacts also would be expected during construction for access. The table below provides a summary of wetland permitting agencies, available permits, impact thresholds, and typical permitting timeframes.

Table 2. Wetlands/Surface Waters Permitting Summary

Impacts		Agency			Approximate Timing
Wetlands	Streams	USACE	VDEQ	VMRC	
<0.5 ac	<300 lf	NWP 51	401 Cert.		2-3 months
< 1 ac	<1,500 lf	SPGP	GP		4-6 months
< 1 ac	> 1,500 lf but < 2,000 lf	SPGP	IP		6-12 months
> 1 ac but < 2 ac	> 1,500 lf	IP	GP		4-12 months
> 2 ac	> 2,000 lf	IP	IP		6-12+ months
	Contributing drainage area > 5 sq. miles*			Permit required	3-6 months

**VMRC (Virginia Marine Resources Commission) can administratively permit projects where the project cost within their jurisdiction is < $500,000*
NWP= Nationwide Permit, GP = general permit, SPGP = State Programmatic General Permit, IP = Individual Permit

Opportunities for Parking

In addition to the neighborhoods and other adjacent developments that will use the shared-use path, there are opportunities to construct small parking lots on City-owned property along the shared-use path corridor. These small lots would allow users to park away from more-dense destination areas, and instead use the path to reach their destination. A search of the City's GIS information provided locations of City-owned property within a quarter-mile of the corridor. No site layout of these properties was performed, but these could be developed during a future design phase of this project. If any of these sites were selected for development as a small parking lot for path users, drainage and stormwater management would have to be included with the site plan.

These sites are east of Plaza Trail and are either undeveloped parcels, or existing uses that would complement the path uses. Pinewood Gardens Park has access off Ansol Lane and Armon Avenue. Currently, there is an unpaved area along the west side of Armon Avenue that is signed "No Parking" along the southern fence line. At the northern end of the park, parking is allowed adjacent to the fence. This area could be paved to provide a better surface for park and shared-use path users.

East of Lynnhaven Parkway is Eureka Park, which is just north of Southern Boulevard. Park users park along the southern edge of the park on Southern Boulevard. This area could be paved, providing a better surface for both park and shared-use path users.

In the northwest quadrant of the Air Station Drive/shared-use path right-of-way, there is an undeveloped parcel where a path parking lot could be constructed. Access to the path would be easy, since the parcel is adjacent to the path.

The triangular area between S. First Colonial Road, Oceana Boulevard, and Southern Boulevard is owned by the City and is undeveloped. A parcel could be improved to include parking for path users. Since the path is diverting north on S. First Colonial Road, the parking lot can be easily connected to the path.

There are several City-owned parcels west of Birdneck Road, south of Southern Boulevard, that could be improved as parking lots for path users. This location will be attractive to path users who want to access the eastern end of the path.

These potential parking locations are shown on the Conceptual Layouts.

Phasing Plan

One of the intents of this study is to develop a plan that includes fundable and constructible segments, and to determine the order in which to prioritize construction of those segments. The 10.5-mile shared-use path has been divided into 10 segments, each with

logical termini. These termini were defined by existing and potential land uses, connections to existing bicycle and pedestrian facilities, and anticipated users of each individual segment as well as the connected segments. Connectivity of the various SGAs also was considered in developing the construction phasing plan.

Many sequencing alternatives were considered. After balancing priorities, benefits, and shortcomings of each option, the top two preferred options for the construction sequence were determined (Option A and Option B below).

To enhance the potential for the success of the entire 10.5-mile path, the volume of users taking advantage of the amenity segment by segment is a key consideration. Creating excitement and the desire for expansion of the path in the community will assist in developing the support for continued funding and construction of the segments. The importance of this was heavily weighted and was a driving factor for the recommended sequencing option, as described below.

Option A would begin at the east end of the corridor (Birdneck Road) and would construct the segments working westward (Segment 10 to 1). This would provide connectivity with the existing South Beach Trail along Norfolk Avenue. The easternmost segments transverse property that is bordered by Naval Air Station Oceana on the south, so there is little potential for additional development in this area.

As the construction continues westward from London Bridge Road, the path would serve more residential areas and some commercial areas as it approached Town Center. West of Town Center, between Independence Boulevard and Witchduck Road, the area is industrial in nature. West of Witchduck Road, the majority of uses adjacent to the shared-use path corridor are a mixture of residential, educational, and light industrial. The final segment would provide a connection to the Newtown transit station.

There are several advantages of proceeding in this order:

- Connecting to the existing South Beach Trail provides continuation of an existing active transportation system
- Maintaining connectivity working east to west with the construction of each segment
- Providing extended connectivity to the Resort Area, an attractive destination. As the segments continue to be constructed eastward, more residential neighborhoods become connected and the potential for usership grows
- Existing path users in the oceanfront area can take advantage of the extended path
- Extending a highly used recreational facility

This approach would help the public know "what to expect next." For example, if the path stops short of your neighborhood with the completion of one segment, you could expect that the next segment would connect to you. If you are at the west end of the corridor, you could expect that it may take some time for the path to reach your neighborhood.

Option B (Recommended) would prioritize the construction of segments in areas with the highest expected use. The determination of segment priorities would be based on areas of existing use (people currently walking the former NSRR right-of-way) and the potential use when destinations are connected. An example of this is the usership generated upon connecting the Thalia Village neighborhood to Town Center, creating a convenient mode of access to a popular destination that does not exist today. The driving intent of this approach is to generate excitement in as many users as possible early in the development of the path, and demonstrate the value this amenity will bring. The support of the people who use the path and want it extended will assist in the desire to continue funding.

Following is a description of the Option B segment construction:

- **Phase 1- Segments 4 and 5 —** Segment 4 is the crossing of Independence Boulevard and Segment 5 is the Town Center segment. With the volume of potential users in the Town Center area, the use of this segment is anticipated to be high. The pedestrian use of the existing tracks west of Independence Boulevard is already prominent, and with a better connection across Independence Boulevard, that use would increase. Also, the construction of the Wegmans and the existing Walmart would draw users from Town Center. The Pocahontas Village neighborhood could access the shared-use path at Kellam Road to go east toward Town Center. Segment 5 would connect from Market Street to Lynn Shores Drive east of Town Center. A crossing of Thalia Creek would provide connectivity between the Thalia neighborhood and Town Center.
- **Phase 2- Segments 10 and 9 —** Segment 10 provides the connection to the South Beach Trail, which connects to the oceanfront. The continuation of this trail system westward would expand the recreational opportunities for those users. The completion of Segment 9 would provide a connection to the existing path on the east side of London Bridge Road. The path on London Bridge Road connects to the Dam Neck Road path to the south and a network of paths and sidewalks in the southern part of the City. This will create significant opportunities for users throughout Virginia Beach to gain access to the new shared-use path.
- **Phase 3- Segments 1 and 2 —** These segments connect the residential neighborhoods in the western portion of the City to the transit station at Newtown Road and educational institutions in that area. Building Segment 1 would provide users with a connection between the transit station and ECPI University and Medical Careers Institute (MCI). This path would provide alternative transportation methods to the businesses and educational institutions. Segment 2 would continue the path to Witchduck Road. The construction of this segment adds the residential neighborhoods south of the corridor to go east toward the transit station at Newtown Road, or east crossing under I-264. The new Housing Resource Center, located on Witchduck Road, would also be connected with a path to the west toward the Newtown Road transit station.
- **Phase 4- Segments 8, 7, and 6 —** The construction of Segments 8, 7, and 6 will continue the path from Segment 9 to the west. Building these segments westward would provide a continuation of the path that connects to the oceanfront. Segment 8 would provide a connection with Lynnhaven Parkway. There is a plan to construct a 10-foot-wide sidewalk on the west side of Lynnhaven Parkway south of I-264 that could connect to this shared-use path. Segment 7 continues to Plaza Trail (which has bike lanes heading south from the shared-use path). It also crosses Wolfsnare Creek and picks up the Pinewood Gardens and Rosegate neighborhoods. Segment 6 would complete the connection of the shared-use path between Town Center and the oceanfront. It crosses Rosemont Road and ends at Lynn Shores Drive. At Lynn Shores Drive, pedestrians are close to Virginia Beach Boulevard, where they can access sidewalks and Hampton Roads Transit (HRT) bus stops.
- **Phase 5- Segment 3 —** This segment is lowest on the order of priorities since there are other projects being planned or designed that provide a parallel opportunity for active transportation users. The Greenwich Road flyover of I-264 project is currently under construction. It includes a 10-foot-wide sidewalk on the north side of the structure and a 5-foot-wide sidewalk on the south side. There are a series of projects to improve Cleveland Street/Columbus Street to Independence Boulevard. West of Witchduck Road, Cleveland Street will have an 8-foot-wide sidewalk on the north side. Current planning of Cleveland Street/Columbus Street improvements, between Witchduck Road and Independence Boulevard, includes sidewalks on both sides and on-street bike lanes. The Cleveland Street corridor is one block north of the shared-use path right-of-way. If these projects are delayed, Segment 3 could rise on the priority list.

Table 3: Phasing Plan Options, Listed in Order of Priority per Option

Option A				Option B			
Construction of the path from east to west. Initial segment connects to the South Beach Trail and the oceanfront. Completed segments form a connected path working towards Newtown Road the Newtown Transit Station.				Priority given to the construction of segments in areas with the highest potential for usage and connection of neighborhoods and SGA's. Create excitement in users and a desire for longer, more connected path.			
Segment Number	**From**	**To**	**Approx. Length (mi)**	**Segment Number**	**From**	**To**	**Approx. Length**
10	Air Station Dr	Birdneck Rd	1.7	4	Kellam Rd	Market St	0.5
9	London Bridge Rd	Air Station Dr	1.1	5	Market St	Lynn Shores Dr	2.1
8	Lynnhaven Rd	London Bridge Rd	0.9	10	Air Station Dr	Birdneck Rd	1.7
7	Plaza Trail	Lynnhaven Rd	1.4	9	London Bridge Rd	Air Station Dr	1.1
6	Lynn Shores Dr	Plaza Trail	0.4	1	Newtown Rd	Ivy Ct	0.5
5	Market St	Lynn Shores Dr	2.1	2	Ivy Ct	Witchduck Rd	1.2
4	Kellam Rd	Market St	0.5	8	Lynnhaven Road	London Bridge Rd	0.9
3	Witchduck Rd	Kellam Rd	1.0	7	Plaza Trail	Lynnhaven Road	1.4
2	Ivy Ct	Witchduck Rd	1.2	6	Lynn Shores Dr	Plaza Trail	0.4
1	Newtown Rd	Ivy Ct	0.5	3	Witchduck Rd	Kellam Rd	1.0

**Segments can be combined as desired. Segments shown represent minimum segment recommended to be constructed to have logical termini.*

Segment 1: Newtown Road to Ivy Court

The westernmost segment of the path extends from the existing transit station at Newtown Road to Ivy Court. This is the westernmost project limit, and also is the dividing line between City of Virginia Beach and City of Norfolk. This transit station connects users to an existing light rail system, as well as an existing bus stop. The eastern limit of Segment 1, at Ivy Court, is the location of ECPI University and MCI. This segment would provide students at those institutions additional options for transportation modes. This segment is approximately 0.5 miles in length.

Segment 2: Ivy Court to Witchduck Road

Extending east from Ivy Court, this segment of the proposed path has its eastern boundary at Witchduck Road. Segment 2 crosses underneath I-264 and serves residential land uses to the south and commercial land uses to the north. The length of this segment is approximately 1.2 miles.

Segment 3: Witchduck Road to Kellam Road

This segment connects Witchduck Road to Kellam Road. It serves residential land uses from the south, commercial development from the north, and an industrial facility. The connection to Witchduck Road supplements the Witchduck Road, Phase 2, project that is currently under construction and includes pedestrian accommodations. It also connects path users to the newly constructed Housing Resource Center. The path will cross pedestrian traffic at the Witchduck Road/I/264 on-ramp/ Southern Boulevard intersection traffic signal that is currently under construction. This segment spans approximately 1.0 mile.

Segment 4: Kellam Road to Market Street

Path users would access Kellam Road to divert to Columbus Street, where the path would head east toward Independence Boulevard.

On Columbus Street, west of Independence Boulevard, there is a proposed 6- to 8-foot pedestrian path on the north side as part of the adjacent Cleveland Street, Phase 4, project.

One of the shared-use path's most difficult street crossings is at Independence Boulevard. This section of Independence Boulevard carries the highest volume of traffic in the City, with an average daily traffic (ADT) of 75,000 vehicles per day. There are multiple adjacent projects that also are considering options to cross pedestrians at Independence Boulevard. A grade-separated facility was considered as part of the light rail extension project that would allow pedestrians and bicyclists to use a bridge to cross over Independence Boulevard. At the time of the light rail design, the shared-use path grade-separated structure was estimated to cost $7.5 million.

Due to the cost-prohibitive nature of a pedestrian/bicycle bridge for a shared-use path-only project, the selected alternative is to cross the shared-use path users at the intersection of Independence Boulevard and Columbus Street. The pedestrian crossing would be on the north leg of the intersection, which would allow the triple left-turn westbound-to-southbound vehicles to move at the same time as the pedestrians.

On the east side of Independence Boulevard, the path will reach Town Center. Since bicycles are not allowed on the sidewalks in Town Center, bicyclists would use the on-road bike lanes on Columbus Street west of Independence Boulevard, and use the vehicular lanes on Columbus Street east of Independence Boulevard. The bicyclists would have access to the NSRR corridor via Market Street.

Crossing Independence Boulevard at-grade will be challenging and may have unacceptable impacts to the vehicular traffic. If an at-grade solution is found to be not viable in future phases of design, a grade-separated structure may be necessary.

Segment 5: Market Street to Lynn Shores Drive

Continuing eastward from Market Street, this segment spans 2.1 miles and ends at Lynne Shores Drive. The western end of this segment links the path to one of the most significant destinations along the corridor—Town Center. The path then passes through residential areas, and serves some commercial land uses on the east end. There is one water crossing in this segment that spans Thalia Creek, which will require a new bridge structure. In this segment, there is an existing trail project, Thalia Creek Greenway, that will be an added amenity to the proposed path.

Segment 6: Lynn Shores Drive to Plaza Trail

East of Lynn Shores Drive, this short segment continues to Plaza Trail. Lynn Shores Drive provides a connection to the existing sidewalk facilities along Bonney Road. This section serves mostly commercial developments, and provides an east-west connection through the majority of the Rosemont SGA. An added benefit is the proximity to an existing HRT bus stop on the south side of Virginia Beach Boulevard. The length of this segment is approximately 0.4 miles in length.

Segment 7: Plaza Trail to Lynnhaven Road

As the path continues east, the next desirable limit is at Lynnhaven Parkway. This segment serves multiple neighborhoods and residential areas, as well as commercial development at its western end. The shared-use path will connect to sidewalks and on-road bike lanes that go south on South Plaza Trail and under I-264. This is an important connection since I-264 often acts as a barrier for pedestrian and bicycle traffic. Another benefit of this segment is the proximity to an existing HRT bus stop on Virginia Beach Boulevard. This segment is approximately 1.4 miles in length.

Segment 8: Lynnhaven Road to London Bridge Road

The next destination east of Lynnhaven Parkway is to London Bridge Road. This segment includes a water crossing over Wolfsnare Creek, which would require a new bridge structure. This crossing is essential to connect pedestrian traffic across the Lynnhaven SGA and provide a new commuter route to connect adjacent neighborhoods and developments. This segment spans approximately 0.9 miles.

Segment 9: London Bridge Road to Air Station Drive

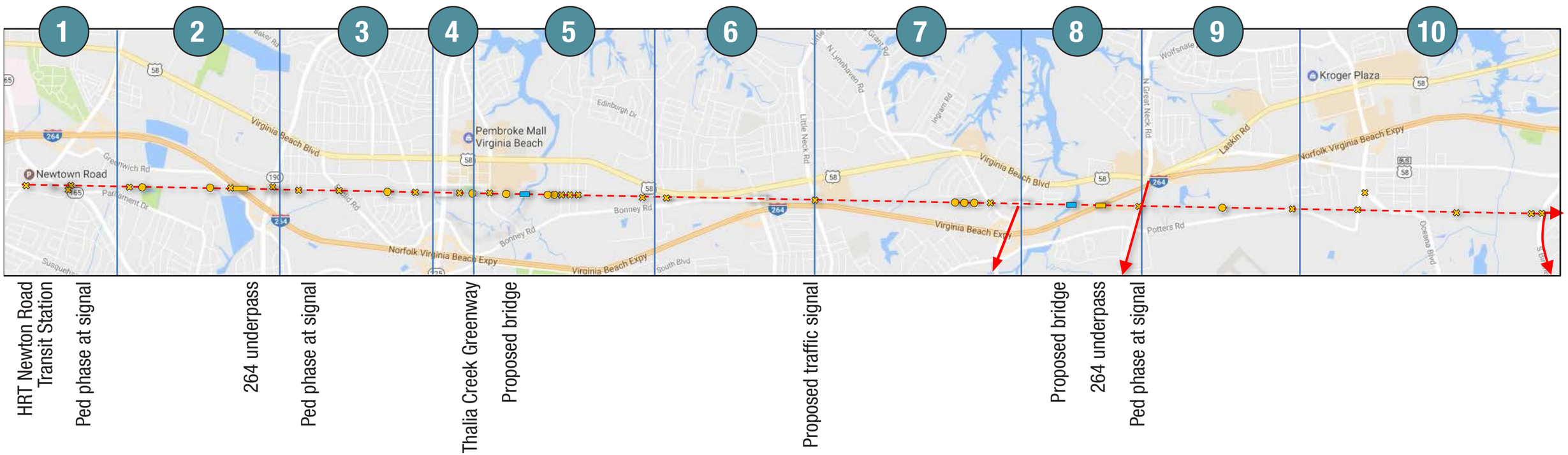
Working east from London Bridge Road, the next logical segment boundary is at Air Station Drive. London Bridge Road has an existing multi-use facility along the east side of the roadway. The London Bridge Road path provides connections to Dam Neck Road and a network of existing trails. At Air Station Drive, path users have an easy connection point to Potters Road. Potters Road in this area has a relatively low traffic volume so cyclists will be comfortable riding on the roadway. This segment is approximately 1.1 miles in length.

Segment 10: Air Station Drive to Birdneck Road

This segment ties into the existing South Beach Trail at Birdneck Road, which serves the oceanfront Resort Area. This segment is unique in that the existing corridor is in a significant amount of fill with steep slopes into the Linkhorn Bay floodplain. At Linkhorn Bay, there is an existing 72-inch corrugated metal culvert under the rail corridor. If an 8-foot sidewalk is selected, the culvert does not need to be lengthened; however, if the 10- or 15-foot path width is selected, the culvert would likely need to be widened accordingly. This segment is approximately 1.7 miles long.

Potential Segments

1	2	3	4	5	6	7	8	9	10
Newton Rd to Ivy Ct	Ivy Ct Witchduck Rd	Witchduck Rd to Kellam Rd	Kellam Rd to Market St	Market St to Lynn Shores Dr	Lynn Shores Dr to Plaza Trail	Plaza Trail to Lynnhaven Rd	Lynnhaven Rd to London Bridge Rd	London Bridge Rd to Air Station Dr	Air Station Dr to Birdneck Rd
0.5 mi.	1.2 mi.	1.0 mi.	0.5 mi	2.1 mi.	0.4 mi.	1.4 mi.	0.9 mi.	1.1 mi.	1.7 mi.



Legend

- Proposed path
- Existing path
- At-grade road crossing (34)
- Interstate underpass (2)
- Other access points (11)
- Water crossing (2)

Order-of-Magnitude Opinion of Probable Costs

To make an informed decision on the preferred alternative, a concept-level order-of-magnitude cost estimate was developed for each alternative. The summary of this analysis is shown in **Table 4**.

Additional detail for each alternative can be found in the tables in **Appendix B**.

The following assumptions were made to generate cost estimates:

- Current-year (2018) construction costs were used. Without knowing the funding year, no escalation was applied to any segment
- Rail and tie removal is in units of "track feet." This is a linear foot measurement that includes removal of both rails. Benefits from recycling rail materials was not considered
- The asphalt pavement section is 2-inch surface mix, 6-inch aggregate base material, and geotextile subgrade stabilization
- In alternatives with asphalt pavement, crushed stone is used for maintenance vehicle turnarounds and shoulders
- One maintenance vehicle turnaround is provided every 0.5 miles
- Crushed stone (whenever used) is assumed to be a 6-inch depth
- The existing drainage system will be maintained; limited pipes and structures will be required
- Water quantity can be achieved through rock check dams and attenuation in linear conveyance system
- 2-foot cut and 1-foot fill is required along entire section
- No excavation required for proposed BMPs
- 1 sign required every 200 feet
- Continental-style crosswalks
- 1 bicycle symbol every 500 feet
- 4-inch dashed stripe down center of path (solid stripe 100-foot before vehicular crossings)
- LED pedestrian light fixture on each side of the path every 90 feet
- 1 underground electrical service every 0.5 miles
- Junction box required every 300 feet
- 25% contingency was applied to the overall construction cost
- Right-of-way costs were estimated at $4M per acre based on recent acquisition costs of adjacent projects
- No utility relocation costs were included
- A 4 x 4" duct back to be installed for the length of the corridor for fiber and communications
- Tree planting is spaced every 50'

Table 4: Cost Estimate Summary Table

Segment	From	To	Approx. Length (mi)	Path Width (ft)	Material	Construction Cost	Right-of-Way Cost	Total Cost
1	Newtown Road	Ivy Court	0.5	8	Crushed Stone	$1,589,000	$127,500	$1,716,500
					Asphalt	$1,606,000	$127,500	$1,733,500
				10	Crushed Stone	$1,755,000	$127,500	$1,882,500
					Asphalt	$1,789,000	$127,500	$1,916,500
				15	Crushed Stone	$1,866,000	$127,500	$1,993,500
					Asphalt	$1,916,000	$127,500	$2,043,500
2	Ivy Court	Witchduck Road	1.2	8	Crushed Stone	$3,640,000		$3,640,000
					Asphalt	$3,746,000		$3,746,000
				10	Crushed Stone	$4,342,000		$4,342,000
					Asphalt	$4,452,000		$4,452,000
				15	Crushed Stone	$4,717,000		$4,717,000
					Asphalt	$4,828,000		$4,828,000
3	Witchduck Road	Kellam Road	1.0	8	Crushed Stone	$3,365,000		$3,365,000
					Asphalt	$3,491,000		$3,491,000
				10	Crushed Stone	$3,910,000		$3,910,000
					Asphalt	$4,005,000		$4,005,000
				15	Crushed Stone	$4,295,000		$4,295,000
					Asphalt	$4,430,000		$4,430,000
4	Kellam Road	Market Street	0.5	Sidewalk Improvements		$1,357,000	$42,000	$1,399,000
5	Market Street	Lynn Shores Drive	2.1	8	Crushed Stone	$6,831,000		$6,831,000
					Asphalt	$6,988,000		$6,988,000
				10	Crushed Stone	$7,874,000		$7,874,000
					Asphalt	$8,053,000		$8,053,000
				15	Crushed Stone	$8,751,000		$8,751,000
					Asphalt	$9,007,000		$9,007,000
6	Lynn Shores Drive	Plaza Trail	0.4	8	Crushed Stone	$2,100,000		$2,100,000
					Asphalt	$2,135,000		$2,135,000
				10	Crushed Stone	$2,340,000		$2,340,000
					Asphalt	$2,388,000		$2,388,000
				15	Crushed Stone	$2,426,000		$2,426,000
					Asphalt	$2,488,000		$2,488,000
7	Plaza Trail	Lynnhaven Road	1.4	8	Crushed Stone	$4,689,000		$4,689,000
					Asphalt	$4,809,000		$4,809,000
				10	Crushed Stone	$5,416,000		$5,416,000
					Asphalt	$5,551,000		$5,551,000
				15	Crushed Stone	$5,924,000		$5,924,000
					Asphalt	$6,109,000		$6,109,000
8	Lynnhaven Road	London Bridge Road	0.9	8	Crushed Stone	$4,087,000	$560,000	$4,647,000
					Asphalt	$4,159,000	$560,000	$4,719,000
				10	Crushed Stone	$4,495,000	$560,000	$5,055,000
					Asphalt	$4,581,000	$560,000	$5,141,000
				15	Crushed Stone	$4,726,000	$560,000	$5,286,000
					Asphalt	$4,849,000	$560,000	$5,409,000
9	London Bridge Road	Air Station Drive	1.1	8	Crushed Stone	$3,741,000		$3,741,000
					Asphalt	$3,822,000		$3,822,000
				10	Crushed Stone	$4,323,000		$4,323,000
					Asphalt	$4,428,000		$4,428,000
				15	Crushed Stone	$4,744,000		$4,744,000
					Asphalt	$4,886,000		$4,886,000
10	Air Station Drive	Birdneck Road	1.7	8	Crushed Stone	$4,852,000		$4,852,000
					Asphalt	$4,980,000		$4,980,000
				10	Crushed Stone	$5,775,000		$5,775,000
					Asphalt	$5,909,000		$5,909,000
				15	Crushed Stone	$6,428,000		$6,428,000
					Asphalt	$6,643,000		$6,643,000

Horizontal Alignment

As stated previously, the length of the corridor was divided into segments to accommodate a phasing plan. The segment end points were determined by identifying logical locations where there is a connection to an existing trail, or a neighborhood that would benefit from being adjacent to the path. Although each segment has many similarities including minor street crossing treatments, stormwater management approaches, and required environmental permitting, there are also unique characteristics of each.

It should be noted that there may be different path widths selected for the various segments. Where use volume is expected to be lower, or there are construction constraints, an 8-foot path may be selected. Where heavy use is expected, a 10- or 15-foot path may be more appropriate.

Below is a description of each segment, along with the associated cost estimate for each. The segments are numbered from west to east for reading convenience; the numbering does not indicate the order in which they may be constructed.

Segment 1: Newtown Road to Ivy Court

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0	0	■ Nationwide Permit 3	$1,716,500
		Asphalt				$1,733,500
10'	10' paved with 2' paved shoulders	Crushed Stone	0	0.3		$1,882,500
		Asphalt				$1,916,500
15'	15' paved with 2' paved shoulders	Crushed Stone	0	0.5		$1,993,500
		Asphalt				$2,043,500

EXISTING LAND USES

The segment between Newtown Road and Ivy Court is a mixture of businesses, residential neighborhoods south of the corridor, and light industrial. The west end is anchored by the Newtown Road transit station and the east end by ECPI University and MSI off Ivy Court. The construction of this section would provide active transportation users from the Arrowhead and Huntington neighborhoods to have access to the transit station and the educational facilities off Ivy Court. It also provides a walkable and bicycle-friendly alternative for the staff of the businesses along Greenwich Road (that back up to the NSRR corridor) to access the transit center at Newtown Road.

STRATEGIC GROWTH AREA

From the western limits of Virginia Beach at Newtown Road, the path is within the Newtown SGA. The vision for the Newtown SGA is a new mixed-use village center, state-of-the-art business parks, an educational campus, new light industrial space, and new residential neighborhoods. The plan is to reinforce the Newtown site as the "gateway" into Virginia Beach and to create interconnected pedestrian and street frameworks. The plan also specifically calls for extension of a bicycle and trail system through the site. Clearly, the addition of the NSRR Corridor Shared-Use Path is in line with the plan for this SGA and would be a true enhancement.

STREET CROSSINGS

This segment has one major intersection crossing and one minor street crossing. The major intersection crossing is at Newtown Road/Princess Anne Road, where existing crosswalks will be used to allow path users to cross both streets safely. To direct path users along Princess Anne Road, fencing will be installed to discourage path users from crossing mid-block where the path ties to Princess Anne Road. The minor street crossing is at Freight Lane and will be a stop condition for path users.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Princess Anne Road/Newtown Road Intersection			●
Freight Lane	●		

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

In this segment, the existing corridor uses a combination of open ditches and a closed system along Princess Anne Road. Generally, the proposed path will mimic existing drainage patterns and use the same conveyance and outfalls as the existing rail and roadway. It is expected that the main outfalls for this segment will be existing closed storm sewer systems that run along adjacent roads such as Princess Anne Road and Southern Boulevard.

Stormwater management will likely be addressed using linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. Applicable features are considered in the cost estimates summarized above and detailed in Appendix B.

Segment 2: Ivy Court to Witchduck Road

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0	0	■ Nationwide Permit 3	$3,640,000
		Asphalt				$3,746,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0	0.7		$4,342,000
		Asphalt				$4,452,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0	2		$4,717,000
		Asphalt				$4,828,000

EXISTING LAND USES

The segment between Ivy Court and Witchduck Road is bordered by light industrial businesses on the north side, and residential neighborhoods on the south side of the path right-of-way. In addition to the Huntington, Parliament Village, and Point O' View neighborhoods, the Point O' View Elementary School is south of the corridor. This segment passes under I-264. Between I-264 and Witchduck Road, there is a stormwater management facility being constructed with the Witchduck Road, Phase 2, project.

Connecting this segment to Segment 1 will provide the neighborhoods and the businesses along Greenwich Road new mode options for getting to the transit station at Newtown Road. On the east end, it will provide access to the new Housing Resource Center being built at the corner of Witchduck Road and Southern Boulevard.

STRATEGIC GROWTH AREA

Similar to the previous segment, this segment of the path is within the Newtown SGA. The Newtown SGA specifically calls for extension of a bicycle and trail system through the site. The Newtown SGA extends from Newtown Road to west of Witchduck Road.

STREET CROSSINGS

This segment has two minor street crossings at Lowther Drive and Greenwich Road. There are proposed improvements to Greenwich Road that include terminating Greenwich Road as a cul-de-sac just south of the shared-use path crossing. Therefore, it is anticipated that this will be a minor street with low traffic volumes at the time the shared-use path is constructed in this area.

This segment also is unique since it crosses underneath I-264. Proposed improvements in this area are anticipated to leave ample space for the shared-use path to cross underneath the structure, and no challenges are anticipated with this crossing.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Lowther Drive	●		
Greenwich Road	●		

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

In this segment, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail. It is expected that the main outfalls for this segment will be existing storm sewer systems such as the existing quadruple 60-inch pipes that cross the railroad and outfall into Kemps Lake.

Stormwater management will likely be addressed with linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. Applicable features are considered in the cost estimates summarized above and detailed in Appendix B.

Neighborhoods between Newtown Road and Independence Boulevard

Segment 3: Witchduck Road to Kellam Road

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0	0	■ Nationwide Permit 3	$3,365,000
		Asphalt				$3,491,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0	0.6		$3,910,000
		Asphalt				$4,005,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0	1.6		$4,295,000
		Asphalt				$4,430,000

EXISTING LAND USES

Segment 3 is between Witchduck Road and Kellam Road. The current uses north of the path corridor between Witchduck road and Euclid Road are a mixture of light industrial and commercial uses. The new Housing Resource Center is located on Southern Boulevard, which is adjacent to the shared-use path right-of-way. South of the corridor, there is a solid materials recycling center and a construction company. East of Euclid Road, north of the path corridor, is a mixture of businesses, trailer park, water towers, a fire station, and a U.S. Post Office. The southern side of the path corridor is adjacent to the Pocahontas Village neighborhood. In this section of the corridor, there is a considerable amount of foot traffic daily.

STRATEGIC GROWTH AREAS

This segment is within the Pembroke SGA. The vision of the Pembroke SGA is a center urban core with, among other things, great streets, mobility, and transit alternatives. The Pembroke SGA has six subareas, which create a framework of complementary urban uses with a defined central area. This majority of this segment falls within the Central Village District portion of the Pembroke Area SGA. The Central Village District is intended to include a strong residential mixed-income, mixed-use emphasis along with small businesses.

STREET CROSSINGS

Within the Segment 3 limits, there are four minor street crossings, and one major street crossing. The major street crossing is at Witchduck Road. The improvements that are currently under construction in this location will be used to direct path users safely across Witchduck Road.

Since the proposed traffic signal cannot accommodate a pedestrian movement on the south leg of the intersection, and it is not anticipated that a signal modification to allow such a movement would be acceptable, path users will cross the I-264 on-ramp on the west leg of the intersection, then cross Witchduck Road on the north leg. The path will continue along the north side of Southern Boulevard to Jersey Avenue, where users will cross Southern Boulevard and access the path right-of-way to the south. The Southern Boulevard Crossing will be a typical minor street crossing where the path users must stop before crossing.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Witchduck Road			●
Southern Boulevard	●		
Pennsylvania Avenue	●		
Dorset Avenue	●		
Euclid Road	●		

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

In this segment, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail. It is expected that the main outfalls for this segment will be existing closed storm sewer systems run along adjacent roads such as Witchduck Road, Southern Boulevard, and Euclid Road. There is a large canal that collects runoff south of the railroad and outfalls under Independence Boulevard into Thalia Creek.

Stormwater management will likely be addressed with linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. Fencing will be proposed to guide traffic to the correct route to cross Witchduck Road. This feature will be especially important since path users may be tempted to attempt to cross on the south leg of the intersection. This feature is considered in the cost estimates summarized above and detailed in Appendix B.

Segment 4: Kellam Road to Market Street

Typical Section Features	Impacts						
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
	Sidewalk Improvements		0	0.8		$1,399,000

EXISTING LAND USES

This segment is challenging because it crosses Independence Boulevard at grade. As the path diverts from the former NSRR right-of-way at Kellam Road and turns east on Columbus Street, there are office buildings on the south side. On the north side of Columbus Street, a new Wegmans grocery store is being constructed, and an office supply store and a bank already exist. As the path crosses to the east side of Independence Boulevard, there is the Westin Hotel/Residences on the north, and a sporting goods store on the south. Market Street has a parking garage on the west side and a park on the east side. This portion of the path is within Town Center, where bicycles are not permitted on the sidewalks.

STRATEGIC GROWTH AREAS

The entirety of this segment is in the Pembroke SGA. The Pembroke SGA, as described for the previous segment, has a vision to be an attractive and efficient thoroughfare to serve many modes of travel. The shared-use path in this segment approaches the center urban core area. This central area, known as Town Center, is the destination at the eastern end of this segment. Recommendations for this SGA include designing and building complete streets to be attractive and efficient thoroughfares to serve many modes of travel. The addition of the path provides a new alternative mode of transportation for pedestrians and bicycles.

STREET CROSSINGS

Segment 4 has one major and one minor street crossing. The major street crossing is at Independence Boulevard. This crossing is the most challenging along the entire 10.5-mile corridor due to the high traffic volumes and wide geometry of the existing Independence Boulevard. The preferred alternative crosses pedestrians on the north leg of the existing signal at Independence Boulevard/Columbus Street. There are concerns that the time required to cross pedestrians will cause the traffic signal level of service (LOS) to deteriorate to an unacceptable level.

To help mitigate that concern, there is the potential to eliminate one of the southbound left-turn lanes and widen the median from its current 4 feet to 16 feet. The wide median would allow for a refuge area where pedestrians could cross half way and wait for the next signal phase to complete the Independence Boulevard crossing. An analysis of the traffic volumes, signal phasing, and signal timing will be required to determine how the intersection would operate with the removal of the left-turn lane and the additional pedestrian crossing phase. This concern will be addressed further as the design progresses. There is also a potential that a grade-separated crossing may be considered at this location in future phases of design. As Town Center continues to develop, there will be an increasing need to cross pedestrians safely across Independence Boulevard. Although this option is considered cost-prohibitive at this conceptual stage, the option may be reconsidered in the future if funding allows.

The minor street crossing on this segment is at the Columbus Street/Kellam Road intersection. After crossing Independence Boulevard, pedestrians and bicyclists will continue along Columbus Street to the existing crosswalks at Kellam Road and Columbus Street, where they can safely cross before returning to the NSRR corridor to the south.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Columbus Street/ Kellam Road Intersection			●
Indpendence Boulevard			●

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

The Segment 4 existing conditions consists of urban streets with closed drainage systems that ultimately outfall into Thalia Creek. The existing stormwater conveyance systems along Kellam Road, Columbus Street, and Market Street will be used.

Stormwater management will likely be addressed through the use of linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The costs for the improvements in Segment 4 include the widening of the sidewalk along Kellam Road. The existing sidewalks west of Independence will remain and are in usable condition. When the Cleveland Street/Columbus Street improvements are made by another project, the sidewalks will be widened. To guide pedestrians to a safe crossing location at Market Street and Kellam Road, safety fencing is proposed. This feature is considered in the cost estimates summarized above and detailed in Appendix B. It is important to note that the current cost estimate does not consider a pedestrian bridge over Independence Boulevard. If this option is selected in the future, its design and construction will be a significant cost factor.

Segment 5: Market Street to Lynn Shores Drive

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0.01	0	■ Nationwide Permit 3 ■ VMRC Permit for bridge crossing	$6,831,000
		Asphalt				$6,988,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0.02	0.8		$7,874,000
		Asphalt				$8,053,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0.04	2.3		$8,751,000
		Asphalt				$9,007,000

EXISTING LAND USES

In Segment 5, the right-of-way continues through Town Center and crosses Thalia Creek. There is a plan to develop the Thalia Creek Greenway that would connect to this shared-use path. The Thalia Creek Greenway is a trail that goes north/south along the creek that would complement the uses of the shared-use path. East of Thalia Creek is the Thalia neighborhood. The construction of this segment of the shared-use path would connect the Thalia neighborhood to Town Center. It also serves as a connection between the Pembroke SGA and the Rosemont SGA.

STRATEGIC GROWTH AREAS

The portion of this segment between Market Street and Thalia Creek falls within the Town Center subarea of the Pembroke SGA. The eastern portion of this segment is within the Rosemont SGA. The vision for the Rosemont SGA is a mixed-use development with a neighborhood center, improved pedestrian and trail facilities, and a street and block structure created to accommodate development and mobility. The shared-use path amenity will serve this vision well.

STREET AND WATER CROSSINGS

This segment has five minor street crossings, one water crossing, and two major street crossings. The minor street crossings will be approached with the typical crossing treatment. The existing rail bridge over Thalia Creek has been analyzed for use as a shared-use path bridge. Additional information on this existing structure can be found in Appendix A. It is anticipated that a new bridge structure will be required for the Thalia Creek crossing.

