EMERALD TRAIL

EMERALD TRAIL DESIGN GUIDELINES

MARCH 2025

DEVELOPED BY:

SCAPE

PREPARED FOR:

GROUNDWORK JACKSONVILLE

THE EMERALD TRAIL VISION

As one of 21 Groundwork Trusts across the country and the only Trust in Florida, Groundwork Jacksonville was established in 2014 to clean up contaminated land and creeks in the urban core and to create parks, playgrounds, trails, and other public spaces.

Groundwork Jacksonville is the City of Jacksonville's nonprofit partner leading design of the Emerald Trail and the McCoys Creek and Hogans Creek restoration projects.

In 2018, Groundwork Jacksonville partnered with the PATH Foundation and KAIZEN Collaborative to develop the Emerald Trail Master Plan. This ambitious plan outlined alignments for more than 30 miles of interconnected multi-modal trails and paths linking pedestrians and cyclists to Downtown, the St. Johns River, Hogans, McCoys Creeks, and 14 historic neighborhoods within Jacksonville's urban core.

The 2019 plan was subsequently adopted by the Jacksonville City Council, and in 2024 the first segment of the Emerald Trail system, the LaVilla Link, opened to the public.

In 2021, The Jacksonville City Council approved an additional local option gas tax of which $132 million was earmarked for the Emerald Trail. Also in 2024, Groundwork Jacksonville and the Jacksonville Transportation Authority were awarded a $147 million grant from the U.S. Department of Transportation for the design and construction of five segments of the Emerald Trail, representing the largest one-time federal grant ever awarded for a City of Jacksonville project.

With funding and initial planning in place, the challenge of implementing the Emerald Trail in its entirety became clear. Simultaneous implementation of multiple segments will require the participation of multiple design and engineering teams, each working on segments with unique conditions and design challenges unforeseen in the 2019 Emerald Trail Master Plan.

Without sufficient coordination and design leadership, these challenges will result in inconsistent and unsatisfactory implementation that undermines the sense of the Emerald Trail as a unified, cohesive open space network.

To preempt these challenges, Groundwork Jacksonville raised private dollars to engage SCAPE in the development of comprehensive design standards to guide and unify the future implementation and management of the Emerald Trail system. Building upon the recommendations of the 2019 Master Plan, these standards consider lessons learned from segments already built or in design, and national design guidance and best practices.

This document provides more detailed recommendations for the design language of the trail and its many constituent trail types, clarifies and refines furnishing and site amenity selection and placement, and provides schematic-level recommendations and considerations for numerous intersection types and configurations.

It also documents recommended approaches for the design of planting areas along the trail, including recommended species lists and example plant combinations, and provides guidance on the design and deployment of trail-side green infrastructure facilities.

These design guidelines represent a critical next step in the planning and implementation of the Emerald Trail, laying the foundation for a unified trail system that links the parks, creeks, open spaces, and neighborhoods of Jacksonville's historic urban core, provides ample opportunities for community connection, and establishes a distinct identity reflective of the city's unique character.

ACKNOWLEDGEMENTS

The creation of these guidelines would not have been possible without the contributions from committed collaborators and stakeholders. We are especially grateful for the contributions of the Technical Advisory Committee (TAC), a group made up of key City of Jacksonville officials whose input and guidance was vital to the development of these guidelines.

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CONTENTS

USING THE DESIGN GUIDELINES

This document is one of many that should be referenced by design teams when developing designs and construction documents for Emerald Trail segments.

It builds off of previous planning efforts and seeks to incorporate guidance, best practices, and regulations from federal, state, and local resources and design standards. Footnotes and directions to additional resources are included throughout the document; a list of the primary sources consulted is also provided on the opposite page for easy reference.

Design and engineering teams are encouraged to use the Emerald Trail Design Guidelines as one tool in the larger framework of design requirements and guidance promulgated by regulatory agencies and transportation organizations. If in doubt, design teams should defer to the recommendations of the Federal Highway Administration (FHWA), American Association of State Highway and Transportation Officials (AASHTO), the National Association of City Transportation Officials (NACTO), the Florida Department of Transportation (FDOT), and the City of Jacksonville (COJ).

Design and engineering teams should coordinate continuously with the COJ Public Works Department and Parks, Recreation, and Community Services Department during design development, documentation, and construction to ensure that all segments of the Emerald Trail satisfy the city's requirements for design, operations, and maintenance.

Other entities with which coordination may be required include, but are not limited to the Jacksonville Electric Authority (JEA), the Jacksonville Transportation Authority (JTA), the COJ Office of Resilience, FDOT, and the residents and communities along the Emerald Trail alignment.

The guidelines are a reference for the Emerald trail design standards. Ultimate responsibility for the detailing, constructability and safety will lie with the design and engineering team of record for any given segment. In all circumstances, all applicable codes, ordinances, and regulations shall take precedence and supersede any conflicting recommendations, provisions, or guidance outlined in the Emerald Trail Design Guidelines. It is the responsibility of the design and engineering team of record to ensure trail compliance with all applicable codes, ordinances, and regulations.

How to Read this Document

Text is formatted in different ways throughout the document depending on the nature of the content being communicated. Text provided in non-indented paragraphs describes context, considerations, background, and other general information related to trail design and construction.

- Text with a bullet to the left includes key descriptive information about products, materials, and assemblies. Built segments of the Emerald Trail should adhere to the specifications and qualities listed here to the greatest feasible extent.

Text with a green vertical rule to the left includes critical requirements and guidelines that must be followed.

Callout Boxes
Callout boxes provide additional context or resources for design teams to consider and/or explore.

PRIMARY REFERENCES

Guide for the Development of Bicycle Facilities, Fourth Edition. American Association of State Highway Transportation Officials (AASHTO), 2012.

Land Development Procedures Manual. City of Jacksonville, 2025.

Manual on Uniform Traffic Control Devices for Streets and Highways (MUCTD) 11th Edition. U.S. Department of Transportation Federal Highway Administration (FWHA), 2023.

Primer on Safe System Approach for Pedestrians and Bicyclists. U.S. Department of Transportation Federal Highway Administration (FWHA), 2021.

Standard Plans for Road Construction, FY 2024-25. Florida Department of Transportation (FDOT), 2024.

Don't Give Up at the Intersection: Designing All Ages and Abilities Bicycle Crossings. National Association of City Transportation Officials (NACTO), 2019.

Urban Street Design Guide. National Association of City Transportation Officals (NACTO), 2013.

Urban Bikeway Design Guide, Third Edition. National Association of City Transportation Officials (NACTO), 2025.

Americans with Disabilities Act (ADA) Accessibility Standards. U.S. Access Board.

Public Right-of-Way Accessibility Guidelines. U.S. Access Board.

2024 FDOT Design Manual. Florida Department of Transportation (FDOT), 2024.

Land Development Procedures Manual. City of Jacksonville, 2025.

THE EMERALD TRAIL

THE EMERALD TRAIL

The 2019 Emerald Trail Master Plan outlined alignments for more than 30 miles of interconnected multi-modal trails and paths linking pedestrians and cyclists to Downtown, the St. Johns River, Hogans, McCoys Creeks, and 14 historic neighborhoods within Jacksonville's urban core.

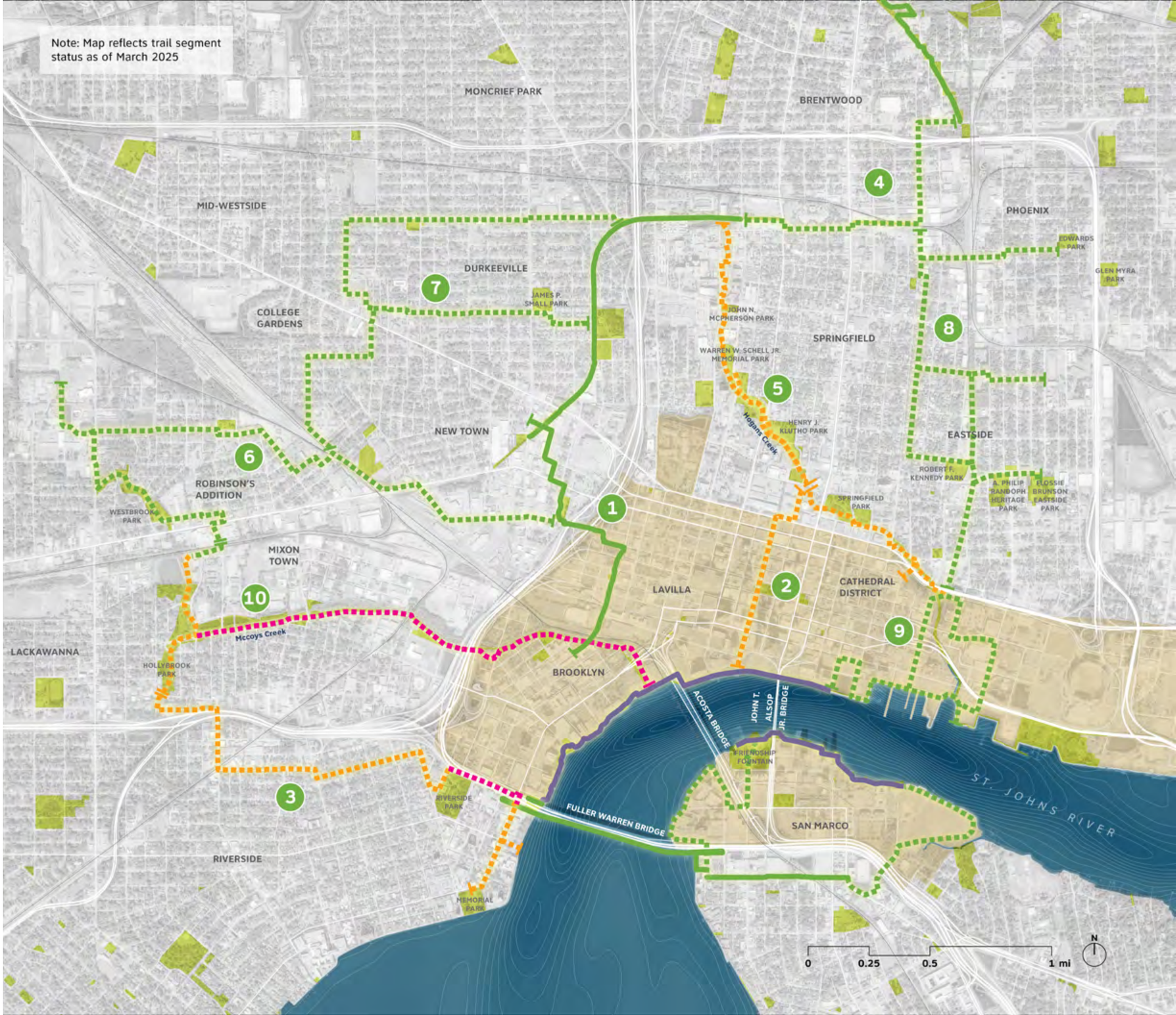
The 2019 Emerald Trail Master Plan identified two "tiers" of trail segments according to implementation priority. Implementation Tier 1 includes segments 1, 2, 3, 4, and 5, as well as the "programmed" Segment 10 running along McCoys Creek. Implementation Tier 2 includes Segments 6 through 9

As of the writing of these guidelines, most of the Implementation Tier 1 Segments are in varying stages of design, construction, or completion. Notably, Segment 1, the LaVilla Link, was completed in 2024. These guidelines seek to incorporate design elements and lessons learned from these segments and carry them forward as a cohesive, unified design language that may be used to guide ongoing design efforts and the development of future trail segments.