The first path crossing is at the western segment terminus of Market Street. At Market Street, path users will access the path right-of-way from the north on Market Street. East of Market Street, the next street crossing is at Constitution Drive. At this location, path traffic will be allowed to cross Constitution Drive at a mid-block "z-crossing". The existing left-turn lane will be shortened, and a median with a refuge area provided.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Market Street	●		
Constitution Drive	●		
Southern Boulevard	●		
Fir Avenue	●		
Thalia Road	●		
Budding Avenue	●		
Kentucky Avenue	●		

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

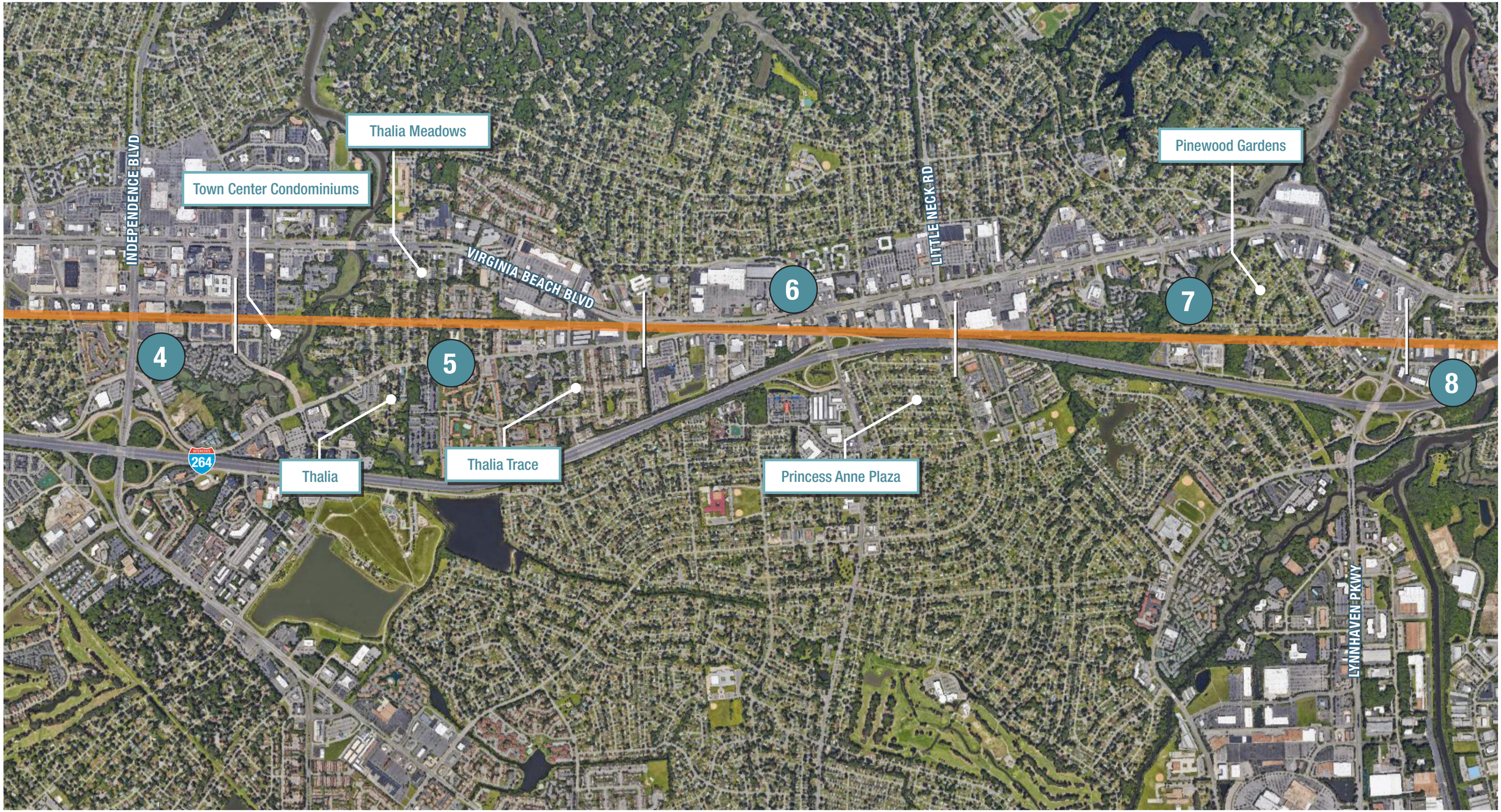
In this segment, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail. It is expected that the main outfalls for this segment will be existing storm sewer systems run along adjacent roads such as Southern Boulevard and Constitution Drive, as well as Thalia Creek.

Stormwater management will likely be addressed with linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for Segment 5 varies depending on the material used and path with selected. No matter which typical section alternative is selected, a water crossing will be required over Thalia Creek to replace the existing railroad structure. The structure is included in the cost estimates summarized above and detailed in Appendix B.

Neighborhoods between Independence Boulevard and Lynnhaven Road



Segment 6: Lynn Shores Drive to Plaza Trail

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0	0	■ Nationwide Permit 3	$2,100,000
		Asphalt				$2,135,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0	0.7		$2,340,000
		Asphalt				$2,388,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0	1.8		$2,426,000
		Asphalt				$2,488,000

EXISTING LAND USES

This segment is within the Rosemont SGA and is bordered on the north by Virginia Beach Boulevard. Being this close to a main east-west roadway provides path users the opportunity to access HRT bus Route 20, which is the highest-ridership route in HRT's system. The area surrounding the path corridor is commercial throughout this segment. However, the Princess Anne Plaza neighborhood is just south of I-264 and there are pedestrian and bicycle accommodations on Plaza Trail under I-264, so those residents will have access to the path.

STRATEGIC GROWTH AREA

This segment is within the Rosemont SGA. The shared-use path is a pedestrian facility that will serve to connect residential and commercial developments within the SGA.

STREET CROSSINGS

As part of Segment 6 from Lynn Shores to Drive Plaza Trail, there are two major street crossings. The first is at Lynn Shores Drive. At this location, the NSRR corridor is very close to the existing traffic signal at Lynn Shores Drive/Virginia Beach Boulevard. Therefore, a slight deviation from the path right-of-way to the north is proposed to allow path users to safely cross at the existing crosswalk at the southern leg of this intersection. The second major street crossing in this segment is at Rosemont Road/I-264 off-ramp/Bonney Road intersection. The preferred crossing alternative is to modify the existing traffic signal and cross path traffic on the north leg of this intersection. The proposed traffic signal at Plaza Trail is incorporated into Segment 7.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Lynn Shores Drive			●
Rosemont Road			●

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

Along this segment, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail. It is expected that the main outfalls for this segment will be existing storm sewer systems that run along adjacent roads (Virginia Beach Boulevard, Bonney Road) that serve adjacent land uses. These systems generally flow toward I-264.

Stormwater management will likely be addressed using linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. At Lynn Shores Drive, guide fencing will be proposed to deter pedestrians from crossing at an unsafe location. This feature is considered in the cost estimates summarized above and detailed in Appendix B

Segment 7: Plaza Trail to Lynnhaven Road

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0	0	■ Nationwide Permit 3	$4,689,000
		Asphalt				$4,809,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0	1		$5,416,000
		Asphalt				$5,551,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0.04	2.2		$5,924,000
		Asphalt				$6,109,000

EXISTING LAND USES

The Segment 7 corridor is generally bounded by I-264 on the south side. The Grace Bible Church, a Dominion Energy transmission plant, and businesses front Ansol Lane, and back up to the former NSRR corridor. There also is the Pinewood Gardens neighborhood that straddles the path right-of-way. On the north side, there are commercial uses and the Rosegate and Pinewood Gardens neighborhoods. West of Lynnhaven Parkway are several automobile dealerships and office buildings.

STRATEGIC GROWTH AREAS

The western end of this segment is in the Rosemont SGA, while the eastern end of this segment is in the Lynnhaven SGA. The vision of the Lynnhaven SGA is a series of mixed-use and flexible developments along with targeted public infrastructure improvements. This SGA is attractive to businesses seeking easy access to transportation and serving the vast residential areas surrounding it. The Lynnhaven SGA seeks to capitalize on existing adjacent assets, and provide neighborhoods with a place to work, learn, and play, all within an easy walk or drive. To implement this plan, the development within this SGA focuses on a few key design principles, including improving multimodal connections from the adjacent neighborhoods, and enabling clear and easy-to-access recreational network. The addition of the path in this area supports the strategic vision for this SGA.

STREET CROSSINGS

This segment has only one major street crossing at Plaza Trail. Due to the limited sight distance for northbound vehicles traveling along Plaza Trail under the I-264 bridge, the City desires to cross pedestrian traffic with a traffic signal at this location. The preferred alternative for this crossing location is to install a new signal at the southernmost entrances from Plaza Trail to Sam's Club and PetSmart. This location is adjacent to the shared-use path right-of-way. Once this traffic signal is installed, the path will be diverted to the southern leg of the intersection to cross Plaza Trail. Because of the sight-distance issue caused by the I-264 fill, there will need to be an advanced traffic signal warning sign south of I-264 for northbound Plaza Trail traffic.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Plaza Trail		●	

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

From Lynnhaven Parkway to Plaza Trail, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail. The main outfall identified in this segment is Pinetree Branch. There are twin 48-inch culverts crossing below the existing tracks to serve drainage into Pinewood Branch from the south.

Stormwater management will likely be addressed with linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. At Plaza Trail, safety fencing would be proposed to direct pedestrian traffic north to the proposed signal where a safe crossing will be provided at a new traffic signal. This feature is considered in the cost estimates summarized above and detailed in Appendix B

Segment 8: Lynnhaven Road to London Bridge Road

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0.2	0	■ Nationwide Permit 3 ■ VMRC Permit for Wolfsnare Creek Bridge Crossing	$4,647,000
		Asphalt				$4,719,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0.3	0.5		$5,055,000
		Asphalt				$5,141,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0.4	1.3		$5,286,000
		Asphalt				$5,409,000

EXISTING LAND USES

Segment 8 crosses Wolfsnare Creek on a new bridge, and passes under I-264 via an existing bridge. North of the path corridor, there are some commercial uses that front Virginia Beach Boulevard and the Eureka Park neighborhood. South of the corridor is a mixture of light industrial uses. As the path approaches London Bridge Road, there is a nursery on the north side and a church on the south side of the right-of-way.

STRATEGIC GROWTH AREAS

The entirety of this section is in the Lynnhaven SGA. As mentioned in the previous section, the vision of the Lynnhaven SGA focuses on a few key design principles, including improving multimodal connections from the adjacent neighborhoods, and enabling clear and easy-to-access recreational network. The addition of the path in this area supports the strategic vision for this SGA.

STREET AND WATER CROSSINGS

There is one minor street crossing at Dean Drive where the path deviates south of the NSRR corridor along Lynnhaven Parkway and S Lynnhaven Road. The existing sidewalk facility will be widened along the east side of Lynnhaven Parkway. At the existing I-264 off-ramp/Lynnhaven Parkway/S Lynnhaven Road intersection traffic signal, pedestrians will cross at the north leg. The path will continue along the east side of S Lynnhaven Road to a proposed traffic signal at Southern Boulevard. At Southern Boulevard, path users will be able to cross S Lynnhaven Road to access the path right-of-way.

In addition, there is one water crossing over Wolfsnare Creek. Additional information on this existing structure can be found in Appendix A. At this point in the study development, it is assumed that a new bridge structure will be required for the Wolfsnare Creek crossing.

	Path Stop	New Traffic Signal	Existing Traffic Signal
S Lynnhaven Road		●	
Lynnhaven Parkway			●
Dean Drive	●		

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

From Lynnhaven Parkway to London Bridge Road, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail. The main outfall identified in this segment is Wolfsnare Creek.

Stormwater management will likely be addressed using linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. In any alternative, the proposed path will need to cross Wolfsnare Creek via a bridged crossing. This structure is considered in the cost estimates summarized above and detailed in Appendix B.

Segment 9: London Bridge Road to Air Station Drive

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0	0	■ Nationwide Permit 3	$3,741,000
		Asphalt				$3,822,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0	0.6		$4,323,000
		Asphalt				$4,428,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0	1.7		$4,744,000
		Asphalt				$4,886,000

EXISTING LAND USES

The area between London Bridge Road and Air Station Drive is currently undeveloped. South of the corridor is Potters Road, and south of that is Naval Air Station Oceana. North of the path corridor, adjacent to London Bridge Road, there is a proposed commerce park that will have access from Potters Road, which will cross the shared-use path.

STRATEGIC GROWTH AREAS

The majority of this section lies within the Lynnhaven SGA. The vision of the Lynnhaven SGA is a series of mixed-use and flexible developments along with targeted public infrastructure improvements. This SGA is attractive to businesses seeking easy access to transportation, and serving the vast residential areas surrounding it. The Lynnhaven SGA seeks to capitalize on existing adjacent assets and provide neighborhoods with a place to work, learn, and play, all within an easy walk or drive. To implement this plan, the development within this SGA focuses on a few design principles, including improving multimodal connections from the adjacent neighborhoods, and enabling clear and easy-to-access recreational network. The addition of the path in this area supports the strategic vision for this SGA.

STREET CROSSINGS

There are three minor street crossings in this segment that will be controlled by stop conditions for the path users. Path users will observe the upcoming crossing by the solid yellow stripe on the path centerline, change in the pavement to concrete, solid white stop bar, and the "STOP" message. There will be ADA-compliant ramps with truncated domes.

There is one major street crossing in this segment at London Bridge Road. In this location, the path will utilize the existing crosswalks on the east, south, and west legs of the existing intersection to safely cross path users across London Bridge Road before returning to the NSRR corridor.

	Path Stop	New Traffic Signal	Existing Traffic Signal
London Bridge Road			●
Private Road	●		
Private Road	●		
Private Road	●		

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

From London Bridge Road to Air Station Drive, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail. The likely main outfalls identified in this segment are the existing storm sewer ditches and systems serving adjacent streets such Potters Road and London Bridge Road.

Stormwater management will likely be addressed through the use of linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER-OF-MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. This segment will require fencing to guide pedestrians to the appropriate crossing location at London Bridge Road, and assure that it is not perceived that the north leg of the intersection is a safe crossing location. This fencing is considered in the cost estimates summarized above and detailed in Appendix B.

Neighborhoods between Lynnhaven Road and Birdneck Road

Segment 10: Air Station Drive to Norfolk Avenue

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0	0	■ Nationwide Permit 3	$4,852,000
		Asphalt				$4,980,000
10'	10' paved with 2' paved shoulders	Crushed Stone	0	1.1		$5,775,000
		Asphalt				$5,909,000
15'	15' paved with 2' paved shoulders	Crushed Stone	0	2.8		$6,428,000
		Asphalt				$6,643,000

EXISTING LAND USES

The westernmost segment will connect to the South Beach Trail at Birdneck Road. The South Beach Trail will provide a connection between this shared-use path and the oceanfront Resort Area. Between Air Station Drive and Birdneck Road, the shared-use path corridor passes through, or adjacent to, several neighborhoods. These include Oceana Village and Oceana Gardens. A portion of this segment crosses the floodplain of Linkhorn Bay.

STRATEGIC GROWTH AREAS

West of Oceana Boulevard, Segment 10 enters the Hilltop Area SGA. The SGA's vision, as defined by the plan for the Hilltop SGA, is to create a convenient, regional retail destination that is within close proximity to the beach. To achieve this, the key recommendations include building upon the existing natural resources to expand access to public open space through an interconnected system of parks and trails, and encouraging redevelopment of obsolete commercial structures with new buildings placed according to new urban planning standards for the district. By incorporating a shared-use path in this area, open spaces will be connected and a major trail will be added to the area. This will encourage new development to spur in the surrounding area; the shared-use path system will support the vision for the Hilltop SGA. At the easternmost limit of this study, where the proposed path meets the existing South Beach Trail, the proposed path touches the limit of the Resort Area SGA. The construction of Segment 10 will connect the Hilltop and Resort Area SGAs.

STREET CROSSINGS

There are six minor street crossings in Segment 10 that will be controlled as stop conditions for the path users. Path users will observe the upcoming crossing by the solid yellow stripe on the path centerline, change in the pavement to concrete, solid white stop bar, and the "STOP" message. There will be ADA-compliant ramps with truncated domes.

There is one major street crossing at Oceana Boulevard. At this location, the path will deviate north from the corridor to the Oceana Boulevard/S. First Colonial Road intersection. This intersection has an existing traffic signal that will be modified to include pedestrian push buttons and signal phasing.

	Path Stop	New Traffic Signal	Existing Traffic Signal
Air Station Drive	●		
S First Colonial Road	●		
Southern Boulevard	●		
Oceana Boulevard			●
Louisa Avenue	●		
Sykes Avenue	●		
Distribution Drive	●		

All at-grade crossings will be handled on a case-by-case basis. Typically, an at-grade crossing will be stop controlled and cross perpendicular to the vehicular travel way. Safety measures including but not limited to signage, flashing beacons, bollards, channelization, and gates will be employed as necessary. Signalized at-grade crossings include intersections with existing signals as well as those with proposed future signal installations. Pedestrian movements will be incorporated into the signal designs.

DRAINAGE AND STORMWATER MANAGEMENT

From Air Station Drive to Birdneck Road, the existing corridor uses an open ditch drainage system. Generally, the proposed path will mimic existing drainage patterns and use the same ditch conveyance and outfalls as the existing rail line. The likely main outfalls identified in this segment are Linkhorn Bay, and existing closed storm sewer systems serving adjacent neighborhoods and streets.

Stormwater management will likely be addressed using linear BMPs such as grassed swales with rock check dam features to reduce velocity and detain flow as needed. No off-site stormwater management solutions are anticipated.

PRELIMINARY ORDER OF MAGNITUDE OPINION OF PROBABLE COST

The cost estimate for this segment varies depending on the material used and the path width selected. If a typical section is selected that has a wide path footprint, the existing 72-inch culvert at Linkhorn Bay will need to be extended. Additionally, this segment will require fencing to guide pedestrians to the appropriate crossing location at Oceana Boulevard and S First Colonial Road. These items are considered in the cost estimates summarized above and detailed in Appendix B

Summary

Typical Section Features			Impacts				
Path Width	Description	Impervious Material	Right of Way (ac)	Stormwater Management (lb/yr)	Environmental	Total Order of Magnitude Cost
8'	8' paved with 1' grassed shoulders	Crushed Stone	0.21	1	■ VMRC Permit for two bridge crossings ■ Nationwide Permit 3 for ditch maintenance and work near water bodies	$36,980,500
		Asphalt				$37,822,500
10'	10' paved with 2' paved shoulders	Crushed Stone	0.32	7		$42,316,500
		Asphalt				$43,242,500
15'	15' paved with 2' paved shoulders	Crushed Stone	0.48	17		$45,963,500
		Asphalt				$47,242,500

What's Next

The main intent of this study was to create a conceptual typical section and alignment for design and construction of a shared-use path facility in the former NSRR corridor. The topics investigated and summarized in the above table are intended to serve as a decision matrix and facilitate discussion to determine the scope of this project moving forward. The preferred alternatives selected as a result of this study will be used to advance the design to a 15 percent preliminary engineering level.

FUNDING OPPORTUNITIES

Being able to fund the shared-use path is a critical step in the continued development of the plan toward construction. With a prioritized plan, and the design moving toward 15 percent, there can be a focus on identifying funding sources. Below is a list of available funding sources at the federal and state levels:

FEDERAL GRANTS

- TIGER Grants – discretionary grants by the U.S. Department of Transportation
  - Local match 20%
  - www.dot.gov/tiger
- Transportation Infrastructure Finance and Innovation Act (TIFIA)
  - www.transportation.gov/buildamerica/programs-services/tifia
- Congestion Mitigation and Air Quality (CMAQ)
  - www.fhwa.dot.gov/environment/air_quality/cmaq/
- Surface Transportation Block Grant
  - www.fhwa.dot.gov/specialfunding/stp/
- Federal Transit Administration (FTA)
  - www.transit.dot.gov/regulations-and-guidance/environmental-programs/livable-sustainable-communities/bicycles-transit

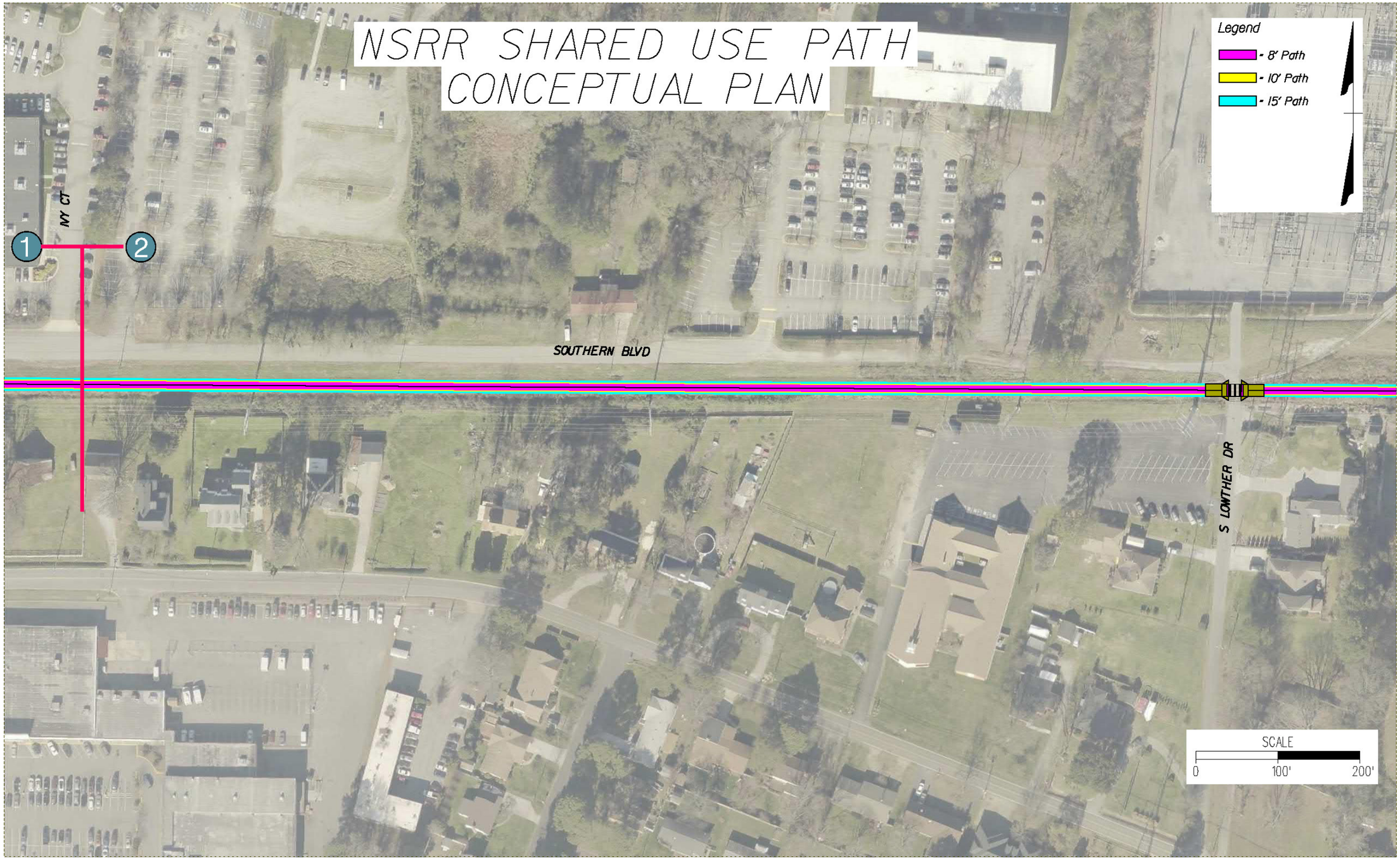
STATE GRANTS

- SMART SCALE – project ranking process based on:
  - Application opportunity – every 2 years (August)
  - www.smartscale.org
- Revenue Sharing – matching local funds
  - Application opportunity – continuous
  - www.virginiadot.org/business/local-assistance-programs.asp
- Transportation Alternatives (TA) Set-Aside Program – 20% local match
  - Application opportunity – annually (November)
  - www.virginiadot.org/business/prenhancegrants.asp
- Safe Routes to School Program (SRTS) – federally funded competitive grant
  - Application opportunity – depends on type of project
  - www.virginiadot.org/programs/ted_Rt2_school_pro.asp
- Highway Safety Improvement Program (HSIP) – 10% local match
  - Application opportunity – annually (January 31)
  - www.virginiadot.org/business/ted_app_pro.asp
- Recreational Trails Program – Matching reimbursement Program
  - Application opportunity – annually (December)
  - www.dcr.virginia.gov/recreational_planning/trailfnd.shtml
- Land and Water Conservation Fund – matching reimbursement program up to 50%
  - Application opportunity – varies (March)
  - www.dcr.virginia.gov/recreational-planning/lwcf

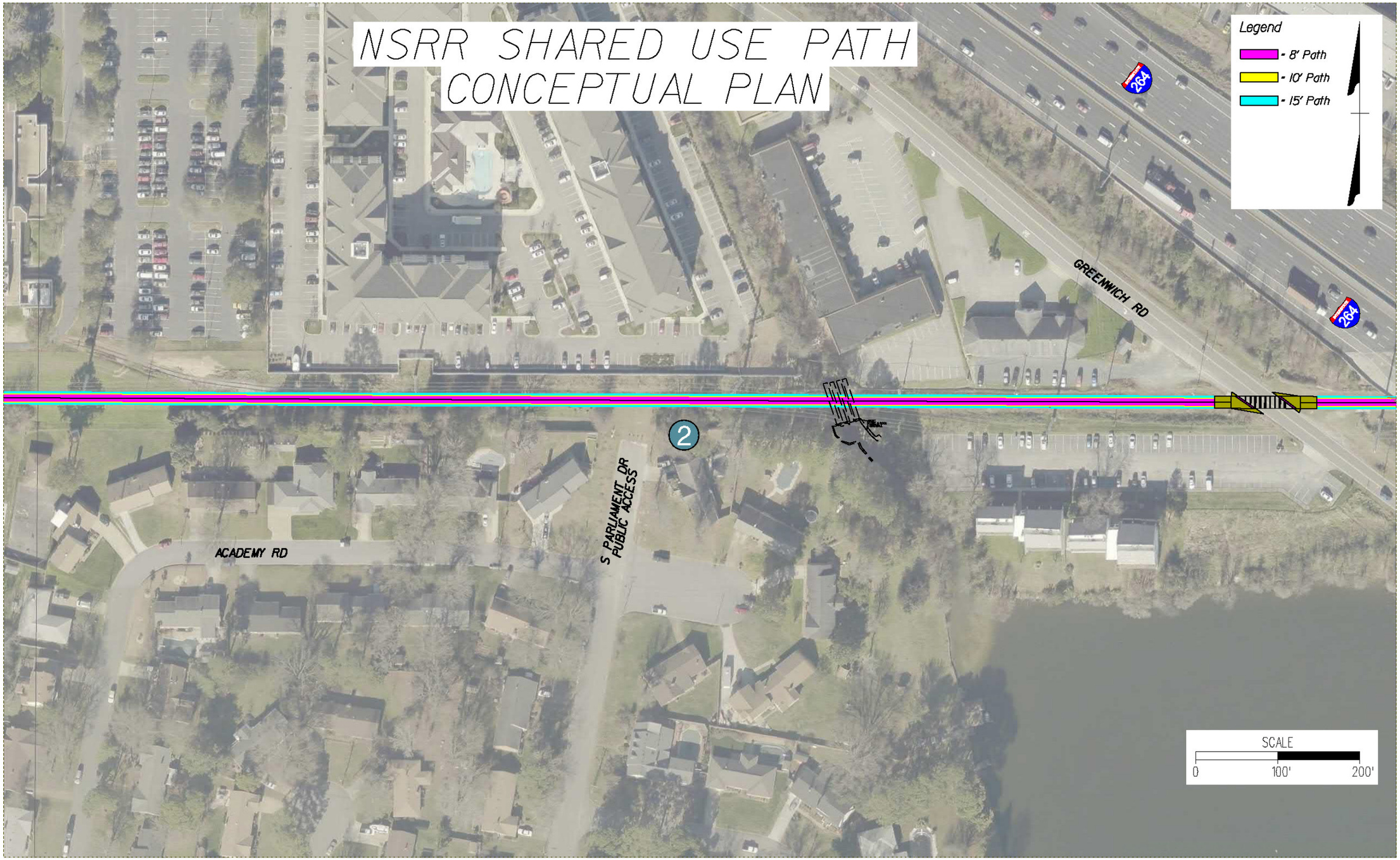
CONCEPTUAL LAYOUT

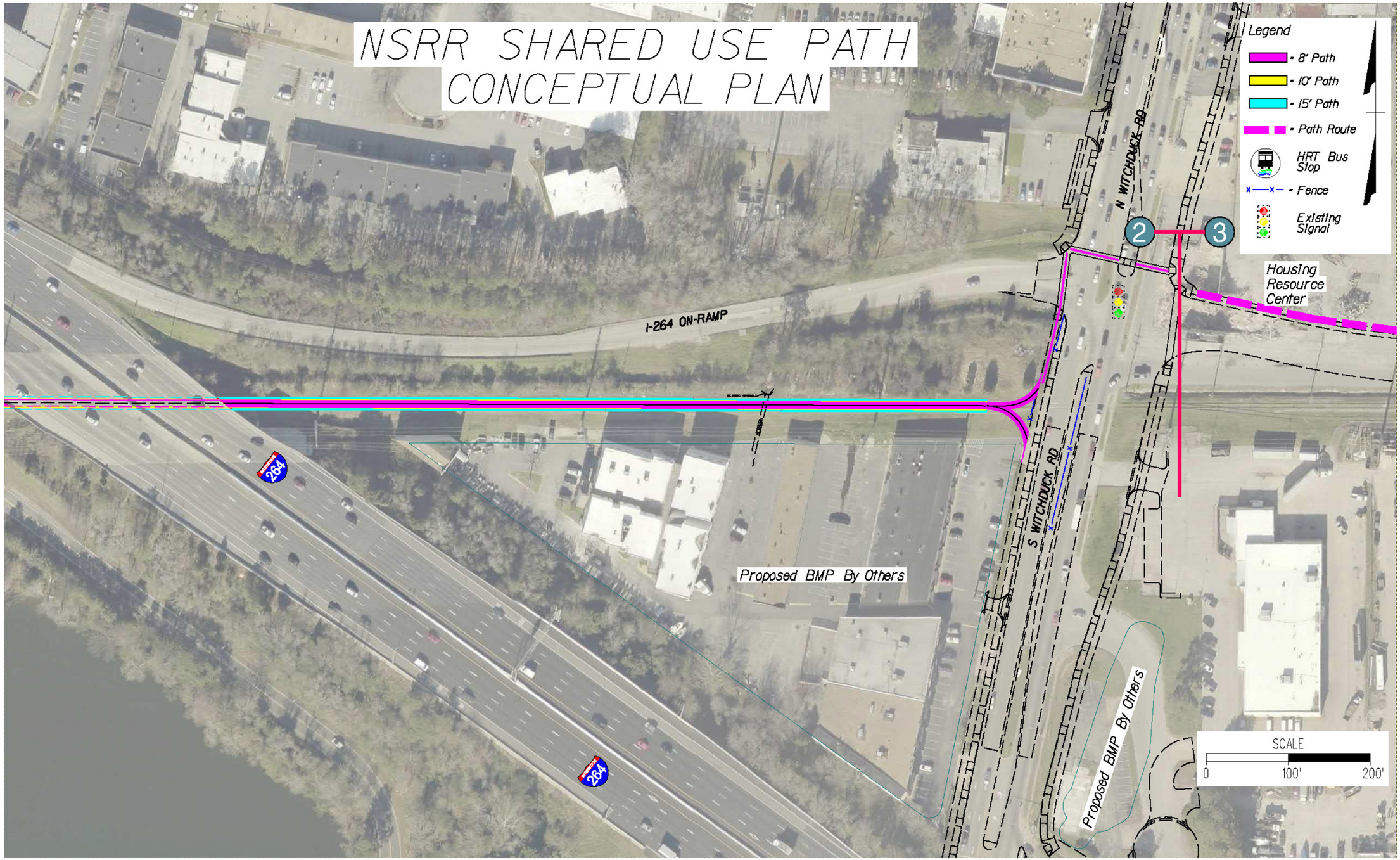
NSRR SHARED USE PATH
CONCEPTUAL PLAN
1
Legend
- 6' Sidewalk
- 7' Sidewalk
- Path Route
- Prop. R/W
Existing Signal
HRT Bus Stop
Newtown Road Transit Center
S NEWTOWN RD
PRINCESS ANNE RD
CURLEW DR
CURLEW DR
CITY OF NORFOLK
CITY OF VIRGINIA BEACH
ARROWHEAD DR
SCALE
0
100'
200'

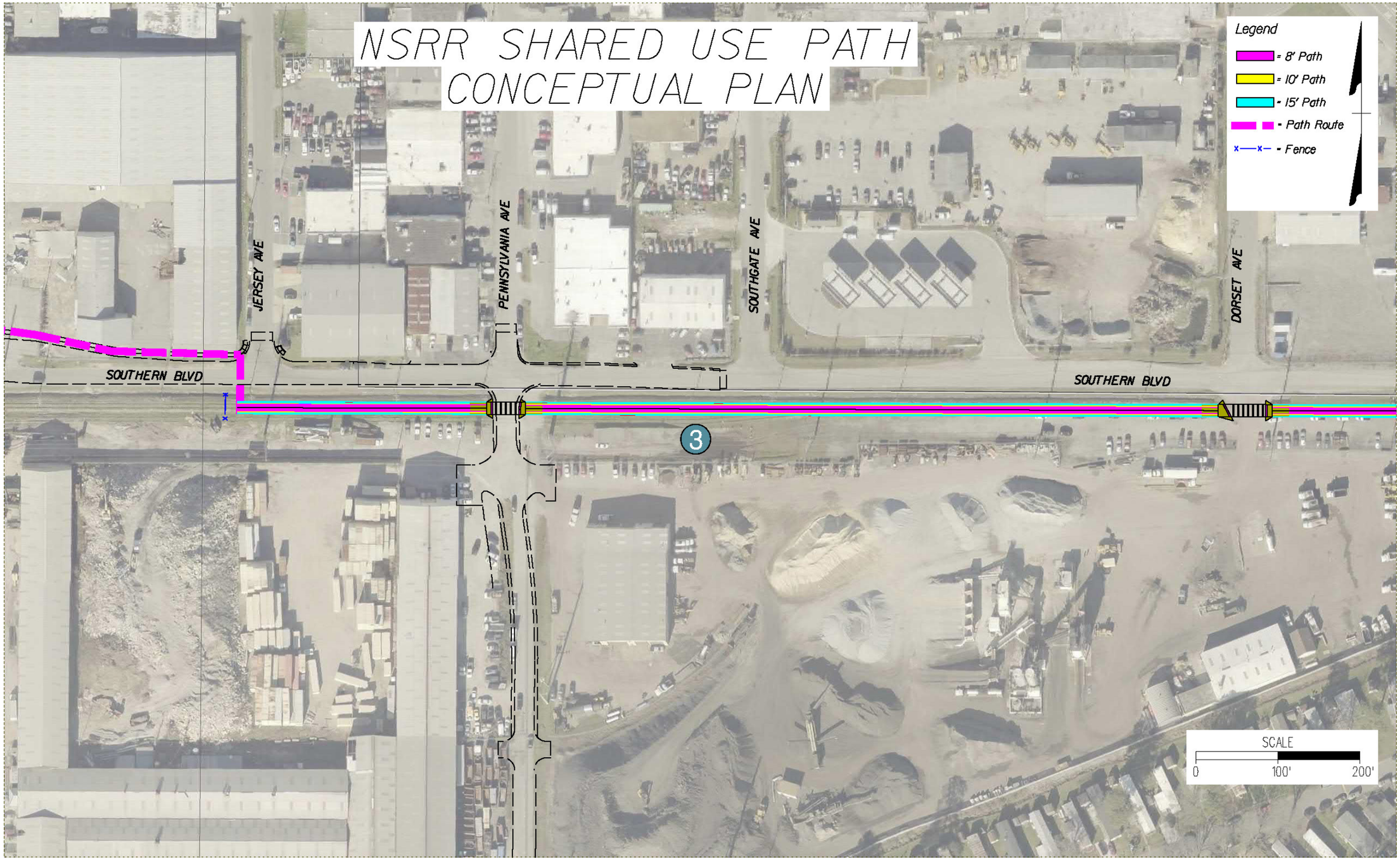
NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
= 6' Sidewalk
= 7' Sidewalk
= Prop. R/W
HRT Bus Stop
= Fence
Existing Signal
PRINCESS ANNE RD
FREIGHT LN
SOUTHERN BLVD
1
ARROWHEAD DR
CHEYENNE RD
PARLIMENT DR
PRINCESS ANNE RD
SCALE
0
100'
200'

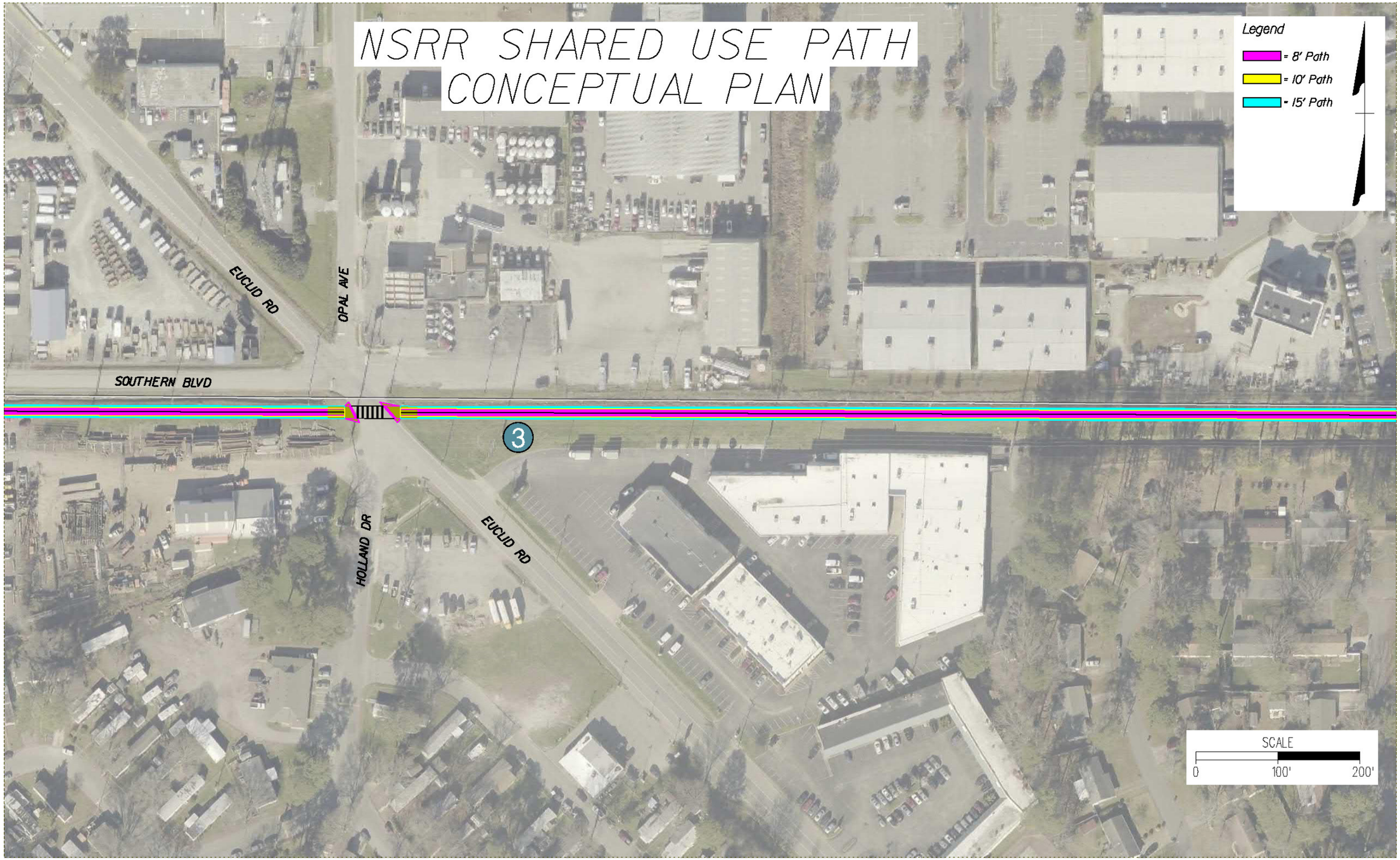

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
NY CT
1
2
SOUTHERN BLVD
S LONTHER DR
SCALE
0
100'
200'