LEGEND

- EXISTING
- PLANNED
- IN DESIGN
- UNDER CONSTRUCTION
- RIVERWALK
- 0 EMERALD TRAIL SEGMENT NUMBERS
- DIA JURISDICTION
- CITY OF JACKSONVILLE PARKS
- RAILWAYS

Data sources: City of Jacksonville, USDA, USGS National Map



DESIGN PRINCIPLES

Early in the development of this document, the design team worked with Groundwork Jacksonville and the Technical Advisory Committee (TAC) to articulate and document the overarching goals that would inform the Emerald Trail Design Guidelines:

1. CURATE A LEGIBLE AND CONTEXTUAL TRAIL IDENTITY.

FORGE A DISTINCTIVE IDENTITY THROUGH A SUITE OF DESIGN ELEMENTS THAT IS UNIQUELY JACKSONVILLE

CELEBRATE AND CONNECT TO THE NEIGHBORHOODS THAT LINE THE TRAIL

FACILITATE A TRAIL THAT IS EASY TO NAVIGATE AND PROVIDES A LOW-STRESS EXPERIENCE

CRAFT A CULTURAL ASSET FOR FUTURE GENERATIONS

2. PROMOTE SAFETY AND UNIVERSAL ACCESS FOR TRAIL USERS OF ALL AGES AND ABILITIES.

DESIGN TO MAXIMIZE SAFETY AND MINIMIZE MODAL CONFLICTS

ENSURE THE TRAIL IS COMFORTABLE, INVITING, AND ACCOMMODATING FOR ALL USERS YEAR-ROUND

ORIENT AND CONNECT TO PUBLIC TRANSPORTATION

CREATE ACCESSIBILE DESIGN STRATEGIES THAT MEET OR EXCEED NATIONAL REQUIREMENTS, GUIDELINES, AND BEST PRACTICES

3. ESTABLISH THE EMERALD TRAIL AS A CATALYST FOR RESILIENCE.

IDENTIFY MATERIALS, ASSEMBLIES, AND PLANTING STRATEGIES THAT WILL WITHSTAND FLOODING AND EXTREME HEAT

MAXIMIZE SHADE AND PASSIVE COOLING STRATEGIES

SPECIFY MATERIALS WITH LOW EMBODIED CARBON EMISSIONS

USE TRAIL DESIGN TO MAXIMIZE RESILIENCE AND PUBLIC HEALTH CO-BENEFITS

4. SUPPORT FEASIBLE AND READILY IMPLEMENTABLE TRAIL DESIGN.

IDENTIFY COST-EFFECTIVE AND SUSTAINABLE MATERIALS, PRODUCTS, AND ASSEMBLIES

DEVELOP DESIGN STRATEGIES THAT ARE SCALABLE, REPLICABLE, AND UTILIZE REGIONAL SUPPLY CHAINS

COORDINATE WITH STATE AND LOCAL STAKEHOLDER REQUIREMENTS

UTILIZE DESIGN STRATEGIES APPROPRIATE TO REGIONAL CONSTRAINTS

TRAIL TYPES

GREENWAY TRAILS

Greenway Trails are the primary trail configuration throughout the Emerald Trail network. They weave through large parks and greenways such as Hogans Creek and McCoys Creek, and are designed to be used by pedestrians, cyclists, scooters, and other modes of non-motorized travel.

SIDEPATHS

Sidepaths are shared-use paths located along streets within existing rights-of-way. In urban areas with limited space, sidepaths create dedicated corridors for non-motorized users, enhancing comfort for cyclists and pedestrians alike.

TWO-WAY CYCLE TRACKS

Two-Way Cycle Tracks create dedicated, separated bike lanes and pedestrian walkways, clarifying traffic patterns and enhancing trail user comfort. When space permits, Two-Way Cycle Tracks include furniture zones between the bike and pedestrian lanes, providing additional amenities for trail users.

NEIGHBORHOOD GREENWAYS

Neighborhood Greenways are designed for low-traffic, low-speed areas where bicycle travel takes priority. Bikes and cars share the same lanes, with traffic-calming elements like speed bumps and curb extensions to enhance safety.

TRAIL MEDALLIONS
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STORMWATER PLANTERS
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TRAFFIC CALMING
pg. 47

TRAIL MARKINGS
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DIRECTIONAL BOLLARDS
pg. 92

SHARED STREETS

Shared Streets are designed as multimodal spaces where pedestrians, cyclists, and vehicles coexist without traditional traffic controls. By eliminating curbs and using subtle design cues, they encourage slower vehicle speeds and prioritize pedestrian movement, fostering a dynamic and interactive streetscape.

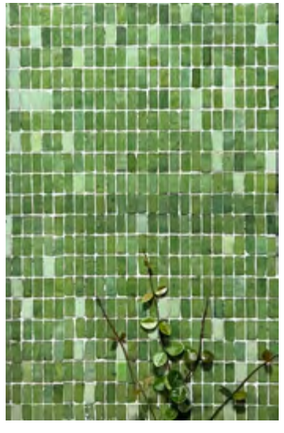
TRAIL SYSTEM COMPONENTS

INSPIRATION

Drawing inspiration from downtown Jacksonville, the trail's materials, colors, and planting design should reflect the city's vibrant communities, unique history, and regional ecology.

The large oak trees that line the streets and the meandering St. Johns River, the rich historical architecture from Henry John Klutho, and coquina sedimentary rock underground all contribute to the area's distinct identity. These elements are thoughtfully woven into the trail's design, with materials, textures, and colors that echo the region's natural and cultural heritage.

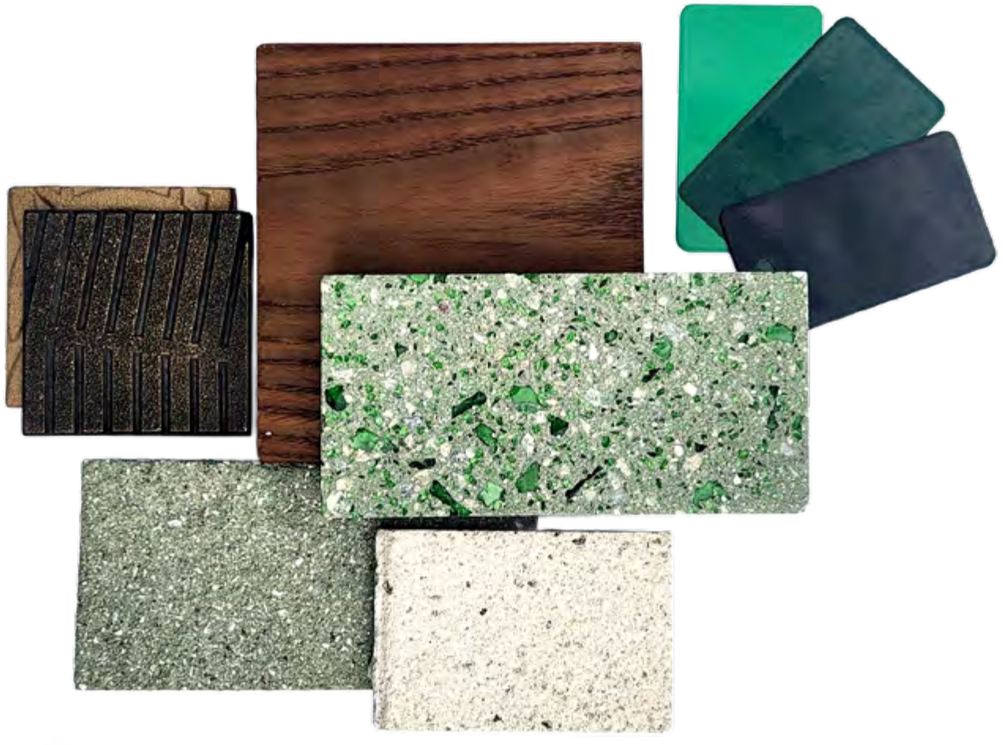
Given the trail's diverse contexts, the material, planting, and color recommendations are flexible to adapt to different areas. In urban spaces, vibrant materials enhance visibility and legibility. In parks, more subdued materials allow nature to be the focus. In residential neighborhoods, materials should blend in quietly without overwhelming the surroundings.



MATERIALITY

The selection of materials plays a crucial role in defining and enhancing the character of the Emerald Trail. Material choices should align with the broader objectives of the Design Guidelines, ensuring sustainability, durability, user comfort, and ease of implementation.

The primary materials used along the trail include cast-in-place concrete, unit paving, wood, and metal accents, which provide durability, visual interest, and vibrancy. Green accents, following the Emerald Trail's signature aesthetic and logo, create a clear identity and legibility. The selection of materials for the different elements is driven by several factors: ease of maintenance, suitability for local weather conditions, comfort for users, and the trail's aesthetic identity. In all cases, trail materials should support year-round use and avoid contributing to increasing urban heat.



COLORS

Consistent use of color is critical to the creation of a unified trail identity across different contexts and trail segments.

Previous design guidance for the Emerald Trail has used print and screen-based color systems to document color palettes. This has created confusion and inconsistency on built segments of the trail, as site furnishing fabricators and suppliers typically use the RAL color system to specify paint colors. The below color chart clarifies the preferred RAL colors that shall be used across the Emerald Trail.

- Generally, site furnishings shall be powder-coated using RAL 6005 - Moss Green.
- Non-regulatory wayfinding signage shall use two RAL colors:
  - » Signage elements and panels shall be RAL 6024 - Traffic Green with white type.
  - » Posts, poles, frames, and other structural elements shall be RAL 9011 - Graphite Black.
  - » See page 84 for more information on Trail Signage.

EMERALD GREEN

RAL	6024 - Traffic Green
PANTONE	PMS 7481
CMYK	C91 M0 Y97 K0
RGB	R0 G180 B81
HEX #	00B451

DARK GREEN

RAL	6005 - Moss Green
PANTONE	PMS 356
CMYK	C97 M27 Y100 K15
RGB	R0 G120 B64
HEX #	007840

LIME GREEN

RAL	6018 - Yellow Green
PANTONE	PMS 376
CMYK	C56 M3 Y100 K0
RGB	R127 G188 B0
HEX #	007840

90% BLACK

RAL	9011 - Graphite Black
PANTONE	PMS 90%BLACK
CMYK	C0 M0 Y0 K90
RGB	R65 G64 B63
HEX #	414142 t

EMERALD TRAIL

TRAIL TYPES AND SURFACING

PRIMARY TRAIL MATERIALS

Cast-In-Place (C.I.P.) Concrete

- The primary material for the shared-use path is cast-in-place concrete with a medium broom finish perpindicular to the path of travel.
- C.I.P. Concrete used on the Emerald Trail should match City of Jacksonville Standard Specifications, including the following sections:
  - » Section 130 - Portland Cement Concrete
  - » Section 132 - Sidewalks and Driveways
  - » Section 135 - Rigid Pavement

Asphalt

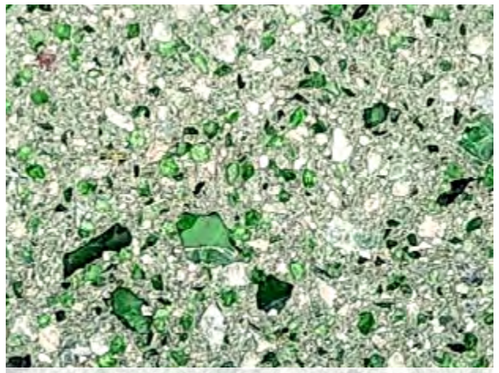
- Asphalt is the preferred paving treatment for dedicated bicycle facilities along the Emerald Trail.
- At intersections and other key moments, asphalt used for dedicated Bicycle Facilities along the Emerald Trail should be colored green using an FDOT-approved surface treatment. (See note on page 145.)

Unit Pavers Fields and Bands

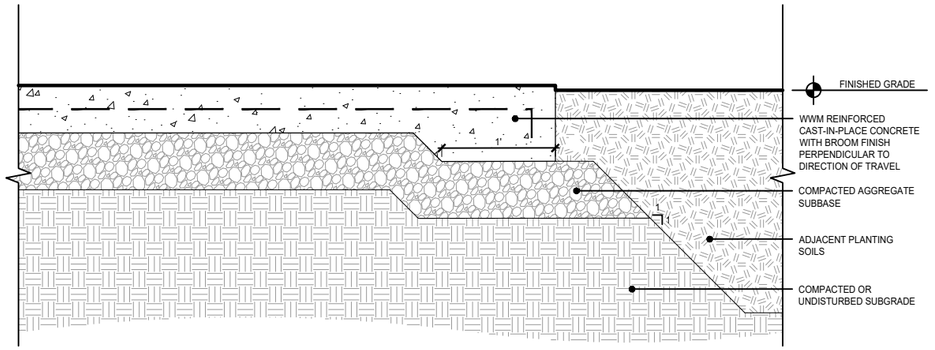
- Field of unit paving shall be used where the path intersects with other trails, sidewalks, or roads; at rest areas and furnishing zones; and in areas where the trail might briefly share right-of-way with vehicular traffic.
- **Paver Type 1 / Glass Aggregate Pavers:** Precast concrete unit pavers for trail intersections shall be 6” x 16” x 2.75” units in green concrete with a green glass exposed aggregate finish, matching mix V25-044 produced by Wausau Tile.
  - » At areas where heavy vehicle loading is anticipated, Type 1 pavers should be 6” x 12” x 2.75”.
- **Paver Type 2 / Furnishing Zone Pavers:** Precast concrete unit pavers for trail furnishing zones shall be 6” x 16” x 2.75” units matching mix V24-125 produced by Wausau Tile.
- **Paver Type 3 / Vehicular Pavers:** Precast unit pavers for Shared-Use Streets or other areas with heavy vehicle traffic shall be 6” x 12” x 3” or 12” x 24” x 3” units matching mix H24-089 produced by Wausau Tile.