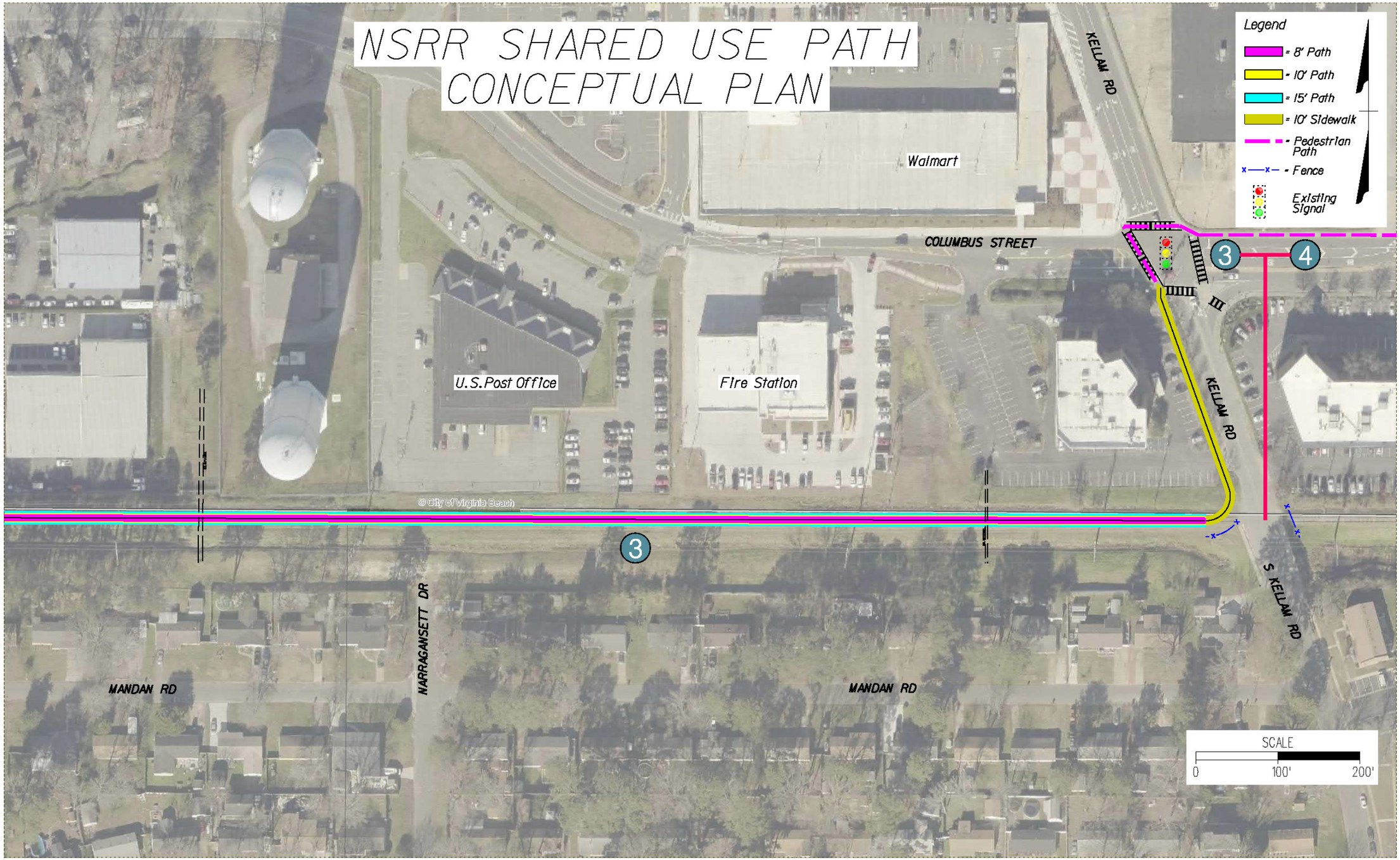
NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
The Virginian Pilot
2
YODER LN
PUBLIC ACCESS
SCALE
0
100'
200'
Point O'View
Elementary School

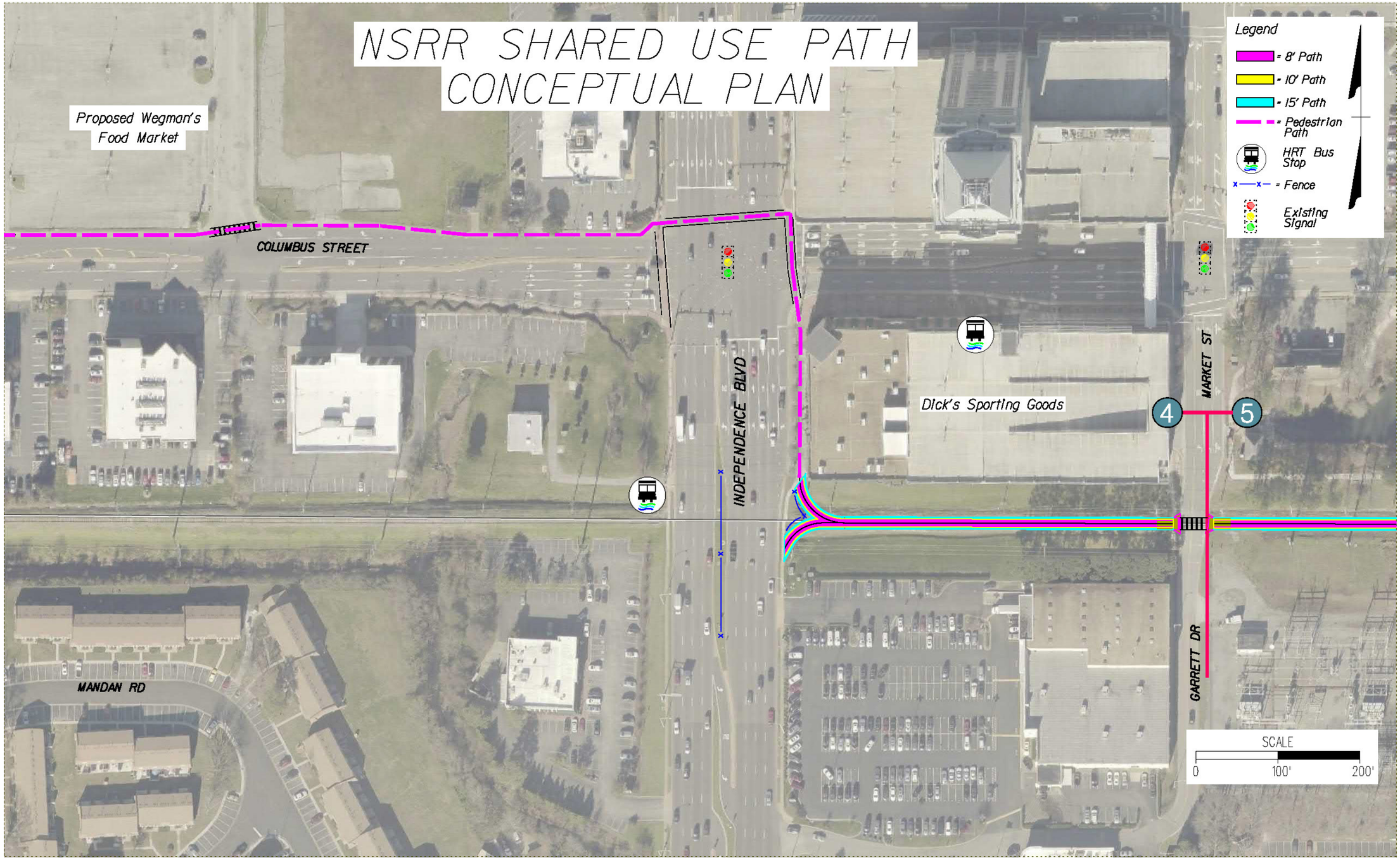

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
264
264
GREENWICH RD
2
S PARLIAMENT DR
PUBLIC ACCESS
ACADEMY RD
SCALE
0
100'
200'

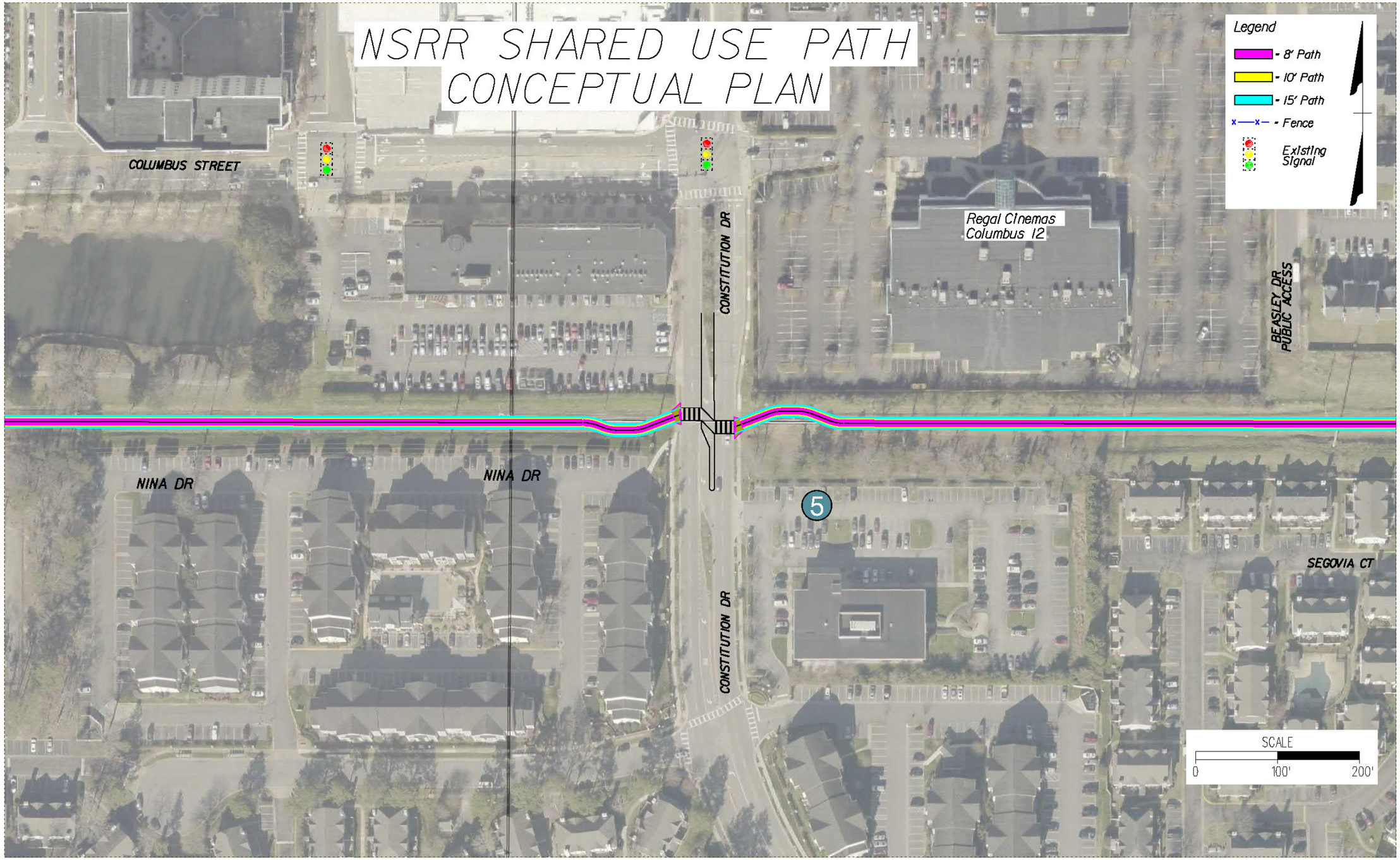

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
8' Path
10' Path
15' Path
Path Route
HRT Bus Stop
Fence
Existing Signal
N WITCHDUCK RD
S WITCHDUCK RD
I-264 ON-RAMP
Housing Resource Center
Proposed BMP By Others
Proposed BMP By Others
2
3
264
264
SCALE
0
100'
200'

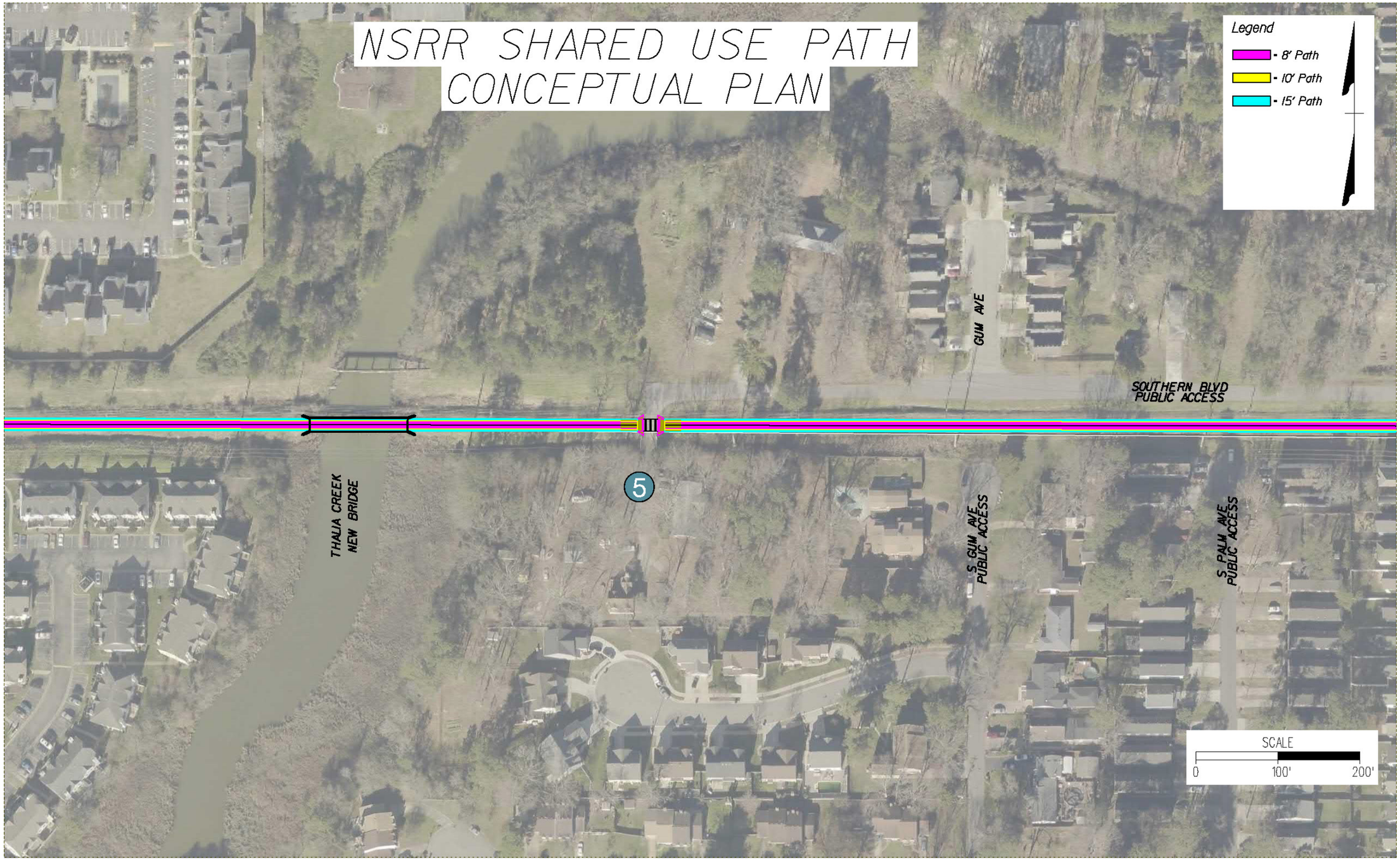

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
= Path Route
= Fence
JERSEY AVE
PENNSYLVANIA AVE
SOUTHGATE AVE
DORSET AVE
SOUTHERN BLVD
SOUTHERN BLVD
3
SCALE
0
100'
200'

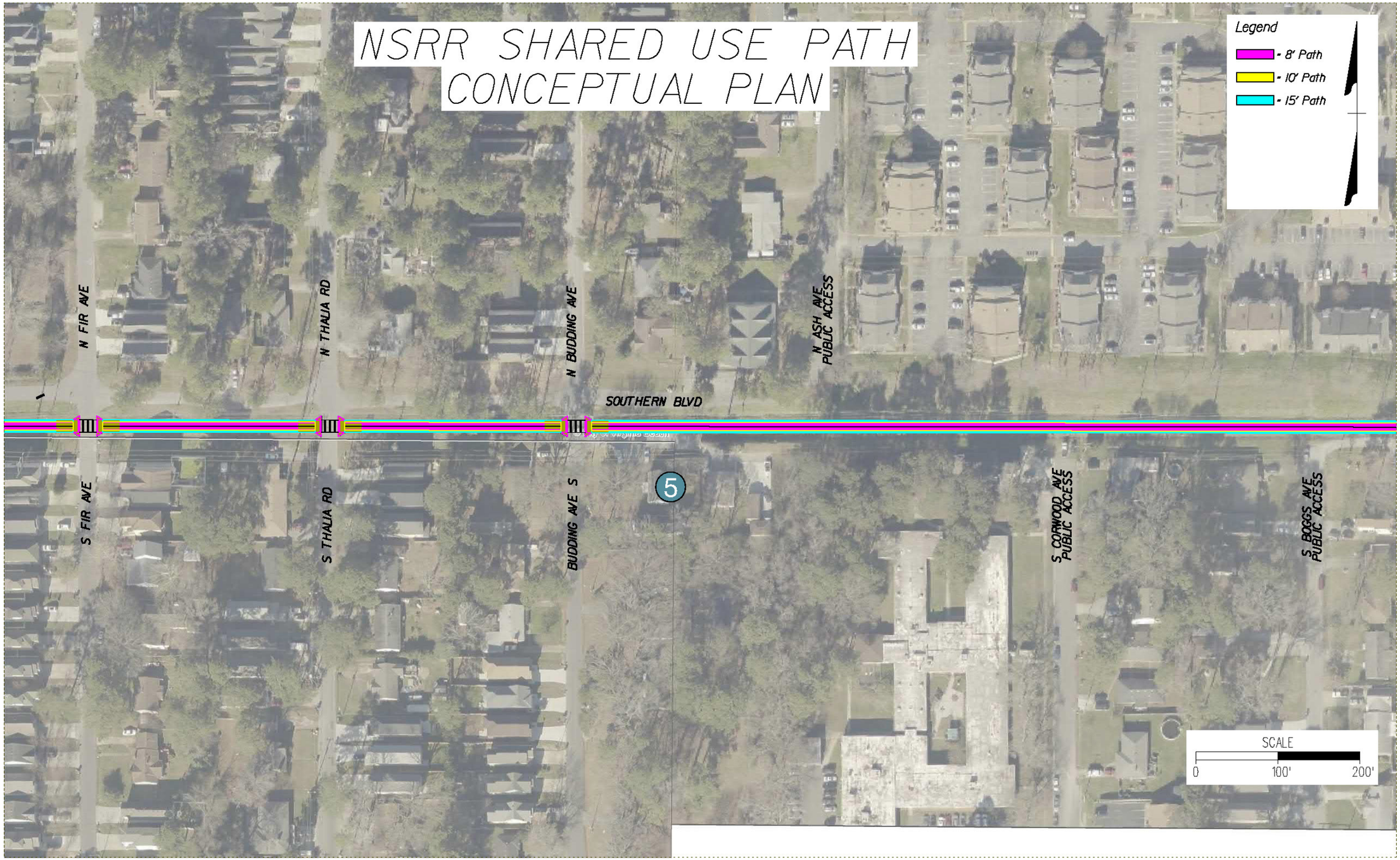

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
EUCLID RD
OPAL AVE
SOUTHERN BLVD
3
HOLLAND DR
EUCLID RD
SCALE
0
100'
200'

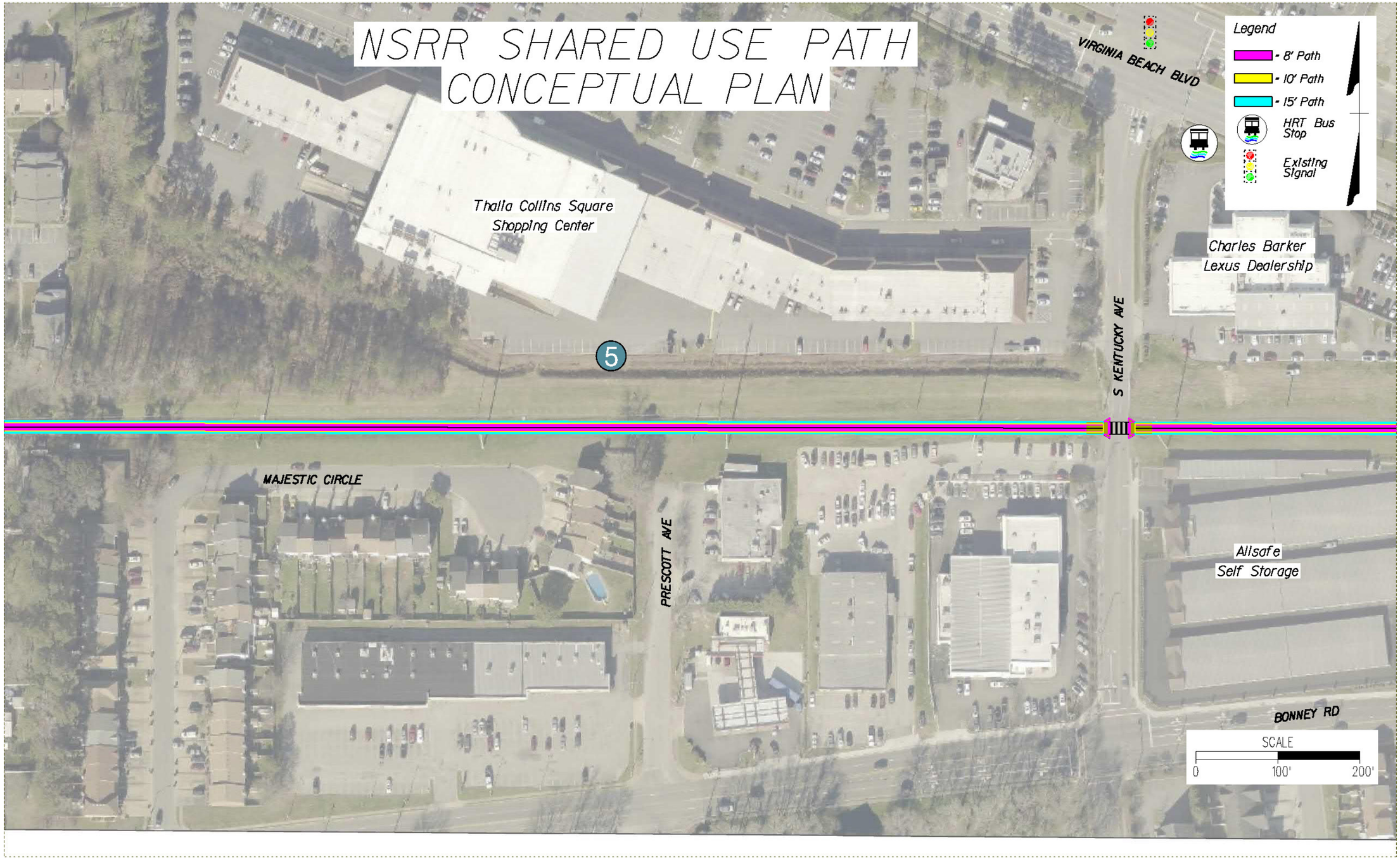

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
= 10' Sidewalk
= Pedestrian Path
= Fence
Existing Signal
Walmart
KELLAM RD
COLUMBUS STREET
U.S.Post Office
Fire Station
© City of Virginia Beach
3
4
S KELLAM RD
NARRAGANSETT DR
MANDAN RD
MANDAN RD
SCALE
0
100'
200'

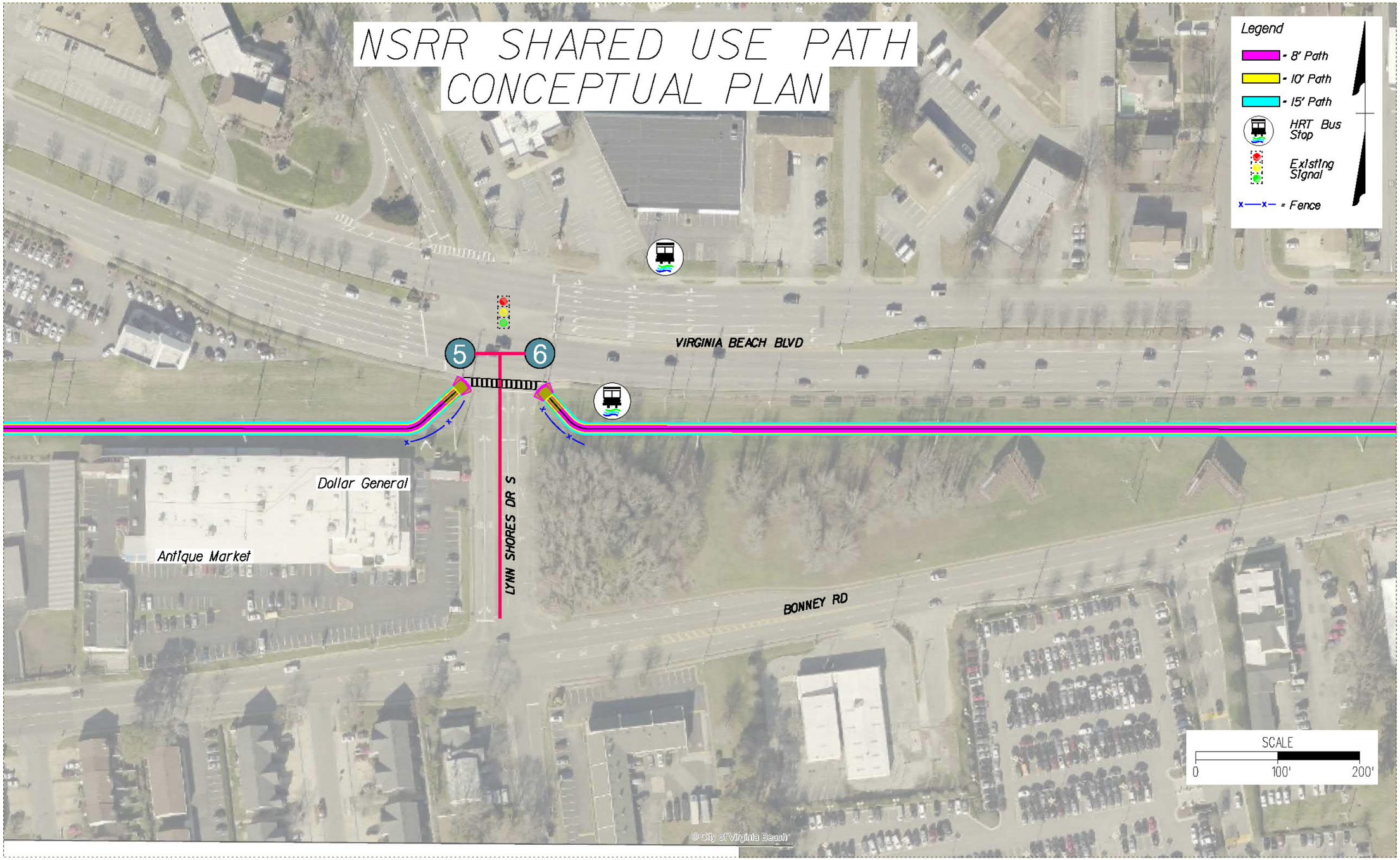

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Proposed Wegman's Food Market
COLUMBUS STREET
INDEPENDENCE BLVD
MARKET ST
GARRETT DR
MANDAN RD
Dick's Sporting Goods
4
5
Legend
= 8' Path
= 10' Path
= 15' Path
= Pedestrian Path
HRT Bus Stop
= Fence
Existing Signal
SCALE
0
100'
200'

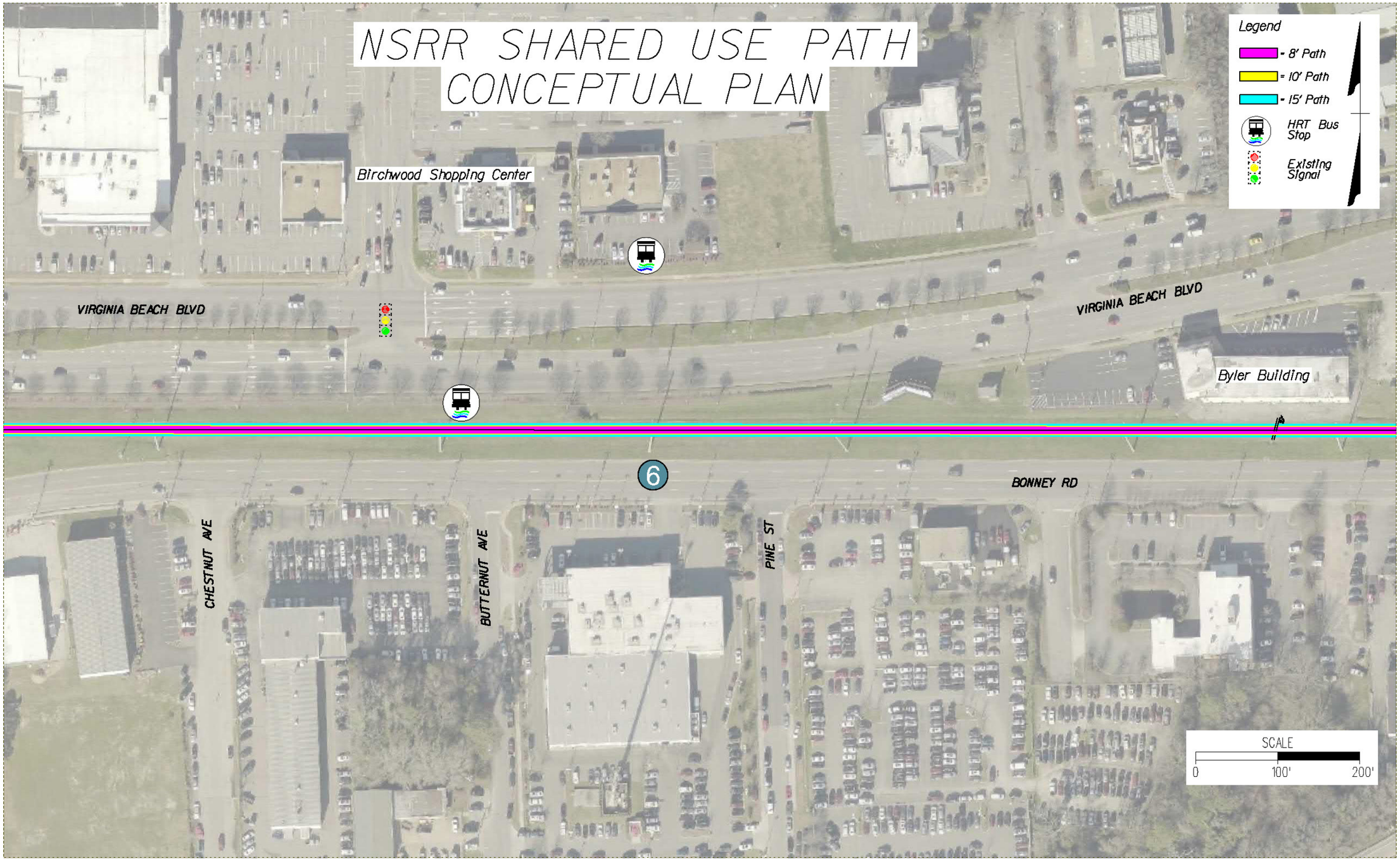

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
- Fence
Existing Signal
COLUMBUS STREET
CONSTITUTION DR
Regal Cinemas Columbus 12
BEASLEY DR PUBLIC ACCESS
NINA DR
NINA DR
5
CONSTITUTION DR
SEGOVIA CT
SCALE
0
100'
200'

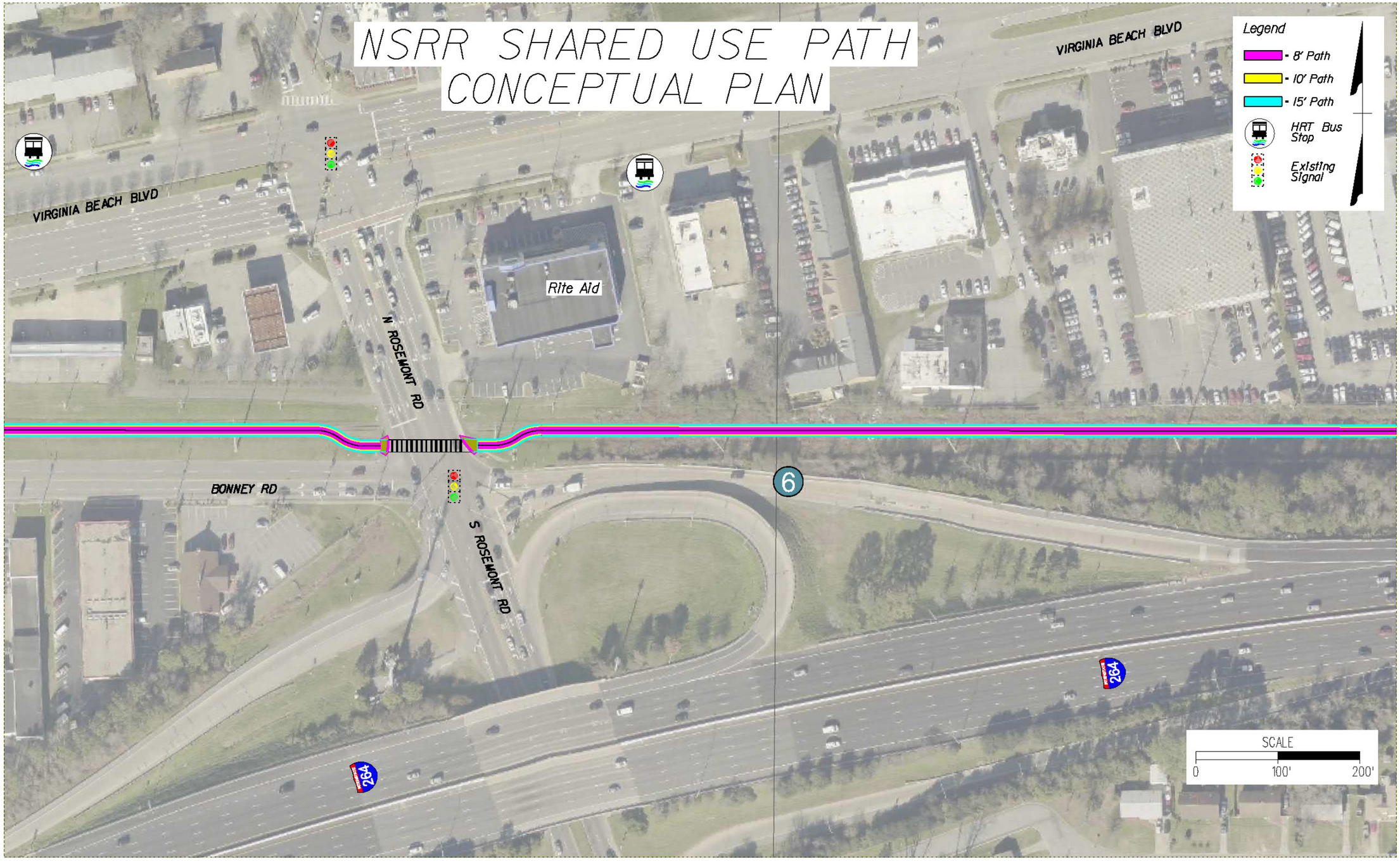

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
GUM AVE
SOUTHERN BLVD
PUBLIC ACCESS
THALIA CREEK
NEW BRIDGE
5
S GUM AVE
PUBLIC ACCESS
S PALM AVE
PUBLIC ACCESS
SCALE
0
100'
200'

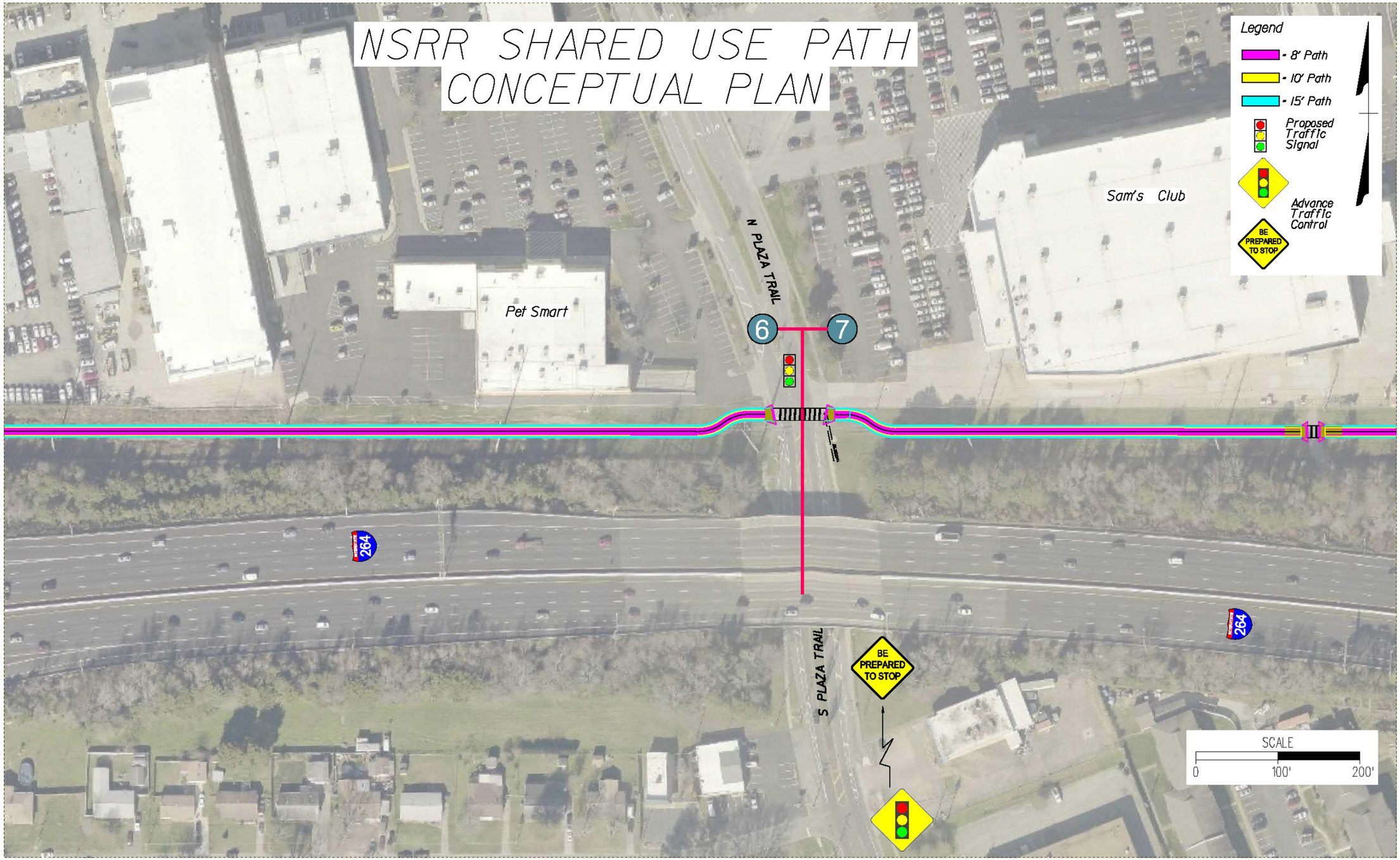

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
N FIR AVE
N THALIA RD
N BUDDING AVE
N ASH AVE
PUBLIC ACCESS
SOUTHERN BLVD
S FIR AVE
S THALIA RD
BUDDING AVE S
5
S CORWOOD AVE
PUBLIC ACCESS
S BOGGS AVE
PUBLIC ACCESS
SCALE
0
100'
200'