CIP Concrete

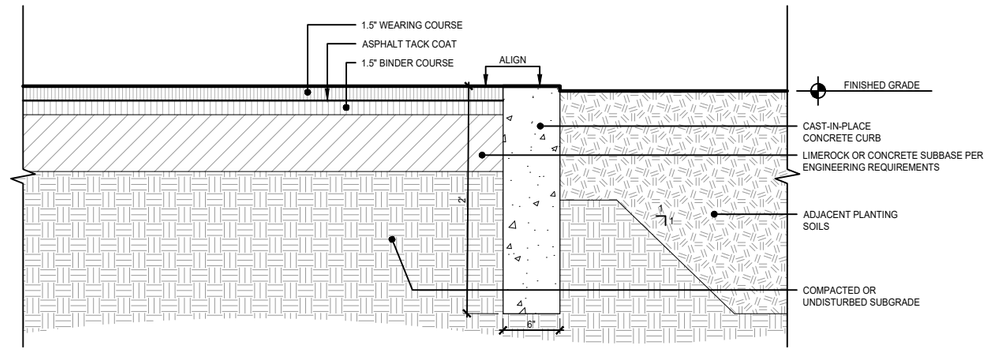
Asphalt with Green Surfacing Where Indicated



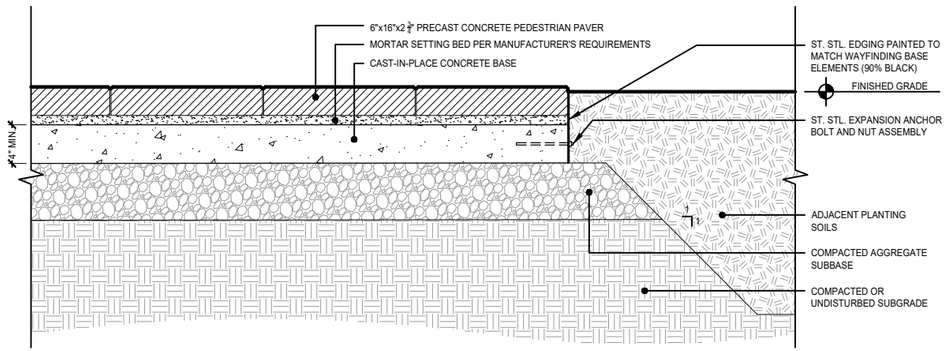
Paver Type 1 Finish



Typical Cast-in-Place Concrete Detail



Typical Asphalt Detail



Typical Unit Paving Detail

ACCENT ELEMENTS

Emerald Trail Medallions

Along the Emerald Trail, lane separation and trail wayfinding is reinforced by cast bronze medallions embedded at regular intervals along the trail centerline. These markers provide an immediate visual cue unique to the Emerald Trail, as well both a visual and tactile cue to users when crossing lanes, improving awareness and safety. Steel medallions are also suitable for retrofitting segments of the trail that have already been built or where existing sidewalks are incorporated into the trail system

- Emerald Trail medallions should be six inches (6”) in diameter and include the Emerald Trail logo (see detail at right). They should be manufactured from solid cast bronze.
- On Greenway Trails, Sidepaths, and Green Alleys, the Emerald Trail Medallions should be embedded along the trail centerline and serve as a directional lane marker.
- On Two-Way Cycle tracks and neighborhood Greenways, the Emerald Trail Medallions should be embedded along the sidewalk centerline.
- Medallions should be spaced at a distance equal to twice (2x) the trail or sidewalk width, but shall be spaced no less than twenty feet (20’) apart.

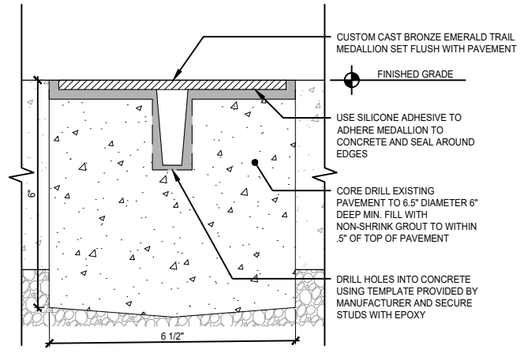
Emerald Trail Medallion

Shared-Use Lane “Sharrow” Marking

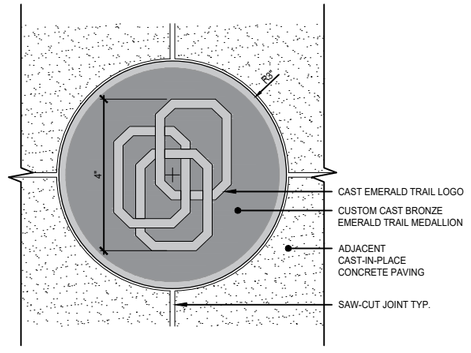
Trail Markings

- Trail markings may be used to ensure trail safety and clearly communicate with trail users.
- All trail markings along the Emerald Trail should comply with the MUTCD Ch. 9C. Markings.
- Markings may be made with thermoplastic, methyl methacrylate (MMA), or other surface-applied treatments appropriate for use on vehicular surfaces.

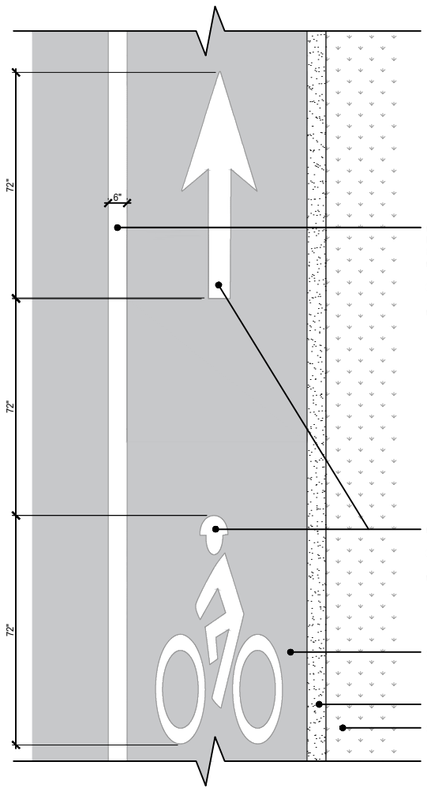
The need for and appropriate use of trail markings will ultimately be up to the design judgement of individual design teams; care should be taken to only use trail markings where necessary and avoid excessive use of superficial surface markings along the trail.



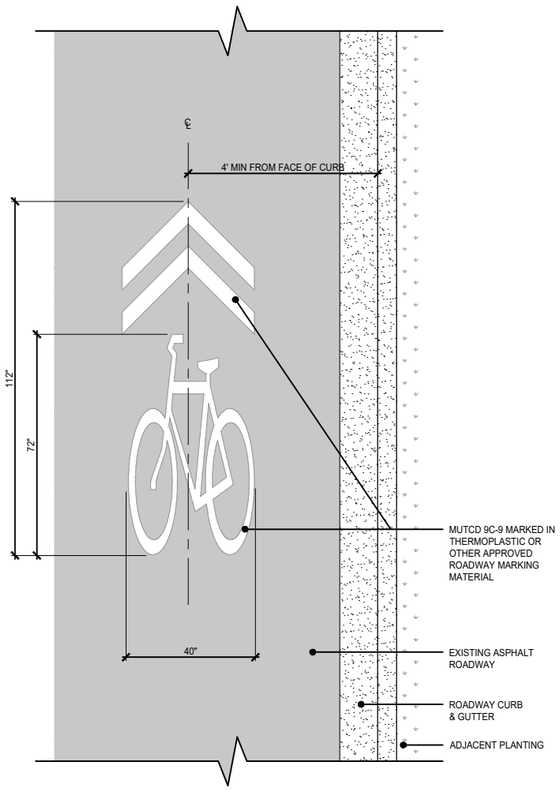
Trail Medalion Section



Trail Medalion Plan



Typical Bicycle Lane Marking



Typical Shared-Use Lane (“Sharrow”) Marking

GREENWAY TRAILS

Greenway Trails are some of the most commonly occurring trail segments within the Emerald Trail system. They consist of shared-use paths within independent rights-of-way or parks, with few crossings or interactions with adjacent streets and roads. Key examples of Greenway Trails include trail segments along Hogans and McCoys Creek, and the S-Line.

Along Greenway Trails, cyclists and pedestrians share directional travel lanes on either side of the trail centerline, and trails are wide enough to accommodate both modes of travel safely. Because Greenway Trails are separated from roads and streets and often pass through green spaces, they provide an immersive, low-stress experience for trail users.

GREENWAY TRAILS (CONTINUED)

Trail Configurations

The preferred width of a Greenway Trail is fourteen feet (14'). A minimum width of ten feet (10') is acceptable in instances where the right-of-way may be constrained. Design teams should consider site-specific conditions and anticipated traffic volume in determining trail width.[1]

> A shoulder providing a minium of two foot (2') clear width is required on each side of a Greenway Trail.[2]

Greenway trails should include periodic rest areas and trail stops with amenities such as seating, water fountains, and waste bins. See page 81 for guidance on design, placement, and frequency of these trail stops.

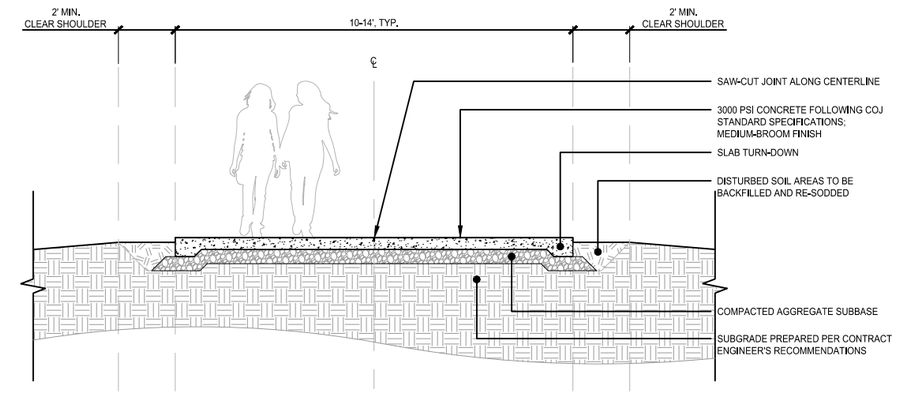
Trail Materials

- Greenway Trails shall be constructed of cast-in-place concrete with a medium broom finish meeting City of Jacksonville standard specifications.
- The centerline of the trail shall be demarcated with Emerald Trail Medallions placed at an interval equal to two times (2x) the width of the trail. Medallion placement shall be coordinated with control joint and expansion joint placement.
- Trail intersections with adjoining paths shall be indicated with unit paver bands running perpendicular to the direction of travel along the trail (see page 35).

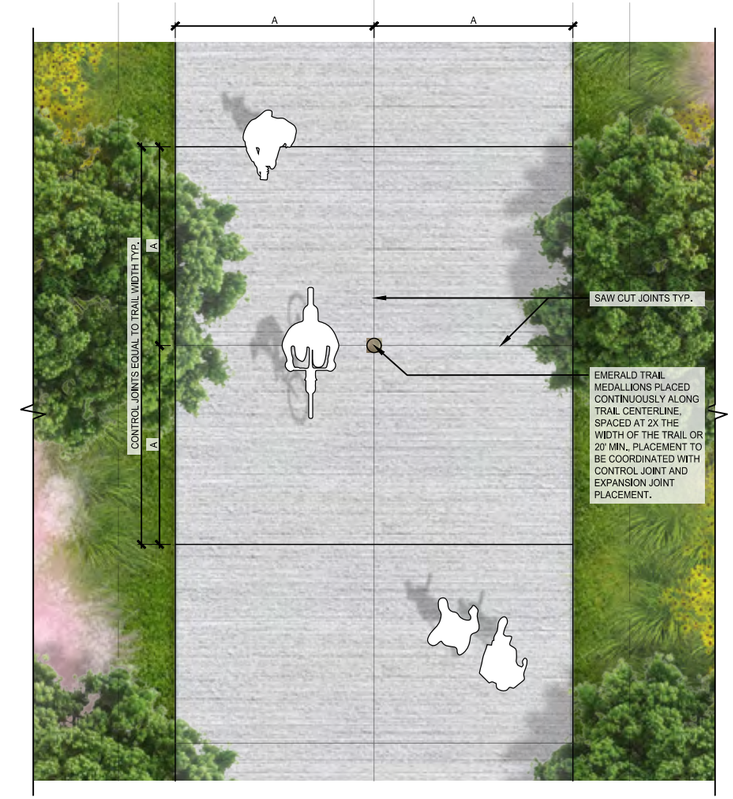
Trail Experience and Context

Greenway Trails represent excellent opportunities to plant large quantities of specimen canopy trees to increase Jacksonville's urban forest canopy. Greenway Trail planting schemes should respond to the surrounding park space and consider trail and park use, sightlines, and context. Design teams should strive to integrate Greenway Trail segments within the surrounding landscape.