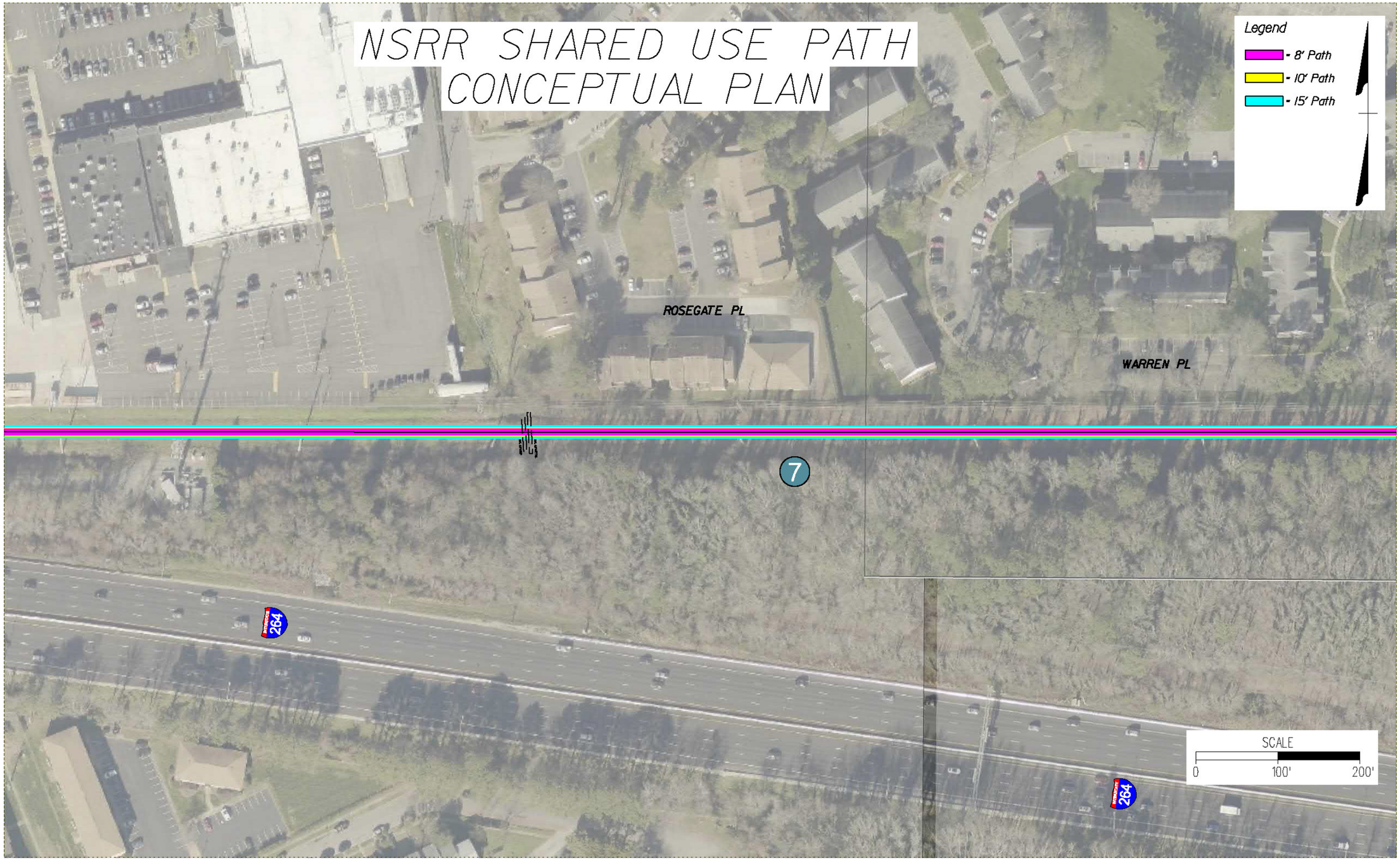

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
HRT Bus Stop
Existing Signal
VIRGINIA BEACH BLVD
Thalia Collins Square Shopping Center
Charles Barker Lexus Dealership
S KENTUCKY AVE
5
MAJESTIC CIRCLE
PRESCOTT AVE
Allsafe Self Storage
BONNEY RD
SCALE
0
100'
200'

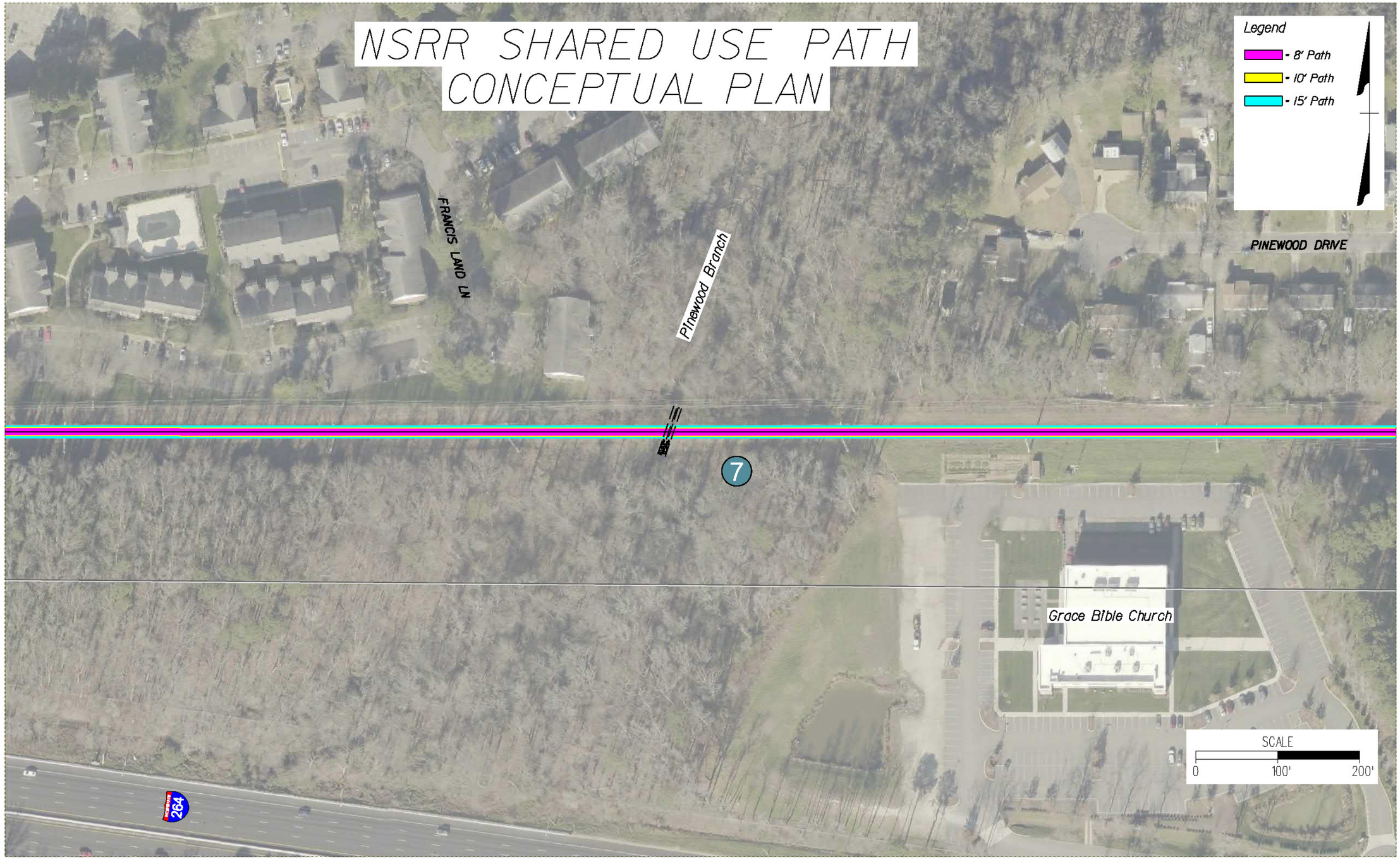

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
HRT Bus Stop
Existing Signal
x—x- = Fence
VIRGINIA BEACH BLVD
5
6
Dollar General
Antique Market
LYNN SHORES DR S
BONNEY RD
SCALE
0
100'
200'
© City of Virginia Beach

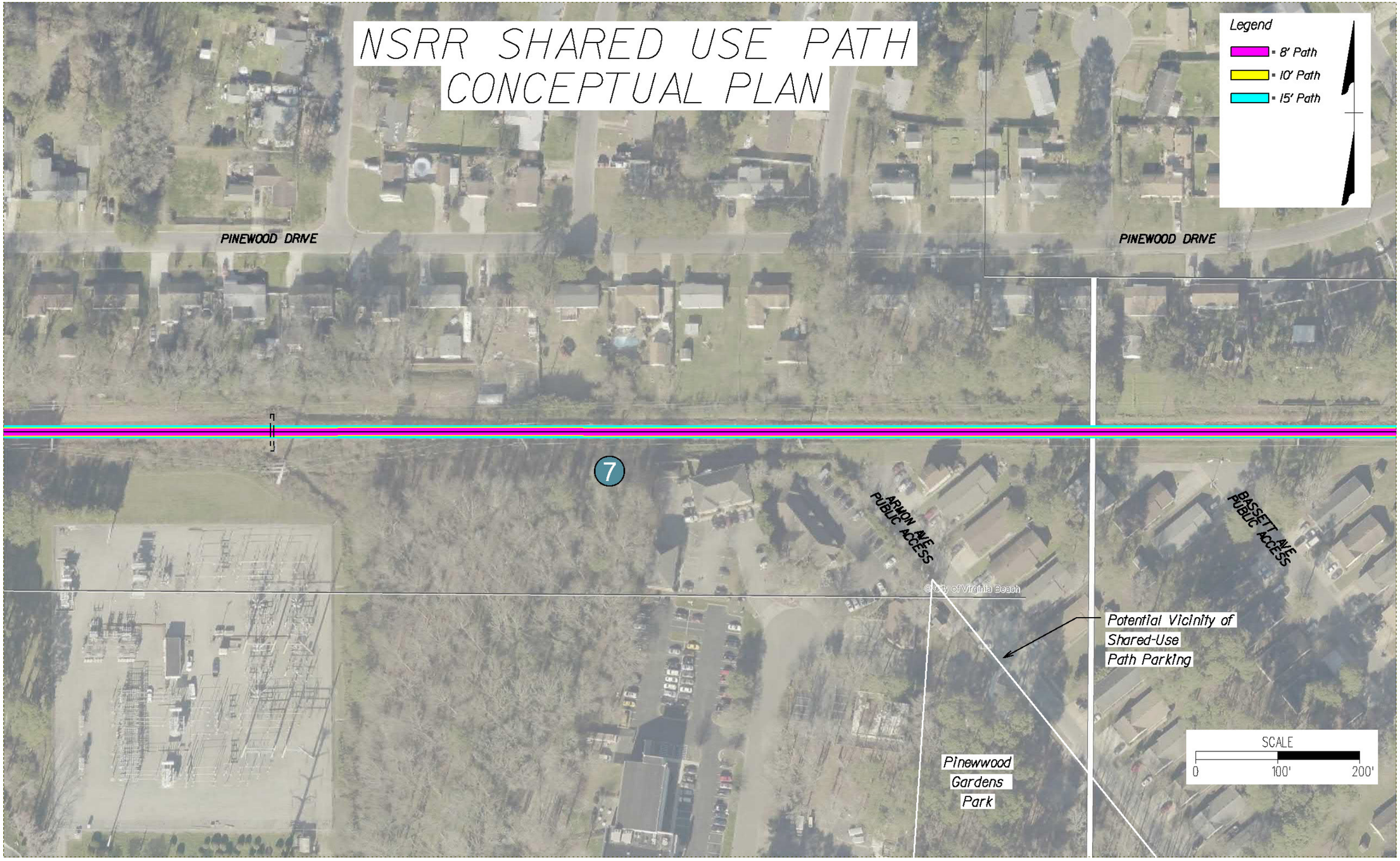

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
HRT Bus Stop
Existing Signal
Birchwood Shopping Center
VIRGINIA BEACH BLVD
VIRGINIA BEACH BLVD
Byler Building
6
BONNEY RD
CHESTNUT AVE
BUTTERNUT AVE
PINE ST
SCALE
0
100'
200'

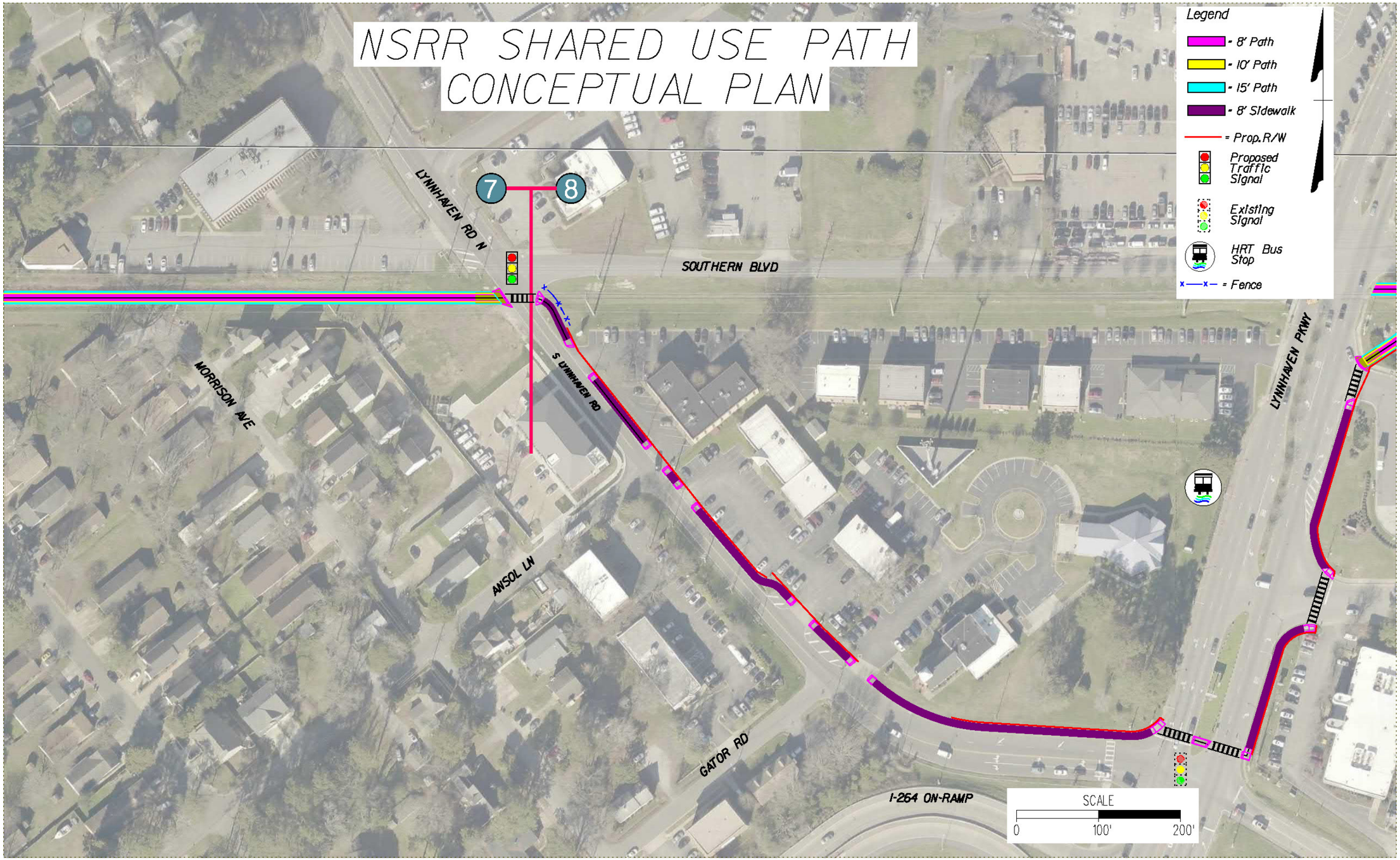

NSRR SHARED USE PATH
CONCEPTUAL PLAN
VIRGINIA BEACH BLVD
VIRGINIA BEACH BLVD
Legend
8' Path
10' Path
15' Path
HRT Bus Stop
Existing Signal
Rite Aid
N ROSEMONT RD
BONNEY RD
S ROSEMONT RD
6
264
264
SCALE
0
100'
200'

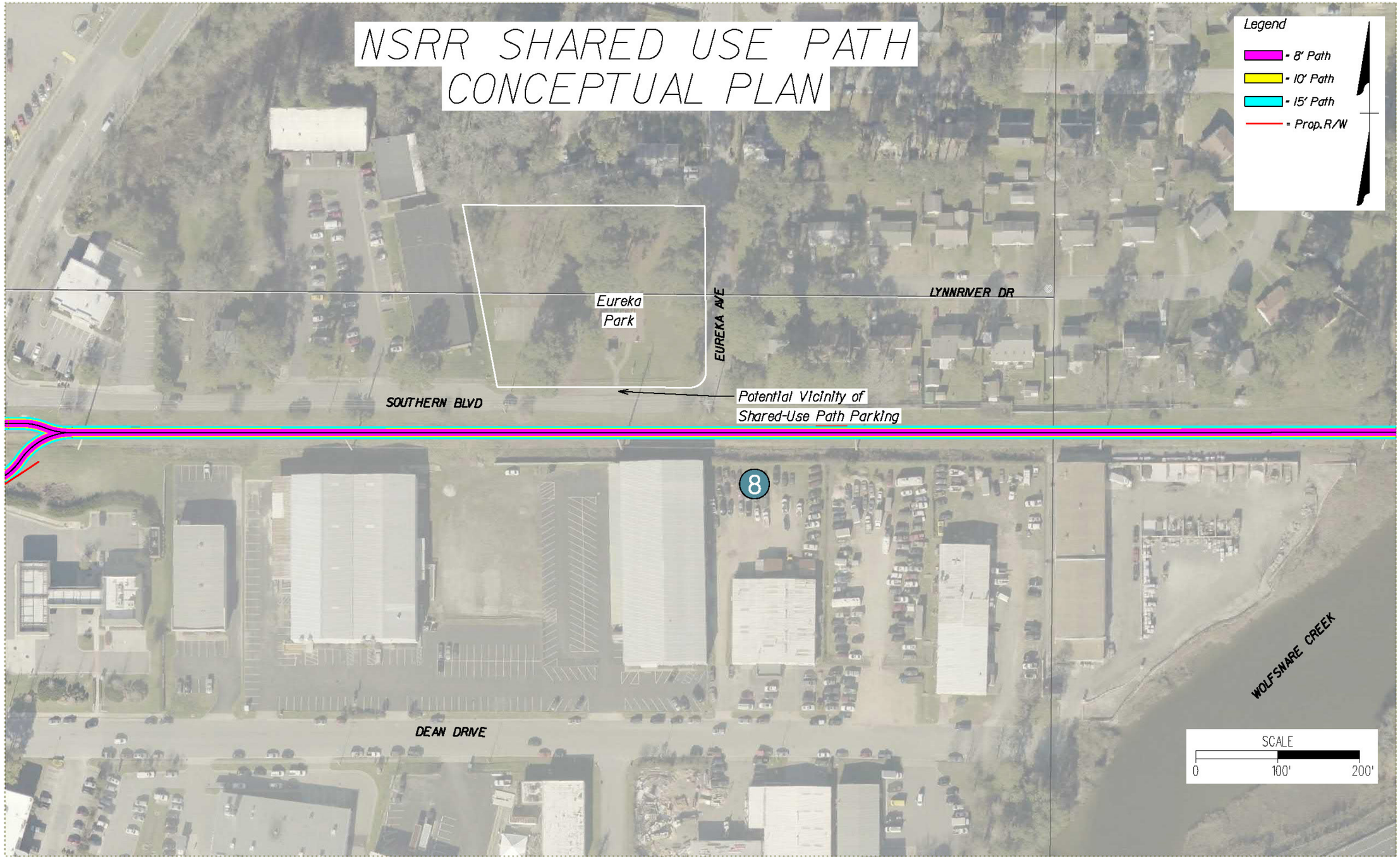

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
Proposed Traffic Signal
Advance Traffic Control
BE PREPARED TO STOP
Sam's Club
Pet Smart
N PLAZA TRAIL
S PLAZA TRAIL
6
7
264
SCALE
0
100'
200'

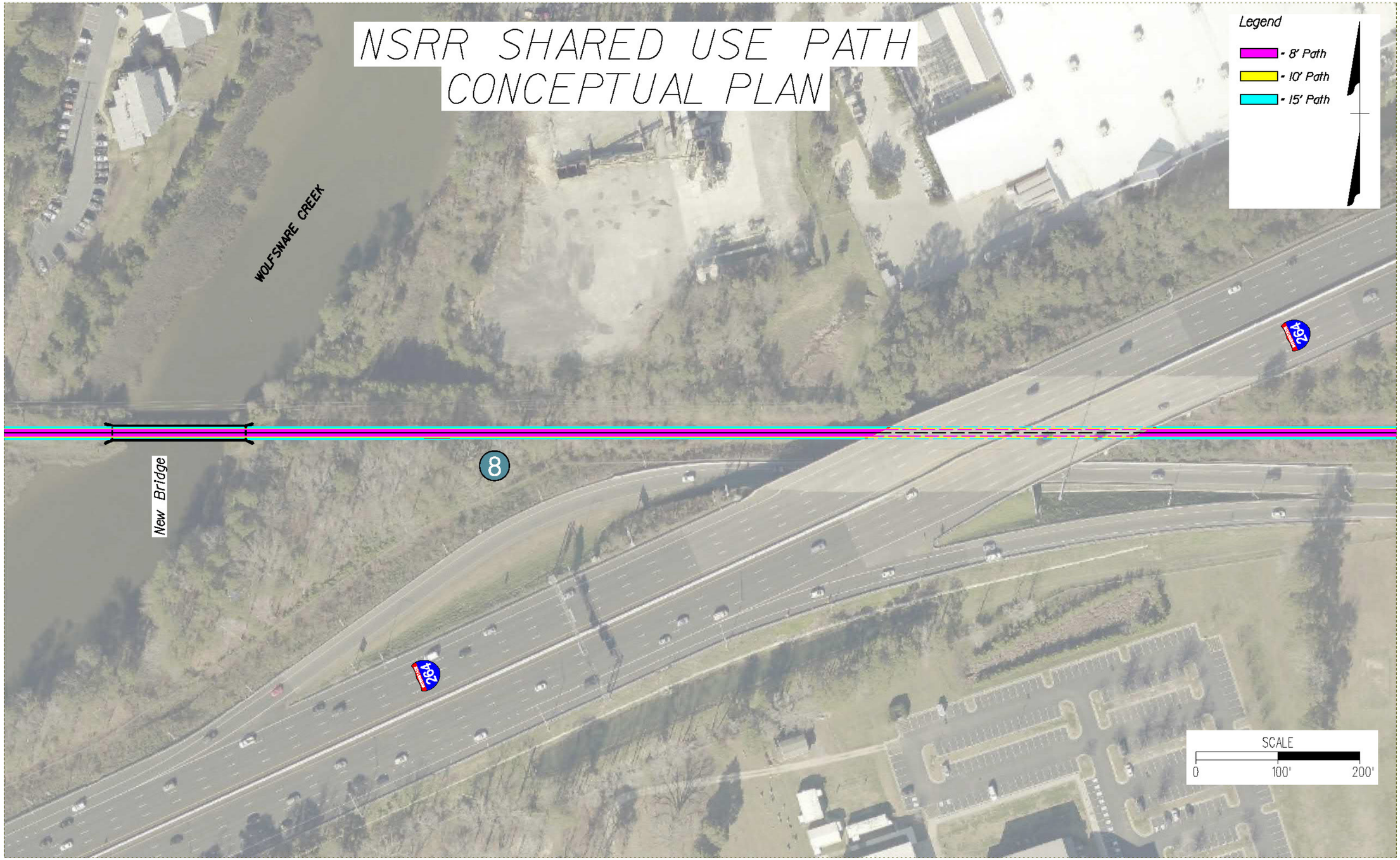

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
ROSEGATE PL
WARREN PL
7
264
264
SCALE
0
100'
200'

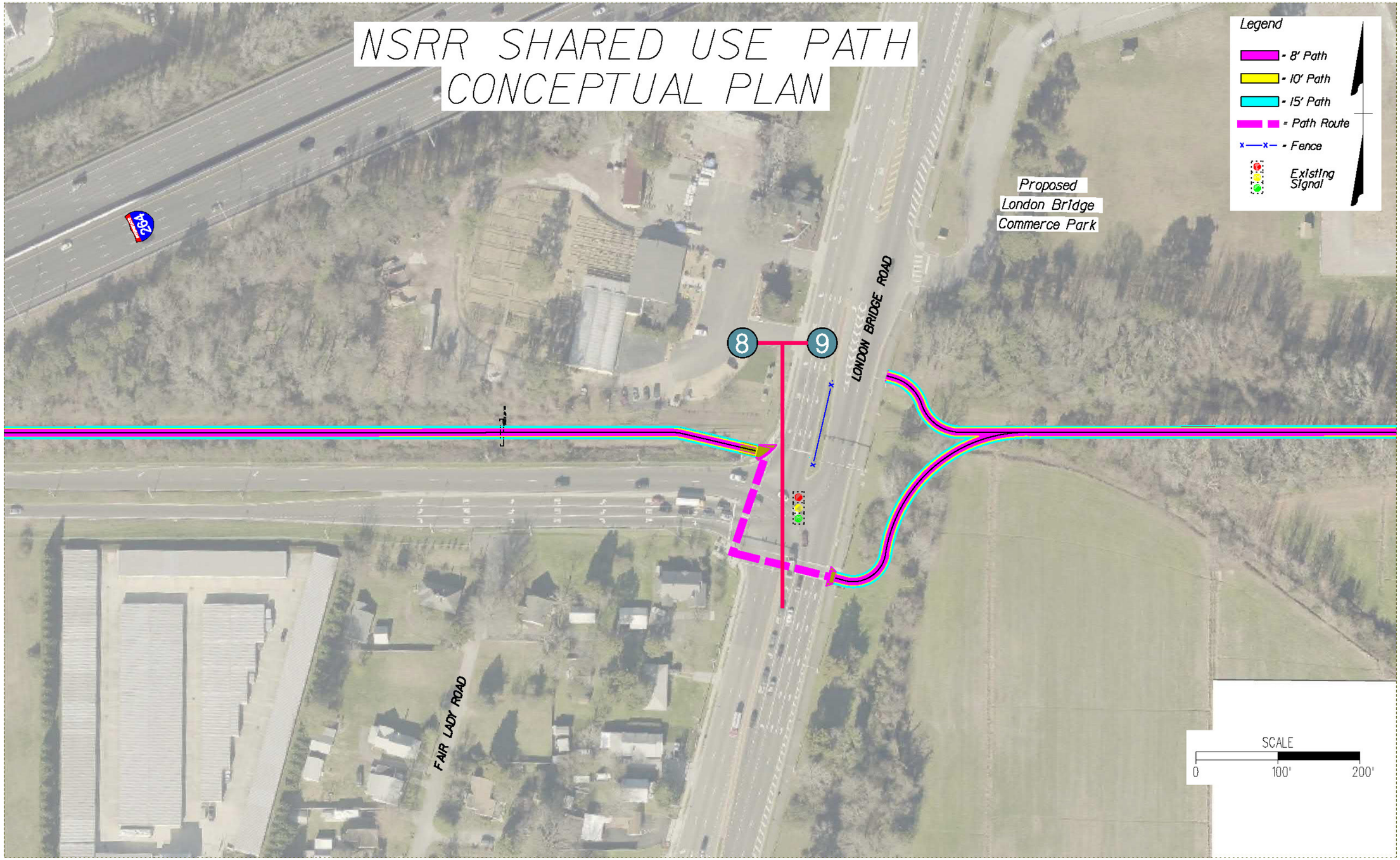

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
8' Path
10' Path
15' Path
FRANCIS LAND LN
Pinewood Branch
PINEWOOD DRIVE
7
Grace Bible Church
SCALE
0
100'
200'
264


NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
PINEWOOD DRIVE
PINEWOOD DRIVE
7
ARMON AVE
PUBLIC ACCESS
BASSETT AVE
PUBLIC ACCESS
© City of Virginia Beach
Potential Vicinity of
Shared-Use
Path Parking
Pinewwood
Gardens
Park
SCALE
0
100'
200'

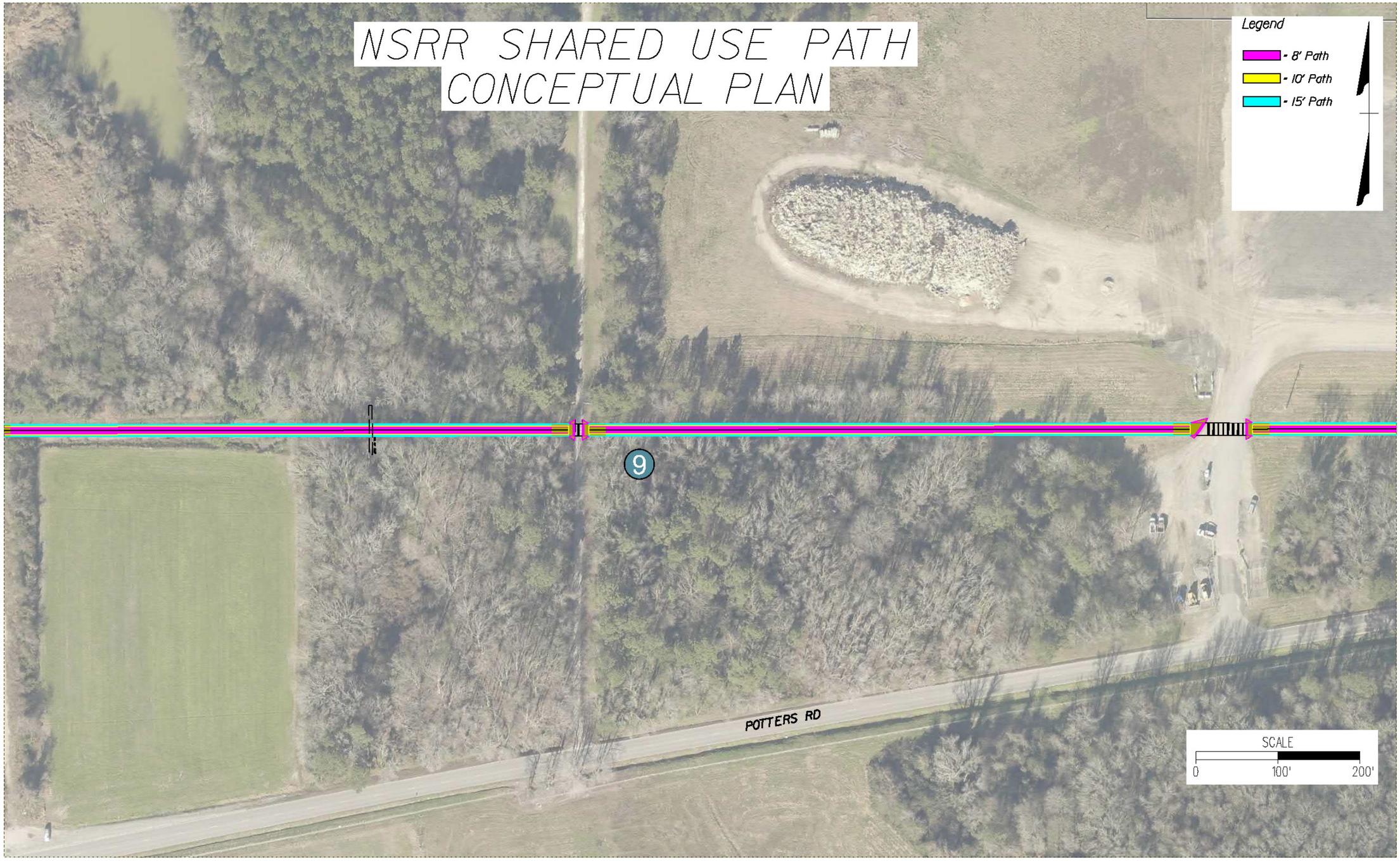

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
= 8' Sidewalk
= Prop. R/W
Proposed Traffic Signal
Existing Signal
HRT Bus Stop
= Fence
7
8
LYNNHAVEN RD N
SOUTHERN BLVD
MORRISON AVE
S LYNNHAVEN RD
ANSOL LN
GATOR RD
I-264 ON-RAMP
LYNNHAVEN PKWY
SCALE
0
100'
200'

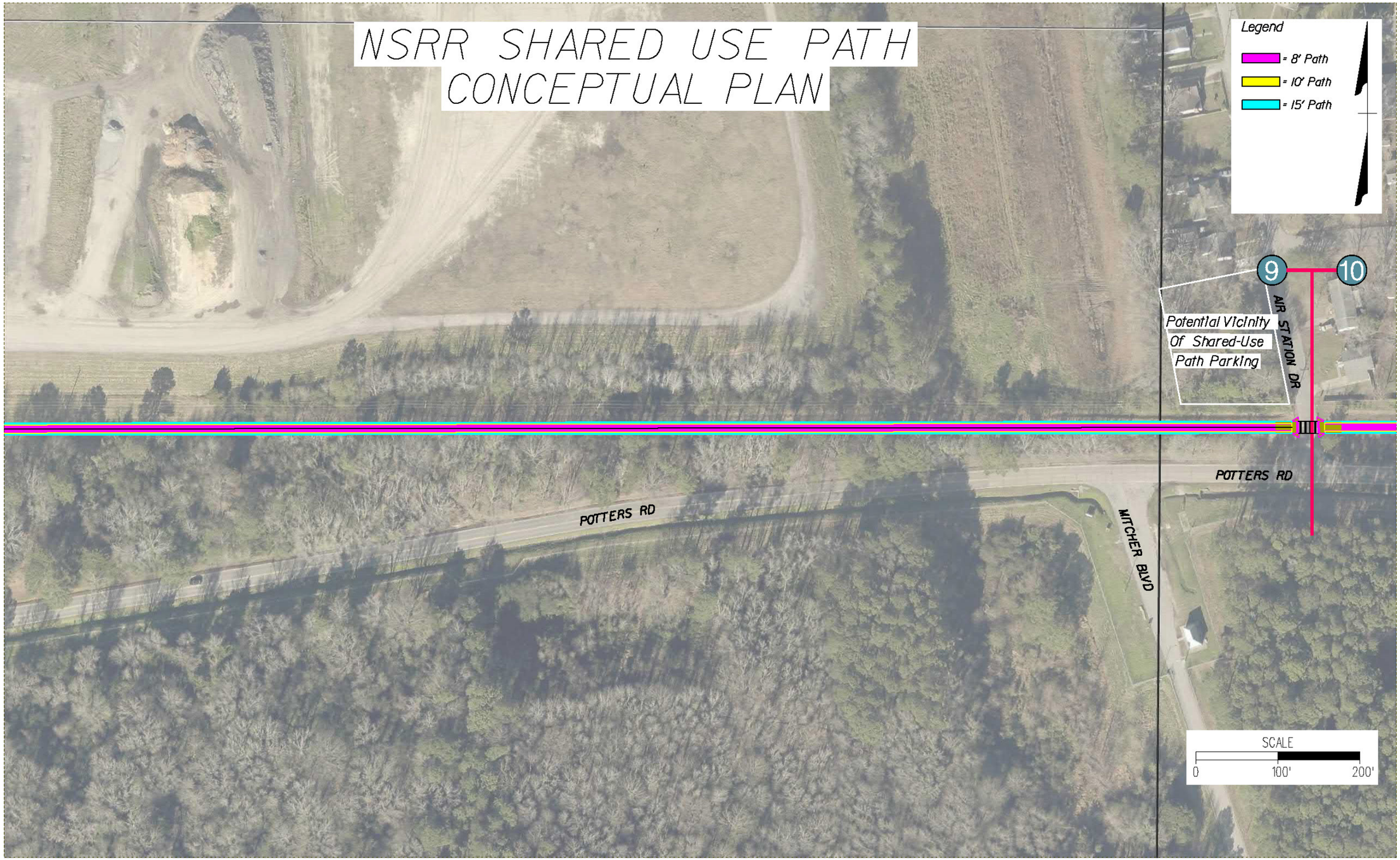

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
= Prop. R/W
Eureka
Park
EUREKA AVE
LYNNRIVER DR
SOUTHERN BLVD
Potential Vicinity of
Shared-Use Path Parking
8
DEAN DRIVE
WOLFSNARE CREEK
SCALE
0
100'
200'

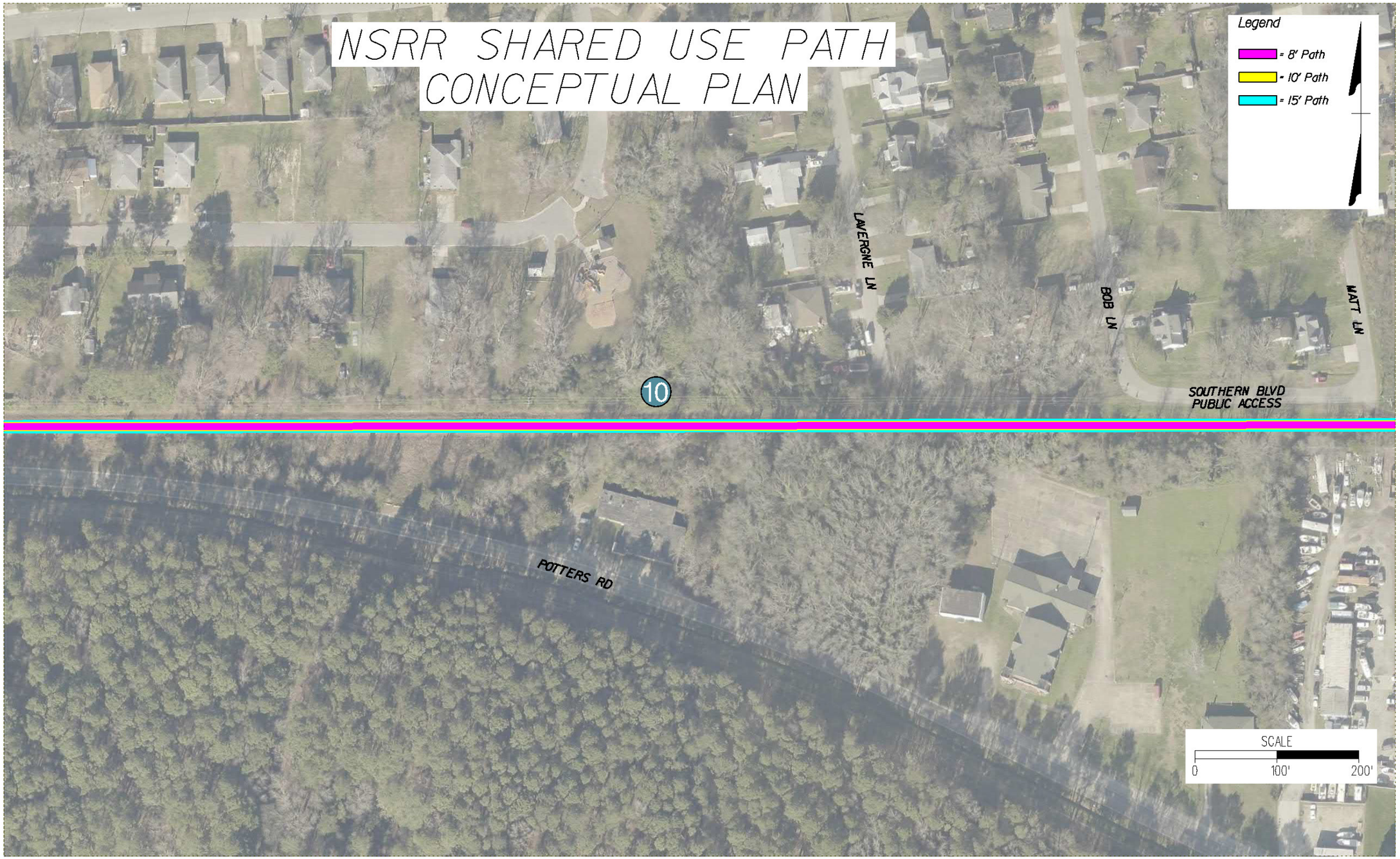

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
8' Path
10' Path
15' Path
WOLFSNARE CREEK
New Bridge
8
264
SCALE
0
100'
200'