1 AASHTO, *Guide for the Development of Bicycle Facilities, Fourth Edition* (American Association of State Highway Transportation Officials, 2012), 5-3.
2 Ibid., 5-4.



Greenway Trail - Typical Section



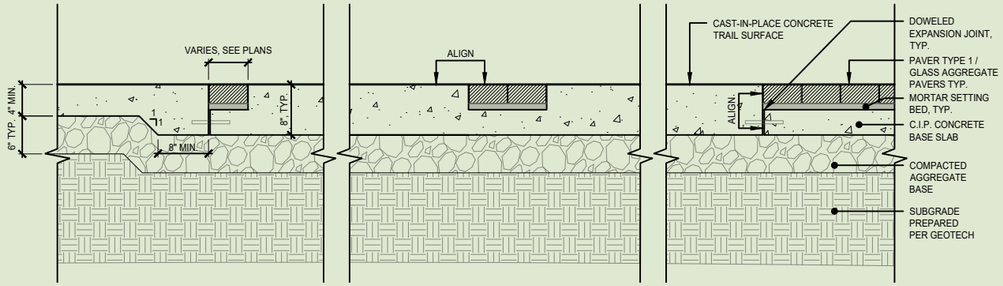
Greenway Trail - Typical Plan View

PAVING BANDS

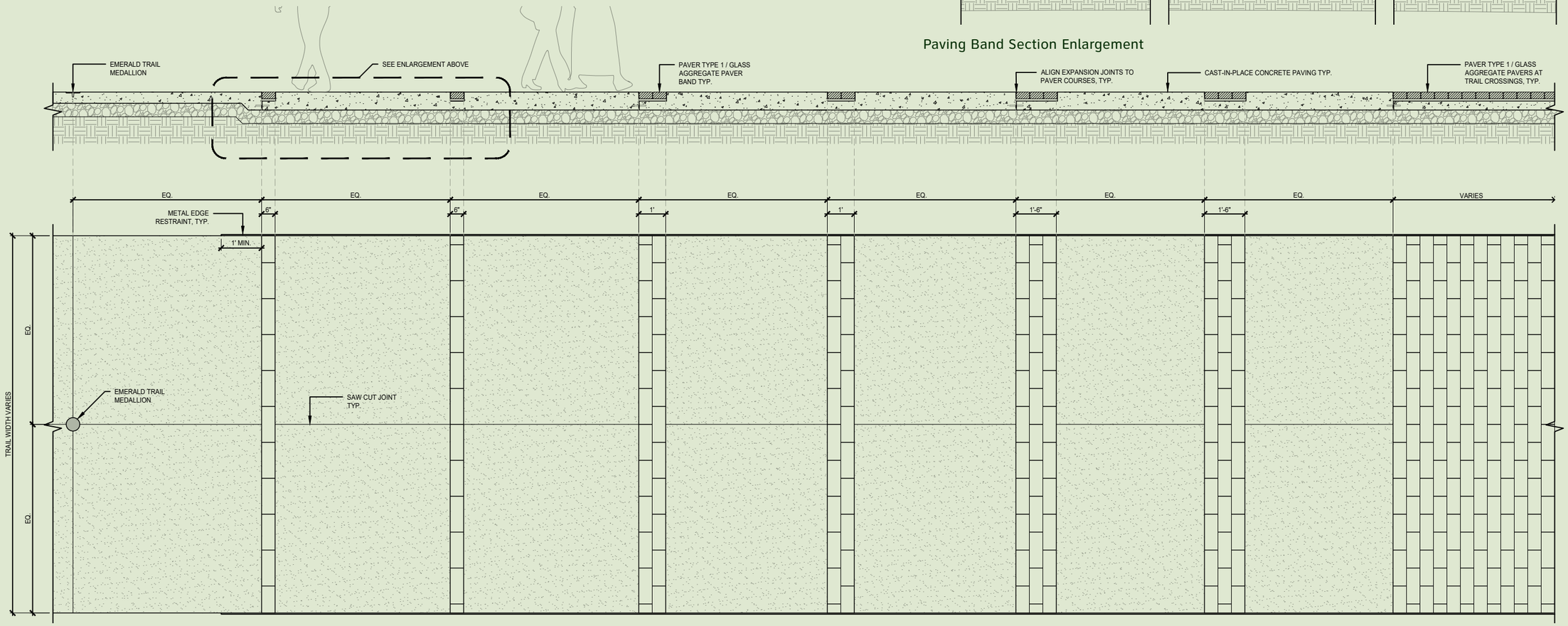
Greenway Trail and Sidepath intersections with adjoining paths and sidewalks introduce a heightened risk of pedestrian/cyclist collision as trail users slow down, turn, or stop. Contrasting paver bands running perpendicular to the direction of travel at intersection approaches provide a subtle visual and textural cue for cyclists to slow down and exercise caution when approaching and passing through trail intersections. At the intersection itself, a solid field of unit pavers signals a “mixing zone” where typical two-way shared use patterns may be interrupted. These cues may be further reinforced by trail markings and signage should conditions warrant.

The paver bands also provide a visual cue to trail users as they enter the Emerald Trail system, serving as a visual signature that subtly welcomes users to the trail no matter where they may enter and helping to reinforce a unified trail identity across the system.

- The standard paver for these paving bands shall be 6” x 16” x 2.75” unit pavers with Green Glass aggregate by Wausau Tile (Paver type 1, see page 27).
- Paving bands should be set on a mortar setting bed underlain by a concrete subslab integral to adjoining concrete paving.
- Doweled expansion joints should be integrated into these bands so they are not visible from the trail surface (see details).
- Paver joint filling should be polymeric sand swept into the joints after paver installation.



Paving Band Section Enlargement



SIDEPATHS

While shared-use paths are ideally situated in independent rights-of-way, they may also share rights-of-way alongside roadways as Sidepaths. Sidepaths may appear similar to sidewalks, however unlike sidewalks they are designed to accommodate two-way traffic from both pedestrians and cyclists.

Sidepaths can serve as important linkages connecting separate Greenway Trails. They also introduce significant complications and safety considerations due to their proximity to roadways. For these reasons, sidepaths are most appropriate over short distances where there are relatively few intersections, driveways, other interruptions or opportunities for interactions with motor vehicles. Where these conditions are not met, design teams should consider alternative trail configurations before committing to a Sidepath approach.

SIDEPATHS (CONTINUED)

Trail Configuration

The primary difference between Sidepaths and Greenway Trails is Sidepaths share a right-of-way with an adjacent roadway, where Greenway Trails follow dedicated rights-of-way separate from motor vehicles. Sidepaths can be constructed with as little as fifteen feet (15') of trail right-of-way, and will likely be most widely deployed in sections of the trail with narrow space between the back of curb and adjacent private property. While this makes Sidepaths an appealing trail configuration for constrained settings, Design Teams should pay special attention to intersection treatments and signage and signalization strategies to ensure trail user safety at potential conflict points. See page 139 for more information on Sidepath crossing strategies.

- Sidepaths require a minimum five foot (5') buffer between the shared-use path and the adjacent roadway. The trail width may reduce to a minimum of ten feet (10') to accommodate the buffer zone. This buffer may be planted and accommodate placement of trail signage and wayfinding, MUTCD signage, and streetlights. Alternatively, if the sidepath is adjacent to parallel parking, the buffer zone may be paved to provide pedestrian access to and from parked vehicles. This paved area may also include trail furnishings such as benches and bike racks, should space allow.
- Where the required five foot buffer is not feasible, a physical barrier such as a wall (see page 72) or railing (see page 60) is required between the sidepath and the roadway.
- When the Sidepath is adjacent to a high-speed highway, the separation buffer should be greater than five feet (5') or include a crashworthy barrier.[3]

Sidepaths should never be placed directly adjacent to roadways.

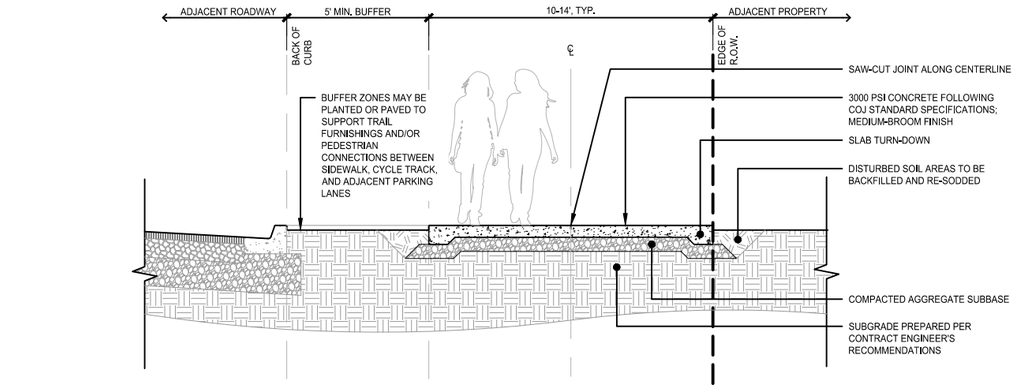
Trail Materials

- As with Greenway Trails, the primary paving surface for Sidepaths is a cast-in-place concrete with a medium broom finish according to COJ standard specifications.
- Furnishing zones adjacent to the Sidepath or in the buffer zone should use Paver Type 2 (see page 27).
- The centerline of the trail shall be demarcated with Emerald Trail Medallions placed at an interval equal to two times (2x) the width of the trail. Medallion placement shall be coordinated with control joint and expansion joint placement.

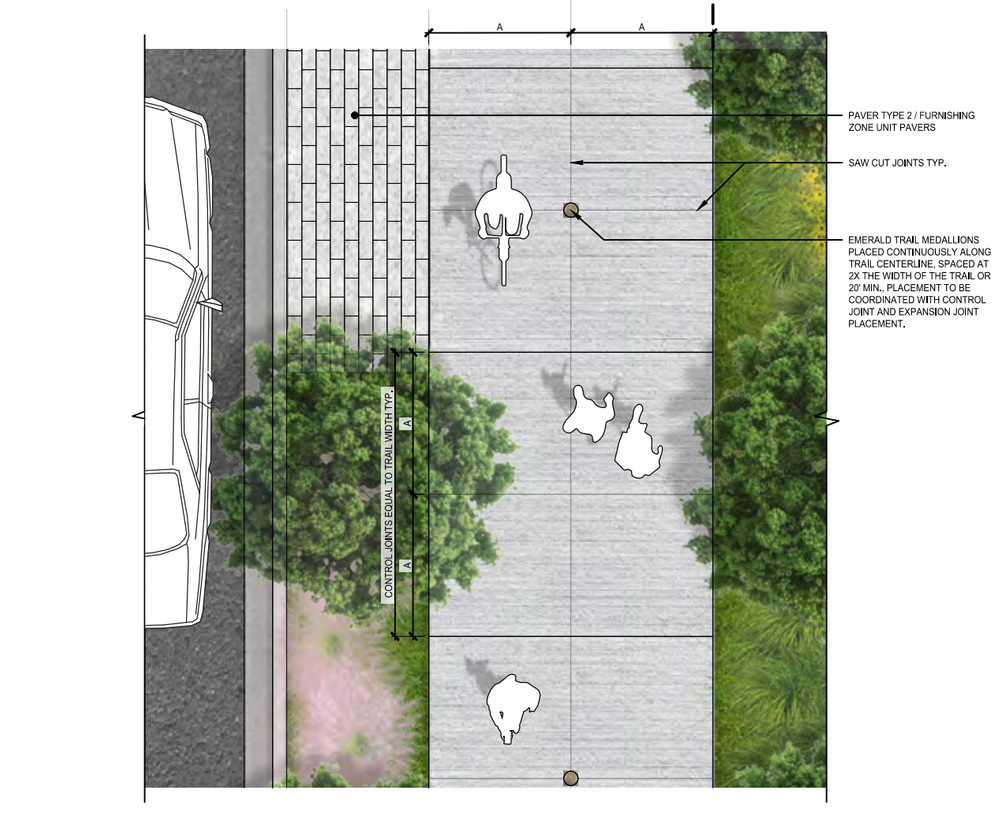
Sidepath Safety

- AASHTO notes there are operational and safety challenges associated with Sidepaths, particularly at intersections, driveways, and curb cuts. Design teams should be aware of these considerations when developing Sidepath designs.[4] See Chapter 5: Trail Crossings for more information and considerations for Sidepath intersections.
- Sidepaths should never pass directly in front of the door or egress paths into and out of buildings. This is to accommodate both door swing as well as minimize the risk of collisions involving cyclists and pedestrians exiting an adjacent building. These pedestrians are unlikely to expect or look for bicycle traffic as they exit the building, creating a high likelihood of collisions or conflicts. In these instances, the Two-Way Cycle Track is the preferred trail configuration. If there is not sufficient space for a Two-Way Cycle Track, design teams should consider creating additional space via curb extensions or creating on-street bicycle infrastructure such as a conventional on-street bicycle lane.