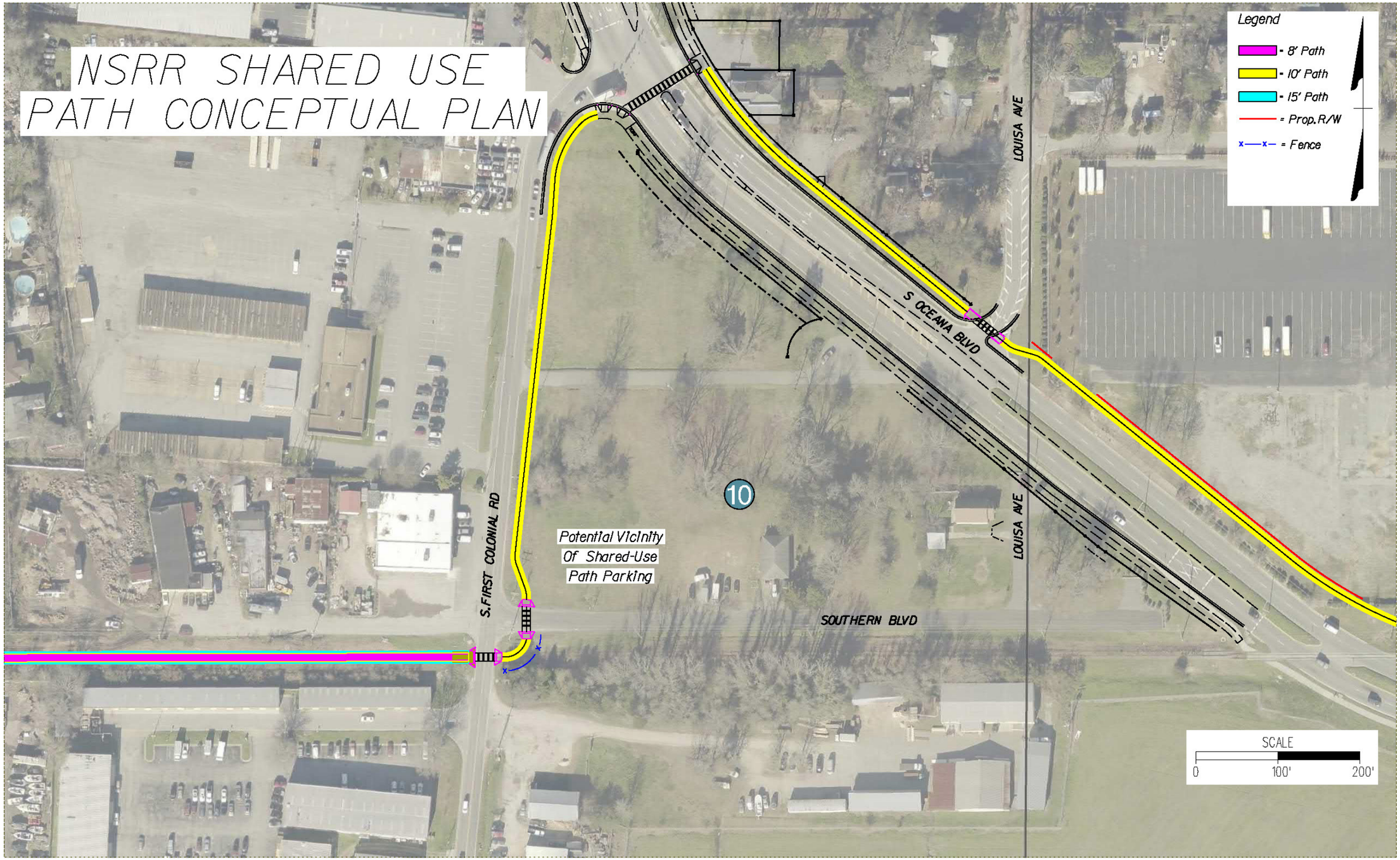

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
= Path Route
= Fence
Existing Signal
Proposed
London Bridge
Commerce Park
LONDON BRIDGE ROAD
FAIR LADY ROAD
8
9
SCALE
0
100'
200'

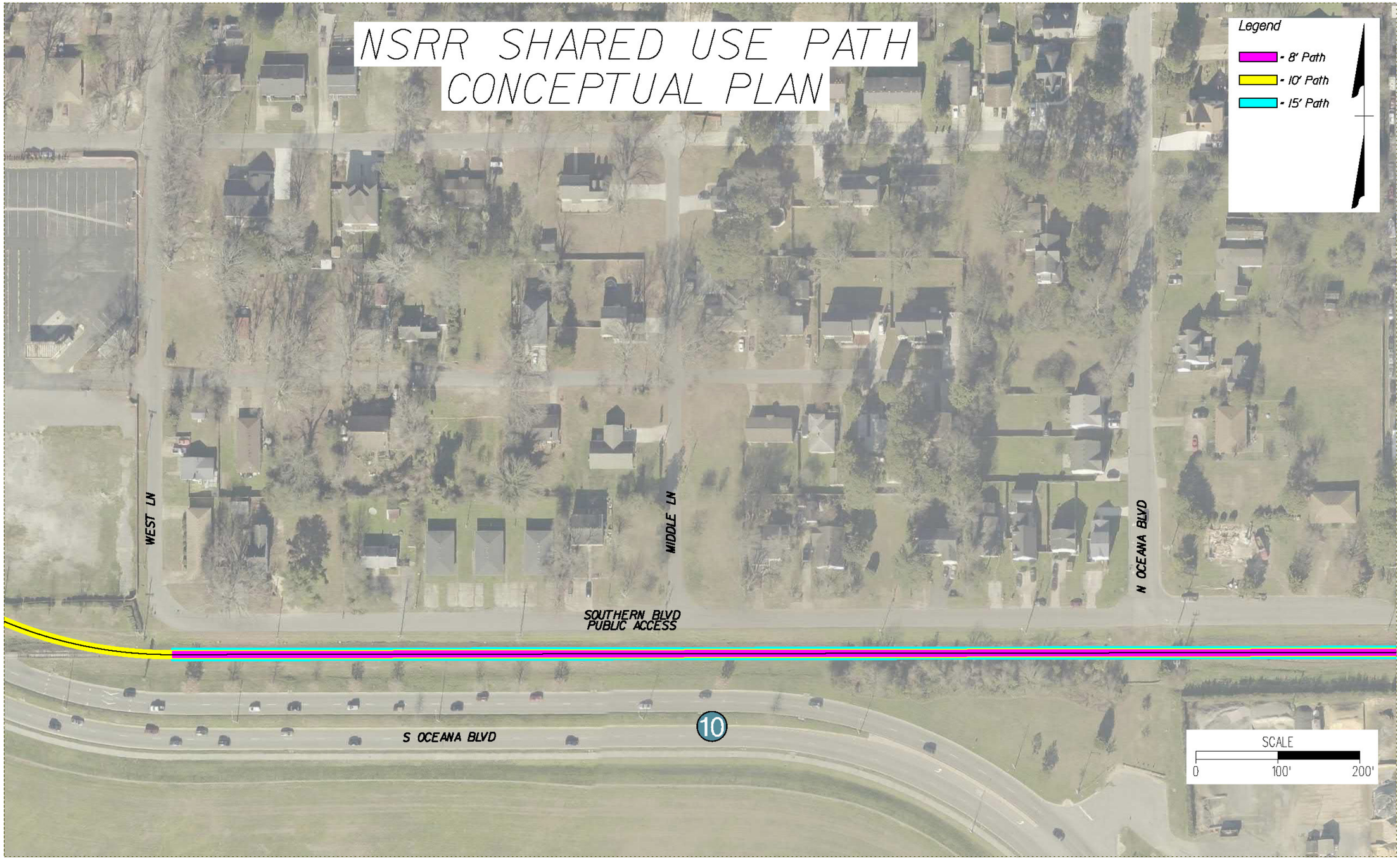
NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
9
SCALE
0
100'
200'

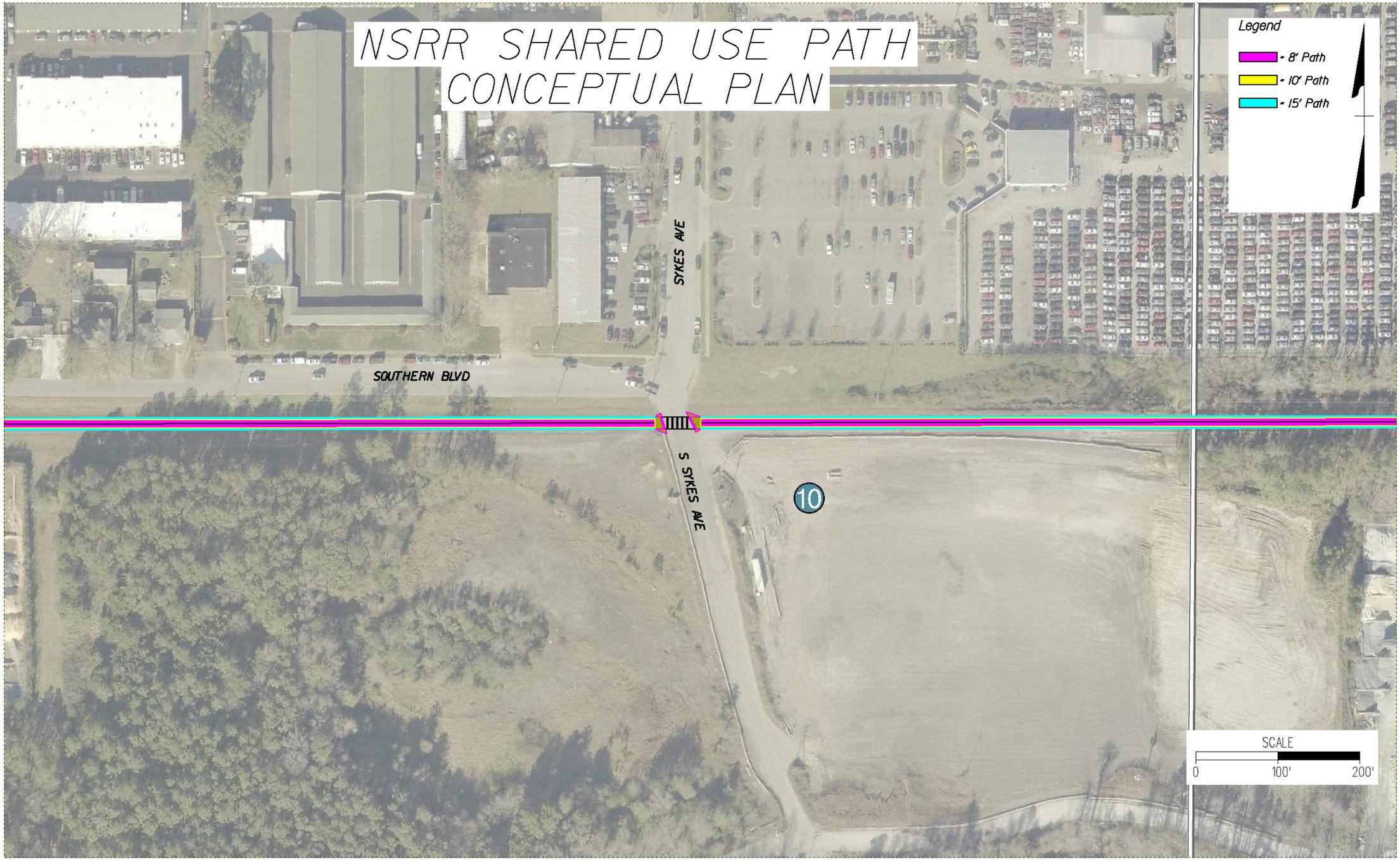

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
9
POTTERS RD
SCALE
0
100'
200'

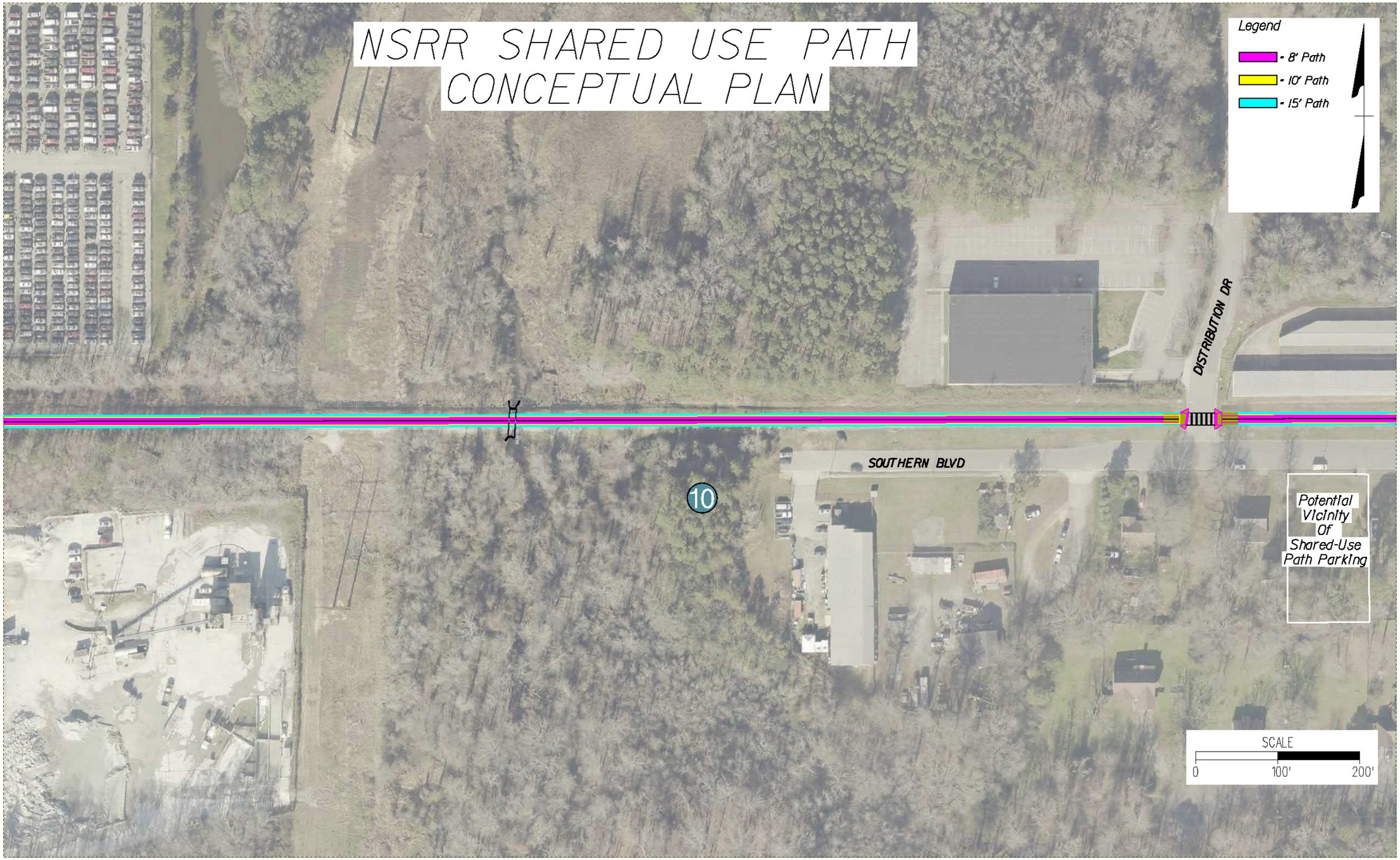

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
9
10
Potential Vicinity
Of Shared-Use
Path Parking
AIR STATION DR
POTTERS RD
POTTERS RD
MITCHER BLVD
SCALE
0
100'
200'

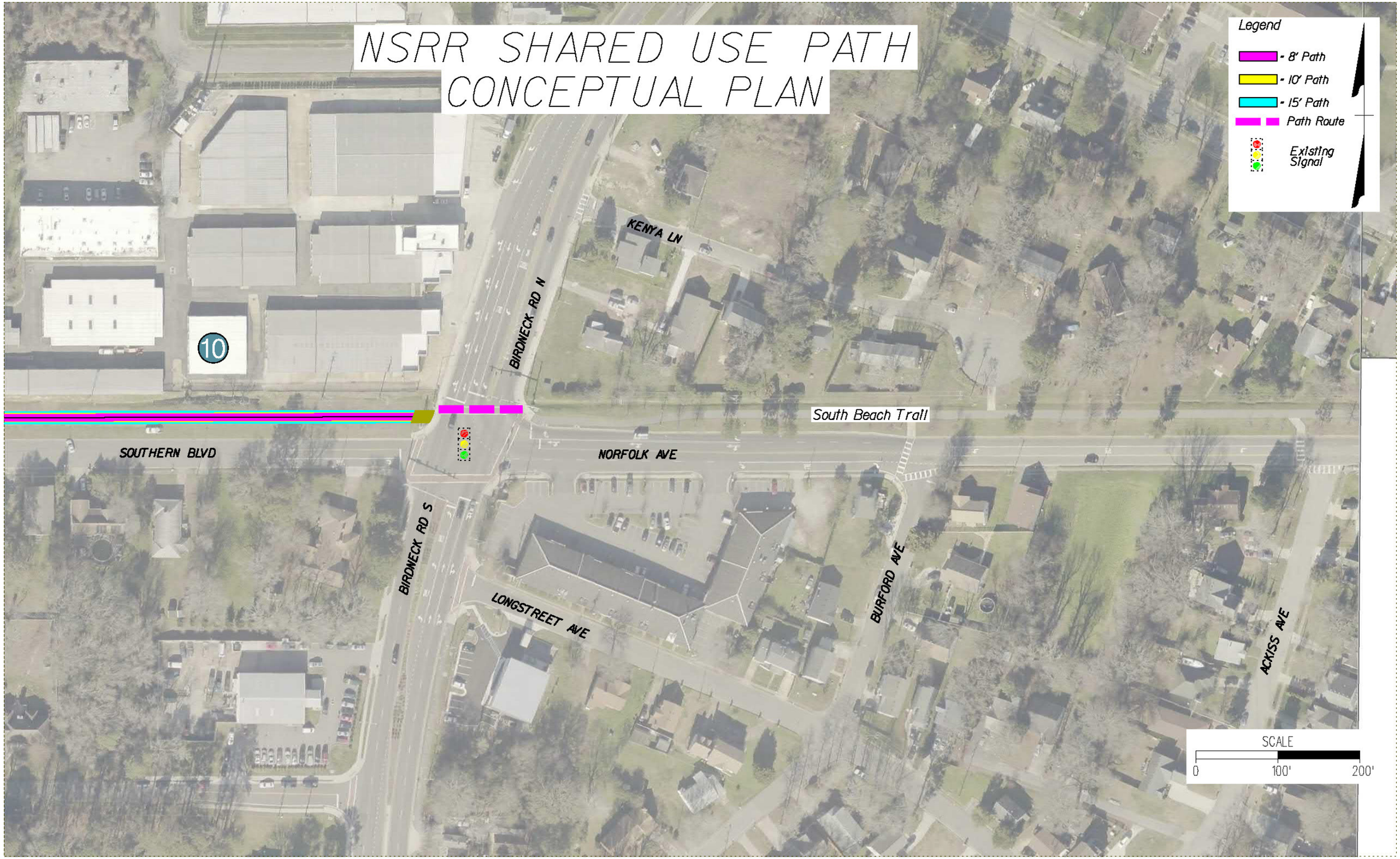

NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
= 8' Path
= 10' Path
= 15' Path
LAVERGNE LN
BOB LN
MATT LN
10
SOUTHERN BLVD
PUBLIC ACCESS
POTTERS RD
SCALE
0
100'
200'


NSRR SHARED USE
PATH CONCEPTUAL PLAN
Legend
8' Path
10' Path
15' Path
Prop. R/W
Fence
S OCEANA BLVD
LOUISA AVE
LOUISA AVE
S. FIRST COLONIAL RD
SOUTHERN BLVD
10
Potential Vicinity
Of Shared-Use
Path Parking
SCALE
0
100'
200'


NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
8' Path
10' Path
15' Path
WEST LN
MIDDLE LN
N OCEANA BLVD
SOUTHERN BLVD
PUBLIC ACCESS
S OCEANA BLVD
10
SCALE
0
100'
200'


NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
8' Path
10' Path
15' Path
SYKES AVE
SOUTHERN BLVD
S SYKES AVE
10
SCALE
0
100'
200'


NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
- 8' Path
- 10' Path
- 15' Path
DISTRIBUTION DR
SOUTHERN BLVD
10
Potential Vicinity Of Shared-Use Path Parking
SCALE
0
100'
200'


NSRR SHARED USE PATH
CONCEPTUAL PLAN
Legend
8' Path
10' Path
15' Path
Path Route
Existing Signal
10
KENYA LN
BIRDNECK RD N
South Beach Trail
SOUTHERN BLVD
NORFOLK AVE
BIRDNECK RD S
LONGSTREET AVE
BURFORD AVE
ACKISS AVE
SCALE
0
100'
200'

APPENDIX A

February 5, 2018

Planning and Community Development
Strategic Growth Areas
4525 Main Street, Suite 710
Virginia Beach, VA 23462

RE: Draft Submittal - NSRR Shared Use Path Conceptual Plan

Clark Nexsen has performed a structural inspection and assessment of the existing condition of two abandoned railroad trestle structures over Thalia Creek and Wolfsnare Creek in Virginia Beach, Virginia to determine their suitability to be modified to carry a shared use path. A Structure Inspection Report in accordance with NBIS standards was completed for each structure and attached for reference. The inspection findings and recommendations for each structure are summarized below.

NSRR OVER THALIA CREEK

The bridge is approximately 116 feet long x 10 feet wide and consists of ten spans, nine bents, and two abutments. The superstructure consists of railroad ties supported by four W16x40 steel beams with a channel diaphragm located in Bays 1 and 3 at midspan. The substructure units vary. Abutments and Bents 1, 8 and 9 consist of a precast concrete cap with five timber piles. The typical bent in the channel consists of a precast concrete cap supported by two plumb and two battered rectangular timber columns; these columns are supported by a timber pile cap and five timber piles. The timber piles, timber pile caps, and lower 2' of the timber columns are submerged at high tide. Random pile bents have been rehabilitated in the past with sections of timber piles cut out and replaced. Pile sizes vary but are typically 8" to 15" in diameter. No drawings of the existing structure were available at the time of inspection, and the age of the structure is unknown, but we understand the bridge was originally constructed to support railroad traffic.

The inspection was completed on foot on top of the deck and below the deck at the abutments. The remaining portion of the structure was inspected using a john boat and hip waders.

The deterioration of the bridge consists primarily of decay to the timber piles/columns and excessive settlement of Bents 3 - 6. The following substructure units have one to three piles/columns with decay resulting in 25% to 90% loss of cross sectional area: Abutment A, Bent 1, Bent 6 - 9, and Abutment B. The majority of piles/columns in the channel are soft at the waterline with decay up to 1" deep around the perimeter. The south end of Bents 3 - 6 have settled (maximum measured settlement of 12" with respect to the north end of the pile cap at Bent 4). The bearings at these bents have been shimmed in the past to correct for this settlement, but a

gap remains under the south bearing plate at Bent 1. Additionally, the timber pile cap was observed to not fully bear on two of five piles at Bent 3. A similar condition exists at four of five piles at Bent 6; timber shims have been placed between the top of pile and timber pile cap in the past. Longitudinal and lateral bracing has areas of decay with up to 100% loss of cross sectional area at numerous locations throughout. Isolated timber backwall and wingwall members have decay with up to 25% loss of cross sectional area.

Additional deterioration includes rust scale with loss of section to the beam ends over the abutments with rust perforations in the web, some extending in front of the bearing. The settlement of the substructure has resulted in some lateral movement of the beams over the bents; the worst location has been retrofitted in the past with additional steel bearing angles to prevent loss of bearing. The timber railroad ties and curbs are in fair condition with moderate checking throughout and isolated areas of decay.

If retrofitted, structural analysis performed by Clark Nexsen indicates that the superstructure would be capable of supporting pedestrian and emergency vehicle loading. However, given the extensive deterioration and settlement of the substructure units and the cost associated with the required repairs, we recommend replacement of the existing bridge with a new structure designed for pedestrian and emergency vehicle loading. A new structure could utilize longer spans and reduce the number of required substructure units. Estimating the cost of a new pedestrian bridge at approximately $150/SF, a new structure with the same length as the existing bridge and a width of 14' would cost approximately $240,000. Cost may vary depending on desired aesthetics and loading requirements.

NSRR OVER WOLFSNARE CREEK

The bridge is approximately 159 feet long x 10 feet wide and consists of thirteen spans, twelve bents, and two abutments. The superstructure typically consists of railroad ties supported by four W16x40 steel beams with a channel diaphragm located in Bays 1 and 3 at midspan. The main channel span consists of six W16x40 steel beams. The substructure units vary. Abutments and Bents 1, 11, and 12 consist of a precast concrete cap with five timber piles; Bents 6 - 8 are similar with six timber piles. Bents 2 - 5 and 8 - 10 consist of a precast concrete cap supported by two plumb and two battered rectangular timber columns; these columns are supported by a timber pile cap and six timber piles. The timber piles, timber pile caps, and lower 2' of the timber columns are submerged at high tide. Bent 3 has been retrofitted with an additional seventh pile below the waterline. Random pile bents have been rehabilitated in the past with sections of timber piles cut out and replaced. Pile sizes vary but are typically 10" to 16" in diameter. No drawings of the existing structure were available at the time of inspection, and the age of the structure is unknown, but we understand the bridge was originally constructed to support railroad traffic.

The inspection was completed on foot on top of the deck and below the deck at the abutments. The remaining portion of the structure was inspected using a john boat.

The deterioration of the bridge consists primarily of decay to the timber piles/columns. The following substructure units have one to four piles/columns with decay resulting in 25% to 100% loss of cross sectional area: Abutment A, Bents 1 - 6, 8 - 12, and Abutment B. Timber pile caps, primarily at Bents 2 - 5, have areas of decay up to 2" deep in the top face. Timber pile caps /concrete bent caps were not fully bearing on isolated timber piles/columns at random locations. Longitudinal and lateral bracing has areas of decay with up to 100% loss of cross sectional area at numerous locations throughout. Isolated timber backwall and wingwall members have decay with up to 100% loss of cross sectional area.

Additional deterioration includes rust scale with loss of section to the beam ends over the abutments with rust perforations in the web, some extending in front of the bearing. The timber railroad ties and curbs are in fair condition with moderate checking throughout and isolated areas of decay.

If retrofitted, structural analysis performed by Clark Nexsen indicates that the superstructure would be capable of supporting pedestrian and emergency vehicle loading. However, given the extensive deterioration of the substructure units and the cost associated with the required repairs, we recommend replacement of the existing bridge with a new structure designed for pedestrian and emergency vehicle loading. A new structure could utilize longer spans and reduce the number of required substructure units. Estimating the cost of a new pedestrian bridge at approximately $150/SF, a new structure with the same length as the existing bridge and a width of 14' would cost approximately $335,000. Cost may vary depending on desired aesthetics and loading requirements.

We appreciate the opportunity to provide the results of this investigation and analysis, and trust the content meets your expectations. Should you have any questions regarding the findings, please do not hesitate to contact us.

Sincerely,

Christopher A. Roberts

Christopher A. Roberts, P.E.
Department Head – Bridge Inspections, Associate Principal

Attachments

CITY OF VIRGINIA BEACH, VIRGINIA
PLANNING AND COMMUNITY DEVELOPMENT
STRATEGIC GROWTH AREAS

STATE BRIDGE NO. N/A

TYPE OF BRIDGE REPORT: REGULAR INSPECTION JANUARY 2018

BRIDGE NAME: ABANDONED NORFOLK SOUTHERN RAILROAD OVER THALIA CREEK

DIRECTION: ABUTMENT A (WEST) TO ABUTMENT B (EAST)

ROUTE NO.: N/A

CLARKNEXSEN
4525 Main Street, Suite 1400
Virginia Beach, VA 23462
clarknexsen.com

STRUCTURE INSPECTION REPORT – COVER PHOTOS

Agency ID:	N/A	**Date of Inspection:**	01/16/2018

RAILWAY LOOKING WEST

RAILWAY LOOKING EAST

STRUCTURE INSPECTION REPORT – COVER PHOTOS

Agency ID:	N/A	**Date of Inspection:**	01/16/2018

SOUTH ELEVATION

NORTH ELEVATION

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

Cnty/City: Virginia Beach **Feature Intersected:** Thalia Creek
Main Route: N/A **Facility Carried:** Abandoned Norfolk Southern Railroad
Location: 0.60 Miles from Independence Boulevard / 0.30 Miles to N Fir Ave
Coordinates: 36°50'23.9"N, 76°07'36.6"W
Lead Inspector: Katie M. Green, P.E.
Additional Inspectors: Mustafa S. Raifet, E.I.T.

DESCRIPTION	Ten Steel Multi-Beam Spans, 116' Long Total.
ORIENTATION	Looking north on the left is Abutment A (Independence Blvd side) on the right is Abutment B (N Fir Ave side). Spans (1 – 10) are numbered from west. Beams (1 – 4), Columns (1 – 4), and Piles (1 – 5) are numbered from north.
MISCELLANEOUS (Items which are structure specific and cannot be included in another section.)	None.
SPECIAL REQUIREMENTS (Special Equipment needed or Special Inspections required such as: Fracture Critical, Underwater, Fatigue Prone, Scour Critical, Moveable Bridge, Segmental Concrete, Pin and Hanger, etc.)	A john boat and hip waders were utilized during this inspection. Visual and tactile inspection of the portion of the structure above the mudline have been performed.
WORK DONE	None.
STRUCTURAL ANALYSIS	If retrofitted, structural analysis indicates that existing superstructure would be capable of supporting pedestrian and emergency vehicle loading.
OVERALL CONDITION	**Poor** Numerous piles and columns throughout substructure have decay with loss of cross sectional area ranging from 25% to 75%; up to 90% at isolated locations. Timber piles below the timber pile caps were not visible at the time of inspection due to the water level; however, the timber pile caps are not fully bearing on timber piles at isolated locations. Timber shims have been inserted between top of piles and timber pile cap at Bent 6 to fill previous gaps. Excessive differential settlement of Bents 3 through 6 (up to 12" at Bent 4). Bearings at Bents 1 - 4 have been shimmed in the past to account for settlement, but bearing plate for Beams 3 and 4 at Bent 1 is not bearing on bent cap for 100% of area. Surface rust with pitting throughout structural steel. Rust scale with loss of section to beam ends at both abutments with rust perforations in beam webs. Beam 3 in Span 7 is not fully bearing on bent cap; additional angle has been installed on east face of pier cap to provide adequate bearing support. Isolated diaphragm connection bolts are loose/missing. Decay with up to 100% loss of cross sectional area at longitudinal bracing connections at Bents 2, 3 and 7. Decay with up to 25% loss of cross sectional area at timber wingwalls and backwalls at abutments. Isolated areas of decay in deck ties and curbs.
RECOMMENDATIONS	*In order to retrofit the existing bridge for pedestrian and emergency vehicle loading, the following actions are required (in addition to installation of pedestrian deck and railing).* 1. Replace/retrofit both abutments and Bents 1, and 3 - 9 due to excessive differential settlement and deterioration of timber piles/columns. (10 EA) 2. Repair beam ends at both abutments. (8 EA) 3. Reset bearings as necessary after performing substructure repairs. (22 EA) 4. Replace timber backwalls and wingwalls. (2 EA)

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

	5. Replace/repair longitudinal and lateral bracing members and connection hardware. (LS)

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

DECK

Deck

Fair

Timber Railroad Ties, 10" wide x 8" high, spaced ~15" on center.

- Up to ¼" wide checking throughout. See Photo #1.
- Random areas of decay, up to 1 SF x up to ½" deep on top face.
- Isolated deck ties have decay ranging from 1" to 3" deep. See table below and Photo #1:

Span	Number of ties	Decay depth
1	1	3"
	1	2"
3	2	1"
	1	2"
4	2	1"
5	1	1"
6	1	1"
8	3	1 ½"

Curbs

Fair

Timber Curbs, 8 ¼" wide x 5" high.

- Up to ¼" wide checking throughout.
- Random areas of decay up to ½" deep throughout.

Span 7

- South Curb: Area of decay, 3' long x 4" wide x up to 2 ½" deep. See Photo #2.

Span 10

- North Curb: Area of minor decay at east end of curb over Abutment B.

SUPERSTRUCTURE

Bearing Devices

Fair

Steel Bearing Plates, 19" L x 26" W x 7/8" thick

- Surface rust throughout bearing plates. See Photo #5.
- Shims placed beneath bearings at Bents 1 through 4 in the past due to previous differential settlement. See "SUBSTRUCTURE - Pile Caps and Settlement" and Photos #3 and #4.

Span 1

At Abutment A

- Beam 1: Up to ¼" gap between bearing plate and bottom flange at beam end. See Photo #5.

At Bent 1

- Beams 3 and 4: Bearing plate is not bearing on bent cap for 100% of area with up to 7/8" gap. See Photo #6.

Span 7

At Bent 6

- Beam 3: Beam end is not fully bearing on bent cap; additional angle has been installed on east face of pier cap to provide adequate bearing support. See Photo #9.

Span 9

At Bent 9

- Beam 1: ¼" gap between bearing plate and beam bottom flange.

Beams

Poor

Four (4) Unpainted Steel Beams, W16x40.

- Surface rust with minor pitting throughout beams. See Photos #5, #7, #10, and #11.

Span 1

At Abutment A

- Beam 1: Rust perforation, 28" long x up to 6" high in bottom of web at beam end extending in front of bearing. Up to 1/8" loss of section to bottom 6" of web for 24" long on interior side in front of rust perforation. 100% loss of section to bottom flange

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

for end 4". Up to ¼" loss of section to exterior side of bottom flange for 12" long in front of rust perforation. See Photo #5.

- Beam 2: Rust perforation, 2" diameter in bottom of web located 6" from beam end behind bearing. Up to 1/8" loss of section to bottom 8" of web for 24" long at beam end extending in front of bearing. Up to 1/32" loss of section to bottom flange for end 6".
- Beam 3: Rust perforation, 4" long x 3" high in bottom of web located 13" in front of centerline of bearing. Up to 1/8" loss of section to bottom 2" of web for 42" long at beam end extending in front of bearing. Up to 1/32" loss of section to bottom flange for end 30".
- Beam 4: Rust perforations, 9 ½" long total x 2" high in bottom of web at beam end behind bearing. Rust perforation, 1 ½" diameter in bottom of web located 22" in front of bearing centerline. See Photo #7. Up to ¼" loss of section to bottom 7" of web for 48" long at beam end on north side extending in front of bearing. Up to 1/8" loss of section to bottom flange for end 12".

Span 2

At Bent 2

- Beam 4: Rust perforation, 1" diameter on north side of bottom flange.

Span 5

At Bent 4

- Beam 2: Beam in Span 5 is offset 1" to the south with respect to Beam 2 in Span 4. See Photo #8.

Span 7

At Bent 6

- Beam 3: Beam in Span 7 is offset 2" to the north with respect to Beam 3 in Span 6. See Photo #9.

Span 10

At Abutment B

- Beam 1: Rust perforation, 10" long x 5" high in bottom of web at beam end behind bearing. Up to ¼" loss of section to bottom 3" of web for 9" long in front of rust perforation on exterior side. Up to 1/16" loss of section to bottom 6" of web for 16" long in front of rust perforation on interior side. Up to ¼" loss of section to bottom flange for end 6".
- Beam 2: Rust perforation, 9" long x 2 ½" high in bottom of web at beam end behind bearing; up to ¼" loss of section for 2" high of web above rust perforation. Up to 1/16" loss of section to bottom 6" of web for 24" long in front of rust perforation. See Photo #10. Up to ¼" loss of section to bottom flange for end 20" on north side.
- Beam 3: Up to ¼" loss of section to bottom 2 ½" of web for 6" long with a rust perforation, 1 ½" long x ½" high in bottom of web at beam end behind bearing. Up to 1/16" loss of section to bottom 6" of web for 25" long in front of rust perforation. Up to 1/8" loss of section to bottom flange for end 6".
- Beam 4: Rust perforation, 4" long x 3" high in bottom of web at beam end behind bearing. Up to 1/16" loss of section to bottom 6" of web for 16" long on interior face. Two areas, up to ¼" loss of section for up to 6" long x up to 2" wide to bottom flange on exterior side. See Photo #11.

Diaphragms or Cross Frames

Good

Steel Channel Diaphragms in Bays 1 and 3, MC6x16.3.

Span 2

- Between Beams 1 and 2: One of two bolts missing at diaphragm connection to Beam 2. See Photo #12.

Span 3

- Between Beams 1 and 2: One of two bolts missing at diaphragm connection to Beam 2.

Span 10

- Between Beams 3 and 4: One of two bolts loose at diaphragm connection to Beam 4.

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

Paint

- See "SUPERSTRUCTURE – Bearing Devices, Beams, and Diaphragms or Cross Frames" and Photos #3 – #12.

SUBSTRUCTURE

ABUTMENTS

Abutments consist of timber backwall, timber wingwalls and a precast concrete cap supported by five timber piles.

Wings

Poor

- Timber wingwall members have pockets of internal decay with up to 25% loss of cross sectional area at some locations. See Photo #13.

Backwalls

Poor

- Timber backwall members have pockets of internal decay with up to 25% loss of cross sectional area at some locations.

Caps

Good

Precast Concrete Cap, 14" wide x 15" high.

- No noteworthy deficiencies.

Piles

Poor

Round Timber Piles, Diameter Varies (9" to 13").

Abutment A

Pile 3

- Decay with up to 75% loss of cross sectional area. See Photo #14.

Pile 4

- Decay, up to ¼" deep on Span 1 side.

Pile 5

- Decay with up to 75% loss of cross sectional area. See Photo #15.

Abutment B

Pile 1

- Decay, 5" wide x full height x 5" deep on southwest side. See Photo #16.

Piles 2 and 5

- Decay with up to 75% loss of cross sectional area. See Photos #17 and #18.

Erosion/Scour/Undermining

Good

- No noteworthy deficiencies.

Settlement

Good

- No noteworthy deficiencies.

BENTS

Bents 1, 8 and 9 consist of a precast concrete cap supported by five timber piles. Bent 9 has been retrofitted in the past; portions of original timber piles have been cut out and replaced. Bents 2 - 7 consist of a precast concrete cap supported by four timber columns; these columns are supported by a timber pile cap and five timber piles located below the waterline.

Caps

Good

Precast Concrete Cap, 14" wide x 15" high.

- Hairline map cracking with superficial spalling at some locations. See Photo #4.

Columns

Poor

Two Plumb and Two Battered Rectangular Timber Columns at Bents 2- 7, 11.75" wide x 13" long.

- Up to 1/8" wide checks throughout.
- Moderate marine growth on columns along waterline.

Bent 2

- Columns 2 and 3: Decay on all faces, full width x 2' high x up to ¼" deep at bottom.

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

Bent 3

- Column 1: Decay, 1 SF x up to 1" deep on south face.

Bent 4

- Column 1: Splinter at top of south east corner.
- Column 2: Check, up to ¼" wide x 24" long at top of west face.
- Column 4: Decay, 1 SF x up to ¼" deep on west face at waterline.

Bent 5

Columns 2 and 3 have been drilled at bottom to determine the condition of the internal portions; no indication of internal decay.

- Column 2: Soft at waterline with up to 1/8" deep area of decay on west face. Splinter, 6" wide x 16" high on south face at top.
- Column 3: Decay, 1 ½ SF x ¾" deep on west face near waterline. Column has a gap up to 1" at bottom above timber pile cap on southwest corner.

Bent 6

- Column 2: Up to 90% loss of cross sectional area for 2 ½' high due to fire damage at top. See Photo #19.

Bent 7

Column 3 has been drilled at bottom to determine the condition of the internal portions; no indication of internal decay.

- Column 1: Splinter, 3" wide x 24" high x up to 3" deep on south face at top.
- Columns 2 and 3: Decay on all faces, full width x up to 2 ½' high x up to 1" deep at bottom. See Photo #20.
- Column 4: Decay on all faces, full width x up to 2 ½' high x up to 1 ½" deep at bottom.

Bracing

Poor

Timber Bracing System, 9 ¾" high x 3" wide typical.

- 1/8" wide checking throughout lateral braces and longitudinal cross-braces; up to ¼" wide at isolated locations.
- Corrosion with up to 100% loss of section to bracing connection hardware. See Photo #21.
- Up to 1" gap between braces and columns/piles at some locations. See Photo #21.

Bent 2

- North and south ends: Longitudinal bracing connections attached to bottom of Piles 1 and 4 are wholly ineffective due to decay with 100% loss of cross sectional area. See Photo #22.

Bent 3

- North end: Longitudinal bracing connection attached to bottom of Pile 1 is wholly ineffective due to 100% of decay.

Bent 5

- East face: Split, 2' long x ½" wide to lateral bracing member at Column 4.

Bent 6

- North end: Longitudinal bracing connection attached to bottom of Pile 1 is wholly ineffective due to decay with 100% loss of cross sectional area. See Photo #23.

Bent 9

- West face: Timber block between lateral bracing and Pile 2 has an internal decay, 6" diameter x full height.

Pile Caps

Fair

Timber Pile Caps, 12" wide x 12" high.

- Up to 1/8" wide checks throughout.
- Moderate marine growth on pile caps.

Bent 3

- Pile cap has differential settlement with south end 6" lower than north end.

Bent 4

- Pile cap has differential settlement with south end 12" lower than north end. See Photo #24.

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

	Bent 5 - Pile cap has differential settlement with south end 4" lower than north end. Bent 6 - Pile cap has differential settlement with south end 6 ½" lower than north end. Bent 7 - Pile cap has a split, 4' long x up to 1 ¾" wide x full depth on south end with up to 2" differential across split on top face. See Photo #25.
Piles	**Poor** *Round Timber Piles, diameter varies (8" to 15"). Timber piles below timber pile caps at Bents 2 - 7 were not visible at time of inspection (low tide) due to water level; piles were inspected by probing below the waterline.* - Up to 1/8" wide checks throughout. - Moderate marine growth on timber piles at and below waterline. Bent 1 - Pile 1: Decay with up to 90% loss of cross sectional area for full height. See Photo #26. - Pile 2: Drilled and determined to be hollow due to internal decay, 1" – 2" remaining on outer circumference. - Pile 3: Hollow due to internal decay with up to 25% loss of cross sectional area. - Pile 5: Splinter, 10" wide x 24" high at top with ½" wide split. Bent 3 - Pile 3: 1" gap between top of pile and timber pile cap. - Pile 4: Offset and not fully bearing; as built condition. Bent 6 - Piles 2 – 5: Timber shims have been inserted between timber pile cap and top of timber piles to fill previous gaps. See Photo #27. Bent 7 - Pile 4 is offset and has 50% loss of bearing; as built condition. Bent 8 *Pile 2 has been drilled at bottom to determine the condition of the internal portions; no indication of internal decay.* - All piles have decay, full circumference x 4' high above mudline x up to 2" deep at bottom. See Photo #28. - Pile 2: Decay, 5" diameter x 3" deep on east face at top. Bent 9 - Pile 3: Decay, 8" wide x 3" high x up to 6" deep on west face at top. - Pile 4: Decay, 7" diameter x 24" deep on top face at west side. - Pile 5: Split, up to 3/8" wide x full height on east face.
Erosion/Scour/Undermining	**Good** - No noteworthy deficiencies.
Settlement	**Poor** - Bents 3 through 6 have differential settlement with south ends lower than north ends. See "Bearing Devices and Pile Caps" and Photos #3, #4, and #24.
CHANNEL AND SLOPE PROTECTION	
Scour	- Footing founded on timber piles and exposed at low tide. See "SUBSTRUCTURE – PIERS – Erosion/Scour/Undermining".
Embankment Erosion	- No noteworthy deficiencies.
Drift	- Moderate accumulation of trash/debris in channel around structure.

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/16/2018

Vegetation	- No noteworthy deficiencies.
Rip Rap/Slope Protection	- No noteworthy deficiencies.
Adequacy of Opening	**Sufficient** - No noteworthy deficiencies.
FIELD POSTING	
Actual Posting	Structure is not posted.
Legibility	Not applicable.
Visibility	Not applicable.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #1

Looking at timber deck ties in Span 8.

Up to ¼" wide checking throughout.

Isolated deck ties have decay ranging from 1" to 3" deep (1 ½" deep at this location).

Photo #2

Looking at south curb in Span 7.

Area of decay, 3' long x 4" wide x up to 2 ½" deep.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #3

Looking at west side of Bent 4 in Span 4.

Shims placed beneath bearings at in the past due to previous differential settlement.

Photo #4

Looking at east side of Bent 4 cap below Beams 3 and 4.

<u>Bearing</u>
Shims placed beneath bearings at in the past due to previous differential settlement.

<u>Bent cap</u>
Hairline map cracking with superficial spalling at some locations.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #5

Looking at exterior side of Beam 1 at Abutment A.

Surface rust throughout bearing plates.

Up to ¼" gap between bearing plate and bottom flange at beam end.

Surface rust with minor pitting throughout beams.

Rust perforation, 28" long x up to 6" high in bottom of web at beam end extending in front of bearing. 100% loss of section to bottom flange for end 4". Up to ¼" loss of section to exterior side of bottom flange for 12" long in front of rust perforation.

Photo #6

Looking at underside of Beams 3 and 4 bearing in Span 1 at Bent 1.

Bearing plate is not bearing on bent cap for 100% of area with up to 7/8" gap.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #7

Looking at exterior side of Beam 4 at Abutment A.

Surface rust with minor pitting throughout beams.

Rust perforations, 9 ½" long total x 2" high in bottom of web at beam end behind bearing. Rust perforation, 1 ½" diameter in bottom of web located 22" in front of bearing centerline.

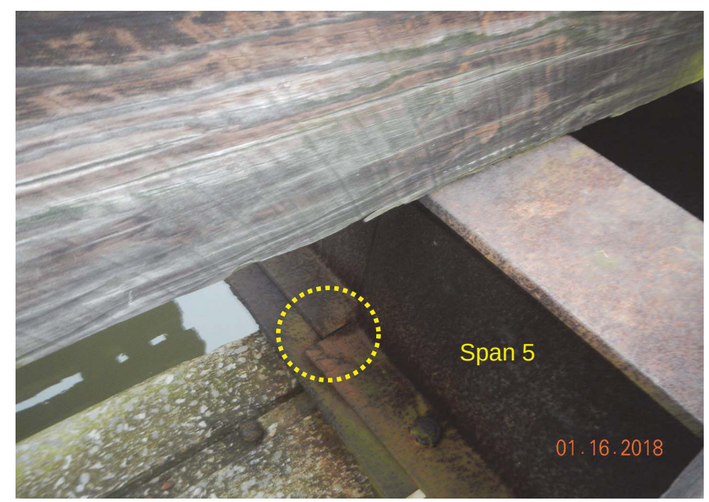


Photo #8

Looking at south side of Beam 2 in Span 5 at Bent 4.

Beam in Span 5 is offset 1" to the south with respect to Beam 2 in Span 4.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

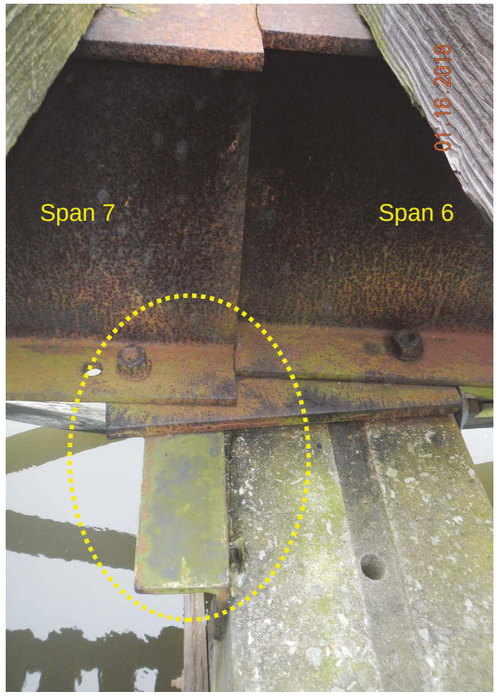


Photo #9

Looking at north side of Beam 3 over Bent 6.

Beam end is not fully bearing on bent cap; additional angle has been installed on east face of pier cap to provide adequate bearing support.

Beam in Span 7 is offset 2” to the north with respect to Beam 3 in Span 6.

Photo #10

Looking at south side of Beam 2 at Abutment B.

Surface rust with minor pitting throughout beams.

Rust perforation, 9” long x 2 ½” high in bottom of web at beam end behind bearing; up to ¼” loss of section for 2” high of web above rust perforation. Up to 1/16” loss of section to bottom 6” of web for 24” long in front of rust perforation.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #11

Looking at exterior side of Beam 4 at Abutment B.

Surface rust with minor pitting throughout beams.

Rust perforation, 4” long x 3” high in bottom of web at beam end behind bearing. Two areas, up to ¼” loss of section for up to 6” long x up to 2” wide to bottom flange on exterior side.

Photo #12

Looking at channel diaphragm connection to Beam 2 in Span 2.

One of two bolts missing at diaphragm connection to Beam 2.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #13

Looking at southeast timber wingwall at Abutment B.

Timber wingwall members have pockets of internal decay with up to 25% loss of cross sectional area at some locations.

Photo #14

Looking at Pile 3 at Abutment A.

Decay with up to 75% loss of cross sectional area.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #15

Looking at Pile 5 at Abutment A.

Decay with up to 75% loss of cross sectional area.

Photo #16

Looking at south side of Pile 1 at Abutment B.

Decay, 5” wide x full height x 5” deep on southwest side.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #17

Looking at Pile 2 at Abutment B.

Decay with up to 75% loss of cross sectional area.

Photo #18

Looking at Pile 5 at Abutment B.

Decay with up to 75% loss of cross sectional area.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #19

Looking at top of Column 2 at Bent 6.

Up to 90% loss of cross sectional area for 2 ½' high due to fire damage at top.

Photo #20

Looking at bottom of Columns 2 and 3 at Bent 7.

Decay on all faces, full width x up to 2 ½' high x up to 1" deep at bottom.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #21

Looking at west side of lateral bracing connection at Bent 6.

Corrosion with up to 100% loss of section to bracing connection hardware.

Up to 1” gap between braces and columns at some locations.

Photo #22

Looking at bottom of longitudinal bracing connection to north side of Pile 1 at Bent 2.

Longitudinal bracing is wholly ineffective due to decay with 100% loss of cross sectional area.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #23

Looking at bottom of longitudinal bracing connection to north side of Pile 1 at Bent 6.

Longitudinal bracing is wholly ineffective due to decay with 100% loss of cross sectional area.

Photo #24

Looking at east side of Bent 4 in Span 5.

Pile cap has differential settlement with south end 12” lower than north end.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #25

Looking at south end of Bent 7 timber pile cap.

Pile cap has a split, 4' long x up to 1 ¾" wide x full depth on south end with up to 2" differential across split on top face.

Photo #26

Looking at Pile 1 at Bent 1.

Decay with up to 90% loss of cross sectional area for full height.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: N/A **Date of Inspection:** 01/16/2018

Photo #27

Looking at east side of Bent 6 timber pile cap.

Piles 2 – 5: Timber shims have been inserted between timber pile cap and top of timber piles to fill previous gaps.

Photo #28

Looking at bottom of Piles 2 and 3 at Bent 8.

All piles have decay, full circumference x 4' high above mudline x up to 2" deep at bottom.

CITY OF VIRGINIA BEACH, VIRGINIA

PLANNING AND COMMUNITY DEVELOPMENT
STRATEGIC GROWTH AREAS

STATE BRIDGE NO. N/A

TYPE OF BRIDGE REPORT: REGULAR INSPECTION JANUARY 2018

BRIDGE NAME: ABANDONED NORFOLK SOUTHERN RAILROAD OVER WOLFSNARE CREEK

DIRECTION: ABUTMENT A (WEST) TO ABUTMENT B (EAST)

ROUTE NO.: N/A

CLARKNEXSEN
4525 Main Street, Suite 1400
Virginia Beach, VA 23462
clarknexsen.com

STRUCTURE INSPECTION REPORT – COVER PHOTOS

Agency ID: N/A **Date of Inspection:** 01/22/2018

RAILWAY LOOKING WEST

RAILWAY LOOKING EAST

STRUCTURE INSPECTION REPORT – COVER PHOTOS

Agency ID: N/A **Date of Inspection:** 01/22/2018

SOUTH ELEVATION

NORTH ELEVATION

STRUCTURE INSPECTION REPORT – COMMENTARY

Agency ID: N/A **Date of Inspection:** 01/22/2018

Cnty/City: Virginia Beach **Feature Intersected:** Wolfsnare Creek
Main Route: N/A **Facility Carried:** Abandoned Norfolk Southern Railroad
Location: 0.40 Miles from Lynnhaven Pkwy / 0.40 Miles to London Bridge Rd
Coordinates: 36°50'20.2"N 76°03'28.6"W
Lead Inspector: Katie M. Green, P.E.
Additional Inspectors: Mustafa S. Raifet, E.I.T.

DESCRIPTION	Thirteen Steel Multi-Beam Spans, 159' Long Total.
ORIENTATION	Looking north on the left is Abutment A (Lynnhaven Pkwy side) on the right is Abutment B (London Bridge Rd side). Spans (1 – 13) are numbered from west. Beams (1 - 4 in Spans 1 - 5, 7 - 13; 1 - 6 in Span 6), Columns (1 - 4 at Bents 2 - 5, 9 and 10) and Piles (1 - 5 at both abutments, Bents 1, 11, 12; 1 - 6 at Bents 2 - 10) are numbered from north.
MISCELLANEOUS (Items which are structure specific and cannot be included in another section.)	None.
SPECIAL REQUIREMENTS (Special Equipment needed or Special Inspections required such as: Fracture Critical, Underwater, Fatigue Prone, Scour Critical, Moveable Bridge, Segmental Concrete, Pin and Hanger, etc.)	A john boat was utilized during this inspection. Visual and tactile inspection of the portion of the structure above the mudline have been performed.
WORK DONE	None.
STRUCTURAL ANALYSIS	If retrofitted, structural analysis indicates that existing superstructure would be capable of supporting pedestrian and emergency vehicle loading.
OVERALL CONDITION	**Poor** Numerous piles and columns throughout substructure have decay with loss of cross sectional area ranging from 25% to 75%; up to 90% at some locations; up to 100% at isolated locations. Timber piles below the timber pile caps were visible at the time of inspection, however the timber pile caps are not fully bearing on timber piles at isolated locations with some of external decay. Surface rust and rust scale on structural steel with loss of section at random locations. Rust scale with loss of section to beam ends at both abutments with rust perforations in beam webs. Concrete pile cap at Bent 7 is not bearing on Pile 3 for 100% of area. Decay with up to 100% loss of cross sectional area at longitudinal and lateral bracing connections at Bents 2, 5 and 7. Decay with up to 100% loss of cross sectional area at horizontal bracing members at Bents 6 – 8. Decay with up to 100% loss of cross sectional area at timber wingwalls and backwalls at abutments. Isolated areas of decay in deck ties and curbs.
RECOMMENDATIONS	*In order to retrofit the existing bridge for pedestrian and emergency vehicle loading, the following actions are required (in addition to installation of pedestrian deck and railing).* 1. Replace/retrofit both abutments and Bents 1, 2, 5, 6, 10 – 12 due to previous movement of Abutment A piles and deterioration of timber piles/columns; replace isolated portions of piles/columns at Bents 3, 4, 8, and 9. (13 EA) 2. Repair beam ends at Abutment A. (4 EA) 3. Replace timber backwalls and wingwalls. (2 EA) 4. Replace/repair longitudinal, lateral and horizontal bracing members and connection hardware. (LS) 5. Realign beams in Span 6. (LS)

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	6. Place shims at top of Piles 2 and 3 at Bent 7 due to loss of bearing. (LS)

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DECK

Deck

Fair

Timber Railroad Ties, 10" wide x 8" high, spaced ~16" on center.

- Up to 1/4" wide checking throughout. See Photos #1 and #2.
- Deck ties have decay ranging from 1" to 4" deep. See table below and Photos #1 and #2:

Span	Number of ties	Decay depth
1	7	2"
2	6	1"
3	6	3"
4	3	2"
5	3	2"
6	5	2"
7	3	1"
8	2	4"
9	4	1"
10	3	2"
11	5	2"
12	3	2"
13	3	2"

Span 13

- Vegetation growing through timber ties on north side at Abutment B.

Curbs

Fair

Timber Curbs, 8 ⅛" wide x 5" high.

- Up to 1/4" wide checking throughout.

Span 1

- South Curb at Abutment A: Area of decay with up to 50% loss of cross sectional area for 5' long. See Photo #3.
- North curb at Abutment A: Area of decay, 24" long x up to 2" deep.

SUPERSTRUCTURE

Bearing Devices

Fair

Steel Bearing Plates, 19" L x 26" W x 7/8" thick

- Surface rust throughout bearing plates. See Photo #4.
- Random areas of rust scale on bearing plates with up to 1/4" loss of section. See Photos #4 and #5.
- Areas of pack rust up to ¼" thick between bearing plates and concrete bent caps. See Photo #5.

Beams

Poor

Four (4) Unpainted Steel Beams, W16x40; six (6) beams in Span 6.

- Surface rust with minor pitting throughout beams.
- Rust scale with up to 1/4" loss of section x up to 4" long x up to full width to top and bottom flanges at random locations, typically adjacent to bearing plates or railroad ties. See Photos #5, #6 and #7.

Span 1

At Abutment A

- Beam ends are in contact with backwall.
- Beam 1: Rust perforation, 26" long x 6" high in bottom of web at beam end with 1/8" loss of section to bottom 9" of web for 24" long in front of rust perforation. Up to 1/4" loss of section to full width of bottom flange for end 20". Up to 1/4" loss of section to bottom of bottom flange for full width x 5" long in front of bearing. See Photo #8.

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- Beam 2: Rust perforation, 24" long x 5" high in bottom of web at beam end with 1/8" loss of section to bottom 8" of web for 9" long in front of rust perforation. Up to 1/4" loss of section to full width of bottom flange for end 20". Up to 1/4" loss of section to bottom of bottom flange for full width x 5" long in front of bearing. See Photo #9.
- Beam 3: Rust perforation, 12" long x 6" high in bottom of web at beam end with 1/8" loss of section to bottom 9" of web for 18" long in front of rust perforation. Up to 1/4" loss of section to full width of bottom flange for end 12". Up to 1/8" loss of section to bottom of bottom flange for full width x 4" long in front of bearing. See Photo #10.
- Beam 4: Rust perforation, 24" long x 3" high in bottom of web at beam end with 1/8" loss of section to bottom 10" of web for 36" long in front of rust perforation. Up to 1/8" loss of section to bottom flange for end 12" on south side. Up to 1/8" loss of section to bottom of bottom flange for full width x 4" long in front of bearing. See Photo #11.

Span 6
At Bent 6
- Beams 1 and 6: Beams have shifted up to 4" towards Beams 2 and 5; 0" gap between beam top flanges over Bent 6.

Span 7
At Bent 6
- Beam 3: Beam in Span 7 is offset 1" to the north with respect to Beam 3 in Span 6.
- Beam 4: Beam in Span 7 is offset 1" to the north with respect to Beam 4 in Span 6. See Photo #12.

Span 9
At Bent 9
- Beam 4: Beam in Span 9 is offset 1/2" to the south with respect to Beam 4 in Span 10.

Span 13
At Bent 12
- Beam 2: Up to 1/4" gap between bottom flange and bearing plate. See Photo #13.

At Abutment B
- Beam 1: Up to 1/16" loss of section to bottom 6" of web for 12" long over bearing.
- Beam 2: Up to 1/8" loss of section to bottom 6" of web for 24" long at beam end. Up to 1/8" loss of section to full width of bottom flange for end 24".
- Beam 3: Up to 1/16" loss of section to bottom 6" of web for 24" long at beam end. Up to 1/16" loss of section to bottom flange for end 24" on north side. See Photo #14.
- Beam 4: Up to 1/16" loss of section to bottom 6" of web for 36" long at beam end. Up to 1/16" loss of section to bottom flange for end 24" on north side.

Diaphragms or Cross Frames **Good**
Steel Channel Diaphragms in Bays 1 and 3, MC6x16.3.

Span 9
- Between Beams 3 and 4: One of two bolts missing at diaphragm connection.

Span 11
- Between Beams 1 and 2: One of two bolts missing at diaphragm connection.

Paint
- See "SUPERSTRUCTURE – Bearing Devices, Beams, and Diaphragms or Cross Frames" and Photos #5 – #14.

SUBSTRUCTURE

ABUTMENTS

Abutments consist of timber backwall, timber wingwalls and a precast concrete cap supported by five timber piles.

Wings **Poor**
- Timber wingwall members have pockets of internal decay with up to 25% loss of cross sectional area at some locations.

Abutment B
- Area of decay with up to 100% loss of cross sectional area at northeast corner.

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Backwalls **Poor**
Abutment A
- Timber backwall members have decay/weathering up to 1" deep.
- North end: Area of decay with up to 30% loss of cross sectional area to timber members. See Photo #15.

Abutment B
- North end: Decay with up to 100% loss of cross sectional area to one timber member.

Caps **Good**
- Accumulation of debris on abutment cap, up to 2" deep.

Piles **Poor**
Round Timber Piles, Diameter Varies (10" to 13").

Abutment A
- Piles 1 – 3: Piles have been braced against Bent 1 piles in the past; abutment piles are leaning east with respect to the bent cap with up to 50% loss of bearing. See Photo #16.
- Pile 1: Decay with up to 40% loss of cross sectional area. See Photo #17.
- Pile 2: Decay with up to 50% loss of cross sectional area. See Photo #18.
- Pile 4: Decay with up to 80% loss of cross sectional area.
- Pile 5: Decay with up to 50% loss of cross sectional area to original portion of pile at ground line. See Photo #19.

Abutment B
- Pile 1: Drilled and determined to be hollow due to internal decay with up to 90% loss of cross sectional area.
- 1/2" gap between top of timber pile and concrete bent cap.
- Pile 2: Drilled and determined to be hollow due to internal decay with up to 50% loss of cross sectional area.
- Piles 4 and 5: Decay with up to 100% loss of cross sectional area. See Photo #20.

Erosion/Scour/Undermining **Good**
- No noteworthy deficiencies.

Settlement **Good**
- No noteworthy deficiencies.

BENTS

Bents 1, 11, and 12 consist of a precast concrete cap supported by five timber piles. Pile 5 at Bent 1 has been retrofitted in the past, 90% of height of original timber pile has been cut out and replaced with rectangular section; 70% of height of Piles 3 and 4 at Bent 11. Bents 6 - 8 consist of a precast concrete cap supported by six timber piles. Bents 2 – 5 and 8 – 10 consist of a precast concrete cap supported by four timber columns; these columns are supported by a timber pile cap and six timber piles located below the waterline; seven timber piles at Bent 3.

Caps **Good**
Precast Concrete Cap, 14" wide x 15" high.
- Hairline map cracking at isolated locations.

Bent 2
- Spall, 8" long x 4" high x ½" deep on east face below Beams 3 and 4.

Bent 3
- Two spalls, 6" diameter x 1" deep each on east face below Beams 3 and 4.

Bent 5
- Spall, 18" long x 4" high x 1 ½" deep on east face below Beams 3 and 4.

Bent 7
- Spall, 6" diameter x 1" deep at south end; 3" diameter x 1" deep on east face below Beams 3 and 4.

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Bent 8
- Spall, 6” diameter x 1” deep on east face below Beams 3 and 4.

Bent 9
- Spall, 2’ long x 6” high x 1 ½” deep on east face.

Columns

Poor

Two Plumb and Two Battered Rectangular Timber Columns at Bents 2 – 5 and 9 – 10, 11.75” x 11.75”.
- Unfilled bolt holes at random locations and up to 1/8” wide checking throughout.
- Up to 1/4” wide checking throughout.

Bent 2
- Checking up to ¼” wide throughout columns.
- Columns 1 – 3: Decay on all faces, full width x 1’ high x up to 1” deep at bottom.
- Column 4: Decay on all faces, full width x 1’ high x up to 2” deep at bottom. See Photos #21 and #22.

Bent 3
- Columns 1 and 2 are up to 2” off center with respect to concrete bent cap. See Photo #23.
- Column 1: Decay, up to 5” wide x 2’ high x up to 5” deep on north face near bottom. See Photo #24.
- Column 2: Decay, full width x 1’ high x up to 1” deep on all faces at bottom.
- Column 3: Splinter, up to 4” wide x 3’ high x 1” deep on northeast corner.

Bent 4
- Columns 1 and 2 are up to 2” off center with respect to concrete bent cap.
- Column 3: Decay on all faces, full width x 1’ high x 1” deep at bottom. South face at top sounds hollow; drilled with no sign of internal decay.

Bent 5
- Columns 1 and 2 are up to 2” off center with respect to concrete bent cap.
- Columns 1, 2 and 4: Decay on all faces, full width x 1’ high x up to 1” deep at bottom.
- Column 1: Drilled at mid-height and determined to be hollow with decay and up to ~70% loss of cross sectional area; sounds hollow for full height.
- Column 2: Drilled at top and determined to be hollow with decay and up to ~60% loss of cross sectional area; sounds hollow for 2 ½” high at top.
- Column 4: Drilled at mid-height and determined to be hollow with decay and up to ~70% loss of cross sectional area; sounds hollow for ~60% of height from top.

Bent 10
- Column 1: Drilled at top and determined to be hollow with decay and up to ~30% loss of cross sectional area for 3’ high at top.
- Column 2: Decay, 4” wide x 4” high x 1/2" deep at bottom of west face; full width x 1’ high x 1” deep at bottom of east face. See Photo #25. Column drilled at mid-height and determined to be hollow with decay and up to ~50% loss of cross sectional area; sounds hollow for ~75% of height.
- Column 3: Decay with up to 75% loss of cross sectional area to bottom 1’ of column. See Photo #26.

Bracing

Poor

Timber Bracing System, 10 ¼” high x 3 ⅜” wide typical. No Longitudinal Bracing Members in Spans 6 – 9 and 11.
- 1/8” wide checking throughout lateral braces and longitudinal cross-braces.
- Horizontal bracing members at bottom of piles at Bents 6 – 8 have decay with up to 100% loss of cross sectional area. See Photo #27.
- Up to 50% loss to section to bracing connection hardware at random locations. See Photo #28.

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Span 2

Bent 2
- Lateral bracing member has decay with 100% loss of cross sectional area at connection to Column 4. See Photos #21 and #22.

Span 3
- Decay with up to 80% loss of cross sectional area to south longitudinal bracing members. See Photo #29.

Bent 2
- Lateral bracing member has decay with 100% loss of cross sectional area at connection to Column 1.
- North longitudinal bracing member has 100% loss of section to lower connection hardware at Column 1.

Span 4

Bent 3
- North longitudinal bracing member disconnected at lower connection to Column 1. See Photo #30.

Span 5

Bent 4
- Lateral bracing member has a split for 7’ long at south end. See Photo #31.

Bent 5
- South longitudinal bracing member has decay with 100% loss of cross sectional area at connection to Column 4.

Span 7

Bent 7
- Lateral bracing member has decay with 100% loss of cross sectional area at connection to Pile 6.

Span 10

Bent 10
- North longitudinal bracing member has a split for 18” long at lower connection to Column 1.

Span 12

Bent 11
- Lateral bracing member disconnected at connection to Pile 5.

Pile Caps

Poor

Timber Pile Caps, 12” wide x 12” high.
- Heavy marine growth at waterline; random timber pile caps are soft on exterior faces with up to ¼” deep decay. See Photos #21, #31, #32, #33 and #34.
- Up to 1/4” wide checking throughout. See Photo #35.

Bent 2
- Decay, full length x up to full width x up to 2” deep on top face. See Photo #21.
- Up to ½” wide checking throughout.

Bent 3
- Up to 1” deep area of decay on top face.
- Up to 1/2" wide checking throughout.

Bent 4
- Decay, full width x up to full width x up to 2” deep on top face. See Photo #35.

Bent 5
- Area of splintering/decay, 5’ long x up to 3” wide on top face x full height on west side between Columns 3 and 4; area extends 3” high for full length between Columns 1 and 3. See Photo #33.

Bent 9
- Decay, up to 1’ long x full perimeter x 2” deep on south end.

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Piles	**Poor** *Round Timber Piles, diameter varies (11" to 16").* - Heavy marine growth at waterline; random timber piles are soft on exterior face with up to ¼" deep decay. See Photos #21, #27, #31, #32, #34 and #36. - Up to 1/4" wide checking throughout. Bent 1 - Piles 1, 2 and 4: Up to 90% loss of cross sectional area due to internal decay. See Photos #37, #38 and #39. - Pile 5: Split, up to 1" wide x 55" high on east face of rectangular retrofitted portion. See Photo #40. Bent 2 - Pile 2: Decay with up to 30% loss of cross sectional area at waterline. Bent 3 - Pile 1: Offset on east side with respect to the pile cap, resulting in ~80% loss of bearing (as-built, pile cap has seven piles to account for this loss of bearing). See Photo #32. - Pile 2: Decay, up to 4" wide x 10" high x up to 1" deep on northeast side. Bent 5 - Pile 1: Offset on east side with respect to the pile cap, resulting in ~25% loss of bearing. Bent 6 - Pile 1: Internal decay with up to ~90% loss of cross sectional area for 16" high at top. See Photo #41. - Piles 2 – 5: Up to 3" off center with respect to concrete bent cap. - Pile 2: Check, 1/2" wide x 3' high x 2" deep at top. - Pile 4: Internal decay with up to ~25% loss of cross sectional area for 19" high at top. See Photo #42. - Pile 5: Splinter, 4" wide x 1 ½' high x up to 1" deep at top of south side. Bent 7 - Pile 1: Decay, 3" wide x 2' high x 2" deep on southwest side at waterline. See Photo #36. - Pile 2: 1/4" gap between top of timber pile and concrete bent cap with ~50% loss of bearing. See Photo #43. - Pile 3: 1/4" gap between top of timber pile and concrete bent cap with 100% loss of bearing. See Photo #44. Checking, up to 1/4" wide x 7" high x 4" deep on west side. Bent 8 - Up to 1/2" wide checking throughout piles. - Pile 1: Drilled at mid-height and determined to be hollow with decay and up to ~60% loss of cross sectional area; sounds hollow for full height. - Pile 3: South side at top sounds hollow; drilled with no indication of internal decay. - Pile 4: Decay, 4" wide x 1' high x up to 1" deep at top of south side and splinter, 8" wide x 2' high at top of north side. - Pile 6: Offset on east side with respect to the bent cap, resulting in ~30% loss of bearing. Bent 9 - Pile 5: Decay with up to ~50% loss of cross sectional area on west side below pile cap. See Photo #34. Bent 10 - Pile 1: Offset with respect to the pile cap, resulting in up to ~25% loss of bearing. Bent 11 - Piles 1, 2 and 5: Drilled at mid-height and determined to be hollow with decay and up to ~90% loss of cross sectional area; sounds hollow for full height. Bent 12 - Exterior piles at Bent 12 have been braced against exterior piles at Bent 11 by two horizontal bracing members. - Pile 1: Decay with up to 90% loss of cross sectional area.

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	- Pile 2: Drilled and determined to be hollow with decay and up to ~40% loss of cross sectional area. See Photo #45. - Pile 4: Drilled and determined to be hollow with decay and up to ~20% loss of cross sectional area. - Pile 5: Decay with up to 95% loss of cross sectional area. See Photo #46.
Erosion/Scour/Undermining	**Good** - No noteworthy deficiencies.
Settlement	**Good** - No noteworthy deficiencies.
CHANNEL AND SLOPE PROTECTION	
Scour	- Footing founded on timber piles and exposed at low tide. See "SUBSTRUCTURE – PIERS – Erosion/Scour/Undermining".
Embankment Erosion	- No noteworthy deficiencies.
Drift	- No noteworthy deficiencies.
Vegetation	- No noteworthy deficiencies.
Rip Rap/Slope Protection	- No noteworthy deficiencies.
Adequacy of Opening	**Sufficient** - No noteworthy deficiencies.
FIELD POSTING	
Actual Posting	Structure is not posted.
Legibility	Not applicable.
Visibility	Not applicable.

STRUCTURE INSPECTION REPORT – PHOTOS

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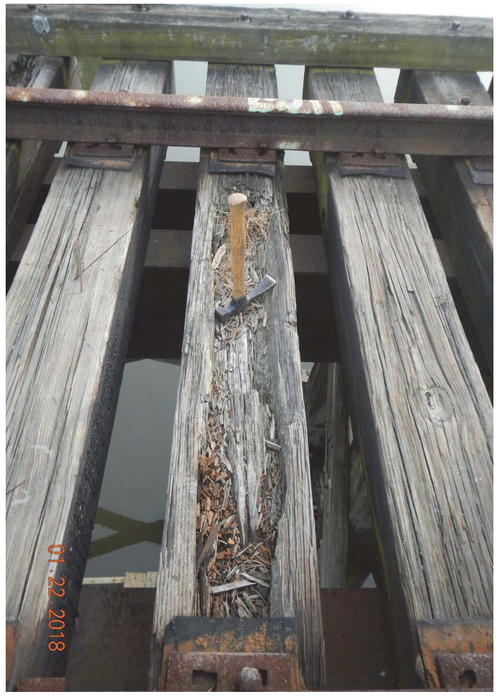

Photo #1

Looking at timber deck ties in Span 3.

Up to 1/4” wide checking throughout.

Deck ties have decay ranging from 1” to 4” deep (3” deep at this location).

Photo #2

Looking at timber deck ties in Span 11.

Up to 1/4” wide checking throughout.

Deck ties have decay ranging from 1” to 4” deep (2” deep at this location).

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Photo #3

Looking at south curb in Span 1 at Abutment A.

Area of decay with up to 50% loss of cross sectional area for 5’ long.

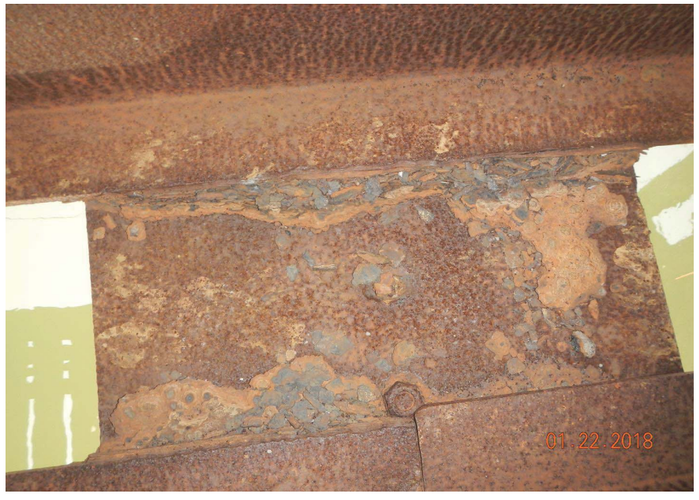

Photo #4

Looking at top face of bearing plate at Bent 6 between Beams 1 and 2.

Surface rust throughout bearing plates.

Random areas of rust scale on bearing plates with up to 1/4” loss of section.

STRUCTURE INSPECTION REPORT – PHOTOS

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Photo #5

Looking at underside of Beams 1 and 2 bearing in Span 13 at Bent 12.

Random areas of rust scale on bearing plates with up to 1/4” loss of section.

Areas of pack rust up to ¼” thick between bearing plates and concrete bent caps.

Rust scale with up to 1/4" loss of section x up to 4” long x up to full width to top and bottom flanges at random locations, typically adjacent to bearing plates or railroad ties.

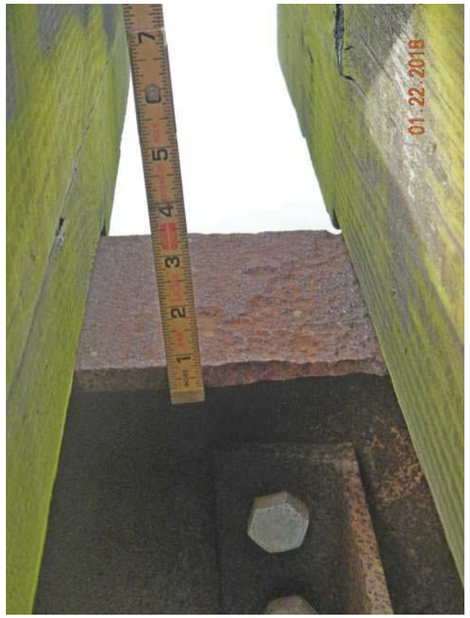

Photo #6

Looking at top flange of Beam 1 in Span 9 near midspan.

Rust scale with up to 1/4" loss of section x up to 4” long x up to full width to top and bottom flanges at random locations, typically adjacent to bearing plates or railroad ties.

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Photo #7

Looking at underside of Beam 4 in Span 3 at Bent 2.

Rust scale with up to 1/4" loss of section x up to 4” long x up to full width to top and bottom flanges at random locations, typically adjacent to bearing plates or railroad ties.

Photo #8

Looking at south side of Beam 1 at Abutment A.

Rust perforation, 26” long x 6” high in bottom of web at beam end with 1/8” loss of section to bottom 9” of web for 24” long in front of rust perforation. Up to 1/4" loss of section to full width of bottom flange for end 20”. Up to 1/4” loss of section to bottom of bottom flange for full width x 5” long in front of bearing.

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Photo #9

Looking at south side of Beam 2 at Abutment A.

Rust perforation, 24” long x 5” high in bottom of web at beam end with 1/8” loss of section to bottom 8” of web for 9” long in front of rust perforation. Up to 1/4" loss of section to full width of bottom flange for end 20”. Up to 1/4” loss of section to bottom of bottom flange for full width x 5” long in front of bearing.

Photo #10

Looking at north side of Beam 3 at Abutment A.

Rust perforation, 12” long x 6” high in bottom of web at beam end with 1/8” loss of section to bottom 9” of web for 18” long in front of rust perforation. Up to 1/4" loss of section to full width of bottom flange for end 12”. Up to 1/8” loss of section to bottom of bottom flange for full width x 4” long in front of bearing.

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Photo #11

Looking at exterior side of Beam 4 at Abutment A.

Rust perforation, 24” long x 3” high in bottom of web at beam end with 1/8” loss of section to bottom 10” of web for 36” long in front of rust perforation. Up to 1/8” loss of section to bottom flange for end 12” on south side. Up to 1/8” loss of section to bottom of bottom flange for full width x 4” long in front of bearing.

Photo #12

Looking at top of Beam 4 over Bent 6.

Beam in Span 7 is offset 1” to the north with respect to Beam 4 in Span 6.

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Photo #13

Looking at south side of Beam 2 in Span 12 at Bent 12.

Up to 1/4” gap between bottom flange and bearing plate.

Photo #14

Looking at north side of Beam 3 at Abutment B.

Up to 1/16” loss of section to bottom 6” of web for 24” long at beam end. Up to 1/16” loss of section to bottom flange for end 24” on north side.

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Photo #15

Looking at north end of Abutment A timber backwall.

Area of decay with up to 30% loss of cross sectional area to timber members.

Photo #16

Looking at pile bracing members at Abutment A.

Piles 1 - 3 have been braced against Bent 1 piles in the past; abutment piles are leaning east with respect to the bent cap with up to 50% loss of bearing.

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Photo #17

Looking at Pile 1 at Abutment A.

Decay with up to 40% loss of cross sectional area.

Photo #18

Looking at Pile 2 at Abutment A.

Decay with up to 50% loss of cross sectional area.

STRUCTURE INSPECTION REPORT – PHOTOS

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Photo #19

Looking at Pile 5 at Abutment A.

Decay with up to 50% loss of cross sectional area to original portion of pile at ground line.

Photo #20

Looking at Piles 4 and 5 at Abutment B.

Decay with up to 100% loss of cross sectional area.

STRUCTURE INSPECTION REPORT – PHOTOS

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Photo #21

Looking at south end of Bent 2 on west side.

A. Decay on all faces of Column 4, full width x 1' high x up to 2" deep at bottom.

B. Lateral bracing member has decay with 100% loss of cross sectional area at connection to Column 4.

C. Heavy marine growth at waterline; random timber pile caps and piles are soft on exterior faces with up to ¼" deep decay.

D. Pile cap has decay, full length x up to full width x up to 2" deep on top face.

Photo #22

Close-up of previous photo looking at bottom of Column 4.

Decay on all faces of Column 4, full width x 1' high x up to 2" deep at bottom.

Lateral bracing member has decay with 100% loss of cross sectional area at connection to Column 4.

STRUCTURE INSPECTION REPORT – PHOTOS

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Photo #23

Looking at top of Column 1 below Bent 3 cap.

Columns 1 and 2 are up to 2" off center with respect to concrete bent cap.

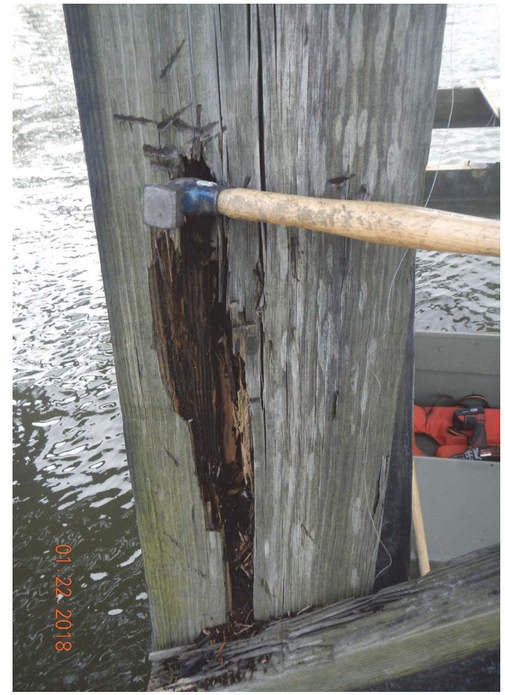

Photo #24

Looking at north face of Column 1 at Bent 3.