3 AASHTO Guide for the Development of Bicycle Facilities, Fourth Edition, 5-11.
4 Ibid., 5.2.2.



Sidepath - Typical Section



Sidepath - Typical Plan View

TWO-WAY CYCLE TRACKS

Where space allows, Two-Way Cycle Tracks are an ideal configuration for an urban multi-modal trail. Unlike Greenway Trails and Sidepaths, Two-Way Cycle Tracks provide dedicated travel lanes for cyclists, creating a comfortable and safe trail experience for cyclists and pedestrians alike.

The width of Two-Way Cycle Tracks also creates additional space for trail amenities such as furnishing, planting, lighting, and signage. In urban contexts such as Downtown Jacksonville, this can amount to a significant enhancement of the urban streetscape. For these reasons, Two-Way Cycle Tracks are the preferred trail type for urban settings and in contexts where the right-of-way width allows.

TWO-WAY CYCLE TRACKS (CONTINUED)

Trail Configuration

- Pedestrian sidewalks should be a minimum of eight feet (8') wide when the trail is within Downtown and Urban Priority Development Areas, and six feet (6') wide in Urban Development Areas as demarcated on the City of Jacksonville Development Area map.[5] Where possible, design teams should seek to exceed these minimums.
- Two-Way Cycle Tracks should be a minimum of ten feet (10') wide and marked to accommodate travel in two directions.
- Cycle Tracks should be vertically separated from the adjacent roadway whever possible, however on-street configurations are also desireable. See page 45 for guidance on these configurations.
- The cycle track should always be located between the pedestrian sidewalk and the adjacent roadway.
- Where the adjacent roadway lane is for parallel parking, a minimum three foot (3') wide buffer should be placed between the back of curb and the roadside edge of the Two-Way Cycle track to accommodate door swing and pedestrian access to and from parked cars.
- Where the adjacent lane is a travel lane, a minimum buffer of one foot (1') is required. This buffer may include the width of a mountable curb.[6]

Trail Materials

- Pedestrian sidewalks should be Standard COJ cast-in-place concrete with a medium broom finish.
- Emerald Trail Medallions should be installed along the centerline of the sidewalk at a spacing equal to two times (2x) the width of the sidewalk, but not less than every twenty feet (20').
- The preferred surface material for the cycle track itself is asphalt, as it provides a softer and smoother ride for cyclists when compared to cast-in-place Concrete.
  - » At intersections and other key moments, the Cycle Track should be colored green with a surface coating conforming to follow all applicable guidance from the City of Jacksonville Land Development Procedures Manual and FDOT Design Manual.[7]
- Asphalt cycle track assemblies include continuous cast-in-place concrete flush curbs on either side of the Asphalt. These curbs shall be standard COJ concrete.

Trail Experience and Context

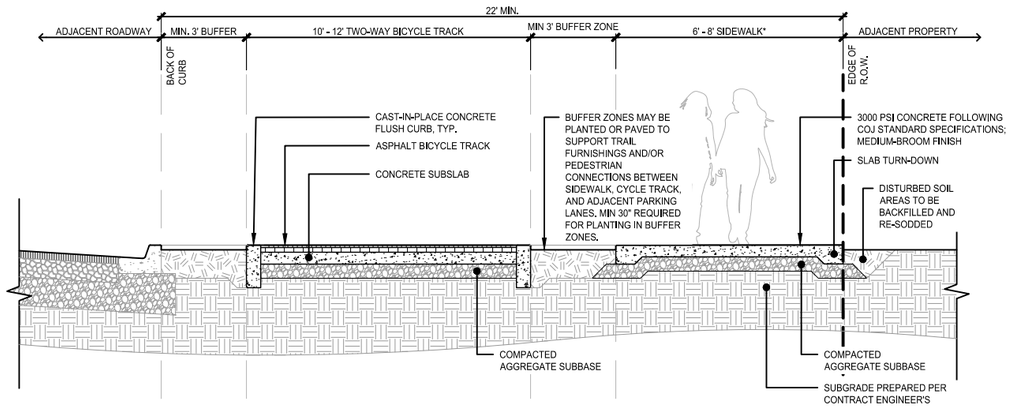
Two-Way Cycle tracks are ideal trail configurations for urban settings. Trails should be sited and configured to integrate with and support adjacent business by providing connections to private retail spillout spaces and enhancing the general streetscape character.

As with Sidepaths, there are some operational and safety considerations associated with Two-Way Cycle Tracks, although these are somewhat mitigated by the placement of cyclists on dedicated bicycle facilities. Still, design teams should take care to ensure the safety and visibility of trail users, especially at intersections, driveways, and other curb cuts. See page 145 for more guidance on the design of Two-Way Cycle Track intersections.

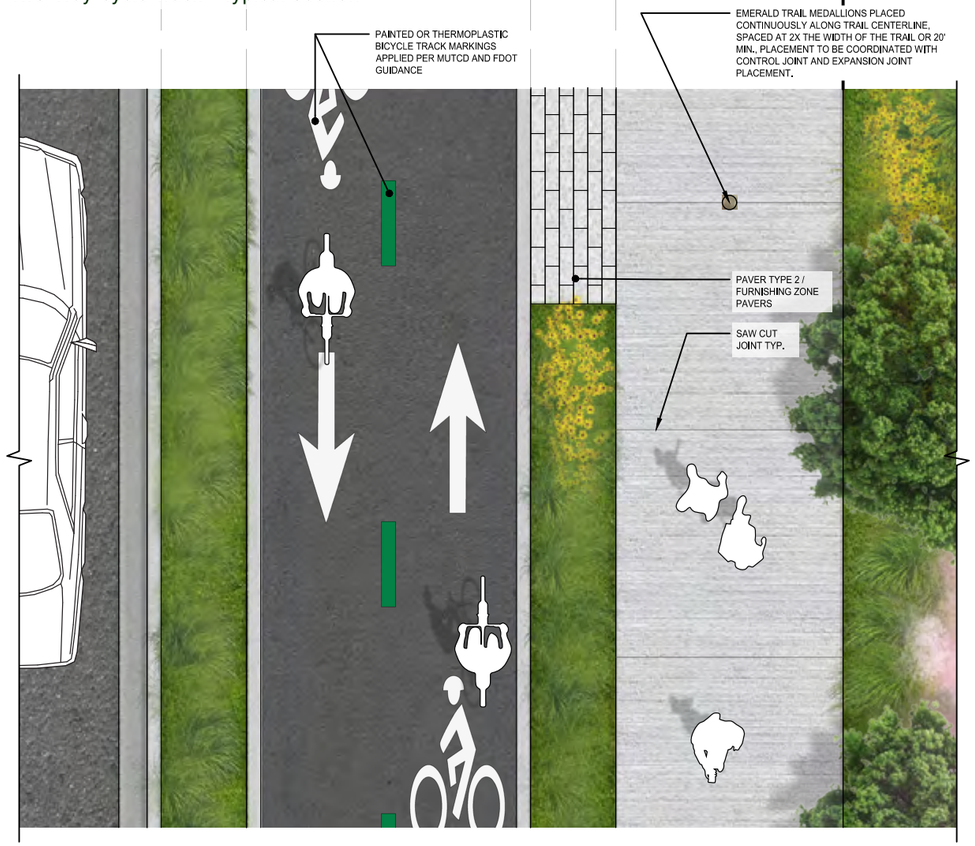
Additional Guidance

- Federal Highway Administration, *Separated Bike Lane Planning and Design Guide*, May 2015. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/separatedbikelane_pdg.pdf

5 City of Jacksonville Land Development Procedures Manual, 2.2.2.
6 NACTO Urban Bikeway Design Guide, 2nd Edition, 38.
7 See Florida Department of Transportation, "Green-Colored Pavement Markings for Bicycle Facilities: Facilities, Materials, Application, and Performance," (February 2023).



Two-Way Cycle Track - Typical Section

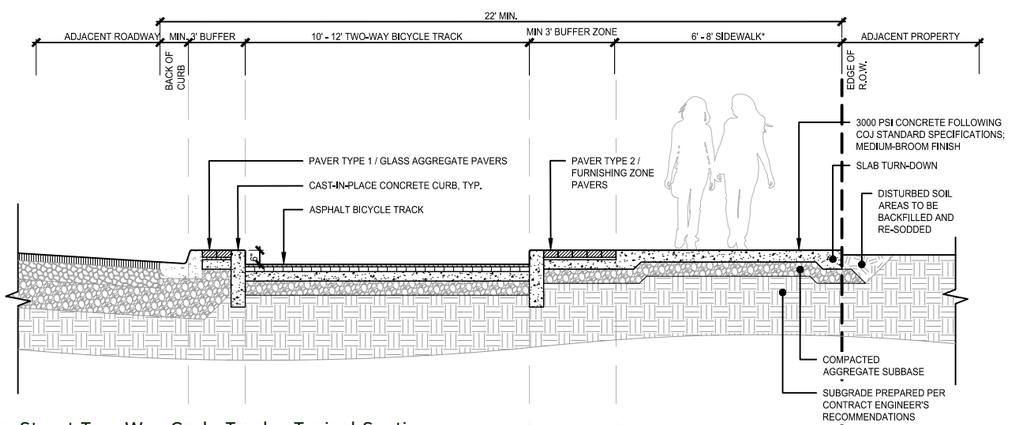


Two-Way Cycle Track - Typical Plan

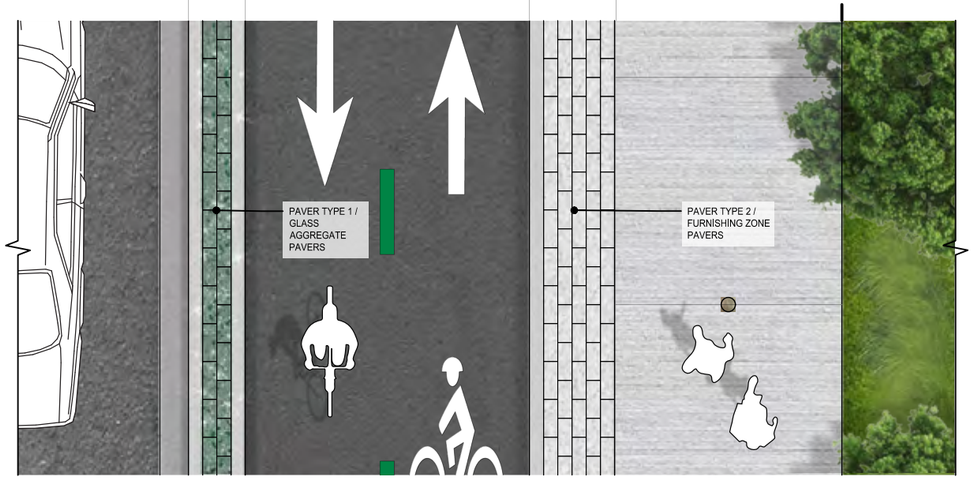
ALTERNATIVE CYCLE TRACK CONFIGURATIONS

Street-Level Cycle Tracks

Street-Level Cycle Tracks are a viable alternative to raised cycle tracks. Placing the cycle track on street level may help manage costs and mitigate drainage and utility conflicts. When cycle tracks are at street level, they should be separated from vehicle travel by a six inch (6") cast-in-place curb inset with green glass aggregate pavers. (Paver Type 1, page 27). The cycle track should also be separated from the adjacent sidewalk by a vertical curb and the sidewalk furnishing zone.



On-Street Two-Way Cycle Track - Typical Section

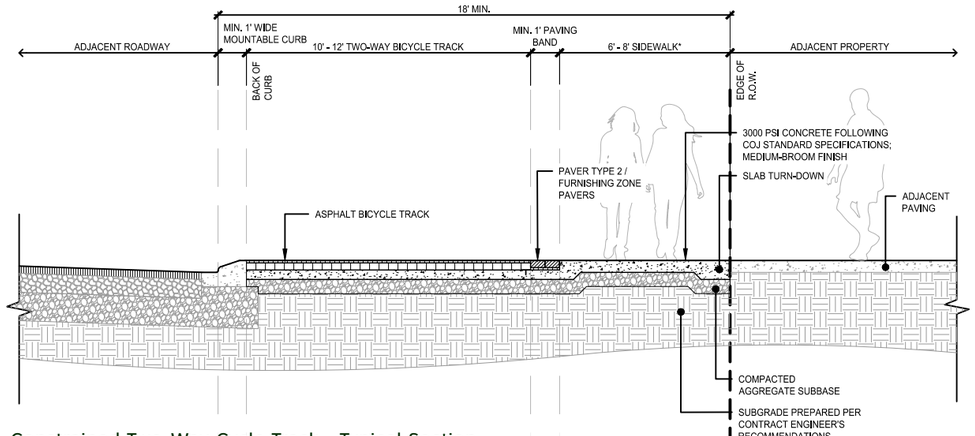


On-Street Two-Way Cycle Track - Typical Plan

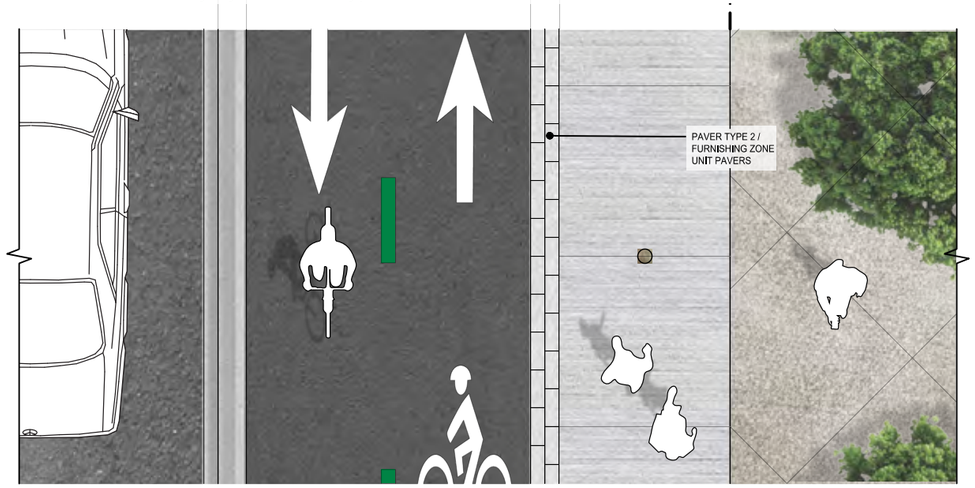
Constrained Cycle Tracks

Two-Way Cycle Tracks may be viable in constrained conditions, provided that average speeds of adjacent traffic do not exceed twenty-five (25) miles per hour. In these settings, the cycle track may be vertically separated from the roadway by a mountable curb. On the sidewalk side, the cycle track may be separated by a band of Type 2 pavers to provide a visual differentation and edge between the sidewalk and bicycle traffic.

> Raised cycle track should not be used In constrained conditions adjacent to on-street parking or high-speed traffic (greater than 25 mph).



Constrained Two-Way Cycle Track - Typical Section



Constrained Two-Way Cycle Track - Typical Plan

NEIGHBORHOOD GREENWAYS

The Emerald Trail winds its way through Jacksonville's historic residential neighborhoods, linking them with the Urban Core's parks, commercial areas, institutions, and cultural destinations.

These residential areas are characterized by narrow rights-of-way, low traffic volumes, and numerous intersections and curb cuts providing vehicle access to private properties. As the trail passes through these neighborhoods, it must take on a different form that responds to the constraints and opportunities presented by alignment rights-of-way and their surrounding contexts.

In Neighborhood Greenways, cyclists are encouraged to use the roadway rather than share a sidewalk with pedestrians. Traffic calming measures may be used to meet target vehicular traffic volumes and speeds, improve trail user safety, and create enhanced streetscapes for neighborhood residents. Wayfinding signage, furnishings, and lighting are deployed, primarily at intersections (see page 151). And unlike other trail types, Neighborhood Greenways may be deployed via retrofits of existing roads and sidewalks using Trail Medallions and markings.

Neighborhood Greenways are in a sense the "headwaters" of the Emerald Trail system. Trail elements here are deployed strategically and with a light touch, providing enough of a visual cue to signal the trail's presence while harmoniously integrating with neighborhoods' primarily residential character. As the trail continues "downhill" toward more active commercial and mixed use areas in and around Downtown, the trail infrastructure becomes more pronounced.

NEIGHBORHOOD GREENWAYS (CONTINUED)

Trail Configuration

Neighborhood Greenways are similar to "Bicycle Boulevards," which are low-speed, low-volume streets where cyclists may safely and comfortably share travel lanes with automobiles. This use is encouraged via shared-use markings ("sharrows"), signage, and traffic calming measures. This configuration is ideal for low-volume and low-speed residential streets, where overly-built bicycle infrastructure is unnecessary and may interfere with safe traffic patterns typical of residential areas.

Pedestrian trail users use adjacent sidewalks, which may be either existing or newly constructed as part of trail construction. New sidewalks must be a minimum of six feet (6') wide, and up to eight feet (8') where appropriate.

Design teams should evaluate existing sidewalks along Neighborhood Greenway segments and provide new sidewalks where width is less than six feet (6') or condition is unsatisfactory.

Trail Materials

Because Neighborhood Greenways build upon existing sidewalk and roadway infrastructure, the primary trail materials will be standard cast-in-place concrete for sidewalks and asphalt for streets. Emerald Trail Medallions should be installed along the centerline of sidewalks, both new and existing, to indicate that the sidewalk is part of the Emerald Trail. Medallions should be placed at twenty feet on-center (20' O.C.). Shared-Use Markings (MUTCD 9C-9) should be marked in thermoplastic or similar approved roadway marking materials.

- Shared-Use Markings should be installed at one-hundred to one-hundred fifty foot (100-150') intervals and placed within fifty feet (50') of each intersection.

Traffic Calming

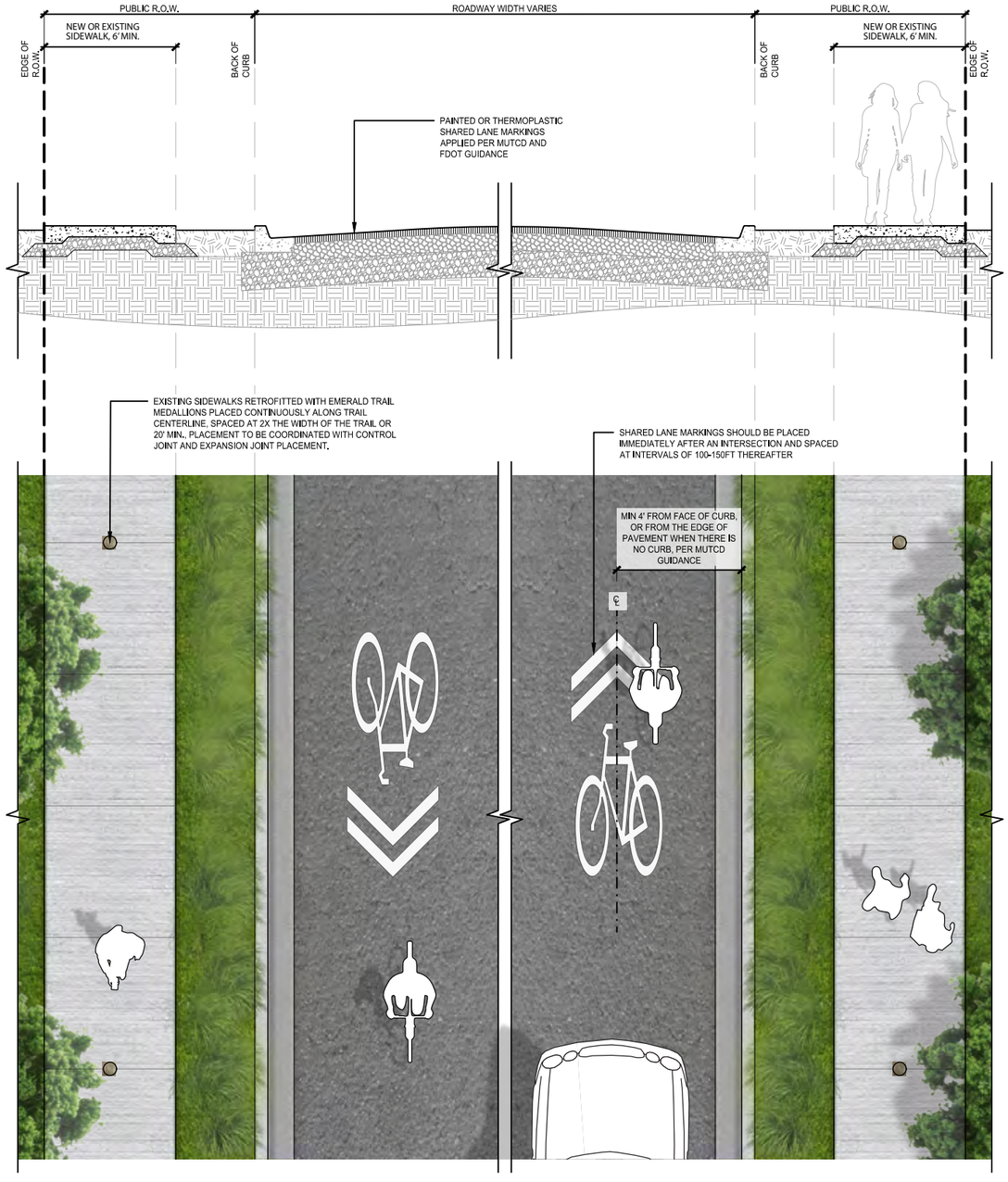
Neighborhood Greenways should have traffic speeds are below 25 MPH and average annual daily traffic (AADT) volumes below 3,000 vehicles per day.[8] Candidate streets for conversion to Neighobrhood Greenways that exceed these thresholds may be modified with traffic calming measures to reduce traffic volumes and speeds to an appropriate level. On roads where these traffic calming measures are deemed impractical or insufficient to reach the required volume and speed, alternative trail types or alignments should be considered. Specific traffic calming strategies that may be considered on Neighborhood Greenways include:

- Curb Extensions
- Speed Bumps or Speed Tables
- Chicanes
- Mini-roundabouts and Traffic Islands

Historic Sidewalks

There may be instances along Neighborhood Greenway segments where the existing sidewalk is constructed from unit pavers, such as the large hexagonal pavers that are typical of many historic areas in Jacksonville's Urban Core. In these instances, design teams should strive to maintain the existing sidewalk assembly, or where reconstruction is required, reconstruct the sidewalk in-kind using the same paver format. Design teams may consider using Paver Finish Type 3 for newly constructed sidewalks with hexagonal paving, and should include the Emerald Trail Medallion embedded in the pavers. In instances where the existing sidewalk is to be retrofitted, design teams should ensure that the sidewalk in question meets all requirements for the ADA and PROWAG, including sidewalk cross slope and trip height.

8 AASHTO Guide for the Development of Bicycle Facilities, Fourth Edition, 2-19.



Typical Neighborhood Greenway Configuration

GREEN ALLEYS

Green Alleys provide significant enhancements to existing alleys along public rights-of-way in the historic Springfield and Riverside neighborhoods, facilitating use by trail users and providing improved infrastructure and access for adjacent property owners.

Green Alleys function as modified shared-use paths or constrained shared-use streets, as they must accommodate two-way bicycle and pedestrian traffic, as well as the occasional slow-moving personal vehicle. Infrastructure improvements will allow through-travel by trail users as well as address longstanding maintenance, safety, access, and drainage issues.

Note: The illustrations and design guidance provided here relating to Green Alleys are subject to revisions pending further engagement and collaboration with trail neighbors and should be considered DRAFT material.

GREEN ALLEYS (CONTINUED)

Trail Configuration

Green Alley configurations are constrained by the width of the existing rights-of-way between private properties, as well as the need to accommodate trail infrastructure and amenities directly within the trail footprint.