Decay, up to 5" wide x 2' high x up to 5" deep on north face near bottom.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #25

Looking at bottom of east side of Column 2 at Bent 10.

Decay, full width x 1' high x 1" deep at bottom of east face.

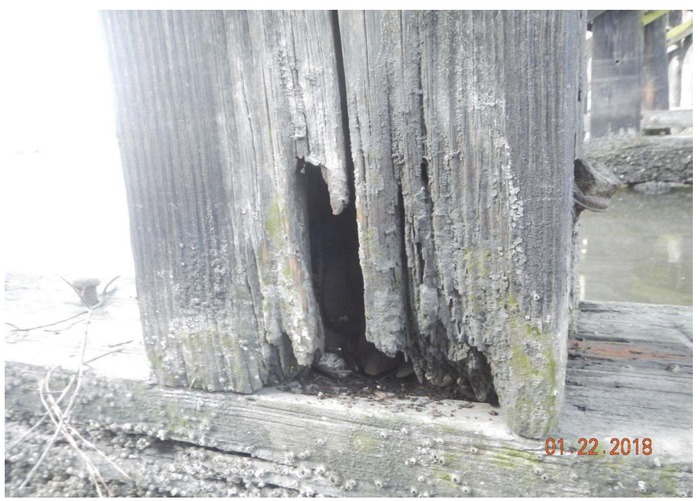

Photo #26

Looking at bottom of east side of Column 3 at Bent 10.

Decay with up to 75% loss of cross sectional area to bottom 1' of column.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #27

Looking at west horizontal bracing member at Bent 6.

Horizontal bracing members at bottom of piles at Bents 6 – 8 have decay with up to 100% loss of cross sectional area.

Photo #28

Looking at west lateral bracing connection hardware attached to bottom of Column 1 at Bent 4.

Up to 50% loss to section to bracing connection hardware at random locations.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #29

Looking at south longitudinal bracing members in Span 3.

Decay with up to 80% loss of cross sectional area to south longitudinal bracing members.

Photo #30

Looking at lower connection of north longitudinal bracing member in Span 4 attached to bottom of Column 1 at Bent 3.

North longitudinal bracing member disconnected at lower connection to Column 1.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #31

Looking at south end of Bent 4 on east side.

Lateral bracing member has a split for 7' long at south end.

Heavy marine growth at waterline; random timber pile caps are soft on exterior faces with up to ¼" deep decay.

Heavy marine growth at waterline; random timber piles are soft on exterior face with up to ¼" deep decay.

Photo #32

Looking at east side of Pile 1 at Bent 3.

Heavy marine growth at waterline; random timber pile caps are soft on exterior faces with up to ¼" deep decay.

Heavy marine growth at waterline; random timber piles are soft on exterior face with up to ¼" deep decay.

Offset on east side with respect to the pile cap, resulting in ~80% loss of bearing (as-built, pile cap has seven piles to account for this loss of bearing).

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #33

Looking at west side of pile cap at Bent 5.

Heavy marine growth at waterline; random timber pile caps are soft on exterior faces with up to ¼" deep decay.

Area of splintering/decay, 5' long x up to 3" wide on top face x full height on west side between Columns 3 and 4; area extends 3" high for full length between Columns 1 and 3.

Photo #34

Looking at west side of Pile 5 at Bent 9.

Heavy marine growth at waterline; random timber pile caps are soft on exterior faces with up to ¼" deep decay.

Heavy marine growth at waterline; random timber piles are soft on exterior face with up to ¼" deep decay.

Decay with up to ~50% loss of cross sectional area on west side below pile cap.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #35

Looking at top face of Bent 4 pile cap between Columns 2 and 3.

Up to 1/4" wide checking throughout pile cap.

Decay, full width x up to full width x up to 2" deep on top face.

Photo #36

Looking at southwest side of Pile 1 at Bent 7.

Heavy marine growth at waterline; random timber piles are soft on exterior face with up to ¼" deep decay.

Decay, 3" wide x 2' high x 2" deep on southwest side at waterline.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #37

Looking at top of Pile 1 at Bent 1.

Up to 90% loss of cross sectional area due to internal decay.

Photo #38

Looking at top of Pile 4 at Bent 1.

Up to 90% loss of cross sectional area due to internal decay.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #39

Looking at Pile 2 at Bent 1 at mid-height.

Up to 90% loss of cross sectional area due to internal decay.

Photo #40

Looking at east face of Pile 5 at Bent 1.

Split, up to 1” wide x 55” high on east face of rectangular retrofitted portion.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #41

Looking at top of Pile 1 at Bent 6.

Internal decay with up to ~90% loss of cross sectional area for 16" high at top.

Photo #42

Looking at top of Pile 4 at Bent 6.

Internal decay with up to ~25% loss of cross sectional area for 19" high at top.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #43

Looking at top of Pile 2 at Bent 7.

1/4" gap between top of timber pile and concrete bent cap with ~50% loss of bearing.

Photo #44

Looking at top of Plie 3 at Bent 7.

1/4" gap between top of timber pile and concrete bent cap with 100% loss of bearing.

STRUCTURE INSPECTION REPORT – PHOTOS

Agency ID: **N/A** **Date of Inspection:** 01/22/2018

Photo #45

Looking at top of Pile 2 at Bent 12.

Drilled and determined to be hollow with decay and up to ~40% loss of cross sectional area.

Photo #46

Looking at Pile 5 at Bent 12.

Decay with up to 95% loss of cross sectional area.

APPENDIX B

Segment 1 – Newton Road to Ivy Court

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Newtown Road to Ivy Court
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$80,200	$81,000
Construction Surveying	1	LS	$5,000	$5,000
Clearing & Grubbing	1	AC	$15,000	$18,000
Rail & Tie Removal	1,500	TF	$20	$30,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	1,400	SY	$3	$4,200
Compacted Crushed Stone (path, turnarounds, shoulders)	400	TONS	$75	$30,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	760	SY	$40	$30,400
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$124,000	$124,000
Earthwork Items				
Earthwork	1	LS	$39,000	$39,000
Signing and Marking Items				
Signing and Marking	1	LS	$4,000	$4,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	17	EA	$10,000	$170,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,500	LF	$40	$60,000
Signalization				
Mid-Block Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$9,000	$9,000
Landscaping				
Trees	15	EA	$500	$7,500
General Landscaping	1	LS	$120,000	$120,000
Maintenance of Traffic				
MOT (Minor Intersections)	1	EA	$10,000	$10,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 1,270,600
			Construction Contingency (25%)	**$ 317,700**
Probable Construction Costs				**$ 1,589,000**
Right-of-Way	5,100	SF	$25	**$ 127,500**
Total Cost for Comparison				**$ 1,716,500**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Newtown Road to Ivy Court
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$80,800	$81,000
Construction Surveying	1	LS	$5,100	$6,000
Clearing & Grubbing	1	AC	$15,000	$18,000
Rail & Tie Removal	1,500	TF	$20	$30,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	200	TON	$120	$24,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	500	TON	$50	$25,000
Geotextile (Subgrade Stabilization)	1,400	SY	$3	$4,200
Compacted Crushed Stone (turnarounds, shoulders)	100	TONS	$75	$7,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	360	SY	$40	$14,400
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$124,000	$124,000
Earthwork Items				
Earthwork	1	LS	$39,000	$39,000
Signing and Marking Items				
Signing and Marking	1	LS	$6,000	$6,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	17	EA	$10,000	$170,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,500	LF	$40	$60,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$9,000	$9,000
Landscaping				
Trees	15	EA	$500	$7,500
General Landscaping	1	LS	$120,000	$120,000
Maintenance of Traffic				
MOT (Minor Intersections)	1	EA	$10,000	$10,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 1,284,100
			Construction Contingency (25%)	**$ 321,100**
Probable Construction Costs				**$ 1,606,000**
Right-of-Way	5,100	SF	$25	**$ 127,500**
Total Cost for Comparison				**$ 1,733,500**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Newtown Road to Ivy Court
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$86,500	$87,000
Construction Surveying	1	LS	$5,700	$6,000
Clearing & Grubbing	1	AC	$15,000	$18,000
Rail & Tie Removal	1,500	TF	$20	$30,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	1,700	SY	$3	$5,100
Compacted Crushed Stone (path, turnarounds, shoulders)	600	TONS	$75	$45,000
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	760	SY	$40	$30,400
Hydraulic Cement Conc. Sidewalk 7" Thick	200	SY	$100	$20,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$124,000	$124,000
Earthwork Items				
General Earthwork	1	LS	$55,000	$55,000
Widen Cross Section	2,800	CY	$30	$84,000
Signing and Marking Items				
Signing and Marking	1	LS	$4,000	$4,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	17	EA	$10,000	$170,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,500	LF	$40	$60,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$9,000	$9,000
Landscaping				
Trees	15	EA	$500	$7,500
General Landscaping	1	LS	$120,000	$120,000
Maintenance of Traffic				
MOT (Minor Intersections)	1	EA	$10,000	$10,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 1,404,000
			Construction Contingency (25%)	**$ 351,000**
Probable Construction Costs				**$ 1,755,000**
Right-of-Way	5,100	SF	$25	**$ 127,500**
Total Cost for Comparison				**$ 1,882,500**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Newtown Road to Ivy Court
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$87,800	$88,000
Construction Surveying	1	LS	$5,800	$6,000
Clearing & Grubbing	1	AC	$15,000	$18,000
Rail & Tie Removal	1,500	TF	$20	$30,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	200	TON	$120	$24,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	600	TON	$50	$30,000
Geotextile (Subgrade Stabilization)	1,700	SY	$3	$5,100
Compacted Crushed Stone (turnarounds, shoulders)	200	TONS	$75	$15,000
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	760	SY	$40	$30,400
Hydraulic Cement Conc. Sidewalk 7" Thick	200	SY	$100	$20,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$124,000	$124,000
Earthwork Items				
General Earthwork	1	LS	$55,000	$55,000
Widen Cross Section	2,800	CY	$30	$84,000
Signing and Marking Items				
Signing and Marking	1	LS	$6,000	$6,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	17	EA	$10,000	$170,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,500	LF	$40	$60,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$9,000	$9,000
Landscaping				
Trees	15	EA	$500	$7,500
General Landscaping	1	LS	$120,000	$120,000
Maintenance of Traffic				
MOT (Minor Intersections)	1	EA	$10,000	$10,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 1,431,000
			Construction Contingency (25%)	**$ 357,800**
Probable Construction Costs				**$ 1,789,000**
Right-of-Way	5,100	SF	$25	**$ 127,500**
Total Cost for Comparison				**$ 1,916,500**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Newtown Road to Ivy Court
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$90,700	$91,000
Construction Surveying	1	LS	$6,100	$7,000
Clearing & Grubbing	1	AC	$15,000	$18,000
Rail & Tie Removal	1,500	TF	$20	$30,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	2,500	SY	$3	$7,500
Compacted Crushed Stone (path, turnarounds, shoulders)	800	TONS	$75	$60,000
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	760	SY	$40	$30,400
Hydraulic Cement Conc. Sidewalk 7" Thick	250	SY	$100	$25,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$124,000	$124,000
Earthwork Items				
General Earthwork	1	LS	$74,000	$74,000
Widen Cross Section	4,200	CY	$30	$126,000
Signing and Marking Items				
Signing and Marking	1	LS	$4,000	$4,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	17	EA	$10,000	$170,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,500	LF	$40	$60,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$9,000	$9,000
Landscaping				
Trees	15	EA	$500	$7,500
General Landscaping	1	LS	$120,000	$120,000
Maintenance of Traffic				
MOT (Minor Intersections)	1	EA	$10,000	$10,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 1,492,400
			Construction Contingency (25%)	**$ 373,100**
Probable Construction Costs				**$ 1,866,000**
Right-of-Way	5,100	SF	$25	**$ 127,500**
Total Cost for Comparison				**$ 1,993,500**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Newtown Road to Ivy Court
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$92,600	$93,000
Construction Surveying	1	LS	$6,300	$7,000
Clearing & Grubbing	1	AC	$15,000	$18,000
Rail & Tie Removal	1,500	TF	$20	$30,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	300	TON	$120	$36,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	900	TON	$50	$45,000
Geotextile (Subgrade Stabilization)	2,500	SY	$3	$7,500
Compacted Crushed Stone (turnarounds, shoulders)	200	TONS	$75	$15,000
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	760	SY	$40	$30,400
Hydraulic Cement Conc. Sidewalk 7" Thick	250	SY	$100	$25,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$124,000	$124,000
Earthwork Items				
General Earthwork	1	LS	$74,000	$74,000
Widen Cross Section	4,200	CY	$30	$126,000
Signing and Marking Items				
Signing and Marking	1	LS	$6,000	$6,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	17	EA	$10,000	$170,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,500	LF	$40	$60,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$9,000	$9,000
Landscaping				
Trees	15	EA	$500	$7,500
General Landscaping	1	LS	$120,000	$120,000
Maintenance of Traffic				
MOT (Minor Intersections)	1	EA	$10,000	$10,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 1,532,400
			Construction Contingency (25%)	**$ 383,100**
Probable Construction Costs				**$ 1,916,000**
Right-of-Way	5,100	SF	$25	**$ 127,500**
Total Cost for Comparison				**$ 2,043,500**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Segment 2 – Ivy Court to Witchduck Road

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Ivy Court to Witchduck Road
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$167,200	$168,000
Construction Surveying	1	LS	$13,700	$14,000
Clearing & Grubbing	5	AC	$15,000	$80,000
Rail & Tie Removal	7,000	TF	$20	$140,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	6,300	SY	$3	$18,900
Compacted Crushed Stone (path, turnarounds, shoulders)	2,000	TONS	$75	$150,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$217,000	$217,000
Earthwork Items				
Earthwork	1	LS	$182,000	$182,000
Signing and Marking Items				
Signing and Marking	1	LS	$15,000	$15,000
Security/Communications/Lighting Items				
Lighting	78	EA	$10,000	$780,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,000	LF	$40	$280,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Erosion & Sediment Control				
E&S Control	1	LS	$38,000	$38,000
Landscaping				
Trees	70	EA	$500	$35,000
General Landscaping	1	LS	$560,000	$560,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$10,000	$10,000
				$ 2,911,400
			Construction Contingency (25%)	**$ 727,900**
Probable Construction Costs				**$ 3,640,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 3,640,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Ivy Court to Witchduck Road
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$171,300	$172,000
Construction Surveying	1	LS	$14,100	$15,000
Clearing & Grubbing	5	AC	$15,000	$80,000
Rail & Tie Removal	7,000	TF	$20	$140,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	700	TON	$120	$84,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,100	TON	$50	$105,000
Geotextile (Subgrade Stabilization)	6,300	SY	$3	$18,900
Compacted Crushed Stone (turnarounds, shoulders)	400	TONS	$75	$30,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$217,000	$217,000
Earthwork Items				
Earthwork	1	LS	$182,000	$182,000
Signing and Marking Items				
Signing and Marking	1	LS	$26,000	$26,000
Security/Communications/Lighting Items				
Lighting	78	EA	$10,000	$780,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,000	LF	$40	$280,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Erosion & Sediment Control				
E&S Control	1	LS	$38,000	$38,000
Landscaping				
Trees	70	EA	$500	$35,000
General Landscaping	1	LS	$560,000	$560,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$10,000	$10,000
				$ 2,996,400
			Construction Contingency (25%)	**$ 749,100**
Probable Construction Costs				**$ 3,746,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 3,746,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Ivy Court to Witchduck Road
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$165,100	$166,000
Construction Surveying	1	LS	$13,500	$14,000
Clearing & Grubbing	5	AC	$15,000	$80,000
Rail & Tie Removal	7,000	TF	$20	$140,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	7,800	SY	$3	$23,400
Compacted Crushed Stone (path, turnarounds, shoulders)	2,800	TONS	$75	$210,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$217,000	$217,000
Earthwork Items				
General Earthwork	1	LS	$255,000	$255,000
Widen Cross Section	13,000	CY	$30	$390,000
Signing and Marking Items				
Signing and Marking	1	LS	$15,000	$15,000
Security/Communications/Lighting Items				
Lighting	78	EA	$10,000	$780,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,000	LF	$40	$280,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Erosion & Sediment Control				
E&S Control	1	LS	$38,000	$38,000
Landscaping				
Trees	70	EA	$500	$35,000
General Landscaping	1	LS	$560,000	$560,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$10,000	$10,000
				$ 3,472,900
			Construction Contingency (25%)	**$ 868,300**
Probable Construction Costs				**$ 4,342,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,342,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Ivy Court to Witchduck Road
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$169,300	$170,000
Construction Surveying	1	LS	$13,900	$14,000
Clearing & Grubbing	5	AC	$15,000	$80,000
Rail & Tie Removal	7,000	TF	$20	$140,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	900	TON	$120	$108,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,600	TON	$50	$130,000
Geotextile (Subgrade Stabilization)	7,800	SY	$3	$23,400
Compacted Crushed Stone (turnarounds, shoulders)	600	TONS	$75	$45,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$217,000	$217,000
Earthwork Items				
General Earthwork	1	LS	$255,000	$255,000
Widen Cross Section	13,000	CY	$30	$390,000
Signing and Marking Items				
Signing and Marking	1	LS	$26,000	$26,000
Security/Communications/Lighting Items				
Lighting	78	EA	$10,000	$780,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,000	LF	$40	$280,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Erosion & Sediment Control				
E&S Control	1	LS	$38,000	$38,000
Landscaping				
Trees	70	EA	$500	$35,000
General Landscaping	1	LS	$560,000	$560,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$10,000	$10,000
				$ 3,560,900
			Construction Contingency (25%)	**$ 890,300**
Probable Construction Costs				**$ 4,452,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,452,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Ivy Court to Witchduck Road
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$179,400	$180,000
Construction Surveying	1	LS	$14,900	$15,000
Clearing & Grubbing	5	AC	$15,000	$80,000
Rail & Tie Removal	7,000	TF	$20	$140,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	7,800	SY	$3	$23,400
Compacted Crushed Stone (path, turnarounds, shoulders)	2,800	TONS	$75	$210,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$217,000	$217,000
Earthwork Items				
General Earthwork	1	LS	$345,000	$345,000
Widen Cross Section	19,500	CY	$30	$585,000
Signing and Marking Items				
Signing and Marking	1	LS	$15,000	$15,000
Security/Communications/Lighting Items				
Lighting	78	EA	$10,000	$780,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,000	LF	$40	$280,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Erosion & Sediment Control				
E&S Control	1	LS	$38,000	$38,000
Landscaping				
Trees	70	EA	$500	$35,000
General Landscaping	1	LS	$560,000	$560,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$10,000	$10,000
				$ 3,772,900
			Construction Contingency (25%)	**$ 943,300**
Probable Construction Costs				**$ 4,717,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,717,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Ivy Court to Witchduck Road
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$183,700	$184,000
Construction Surveying	1	LS	$15,300	$16,000
Clearing & Grubbing	5	AC	$15,000	$80,000
Rail & Tie Removal	7,000	TF	$20	$140,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	900	TON	$120	$108,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,600	TON	$50	$130,000
Geotextile (Subgrade Stabilization)	7,800	SY	$3	$23,400
Compacted Crushed Stone (turnarounds, shoulders)	600	TONS	$75	$45,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$217,000	$217,000
Earthwork Items				
General Earthwork	1	LS	$345,000	$345,000
Widen Cross Section	19,500	CY	$30	$585,000
Signing and Marking Items				
Signing and Marking	1	LS	$26,000	$26,000
Security/Communications/Lighting Items				
Lighting	78	EA	$10,000	$780,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,000	LF	$40	$280,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	1	EA	$20,000	$20,000
Erosion & Sediment Control				
E&S Control	1	LS	$38,000	$38,000
Landscaping				
Trees	70	EA	$500	$35,000
General Landscaping	1	LS	$560,000	$560,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$10,000	$10,000
				$ 3,861,900
			Construction Contingency (25%)	**$ 965,500**
Probable Construction Costs				**$ 4,828,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,828,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Segment 3 – Witchduck Road to Kellam Road

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Witchduck Road to Kellam Road
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$131,600	$132,000
Construction Surveying	1	LS	$10,100	$11,000
Clearing & Grubbing	4	AC	$15,000	$60,000
Rail & Tie Removal	5,280	TF	$20	$106,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	4,700	SY	$3	$14,100
Compacted Crushed Stone (path, turnarounds, shoulders)	1,500	TONS	$75	$112,500
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 7" Thick	300	SY	$100	$30,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$188,000	$188,000
Earthwork Items				
Earthwork	1	LS	$137,000	$137,000
Signing and Marking Items				
Signing and Marking	1	LS	$12,000	$12,000
Guide Fence	700	LF	$30	$21,000
Security/Communications/Lighting Items				
Lighting	59	EA	$10,000	$590,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	5,280	LF	$40	$211,200
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$29,000	$29,000
Landscaping				
Trees	53	EA	$500	$26,400
General Landscaping	1	LS	$422,400	$422,400
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 2,691,600
			Construction Contingency (25%)	**$ 672,900**
Probable Construction Costs				**$ 3,365,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 3,365,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Witchduck Road to Kellam Road
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$159,200	$160,000
Construction Surveying	1	LS	$12,900	$13,000
Clearing & Grubbing	4	AC	$15,000	$60,000
Rail & Tie Removal	5,280	TF	$20	$106,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	600	TON	$120	$72,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	1,600	TON	$50	$80,000
Geotextile (Subgrade Stabilization)	4,700	SY	$3	$14,100
Compacted Crushed Stone (turnarounds, shoulders)	300	TONS	$75	$22,500
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 7" Thick	300	SY	$100	$30,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$188,000	$188,000
Earthwork Items				
Earthwork	1	LS	$137,000	$137,000
Signing and Marking Items				
Signing and Marking	1	LS	$21,000	$21,000
Guide Fence	700	LF	$30	$21,000
Security/Communications/Lighting Items				
Lighting	59	EA	$10,000	$590,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	5,280	LF	$40	$211,200
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$29,000	$29,000
Landscaping				
Trees	53	EA	$500	$26,400
General Landscaping	1	LS	$422,400	$422,400
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 2,792,600
			Construction Contingency (25%)	**$ 698,200**
Probable Construction Costs				**$ 3,491,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 3,491,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Witchduck Road to Kellam Road
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$152,300	$153,000
Construction Surveying	1	LS	$12,200	$13,000
Clearing & Grubbing	4	AC	$15,000	$60,000
Rail & Tie Removal	5,280	TF	$20	$106,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	5,900	SY	$3	$17,700
Compacted Crushed Stone (path, turnarounds, shoulders)	2,100	TONS	$75	$157,500
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$188,000	$188,000
Earthwork Items				
General Earthwork	1	LS	$192,000	$192,000
Widen Cross Section	9,800	CY	$30	$294,000
Signing and Marking Items				
Signing and Marking	1	LS	$12,000	$12,000
Guide Fence	700	LF	$30	$21,000
Security/Communications/Lighting Items				
Lighting	59	EA	$10,000	$590,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	5,280	LF	$40	$211,200
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$29,000	$29,000
Landscaping				
Trees	53	EA	$500	$26,400
General Landscaping	1	LS	$422,400	$422,400
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,127,700
			Construction Contingency (25%)	**$ 782,000**
Probable Construction Costs				**$ 3,910,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 3,910,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Witchduck Road to Kellam Road
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$156,000	$156,000
Construction Surveying	1	LS	$12,600	$13,000
Clearing & Grubbing	4	AC	$15,000	$60,000
Rail & Tie Removal	5,280	TF	$20	$106,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	700	TON	$120	$84,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,000	TON	$50	$100,000
Geotextile (Subgrade Stabilization)	5,900	SY	$3	$17,700
Compacted Crushed Stone (turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$188,000	$188,000
Earthwork Items				
General Earthwork	1	LS	$192,000	$192,000
Widen Cross Section	9,800	CY	$30	$294,000
Signing and Marking Items				
Signing and Marking	1	LS	$21,000	$21,000
Guide Fence	700	LF	$30	$21,000
Security/Communications/Lighting Items				
Lighting	59	EA	$10,000	$590,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	5,280	LF	$40	$211,200
Signalization				
Minor Streer Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$29,000	$29,000
Landscaping				
Trees	53	EA	$500	$26,400
General Landscaping	1	LS	$422,400	$422,400
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,203,700
			Construction Contingency (25%)	**$ 801,000**
Probable Construction Costs				**$ 4,005,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,005,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Witchduck Road to Kellam Road
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$167,000	$167,000
Construction Surveying	1	LS	$13,700	$14,000
Clearing & Grubbing	4	AC	$15,000	$60,000
Rail & Tie Removal	5,280	TF	$20	$106,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	8,800	SY	$3	$26,400
Compacted Crushed Stone (path, turnarounds, shoulders)	2,800	TONS	$75	$210,000
CG-12 Detectable Warning Surface	40	SY	$550	$22,000
Hydraulic Cement Conc. Sidewalk 7" Thick	500	SY	$100	$50,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$188,000	$188,000
Earthwork Items				
General Earthwork	1	LS	$261,000	$261,000
Widen Cross Section	14,700	CY	$30	$441,000
Signing and Marking Items				
Signing and Marking	1	LS	$12,000	$12,000
Guide Fence	700	LF	$30	$21,000
Security/Communications/Lighting Items				
Lighting	59	EA	$10,000	$590,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	5,280	LF	$40	$211,200
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$29,000	$29,000
Landscaping				
Trees	53	EA	$500	$26,400
General Landscaping	1	LS	$422,400	$422,400
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,435,400
			Construction Contingency (25%)	**$ 858,900**
Probable Construction Costs				**$ 4,295,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,295,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Witchduck Road to Kellam Road
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$172,200	$173,000
Construction Surveying	1	LS	$14,200	$15,000
Clearing & Grubbing	4	AC	$15,000	$60,000
Rail & Tie Removal	5,280	TF	$20	$106,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,000	TON	$120	$120,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,900	TON	$50	$145,000
Geotextile (Subgrade Stabilization)	8,800	SY	$3	$26,400
Compacted Crushed Stone (turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	40	SY	$550	$22,000
Hydraulic Cement Conc. Sidewalk 7" Thick	500	SY	$100	$50,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$188,000	$188,000
Earthwork Items				
General Earthwork	1	LS	$261,000	$261,000
Widen Cross Section	14,700	CY	$30	$441,000
Signing and Marking Items				
Signing and Marking	1	LS	$21,000	$21,000
Guide Fence	700	LF	$30	$21,000
Security/Communications/Lighting Items				
Lighting	59	EA	$10,000	$590,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	5,280	LF	$40	$211,200
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$29,000	$29,000
Landscaping				
Trees	53	EA	$500	$26,400
General Landscaping	1	LS	$422,400	$422,400
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,543,900
			Construction Contingency (25%)	**$ 886,000**
Probable Construction Costs				**$ 4,430,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,430,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Segment 4 – Kellam Road to Market Street

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Kellam Road to Market Street
Sidewalk Improvements

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$70,800	$71,000
Construction Surveying	1	LS	$4,100	$5,000
Clearing & Grubbing	533	SY	$75	$40,000
Rail & Tie Removal	1,700	TF	$20	$34,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	100	TON	$120	$12,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	200	TON	$50	$10,000
Curb (CG-6)	400	LF	$50	$20,000
Compacted Crushed Stone (turnarounds, shoulders)	0	TONS	$75	$0
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	340	SY	$40	$13,600
Hydraulic Cement Conc. Sidewalk 7" Thick	80	SY	$100	$8,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$5,000	$5,000
Earthwork Items				
Earthwork	1	LS	$0	$0
Signing and Marking Items				
Signing and Marking	1	LS	$2,000	$2,000
Guide Fence	200	LF	$30	$6,000
Security/Communicatons/Lighting Items				
Emergency Call Boxes	2	EA	$2,500	$5,000
Signalization				
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Minor Road Intersecton Modifications	2	EA	$150,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$0	$0
Maintenance of Traffic				
MOT (Minor Intersections)	2	EA	$50,000	$100,000
MOT (Major Intersections)	1	EA	$100,000	$100,000
				$ 1,085,100
			Construction Contingency (25%)	**$ 271,300**
Probable Construction Costs				**$ 1,357,000**
Right-of-Way	1,200	AC	$35	**$ 42,000**
Total Cost for Comparison				**$ 1,399,000**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Segment 5 – Market Street to Lynn Shores Drive

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Market Street to Lynn shores Drive
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$286,400	$287,000
Construction Surveying	1	LS	$25,600	$26,000
Clearing & Grubbing	8	AC	$15,000	$127,000
Rail & Tie Removal	11,100	TF	$20	$222,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	9,900	SY	$3	$29,700
Compacted Crushed Stone (path, turnarounds, shoulders)	3,200	TONS	$75	$240,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	360	SY	$100	$36,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$286,000	$286,000
Bridge				
Bridge at Thalia Creek	2,500	SF	$150	$375,000
Earthwork Items				
Earthwork	1	LS	$288,000	$288,000
Signing and Marking Items				
Signing and Marking	1	LS	$25,000	$25,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	124	EA	$10,000	$1,240,000
Emergency Call Boxes	9	EA	$2,500	$22,500
Security Cameras	9	EA	$20,000	$180,000
Communications Conduit (4 - 4")	11,100	LF	$40	$444,000
Signalization				
Mid-Block Crossings (Constitution Drive)	1	EA	$100,000	$100,000
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$60,000	$60,000
Landscaping				
Trees	111	EA	$500	$55,500
General Landscaping	1	LS	$888,000	$888,000
Maintenance of Traffic				
MOT (Minor Intersections)	4	EA	$10,000	$40,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 5,464,200
			Construction Contingency (25%)	**$ 1,366,100**
Probable Construction Costs				**$ 6,831,000**
Right-of-Way	0	SF		**$ -**
Total Cost for Comparison				**$ 6,831,000**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Market Street to Lynn Shores Drive
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$292,400	$293,000
Construction Surveying	1	LS	$26,200	$27,000
Clearing & Grubbing	8	AC	$15,000	$127,000
Rail & Tie Removal	11,100	TF	$20	$222,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,100	TON	$120	$132,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	3,300	TON	$50	$165,000
Geotextile (Subgrade Stabilization)	9,900	SY	$3	$29,700
Compacted Crushed Stone (turnarounds, shoulders)	600	TONS	$75	$45,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	360	SY	$100	$36,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$286,000	$286,000
Bridge				
Bridge at Thalia Creek	2,500	SF	$150	$375,000
Earthwork Items				
Earthwork	1	LS	$288,000	$288,000
Signing and Marking Items				
Signing and Marking	1	LS	$42,000	$42,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	124	EA	$10,000	$1,240,000
Emergency Call Boxes	9	EA	$2,500	$22,500
Security Cameras	9	EA	$20,000	$180,000
Communications Conduit (4 - 4")	11,100	LF	$40	$444,000
Signalization				
Mid-Block Crossings (Constitution Drive)	1	EA	$100,000	$100,000
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$60,000	$60,000
Landscaping				
Trees	111	EA	$500	$55,500
General Landscaping	1	LS	$888,000	$888,000
Maintenance of Traffic				
MOT (Minor Intersections)	4	EA	$10,000	$40,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 5,590,200
			Construction Contingency (25%)	**$ 1,397,600**
Probable Construction Costs				**$ 6,988,000**
Right-of-Way	0	SF		**$ -**
Total Cost for Comparison				**$ 6,988,000**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Market Street to Lynn Shores Drive
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$279,300	$280,000
Construction Surveying	1	LS	$24,900	$25,000
Clearing & Grubbing	8	AC	$15,000	$127,000
Rail & Tie Removal	11,100	TF	$20	$222,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	12,400	SY	$3	$37,200
Compacted Crushed Stone (path, turnarounds, shoulders)	4,400	TONS	$75	$330,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	480	SY	$100	$48,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$286,000	$286,000
Bridge				
Bridge at Thalia Creek	2,500	SF	$150	$375,000
Earthwork Items				
General Earthwork	1	LS	$403,000	$403,000
Widen Cross Section	20,600	CY	$30	$618,000
Signing and Marking Items				
Signing and Marking	1	LS	$25,000	$25,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	124	EA	$10,000	$1,240,000
Emergency Call Boxes	9	EA	$2,500	$22,500
Security Cameras	9	EA	$20,000	$180,000
Communications Conduit (4 - 4")	11,100	LF	$40	$444,000
Signalization				
Mid-Block Crossings (Constitution Drive)	1	EA	$100,000	$100,000
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$60,000	$60,000
Landscaping				
Trees	111	EA	$500	$55,500
General Landscaping	1	LS	$888,000	$888,000
Maintenance of Traffic				
MOT (Minor Intersections)	4	EA	$10,000	$40,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 6,298,700
			Construction Contingency (25%)	**$ 1,574,700**
Probable Construction Costs				**$ 7,874,000**
Right-of-Way	0	SF		**$ -**
Total Cost for Comparison				**$ 7,874,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Market Street to Lynn Shores Drive
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$286,100	$287,000
Construction Surveying	1	LS	$25,500	$26,000
Clearing & Grubbing	8	AC	$15,000	$127,000
Rail & Tie Removal	11,100	TF	$20	$222,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,400	TON	$120	$168,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	4,100	TON	$50	$205,000
Geotextile (Subgrade Stabilization)	12,400	SY	$3	$37,200
Compacted Crushed Stone (turnarounds, shoulders)	1,000	TONS	$75	$75,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	480	SY	$100	$48,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$286,000	$286,000
Bridge				
Bridge at Thalia Creek	2,500	SF	$150	$375,000
Earthwork Items				
General Earthwork	1	LS	$403,000	$403,000
Widen Cross Section	20,600	CY	$30	$618,000
Signing and Marking Items				
Signing and Marking	1	LS	$42,000	$42,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	124	EA	$10,000	$1,240,000
Emergency Call Boxes	9	EA	$2,500	$22,500
Security Cameras	9	EA	$20,000	$180,000
Communications Conduit (4 - 4")	11,100	LF	$40	$444,000
Signalization				
Mid-Block Crossings (Constitution Drive)	1	EA	$100,000	$100,000
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$60,000	$60,000
Landscaping				
Trees	111	EA	$500	$55,500
General Landscaping	1	LS	$888,000	$888,000
Maintenance of Traffic				
MOT (Minor Intersections)	4	EA	$10,000	$40,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 6,441,700
			Construction Contingency (25%)	**$ 1,610,500**
Probable Construction Costs				**$ 8,053,000**
Right-of-Way	0	SF		**$ -**
Total Cost for Comparison				**$ 8,053,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Market Street to Lynn Shores Drive
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$312,800	$313,000
Construction Surveying	1	LS	$28,200	$29,000
Clearing & Grubbing	8	AC	$15,000	$127,000
Rail & Tie Removal	11,100	TF	$20	$222,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	18,500	SY	$3	$55,500
Compacted Crushed Stone (path, turnarounds, shoulders)	6,000	TONS	$75	$450,000
CG-12 Detectable Warning Surface	40	SY	$550	$22,000
Hydraulic Cement Conc. Sidewalk 7" Thick	600	SY	$100	$60,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$286,000	$286,000
Bridge				
Bridge at Thalia Creek	2,875	SF	$150	$431,250
Earthwork Items				
General Earthwork	1	LS	$547,000	$547,000
Widen Cross Section	30,900	CY	$30	$927,000
Signing and Marking Items				
Signing and Marking	1	LS	$25,000	$25,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	124	EA	$10,000	$1,240,000
Emergency Call Boxes	9	EA	$2,500	$22,500
Security Cameras	9	EA	$20,000	$180,000
Communications Conduit (4 - 4")	11,100	LF	$40	$444,000
Signalization				
Mid-Block Crossings (Constitution Drive)	1	EA	$100,000	$100,000
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$60,000	$60,000
Landscaping				
Trees	111	EA	$500	$55,500
General Landscaping	1	LS	$888,000	$888,000
Maintenance of Traffic				
MOT (Minor Intersections)	4	EA	$10,000	$40,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 7,000,750
			Construction Contingency (25%)	**$ 1,750,200**
Probable Construction Costs				**$ 8,751,000**
Right-of-Way	0	SF		**$ -**
Total Cost for Comparison				**$ 8,751,000**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Market Street to Lynn Shores Drive
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$322,500	$323,000
Construction Surveying	1	LS	$29,100	$30,000
Clearing & Grubbing	8	AC	$15,000	$126,000
Rail & Tie Removal	11,088	TF	$20	$222,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	2,100	TON	$120	$252,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	6,100	TON	$50	$305,000
Geotextile (Subgrade Stabilization)	18,500	SY	$3	$55,500
Compacted Crushed Stone (turnarounds, shoulders)	1,000	TONS	$75	$75,000
CG-12 Detectable Warning Surface	40	SY	$550	$22,000
Hydraulic Cement Conc. Sidewalk 7" Thick	600	SY	$100	$60,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$286,000	$286,000
Bridge				
Bridge at Thalia Creek	2,875	SF	$150	$431,250
Earthwork Items				
General Earthwork	1	LS	$547,000	$547,000
Widen Cross Section	30,800	CY	$30	$924,000
Signing and Marking Items				
Signing and Marking	1	LS	$42,000	$42,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	124	EA	$10,000	$1,240,000
Emergency Call Boxes	9	EA	$2,500	$22,500
Security Cameras	9	EA	$20,000	$180,000
Communications Conduit (4 - 4")	11,088	LF	$40	$443,520
Signalization				
Mid-Block Crossings (Constitution Drive)	1	EA	$100,000	$100,000
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$60,000	$60,000
Landscaping				
Trees	111	EA	$500	$55,440
General Landscaping	1	LS	$887,040	$887,040
Maintenance of Traffic				
MOT (Minor Intersections)	4	EA	$10,000	$40,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 7,205,250
			Construction Contingency (25%)	**$ 1,801,400**
Probable Construction Costs				**$ 9,007,000**
Right-of-Way	0	SF		**$ -**
Total Cost for Comparison				**$ 9,007,000**

*This estimate does not include utility relocation(s).