- The primary Green Alley trail element is a centrally aligned shared-use path ranging from eight to ten feet (8-10') in width. The trail material should be cast-in-place concrete with the Emerald Trail Medallion embedded along the trail centerline.
- Green Alley trails should be lined on both sides by vehicular rated permeable paver shoulders.
- Green Alley permeable paving shoulders should be interplanted with turf or backfilled with clean, washed, open-graded 3/8" (#8) crushed limestone. Permeable shoulders should be of equal widths and scaled according to the trail width and total available right-of-way.
- Permeable shoulders should include a continuous perforated underdrain connected to an approved stormwater sewer or outfall. Surface drains may be included at periodic intervals for maintenance and cleanout access.

Green Alleys may include newly constructed fencing. Design teams should coordinate with adjacent property owners to understand their access needs, privacy concerns, and aesthetic preferences. A proposed system for new trail fencing can be found on page 71. Specific trail fence designs should be coordinated with adjacent property owners and take into consideration all access requirements.

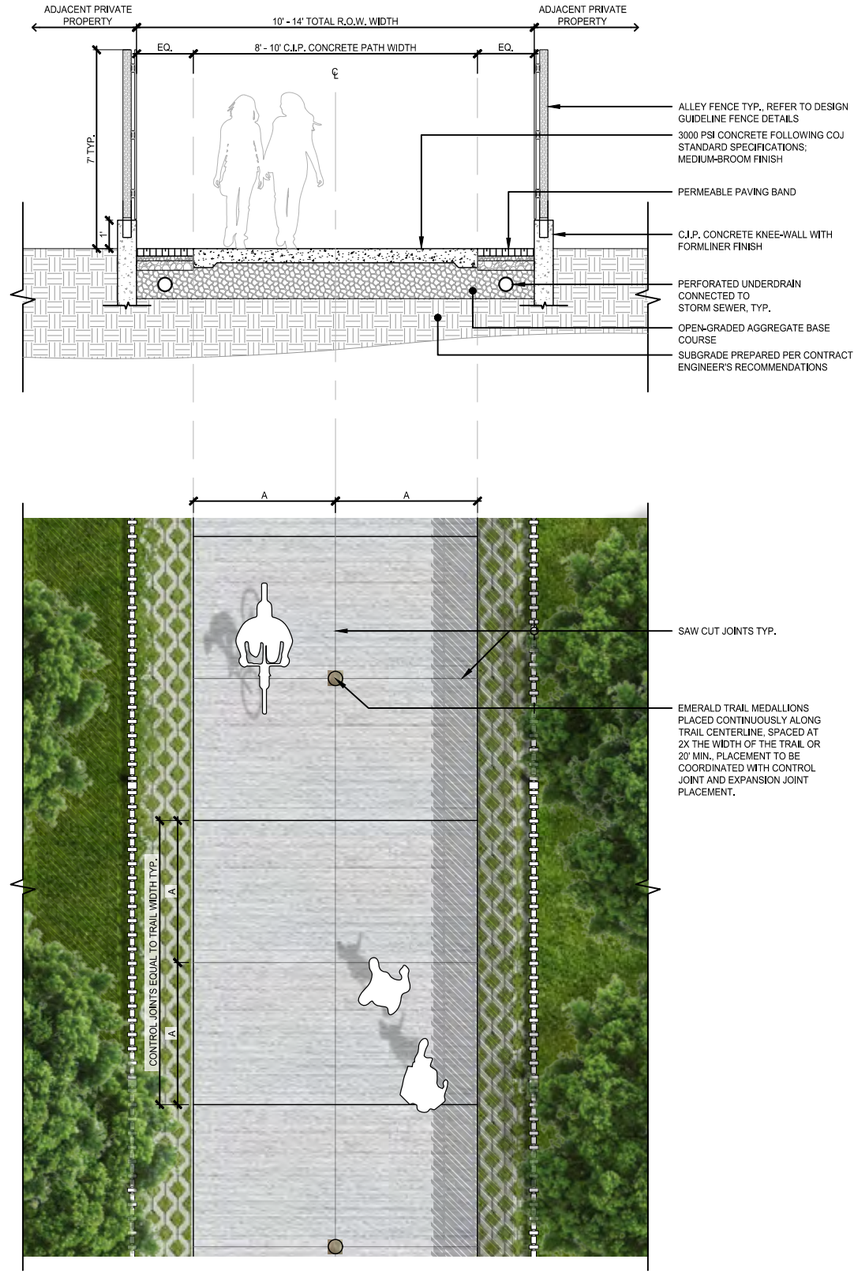
- Trail fencing should include fence-mounted lighting to provide a minimum required illuminance of two and a half horizontal footcandles (2.5 HFC). Lighting should be positioned to minimize glare and contrast, and may be time or motion-controlled to avoid providing unnecessary lighting. See page 75 for more information on trail lighting requirements.
- Where new fencing is provided, trail lighting should be mounted to the fence assembly. Trail lighting may also be mounted on existing fences with the permission of the respective property owner.
- Where new fences are not provided, bollard lighting may may be mounted in the permeable paver shoulder to meeting minimum illuminance goals.

Trail Materials

- The main trail in Green Alleys shall be cast-in-place concrete with a medium broom finish conforming with City of Jacksonville standard specifications.
- Emerald Trail Medallions shall be installed along the centerline of the trail at an interval equal to two-times (2x) the width of the trail, and their placement shall be coordinated with control and expansion joints.
- Permeable pavers shall be Unilock Grasspave or a similar permeable product approved for vehicular travel.
- Modified wood products such as Thermory or Kebony are the preferred material for wooden trail fencing due to their durability and rot resistance. Untreated cedar may also be used for trail fencing. Pressure treated lumber should never be used for trail fencing.

Design Considerations

- Green Alleys pass directly through residential areas and are highly constrained. Trail design should be sensitive to the needs of adjacent residents and support their regular use of the alleys.
- Designs should maintain open sightlines across the length of the block. Plantings, if used, should be low profile. In some instances, the cast-in-place concrete trail may need to flare or expand to provide room for cyclists or those using wheelchairs to pull aside for slow moving automobiles.



Typical Green Alley Configuration

SHARED-USE STREETS

In select portions of the trail where context and traffic patterns allow, design teams may elect to pursue a Shared-Use Street strategy. Shared-Use Streets, also known as *Woonerfs*, are public spaces occupying the full right-of-way that facilitate the movement of pedestrians, cyclists and cars in a shared, curbless street condition without the designation of separate travel lanes. Shared-Use Streets prioritize the pedestrian and create a sense of place through landscape, materials, furnishing zones, and minimal traffic markings. The design should vary to respond to specific site conditions, but required and recommended features and best practices are outlined below.

Required Elements

- Shared space for pedestrians, cyclists, and vehicles.
- Prioritize pedestrians and slow vehicular speed by creating uncertainty for drivers with traffic calming measures such as lane shifts or bump-outs.
- Retrofitted street raised to sidewalk level to create a flush or curbless condition.
- Minimal traffic markings.

Preferred Elements where Space Allows

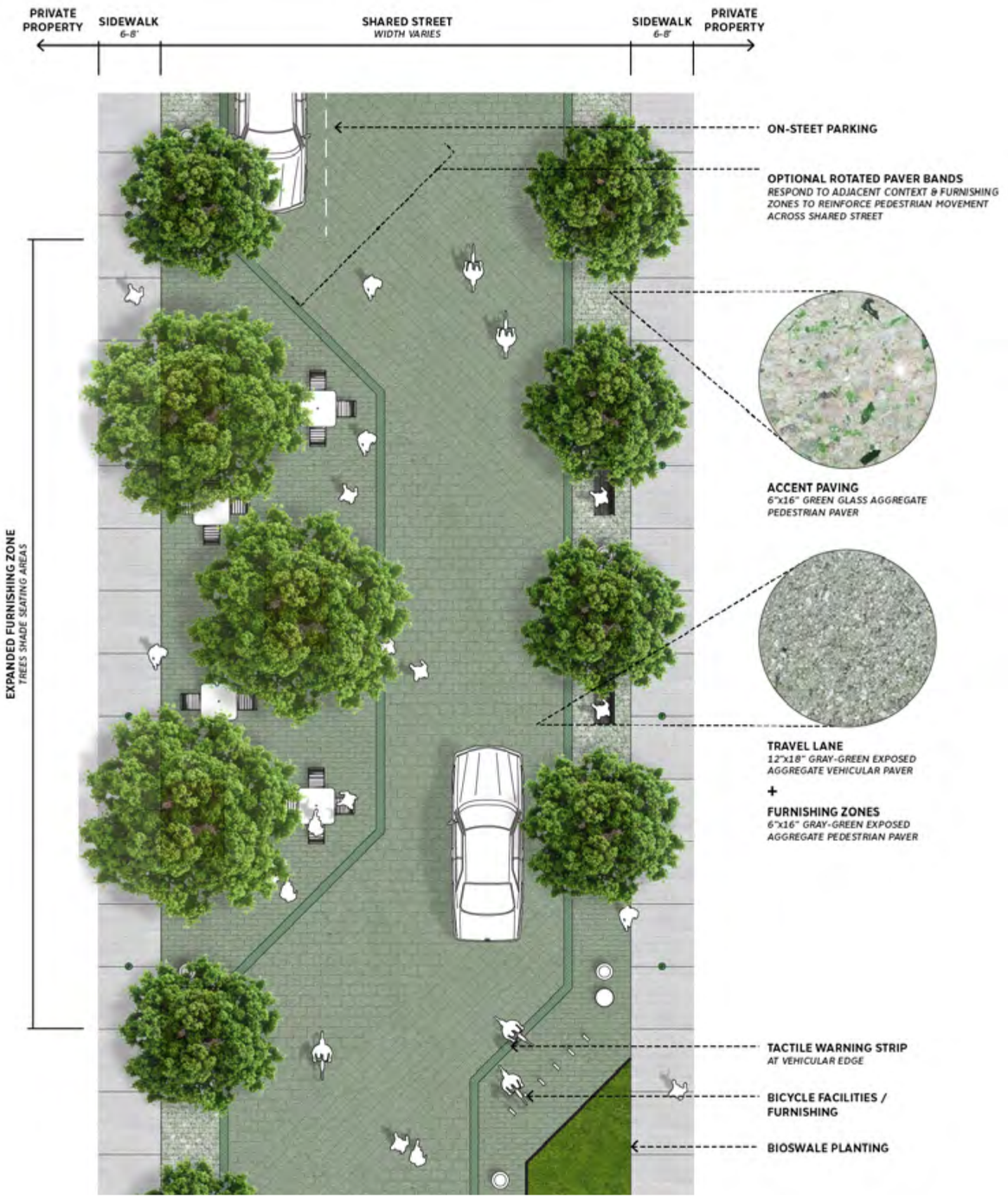
- (Flush) curb extensions / chicanes.
- Street trees.
- Outdoor furnishing zones & landscape areas.
- On-Street Parking.
- Bioswales and green infrastructure, including elements such as permeable pavers.

Trail Configuration

- The Shared-Use Street condition should take advantage of the entire public right-of-way with paving, landscaping, furnishing, and street tree strategies.
- A 4’-6’ wide pedestrian sidewalk may border one or both sides of the shared street to facilitate connections to existing or planned buildings or paving adjacent to the Shared-Use Street.
- The street should accommodate two vehicular travel lanes, but may narrow to one travel lane width for short sections provided there is adequate sight distance for drivers to see, negotiate, and yield to oncoming traffic.
- Where space allows, street tree pits should follow one or both sides of the shared street at regular intervals. The area between tree pits should be paved to facilitate movement across the street to adjacent property, and should incorporate trail furnishing elements where appropriate.
- Landscape or furnishing zones may extend into the street and taper at a 45 degree angle to facilitate vehicular movement. The location of furnishing zones should respond to adjacent site conditions and pedestrian use.
- Expanded furnishing zones should include flexible seating for gathering and must provide regularly spaced shade trees for pedestrian comfort and cooling.
- Expanded landscape zones should function as bioswales whenever possible. See page 128.

Trail Materials

- Shared-Use Streets should use precast exposed aggregate unit paving as the primary paving material to signal a slow, shared condition to drivers and create a sense of place. Pavers should be vehicular rated within the vehicular travel lane, though adjacent furnishing areas may be pedestrian-rated.
- The exposed glass aggregate accent paver should be used sparingly for accent areas, such as the furnishing zone between tree pits.
- The primary paving zone should be one consistent paving color and utilize changes in direction to emphasize movement across the street and delineate furnishing zones. Diagonally oriented paving bands may be used to highlight specific zones or relationships to adjacent property.
- A dark green tactile warning paver must be used to delineate vehicular zones.