*This estimate is based on 2018 dollars

Segment 6 – Lynn Shores Drive to Plaza Trail

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynn Shores Drive to Plaza Trail
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$96,300	$97,000
Construction Surveying	1	LS	$6,600	$7,000
Clearing & Grubbing	1	AC	$15,000	$22,000
Rail & Tie Removal	1,850	TF	$20	$37,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	1,700	SY	$3	$5,100
Compacted Crushed Stone (path, turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	630	SY	$40	$25,200
Hydraulic Cement Conc. Sidewalk 7" Thick	90	SY	$100	$9,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$130,000	$130,000
Earthwork Items				
Earthwork	1	LS	$48,000	$48,000
Signing and Marking Items				
Signing and Marking	1	LS	$5,000	$5,000
Guide Fence	200	LF	$30	$6,000
Security/Communications/Lighting Items				
Lighting	21	EA	$10,000	$210,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,850	LF	$40	$74,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$11,000	$11,000
Landscaping				
Trees	19	EA	$500	$9,250
General Landscaping	1	LS	$148,000	$148,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 1,679,550
			Construction Contingency (25%)	**$ 419,900**
Probable Construction Costs				**$ 2,100,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 2,100,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynne Shores Drive to Plaza Trail
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$97,700	$98,000
Construction Surveying	1	LS	$6,800	$7,000
Clearing & Grubbing	1	AC	$15,000	$22,000
Rail & Tie Removal	1,850	TF	$20	$37,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	200	TON	$120	$24,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	600	TON	$50	$30,000
Geotextile (Subgrade Stabilization)	1,700	SY	$3	$5,100
Compacted Crushed Stone (turnarounds, shoulders)	100	TONS	$75	$7,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	630	SY	$40	$25,200
Hydraulic Cement Conc. Sidewalk 7" Thick	90	SY	$100	$9,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$130,000	$130,000
Earthwork Items				
Earthwork	1	LS	$48,000	$48,000
Signing and Marking Items				
Signing and Marking	1	LS	$8,000	$8,000
Guide Fence	200	LF	$30	$6,000
Security/Communications/Lighting Items				
Lighting	21	EA	$10,000	$210,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,850	LF	$40	$74,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$11,000	$11,000
Landscaping				
Trees	19	EA	$500	$9,250
General Landscaping	1	LS	$148,000	$148,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 1,707,550
			Construction Contingency (25%)	**$ 426,900**
Probable Construction Costs				**$ 2,135,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 2,135,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynn Shores Drive to Plaza Trail
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$105,500	$106,000
Construction Surveying	1	LS	$7,600	$8,000
Clearing & Grubbing	1	AC	$15,000	$22,000
Rail & Tie Removal	1,850	TF	$20	$37,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	2,100	SY	$3	$6,300
Compacted Crushed Stone (path, turnarounds, shoulders)	700	TONS	$75	$52,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	630	SY	$100	$63,000
Hydraulic Cement Conc. Sidewalk 7" Thick	120	SY	$100	$12,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$130,000	$130,000
Earthwork Items				
General Earthwork	1	LS	$68,000	$68,000
Widen Cross Section	3,500	CY	$30	$105,000
Signing and Marking Items				
Signing and Marking	1	LS	$5,000	$5,000
Guide Fence	200	LF	$30	$6,000
Security/Communications/Lighting Items				
Lighting	21	EA	$10,000	$210,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,850	LF	$40	$74,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$11,000	$11,000
Landscaping				
Trees	19	EA	$500	$9,250
General Landscaping	1	LS	$148,000	$148,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 1,871,550
			Construction Contingency (25%)	**$ 467,900**
Probable Construction Costs				**$ 2,340,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 2,340,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynn Shores Drive to Plaza Trail
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$107,300	$108,000
Construction Surveying	1	LS	$7,700	$8,000
Clearing & Grubbing	1	AC	$15,000	$22,000
Rail & Tie Removal	1,850	TF	$20	$37,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	300	TON	$120	$36,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	700	TON	$50	$35,000
Geotextile (Subgrade Stabilization)	2,100	SY	$3	$6,300
Compacted Crushed Stone (turnarounds, shoulders)	200	TONS	$75	$15,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	630	SY	$100	$63,000
Hydraulic Cement Conc. Sidewalk 7" Thick	120	SY	$100	$12,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$130,000	$130,000
Earthwork Items				
General Earthwork	1	LS	$68,000	$68,000
Widen Cross Section	3,500	CY	$30	$105,000
Signing and Marking Items				
Signing and Marking	1	LS	$8,000	$8,000
Guide Fence	200	LF	$30	$6,000
Security/Communications/Lighting Items				
Lighting	21	EA	$10,000	$210,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,850	LF	$40	$74,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$11,000	$11,000
Landscaping				
Trees	19	EA	$500	$9,250
General Landscaping	1	LS	$148,000	$148,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 1,910,050
			Construction Contingency (25%)	**$ 477,600**
Probable Construction Costs				**$ 2,388,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 2,388,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynn Shores Drive to Plaza Trail
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$108,700	$109,000
Construction Surveying	1	LS	$7,900	$8,000
Clearing & Grubbing	1	AC	$15,000	$22,000
Rail & Tie Removal	1,850	TF	$20	$37,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	3,100	SY	$3	$9,300
Compacted Crushed Stone (path, turnarounds, shoulders)	1,000	TONS	$75	$75,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	630	SY	$40	$25,200
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$130,000	$130,000
Earthwork Items				
General Earthwork	1	LS	$92,000	$92,000
Widen Cross Section	5,200	CY	$30	$156,000
Signing and Marking Items				
Signing and Marking	1	LS	$5,000	$5,000
Guide Fence	200	LF	$30	$6,000
Security/Communications/Lighting Items				
Lighting	21	EA	$10,000	$210,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,850	LF	$40	$74,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$11,000	$11,000
Landscaping				
Trees	19	EA	$500	$9,250
General Landscaping	1	LS	$148,000	$148,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 1,940,250
			Construction Contingency (25%)	**$ 485,100**
Probable Construction Costs				**$ 2,426,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 2,426,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynn Shores Drive to Plaza Trail
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$111,100	$112,000
Construction Surveying	1	LS	$8,100	$9,000
Clearing & Grubbing	1	AC	$15,000	$22,000
Rail & Tie Removal	1,850	TF	$20	$37,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	400	TON	$120	$48,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	1,100	TON	$50	$55,000
Geotextile (Subgrade Stabilization)	3,100	SY	$3	$9,300
Compacted Crushed Stone (turnarounds, shoulders)	200	TONS	$75	$15,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	630	SY	$40	$25,200
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$130,000	$130,000
Earthwork Items				
General Earthwork	1	LS	$92,000	$92,000
Widen Cross Section	5,200	CY	$30	$156,000
Signing and Marking Items				
Signing and Marking	1	LS	$8,000	$8,000
Guide Fence	200	LF	$30	$6,000
Security/Communications/Lighting Items				
Lighting	21	EA	$10,000	$210,000
Emergency Call Boxes	2	EA	$2,500	$5,000
Security Cameras	2	EA	$20,000	$40,000
Communications Conduit (4 - 4")	1,850	LF	$40	$74,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$11,000	$11,000
Landscaping				
Trees	19	EA	$500	$9,250
General Landscaping	1	LS	$148,000	$148,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 1,990,250
			Construction Contingency (25%)	**$ 497,600**
Probable Construction Costs				**$ 2,488,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 2,488,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Segment 7 – Plaza Trail to Lynnhaven Road

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Plaza Trail to Lynnhaven Road
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$172,900	$173,000
Construction Surveying	1	LS	$14,300	$15,000
Clearing & Grubbing	6	AC	$15,000	$83,000
Rail & Tie Removal	7,300	TF	$20	$146,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	6,500	SY	$3	$19,500
Compacted Crushed Stone (path, turnarounds, shoulders)	2,100	TON	$75	$157,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	800	SY	$40	$32,000
Hydraulic Cement Conc. Sidewalk 7" Thick	90	SY	$100	$9,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$222,000	$222,000
Earthwork Items				
Earthwork	1	LS	$190,000	$190,000
Signing and Marking Items				
Signing and Marking	1	LS	$16,000	$16,000
Guide Fence	900	LF	$30	$27,000
Security/Communications/Lighting Items				
Lighting	82	EA	$10,000	$820,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,300	LF	$40	$292,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$40,000	$40,000
Landscaping				
Trees	73	EA	$500	$36,500
General Landscaping	1	LS	$584,000	$584,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 3,751,000
			Construction Contingency (25%)	**$ 937,800**
Probable Construction Costs				**$ 4,689,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,689,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Plaza Trail to Lynnhaven Road
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$177,400	$178,000
Construction Surveying	1	LS	$14,700	$15,000
Clearing & Grubbing	6	AC	$15,000	$83,000
Rail & Tie Removal	7,300	TF	$20	$146,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	800	TON	$120	$96,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,200	TON	$50	$110,000
Geotextile (Subgrade Stabilization)	6,500	SY	$3	$19,500
Compacted Crushed Stone (turnarounds, shoulders)	400	TON	$75	$30,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	800	SY	$40	$32,000
Hydraulic Cement Conc. Sidewalk 7" Thick	90	SY	$100	$9,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$222,000	$222,000
Earthwork Items				
Earthwork	1	LS	$190,000	$190,000
Signing and Marking Items				
Signing and Marking	1	LS	$28,000	$28,000
Guide Fence	900	LF	$30	$27,000
Security/Communications/Lighting Items				
Lighting	82	EA	$10,000	$820,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,300	LF	$40	$292,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$40,000	$40,000
Landscaping				
Trees	73	EA	$500	$36,500
General Landscaping	1	LS	$584,000	$584,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 3,846,500
			Construction Contingency (25%)	**$ 961,700**
Probable Construction Costs				**$ 4,809,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,809,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Plaza Trail to Lynnhaven Road
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$200,600	$201,000
Construction Surveying	1	LS	$17,000	$17,000
Clearing & Grubbing	6	AC	$15,000	$83,000
Rail & Tie Removal	7,300	TF	$20	$146,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	8,200	SY	$3	$24,600
Compacted Crushed Stone (path, turnarounds, shoulders)	2,900	TON	$75	$217,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	800	SY	$40	$32,000
Hydraulic Cement Conc. Sidewalk 7" Thick	120	SY	$100	$12,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$222,000	$222,000
Earthwork Items				
General Earthwork	1	LS	$265,000	$265,000
Widen Cross Section	13,600	CY	$30	$408,000
Signing and Marking Items				
Signing and Marking	1	LS	$16,000	$16,000
Guide Fence	900	LF	$30	$27,000
Security/Communications/Lighting Items				
Lighting	82	EA	$10,000	$820,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,300	LF	$40	$292,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$40,000	$40,000
Landscaping				
Trees	73	EA	$500	$36,500
General Landscaping	1	LS	$584,000	$584,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 4,332,100
			Construction Contingency (25%)	**$ 1,083,100**
Probable Construction Costs				**$ 5,416,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 5,416,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Plaza Trail to Lynnhaven Road
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$205,700	$206,000
Construction Surveying	1	LS	$17,500	$18,000
Clearing & Grubbing	6	AC	$15,000	$83,000
Rail & Tie Removal	7,300	TF	$20	$146,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,000	TON	$120	$120,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,700	TON	$50	$135,000
Geotextile (Subgrade Stabilization)	8,200	SY	$3	$24,600
Compacted Crushed Stone (turnarounds, shoulders)	700	TON	$75	$52,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	800	SY	$40	$32,000
Hydraulic Cement Conc. Sidewalk 7" Thick	120	SY	$100	$12,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$222,000	$222,000
Earthwork Items				
General Earthwork	1	LS	$265,000	$265,000
Widen Cross Section	13,600	CY	$30	$408,000
Signing and Marking Items				
Signing and Marking	1	LS	$28,000	$28,000
Guide Fence	900	LF	$30	$27,000
Security/Communications/Lighting Items				
Lighting	82	EA	$10,000	$820,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,300	LF	$40	$292,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$40,000	$40,000
Landscaping				
Trees	73	EA	$500	$36,500
General Landscaping	1	LS	$584,000	$584,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 4,440,100
			Construction Contingency (25%)	**$ 1,110,100**
Probable Construction Costs				**$ 5,551,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 5,551,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Plaza Trail to Lynnhaven Road
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$220,000	$220,000
Construction Surveying	1	LS	$18,900	$19,000
Clearing & Grubbing	6	AC	$15,000	$83,000
Rail & Tie Removal	7,300	TF	$20	$146,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	12,200	SY	$3	$36,600
Compacted Crushed Stone (path, turnarounds, shoulders)	3,900	TON	$75	$292,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	800	SY	$40	$32,000
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$222,000	$222,000
Earthwork Items				
General Earthwork	1	LS	$360,000	$360,000
Widen Cross Section	20,300	CY	$30	$609,000
Signing and Marking Items				
Signing and Marking	1	LS	$16,000	$16,000
Guide Fence	900	LF	$30	$27,000
Security/Communications/Lighting Items				
Lighting	82	EA	$10,000	$820,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,300	LF	$40	$292,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$40,000	$40,000
Landscaping				
Trees	73	EA	$500	$36,500
General Landscaping	1	LS	$584,000	$584,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 4,739,100
			Construction Contingency (25%)	**$ 1,184,800**
Probable Construction Costs				**$ 5,924,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 5,924,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Plaza Trail to Lynnhaven Road
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$227,000	$227,000
Construction Surveying	1	LS	$19,600	$20,000
Clearing & Grubbing	6	AC	$15,000	$83,000
Rail & Tie Removal	7,300	TF	$20	$146,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,400	TON	$120	$168,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	4,000	TON	$50	$200,000
Geotextile (Subgrade Stabilization)	12,200	SY	$3	$36,600
Compacted Crushed Stone (turnarounds, shoulders)	700	TON	$75	$52,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	800	SY	$40	$32,000
Hydraulic Cement Conc. Sidewalk 7" Thick	150	SY	$100	$15,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$222,000	$222,000
Earthwork Items				
General Earthwork	1	LS	$360,000	$360,000
Widen Cross Section	20,300	CY	$30	$609,000
Signing and Marking Items				
Signing and Marking	1	LS	$28,000	$28,000
Guide Fence	900	LF	$30	$27,000
Security/Communications/Lighting Items				
Lighting	82	EA	$10,000	$820,000
Emergency Call Boxes	6	EA	$2,500	$15,000
Security Cameras	6	EA	$20,000	$120,000
Communications Conduit (4 - 4")	7,300	LF	$40	$292,000
Signalization				
Major Road Crossing (Include Signal Modifications)	2	EA	$300,000	$600,000
Erosion & Sediment Control				
E&S Control	1	LS	$40,000	$40,000
Landscaping				
Trees	73	EA	$500	$36,500
General Landscaping	1	LS	$584,000	$584,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	2	EA	$50,000	$100,000
				$ 4,887,100
			Construction Contingency (25%)	**$ 1,221,800**
Probable Construction Costs				**$ 6,109,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 6,109,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Segment 8 – Lynnhaven Road to London Bridge Road

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynnhaven Road to London Bridge Road
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$162,500	$163,000
Construction Surveying	1	LS	$13,200	$14,000
Clearing & Grubbing	4	AC	$15,000	$55,000
Rail & Tie Removal	4,800	TF	$20	$96,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	4,300	SY	$3	$12,900
Compacted Crushed Stone (path, turnarounds, shoulders)	1,400	TONS	$75	$105,000
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 4" Thick	430	SY	$40	$17,200
Hydraulic Cement Conc. Sidewalk 7" Thick	450	SY	$100	$45,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$180,000	$180,000
Bridge				
Bridge at Wolfsnare Creek	5,000	SF	$150	$750,000
Earthwork Items				
Earthwork	1	LS	$125,000	$125,000
Signing and Marking Items				
Signing and Marking	1	LS	$11,000	$11,000
Guide Fence	800	LF	$30	$24,000
Security/Communications/Lighting Items				
Lighting	54	EA	$10,000	$540,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	4,800	LF	$40	$192,000
Signalization				
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$27,000	$27,000
Landscaping				
Trees	48	EA	$500	$24,000
General Landscaping	1	LS	$384,000	$384,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$50,000	$50,000
				$ 3,269,600
			Construction Contingency (25%)	**$ 817,400**
Probable Construction Costs				**$ 4,087,000**
Right-of-Way	16,000	SF	$35	**$ 560,000**
Total Cost for Comparison				**$ 4,647,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynnhaven Road to London Bridge Road
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$165,200	$166,000
Construction Surveying	1	LS	$13,500	$14,000
Clearing & Grubbing	4	AC	$15,000	$55,000
Rail & Tie Removal	4,800	TF	$20	$96,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	500	TON	$120	$60,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	1,400	TON	$50	$70,000
Geotextile (Subgrade Stabilization)	4,300	SY	$3	$12,900
Compacted Crushed Stone (turnarounds, shoulders)	300	TONS	$75	$22,500
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 4" Thick	430	SY	$40	$17,200
Hydraulic Cement Conc. Sidewalk 7" Thick	450	SY	$100	$45,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$180,000	$180,000
Bridge				
Bridge at Wolfsnare Creek	5,000	SF	$150	$750,000
Earthwork Items				
Earthwork	1	LS	$125,000	$125,000
Signing and Marking Items				
Signing and Marking	1	LS	$18,000	$18,000
Guide Fence	800	LF	$30	$24,000
Security/Communications/Lighting Items				
Lighting	54	EA	$10,000	$540,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	4,800	LF	$40	$192,000
Signalization				
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$27,000	$27,000
Landscaping				
Trees	48	EA	$500	$24,000
General Landscaping	1	LS	$384,000	$384,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$50,000	$50,000
				$ 3,327,100
			Construction Contingency (25%)	**$ 831,800**
Probable Construction Costs				**$ 4,159,000**
Right-of-Way	16,000	SF	$35	**$ 560,000**
Total Cost for Comparison				**$ 4,719,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynnhaven Road to London Bridge Road
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$178,000	$178,000
Construction Surveying	1	LS	$14,800	$15,000
Clearing & Grubbing	4	AC	$15,000	$55,000
Rail & Tie Removal	4,800	TF	$20	$96,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	5,400	SY	$3	$16,200
Compacted Crushed Stone (path, turnarounds, shoulders)	1,900	TONS	$75	$142,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	430	SY	$40	$17,200
Hydraulic Cement Conc. Sidewalk 7" Thick	80	SY	$100	$8,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$180,000	$180,000
Bridge				
Bridge at Wolfsnare Creek	5,000	SF	$150	$750,000
Earthwork Items				
General Earthwork	1	LS	$175,000	$175,000
Widen Cross Section	8,900	CY	$30	$267,000
Signing and Marking Items				
Signing and Marking	1	LS	$11,000	$11,000
Guide Fence	800	LF	$30	$24,000
Security/Communications/Lighting Items				
Lighting	54	EA	$10,000	$540,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	4,800	LF	$40	$192,000
Signalization				
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$27,000	$27,000
Landscaping				
Trees	48	EA	$500	$24,000
General Landscaping	1	LS	$384,000	$384,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$50,000	$50,000
				$ 3,595,400
			Construction Contingency (25%)	**$ 898,900**
Probable Construction Costs				**$ 4,495,000**
Right-of-Way	16,000	SF	$35	**$ 560,000**
Total Cost for Comparison				**$ 5,055,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynnhaven Road to London Bridge Road
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$181,300	$182,000
Construction Surveying	1	LS	$15,100	$16,000
Clearing & Grubbing	4	AC	$15,000	$55,000
Rail & Tie Removal	4,800	TF	$20	$96,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	600	TON	$120	$72,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	1,800	TON	$50	$90,000
Geotextile (Subgrade Stabilization)	5,400	SY	$3	$16,200
Compacted Crushed Stone (turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	430	SY	$40	$17,200
Hydraulic Cement Conc. Sidewalk 7" Thick	80	SY	$100	$8,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$180,000	$180,000
Bridge				
Bridge at Wolfsnare Creek	5,000	SF	$150	$750,000
Earthwork Items				
General Earthwork	1	LS	$175,000	$175,000
Widen Cross Section	8,900	CY	$30	$267,000
Signing and Marking Items				
Signing and Marking	1	LS	$18,000	$18,000
Guide Fence	800	LF	$30	$24,000
Security/Communications/Lighting Items				
Lighting	54	EA	$10,000	$540,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	4,800	LF	$40	$192,000
Signalization				
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$27,000	$27,000
Landscaping				
Trees	48	EA	$500	$24,000
General Landscaping	1	LS	$384,000	$384,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$50,000	$50,000
				$ 3,664,400
			Construction Contingency (25%)	**$ 916,100**
Probable Construction Costs				**$ 4,581,000**
Right-of-Way	16,000	SF	$35	**$ 560,000**
Total Cost for Comparison				**$ 5,141,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynnhaven Road to London Bridge Road
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$186,800	$187,000
Construction Surveying	1	LS	$15,600	$16,000
Clearing & Grubbing	4	AC	$15,000	$55,000
Rail & Tie Removal	4,800	TF	$20	$96,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	8,000	SY	$3	$24,000
Compacted Crushed Stone (path, turnarounds, shoulders)	2,600	TONS	$75	$195,000
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	430	SY	$40	$17,200
Hydraulic Cement Conc. Sidewalk 7" Thick	100	SY	$100	$10,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$180,000	$180,000
Bridge				
Bridge at Wolfsnare Creek	5,750	SF	$150	$862,500
Earthwork Items				
General Earthwork	1	LS	$175,000	$175,000
Widen Cross Section	8,900	CY	$30	$267,000
Signing and Marking Items				
Signing and Marking	1	LS	$11,000	$11,000
Guide Fence	800	LF	$30	$24,000
Security/Communications/Lighting Items				
Lighting	54	EA	$10,000	$540,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	4,800	LF	$40	$192,000
Signalization				
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$27,000	$27,000
Landscaping				
Trees	48	EA	$500	$24,000
General Landscaping	1	LS	$384,000	$384,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$50,000	$50,000
				$ 3,780,200
			Construction Contingency (25%)	**$ 945,100**
Probable Construction Costs				**$ 4,726,000**
Right-of-Way	16,000	SF	$35	**$ 560,000**
Total Cost for Comparison				**$ 5,286,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Lynnhaven Road to London Bridge Road
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$191,500	$192,000
Construction Surveying	1	LS	$16,100	$17,000
Clearing & Grubbing	4	AC	$15,000	$55,000
Rail & Tie Removal	4,800	TF	$20	$96,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	900	TON	$120	$108,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,700	TON	$50	$135,000
Geotextile (Subgrade Stabilization)	8,000	SY	$3	$24,000
Compacted Crushed Stone (turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	10	SY	$550	$5,500
Hydraulic Cement Conc. Sidewalk 4" Thick	430	SY	$40	$17,200
Hydraulic Cement Conc. Sidewalk 7" Thick	100	SY	$100	$10,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$180,000	$180,000
Bridge				
Bridge at Wolfsnare Creek	5,750	SF	$150	$862,500
Earthwork Items				
General Earthwork	1	LS	$175,000	$175,000
Widen Cross Section	8,900	CY	$30	$267,000
Signing and Marking Items				
Signing and Marking	1	LS	$18,000	$18,000
Guide Fence	800	LF	$30	$24,000
Security/Communications/Lighting Items				
Lighting	54	EA	$10,000	$540,000
Emergency Call Boxes	4	EA	$2,500	$10,000
Security Cameras	4	EA	$20,000	$80,000
Communications Conduit (4 - 4")	4,800	LF	$40	$192,000
Signalization				
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$27,000	$27,000
Landscaping				
Trees	48	EA	$500	$24,000
General Landscaping	1	LS	$384,000	$384,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	1	EA	$50,000	$50,000
				$ 3,878,700
			Construction Contingency (25%)	**$ 969,700**
Probable Construction Costs				**$ 4,849,000**
Right-of-Way	16,000	SF	$35	**$ 560,000**
Total Cost for Comparison				**$ 5,409,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Segment 9 – London Bridge Road to Air Station Drive

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
London Bridge Road to Air Station Drive
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$168,700	$169,000
Construction Surveying	1	LS	$13,800	$14,000
Clearing & Grubbing	4	AC	$15,000	$66,000
Rail & Tie Removal	5,800	TF	$20	$116,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	5,200	SY	$3	$15,600
Compacted Crushed Stone (path, turnarounds, shoulders)	1,700	TONS	$75	$127,500
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	890	SY	$40	$35,600
Hydraulic Cement Conc. Sidewalk 7" Thick	240	SY	$100	$24,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$197,000	$197,000
Earthwork Items				
Earthwork	1	LS	$151,000	$151,000
Signing and Marking Items				
Signing and Marking	1	LS	$13,000	$13,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	65	EA	$10,000	$650,000
Emergency Call Boxes	5	EA	$2,500	$12,500
Security Cameras	5	EA	$20,000	$100,000
Communications Conduit (4 - 4")	5,800	LF	$40	$232,000
Signalization				
Mior Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$32,000	$32,000
Landscaping				
Trees	58	EA	$500	$29,000
General Landscaping	1	LS	$464,000	$464,000
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 2,992,200
			Construction Contingency (25%)	**$ 748,100**
Probable Construction Costs				**$ 3,741,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 3,741,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
London Bridge Road to Air Station Drive
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$171,800	$172,000
Construction Surveying	1	LS	$14,200	$15,000
Clearing & Grubbing	4	AC	$15,000	$66,000
Rail & Tie Removal	5,800	TF	$20	$116,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	600	TON	$120	$72,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	1,700	TON	$50	$85,000
Geotextile (Subgrade Stabilization)	5,200	SY	$3	$15,600
Compacted Crushed Stone (turnarounds, shoulders)	300	TONS	$75	$22,500
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	890	SY	$40	$35,600
Hydraulic Cement Conc. Sidewalk 7" Thick	240	SY	$100	$24,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$197,000	$197,000
Earthwork Items				
Earthwork	1	LS	$151,000	$151,000
Signing and Marking Items				
Signing and Marking	1	LS	$22,000	$22,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	65	EA	$10,000	$650,000
Emergency Call Boxes	5	EA	$2,500	$12,500
Security Cameras	5	EA	$20,000	$100,000
Communications Conduit (4 - 4")	5,800	LF	$40	$232,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$32,000	$32,000
Landscaping				
Trees	58	EA	$500	$29,000
General Landscaping	1	LS	$464,000	$464,000
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,057,200
			Construction Contingency (25%)	**$ 764,300**
Probable Construction Costs				**$ 3,822,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 3,822,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
London Bridge Road to Air Station Drive
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$190,900	$191,000
Construction Surveying	1	LS	$16,100	$17,000
Clearing & Grubbing	4	AC	$15,000	$66,000
Rail & Tie Removal	5,800	TF	$20	$116,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	6,500	SY	$3	$19,500
Compacted Crushed Stone (path, turnarounds, shoulders)	2,300	TONS	$75	$172,500
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	890	SY	$40	$35,600
Hydraulic Cement Conc. Sidewalk 7" Thick	320	SY	$100	$32,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$197,000	$197,000
Earthwork Items				
General Earthwork	1	LS	$211,000	$211,000
Widen Cross Section	10,800	CY	$30	$324,000
Signing and Marking Items				
Signing and Marking	1	LS	$13,000	$13,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	65	EA	$10,000	$650,000
Emergency Call Boxes	5	EA	$2,500	$12,500
Security Cameras	5	EA	$20,000	$100,000
Communications Conduit (4 - 4")	5,800	LF	$40	$232,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$32,000	$32,000
Landscaping				
Trees	58	EA	$500	$29,000
General Landscaping	1	LS	$464,000	$464,000
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,458,100
			Construction Contingency (25%)	**$ 864,600**
Probable Construction Costs				**$ 4,323,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,323,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
London Bridge Road to Air Station Drive
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$194,900	$195,000
Construction Surveying	1	LS	$16,500	$17,000
Clearing & Grubbing	4	AC	$15,000	$66,000
Rail & Tie Removal	5,800	TF	$20	$116,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	800	TON	$120	$96,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,200	TON	$50	$110,000
Geotextile (Subgrade Stabilization)	6,500	SY	$3	$19,500
Compacted Crushed Stone (turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	20	SY	$550	$11,000
Hydraulic Cement Conc. Sidewalk 4" Thick	890	SY	$40	$35,600
Hydraulic Cement Conc. Sidewalk 7" Thick	320	SY	$100	$32,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$197,000	$197,000
Earthwork Items				
General Earthwork	1	LS	$211,000	$211,000
Widen Cross Section	10,800	CY	$30	$324,000
Signing and Marking Items				
Signing and Marking	1	LS	$22,000	$22,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	65	EA	$10,000	$650,000
Emergency Call Boxes	5	EA	$2,500	$12,500
Security Cameras	5	EA	$20,000	$100,000
Communications Conduit (4 - 4")	5,800	LF	$40	$232,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$32,000	$32,000
Landscaping				
Trees	58	EA	$500	$29,000
General Landscaping	1	LS	$464,000	$464,000
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,542,100
			Construction Contingency (25%)	**$ 885,600**
Probable Construction Costs				**$ 4,428,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,428,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
London Bridge Road to Air Station Drive
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$207,000	$207,000
Construction Surveying	1	LS	$17,700	$18,000
Clearing & Grubbing	4	AC	$15,000	$66,000
Rail & Tie Removal	5,800	TF	$20	$116,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	9,700	SY	$3	$29,100
Compacted Crushed Stone (path, turnarounds, shoulders)	3,100	TONS	$75	$232,500
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 4" Thick	890	SY	$40	$35,600
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$197,000	$197,000
Earthwork Items				
General Earthwork	1	LS	$286,000	$286,000
Widen Cross Section	16,200	CY	$30	$486,000
Signing and Marking Items				
Signing and Marking	1	LS	$13,000	$13,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	65	EA	$10,000	$650,000
Emergency Call Boxes	5	EA	$2,500	$12,500
Security Cameras	5	EA	$20,000	$100,000
Communications Conduit (4 - 4")	5,800	LF	$40	$232,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$32,000	$32,000
Landscaping				
Trees	58	EA	$500	$29,000
General Landscaping	1	LS	$464,000	$464,000
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,795,200
			Construction Contingency (25%)	**$ 948,800**
Probable Construction Costs				**$ 4,744,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,744,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
London Bridge Road to Air Station Drive
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$212,300	$213,000
Construction Surveying	1	LS	$18,200	$19,000
Clearing & Grubbing	4	AC	$15,000	$66,000
Rail & Tie Removal	5,800	TF	$20	$116,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,100	TON	$120	$132,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	3,200	TON	$50	$160,000
Geotextile (Subgrade Stabilization)	9,700	SY	$3	$29,100
Compacted Crushed Stone (turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 4" Thick	890	SY	$40	$35,600
Hydraulic Cement Conc. Sidewalk 7" Thick	400	SY	$100	$40,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$197,000	$197,000
Earthwork Items				
General Earthwork	1	LS	$286,000	$286,000
Widen Cross Section	16,200	CY	$30	$486,000
Signing and Marking Items				
Signing and Marking	1	LS	$22,000	$22,000
Guide Fence	1,500	LF	$30	$45,000
Security/Communications/Lighting Items				
Lighting	65	EA	$10,000	$650,000
Emergency Call Boxes	5	EA	$2,500	$12,500
Security Cameras	5	EA	$20,000	$100,000
Communications Conduit (4 - 4")	5,800	LF	$40	$232,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	3	EA	$20,000	$60,000
Major Road Crossing (Include Signal Modifications)	1	EA	$300,000	$300,000
Erosion & Sediment Control				
E&S Control	1	LS	$32,000	$32,000
Landscaping				
Trees	58	EA	$500	$29,000
General Landscaping	1	LS	$464,000	$464,000
Maintenance of Traffic				
MOT (Minor Intersections)	3	EA	$10,000	$30,000
MOT (Major Intersections)	1	EA	$50,000	$50,000
				$ 3,908,200
			Construction Contingency (25%)	**$ 977,100**
Probable Construction Costs				**$ 4,886,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,886,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Segment 10 – Air Station Drive to Birdneck Road

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Air Station Drive to Birdneck Road
8' Wide Crushed Stone Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$213,400	$214,000
Construction Surveying	1	LS	$18,300	$19,000
Clearing & Grubbing	7	AC	$15,000	$103,000
Rail & Tie Removal	9,000	TF	$20	$180,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	8,000	SY	$3	$24,000
Compacted Crushed Stone (path, turnarounds, shoulders)	2,600	TONS	$75	$195,000
CG-12 Detectable Warning Surface	33	SY	$550	$18,375
Hydraulic Cement Conc. Sidewalk 7" Thick	450	SY	$100	$45,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$251,000	$251,000
Earthwork Items				
Earthwork	1	LS	$234,000	$234,000
Signing and Marking Items				
Signing and Marking	1	LS	$20,000	$20,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	100	EA	$10,000	$1,000,000
Emergency Call Boxes	7	EA	$2,500	$17,500
Security Cameras	7	EA	$20,000	$140,000
Communications Conduit (4 - 4")	9,000	LF	$40	$360,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	6	EA	$20,000	$120,000
Erosion & Sediment Control				
E&S Control	1	LS	$49,000	$49,000
Landscaping				
Trees	90	EA	$500	$45,000
General Landscaping	1	LS	$720,000	$720,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	6	EA	$10,000	$60,000
				$ 3,880,875
			Construction Contingency (25%)	**$ 970,300**
Probable Construction Costs				**$ 4,852,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,852,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Air Station Drive to Birdneck Road
8' Wide Asphalt Path with 1' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$218,300	$219,000
Construction Surveying	1	LS	$18,800	$19,000
Clearing & Grubbing	7	AC	$15,000	$103,000
Rail & Tie Removal	9,000	TF	$20	$180,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	900	TON	$120	$108,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	2,700	TON	$50	$135,000
Geotextile (Subgrade Stabilization)	8,000	SY	$3	$24,000
Compacted Crushed Stone (turnarounds, shoulders)	500	TONS	$75	$37,500
CG-12 Detectable Warning Surface	30	SY	$550	$16,500
Hydraulic Cement Conc. Sidewalk 7" Thick	450	SY	$100	$45,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$251,000	$251,000
Earthwork Items				
Earthwork	1	LS	$234,000	$234,000
Signing and Marking Items				
Signing and Marking	1	LS	$34,000	$34,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	100	EA	$10,000	$1,000,000
Emergency Call Boxes	7	EA	$2,500	$17,500
Security Cameras	7	EA	$20,000	$140,000
Communications Conduit (4 - 4")	9,000	LF	$40	$360,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	6	EA	$20,000	$120,000
Erosion & Sediment Control				
E&S Control	1	LS	$49,000	$49,000
Landscaping				
Trees	90	EA	$500	$45,000
General Landscaping	1	LS	$720,000	$720,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	6	EA	$10,000	$60,000
				$ 3,983,500
			Construction Contingency (25%)	**$ 995,900**
Probable Construction Costs				**$ 4,980,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 4,980,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Air Station Drive to Birdneck Road
10' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$248,600	$249,000
Construction Surveying	1	LS	$21,800	$22,000
Clearing & Grubbing	7	AC	$15,000	$103,000
Rail & Tie Removal	9,000	TF	$20	$180,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	10,000	SY	$3	$30,000
Compacted Crushed Stone (path, turnarounds, shoulders)	3,600	TONS	$75	$270,000
CG-12 Detectable Warning Surface	40	SY	$550	$22,000
Hydraulic Cement Conc. Sidewalk 7" Thick	600	SY	$100	$60,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$251,000	$251,000
Extend 72" CMP at Linkhorn Outfall	15	LF	$500	$7,500
Earthwork Items				
General Earthwork	1	LS	$327,000	$327,000
Widen Cross Section	16,700	CY	$30	$501,000
Signing and Marking Items				
Signing and Marking	1	LS	$20,000	$20,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	100	EA	$10,000	$1,000,000
Emergency Call Boxes	7	EA	$2,500	$17,500
Security Cameras	7	EA	$20,000	$140,000
Communications Conduit (4 - 4")	9,000	LF	$40	$360,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	6	EA	$20,000	$120,000
Erosion & Sediment Control				
E&S Control	1	LS	$49,000	$49,000
Landscaping				
Trees	90	EA	$500	$45,000
General Landscaping	1	LS	$720,000	$720,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	6	EA	$10,000	$60,000
				$ 4,620,000
			Construction Contingency (25%)	**$ 1,155,000**
Probable Construction Costs				**$ 5,775,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 5,775,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Air Station Drive to Birdneck Road
10' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$253,700	$254,000
Construction Surveying	1	LS	$22,300	$23,000
Clearing & Grubbing	7	AC	$15,000	$103,000
Rail & Tie Removal	9,000	TF	$20	$180,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,100	TON	$120	$132,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	3,300	TON	$50	$165,000
Geotextile (Subgrade Stabilization)	10,000	SY	$3	$30,000
Compacted Crushed Stone (turnarounds, shoulders)	800	TONS	$75	$60,000
CG-12 Detectable Warning Surface	40	SY	$550	$22,000
Hydraulic Cement Conc. Sidewalk 7" Thick	600	SY	$100	$60,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$251,000	$251,000
Extend 72" CMP at Linkhorn Outfall	15	LF	$500	$7,500
Earthwork Items				
General Earthwork	1	LS	$327,000	$327,000
Widen Cross Section	16,700	CY	$30	$501,000
Signing and Marking Items				
Signing and Marking	1	LS	$34,000	$34,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	100	EA	$10,000	$1,000,000
Emergency Call Boxes	7	EA	$2,500	$17,500
Security Cameras	7	EA	$20,000	$140,000
Communications Conduit (4 - 4")	9,000	LF	$40	$360,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	6	EA	$20,000	$120,000
Erosion & Sediment Control				
E&S Control	1	LS	$49,000	$49,000
Landscaping				
Trees	90	EA	$500	$45,000
General Landscaping	1	LS	$720,000	$720,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	6	EA	$10,000	$60,000
				$ 4,727,000
			Construction Contingency (25%)	**$ 1,181,800**
Probable Construction Costs				**$ 5,909,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 5,909,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Air Station Drive to Birdneck Road
15' Wide Crushed Stone Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$273,400	$274,000
Construction Surveying	1	LS	$24,300	$25,000
Clearing & Grubbing	7	AC	$15,000	$103,000
Rail & Tie Removal	9,000	TF	$20	$180,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
Geotextile (Subgrade Stabilization)	15,000	SY	$3	$45,000
Compacted Crushed Stone (path, turnarounds, shoulders)	4,800	TONS	$75	$360,000
CG-12 Detectable Warning Surface	50	SY	$550	$27,500
Hydraulic Cement Conc. Sidewalk 7" Thick	750	SY	$100	$75,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$251,000	$251,000
Extend 72" CMP at Linkhorn Outfall	20	LF	$500	$10,000
Earthwork Items				
General Earthwork	1	LS	$444,000	$444,000
Widen Cross Section	25,000	CY	$30	$750,000
Signing and Marking Items				
Signing and Marking	1	LS	$20,000	$20,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	100	EA	$10,000	$1,000,000
Emergency Call Boxes	7	EA	$2,500	$17,500
Security Cameras	7	EA	$20,000	$140,000
Communications Conduit (4 - 4")	9,000	LF	$40	$360,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	6	EA	$20,000	$120,000
Erosion & Sediment Control				
E&S Control	1	LS	$49,000	$49,000
Landscaping				
Trees	90	EA	$500	$45,000
General Landscaping	1	LS	$720,000	$720,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	6	EA	$10,000	$60,000
				$ 5,142,000
			Construction Contingency (25%)	**$ 1,285,500**
Probable Construction Costs				**$ 6,428,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 6,428,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Estimated Opinion of Probable Construction Cost

PROJECT: Former Norfolk Southern Railroad Shared Use Path Conceptual Study
Air Station Drive to Birdneck Road
15' Wide Asphalt Path with 2' Crushed Stone Shoulder Each Side

Description	Quantity	Units	Unit Price	Cost
General Items				
Mobilization	1	LS	$281,600	$282,000
Construction Surveying	1	LS	$25,100	$26,000
Clearing & Grubbing	7	AC	$15,000	$103,000
Rail & Tie Removal	9,000	TF	$20	$180,000
Field Office, Type 1	12	MO	$4,000	$48,000
Pavement Items				
2" Asphalt Concrete Ty. SM-9.5A	1,700	TON	$120	$204,000
6" Agg. Base Mat. Ty. I No. 21A or 21B	4,900	TON	$50	$245,000
Geotextile (Subgrade Stabilization)	15,000	SY	$3	$45,000
Compacted Crushed Stone (turnarounds, shoulders)	800	TONS	$75	$60,000
CG-12 Detectable Warning Surface	50	SY	$550	$27,500
Hydraulic Cement Conc. Sidewalk 7" Thick	750	SY	$100	$75,000
Drainage & Stormwater Management Items				
Drainage and Stormwater Management	1	LS	$251,000	$251,000
Extend 72" CMP at Linkhorn Outfall	20	LF	$500	$10,000
Earthwork Items				
General Earthwork	1	LS	$444,000	$444,000
Widen Cross Section	25,000	CY	$30	$750,000
Signing and Marking Items				
Signing and Marking	1	LS	$34,000	$34,000
Guide Fence	600	LF	$30	$18,000
Security/Communications/Lighting Items				
Lighting	100	EA	$10,000	$1,000,000
Emergency Call Boxes	7	EA	$2,500	$17,500
Security Cameras	7	EA	$20,000	$140,000
Communications Conduit (4 - 4")	9,000	LF	$40	$360,000
Signalization				
Minor Street Crossings (Stop-Sign Controlled)	6	EA	$20,000	$120,000
Erosion & Sediment Control				
E&S Control	1	LS	$49,000	$49,000
Landscaping				
Trees	90	EA	$500	$45,000
General Landscaping	1	LS	$720,000	$720,000
Maintenance of Traffic				
MOT (At-Grade Intersections)	6	EA	$10,000	$60,000
				$ 5,314,000
			Construction Contingency (25%)	**$ 1,328,500**
Probable Construction Costs				**$ 6,643,000**
Right-of-Way	0	AC		**$ -**
Total Cost for Comparison				**$ 6,643,000**

*This estimate does not include utility relocation(s).
*This estimate is based on 2018 dollars

Kimley»Horn