Shared-Use Street Typical Plan

BOARDWALKS AND RAILINGS

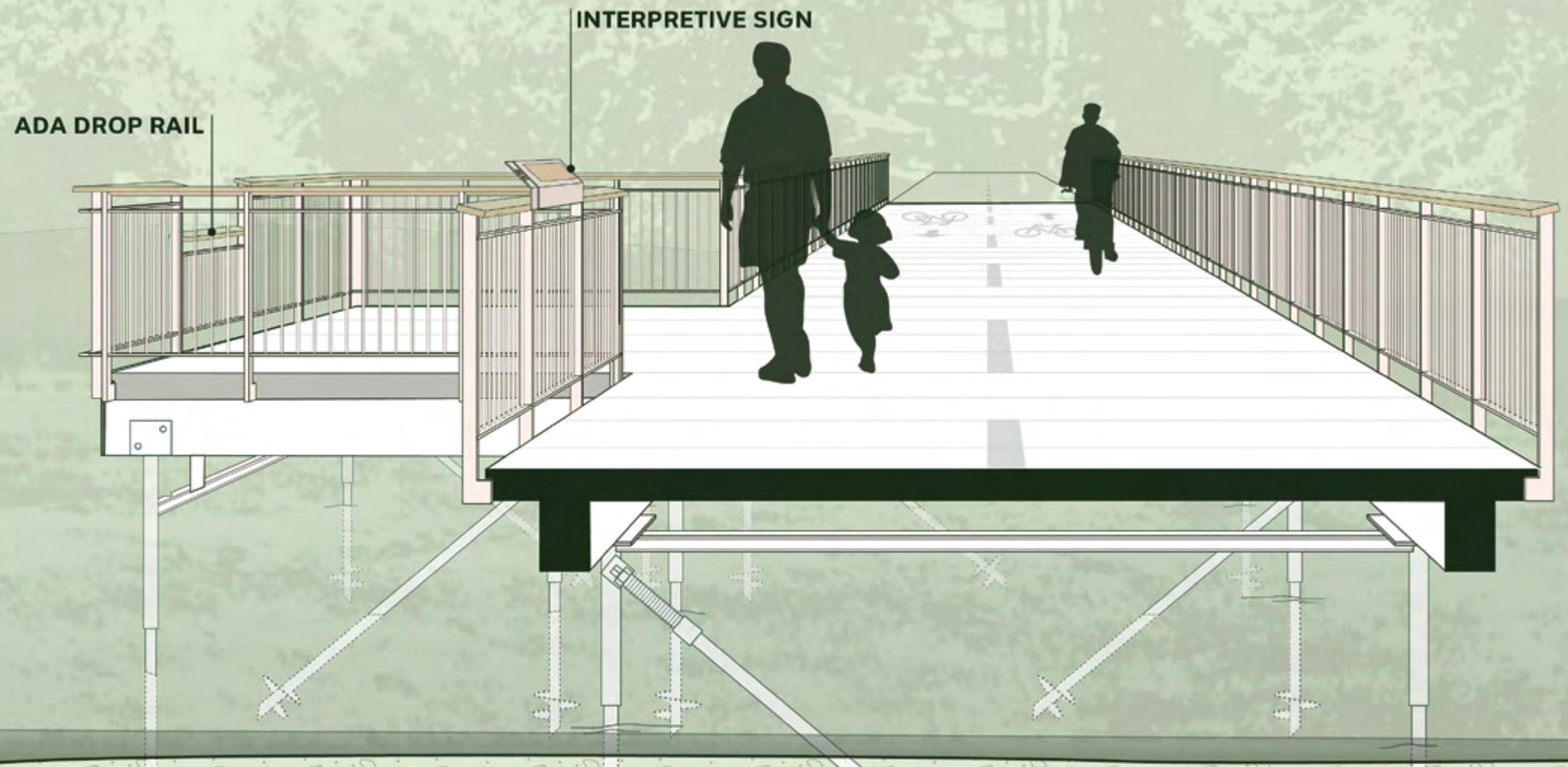
Along the Emerald Trail, boardwalks will facilitate movement over wetlands and in areas where reoccurring ponding water is likely. This also includes constructed wetlands or areas with stormwater management improvements.

Boardwalk Materials
Thermally-modified wood decking is the preferred material for boardwalks along the Emerald Trail. This decking type is sustainably produced, rot resistant, and extremely durable, with a hardness and dimensional stability comparable to tropical hardwoods. Acetylated or furfylated wood products such as Accoya and Kebony may also be considered. Metal bar-grate decking may also be used to allow light to planting beneath the boardwalk or create special opportunities to observe water, such as at get downs. Recycled plastic lumber and other composite decking materials are not recommended due to their tendency to absorb heat and warp over time. Pressure treated lumber should never be used as decking material along the Emerald Trail.

Railings
Railing designs along the Emerald Trail should prioritize visual porosity and transparency, which may be achieved with materials such as thin vertical posts and steel cable netting. Wooden top rails and lean rails ensure that railings are comfortable to touch year-round, and may also incorporate interpretive signage. Railing designs should always comply with all applicable accessibility and safety requirements.

- Stainless steel is the preferred material for trail railings. Thermory or Kebony is preferred for wood top rails and lean rails.

Structural Systems
Boardwalks within the Emerald Trail may be constructed on helical piles, which can be installed with portable installation equipment and lighter machinery, to access sensitive areas that require minimal disturbance. This includes areas with sensitive or soft soils and difficult terrain. Other systems may be considered in areas where geotechnical conditions do not allow for helical systems.



TRAIL FURNISHINGS

OFF-THE-SHELF SEATING

Primary Trail Bench

- The Freesia Bench by Victor Stanley with Kebony wood slats is the preferred off-the-shelf seating option for the Emerald Trail.
  - » The all-metal version may also be used in areas that are well shaded.
- The backed configuration is preferred, however backless benches may be considered if site-specific conditions warrant.
- Kebony is the only approved wood product that may be specified with the Freesia Bench. Ipe or other exotic wood should never be specified for any elements or furnishings on the Emerald Trail.
- Benches should be surface mounted to an underlying concrete slab according to the manufacturer's installation instructions.
- The powder coat color shall be RAL 6005 - Moss Green.

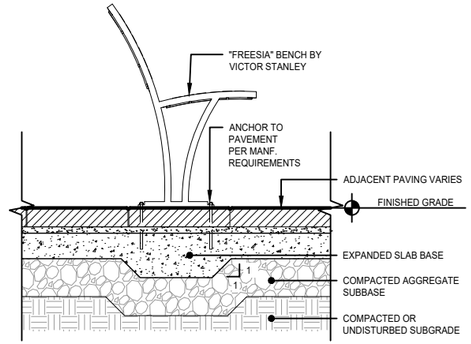
Picnic Tables

- The CP Table series by Victor Stanley is the preferred picnic table for expanded furnishing / gathering zones along the trail.
- The table is available with two, three, or four benches. A combination may be used, but CP-3 with the 4' tabletop must be included for wheelchair access.
- Tables should be surface mounted to an underlying concrete slab according to the manufacturer's installation instructions.
- The powder coat color shall be RAL 6005 - Moss Green. The wood seats and table top shall be Kebony.

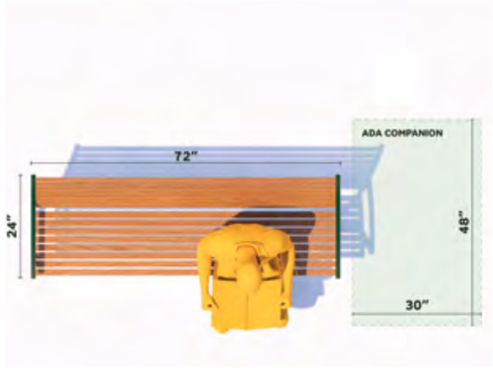
Timber Benches

- The Rough&Ready line of benches produced by Streetlife may be considered in portions of the trail with more industrial or naturalistic character.
- Streetlife benches should use Accoya Wood slats and powder coated steel frames in RAL 6005 - Moss Green. Timber benches should not be specified with Ipe or Recycled Plastic Lumber slats.

Victor Stanley Freesia Bench

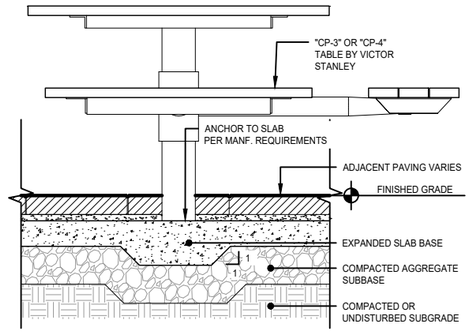


Victor Stanley Freesia Bench Typical Section

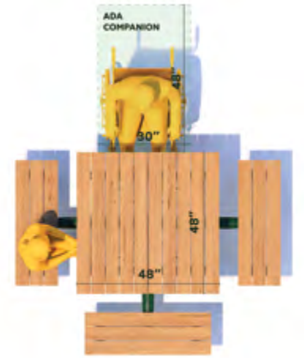


Victor Stanley Fresia Bench Typical Plan

Victor Stanley CP-3 / CP-4 Table

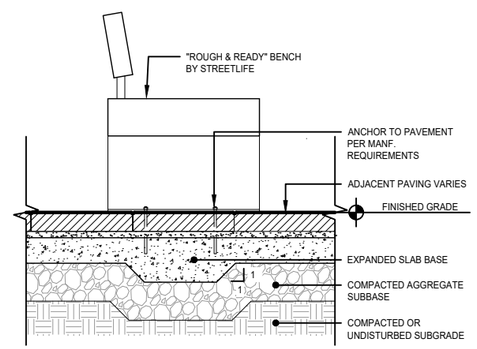


Victor Stanley CP-3 / CP-4 Table Typical Section

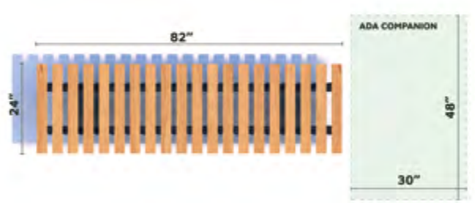


Victor Stanley CP-3 / CP-4 Table Typical Plan

Rough&Ready Crosswise Bench by Streetlife



Section Detail



Rough&Ready Crosswise Bench Typical Plan

CUSTOM CONCRETE BENCHES

Custom seating options can define and enhance the character of the Emerald Trail while providing opportunities for rest and socializing. The two custom bench options shown here draw inspiration from McCoys and Hogans Creek and their respective watersheds.

The custom bench system developed for the Emerald Trail consist of three elements:

- A concrete base
- A custom formliner pattern finish
- A wooden seat topper

Introducing variations to these three elements provides flexibility to respond to site- and context-specific conditions while maintaining a unified look and feel across the system.

McCoys Creek Watershed Custom Bench

The McCoys Creek variation of the custom bench features a geometric, fan-like pattern inspired by the leaves of Florida-native palms such as the Cabbage Palm and the Saw Palmetto. This design references the region's native vegetation and nods to the restoration of McCoys Creek and its historic floodplain alongside the construction of the Emerald Trail.

Hogans Creek Watershed Custom Bench

The Hogans Creek watershed draws inspiration from the architectural legacy of Henry Klutho and the Prairie School style for which he advocated. It features an abstracted Live Oak leaf motif, rendered in an abstracted style adapted from ornamental elements of Klutho's built work.

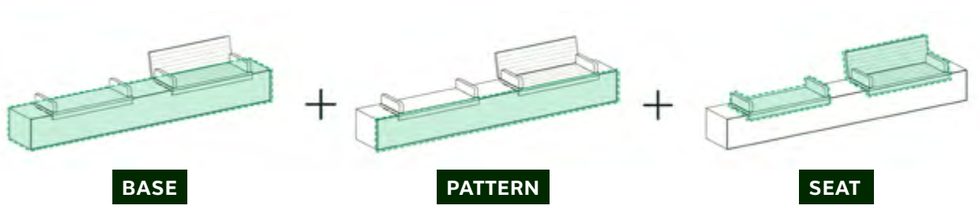
Bench Deployment

Cast-in-place Concrete benches provide distinct qualities that may make them preferable to off-the-shelf seating in certain contexts. For example: at trailheads, they may be used to frame and delineate spaces. In flood-prone areas, they may provide a more resilient seating option than a surface-mounted metal bench. Along cycle tracks, they may be used to reinforce the separation of pedestrian and bicycle facilities.

Watershed-Based Use

The distinct formliner patterns provided create the opportunity for subtle placemaking and wayfinding across the Emerald Trail network by linking the benches to the the different watersheds.

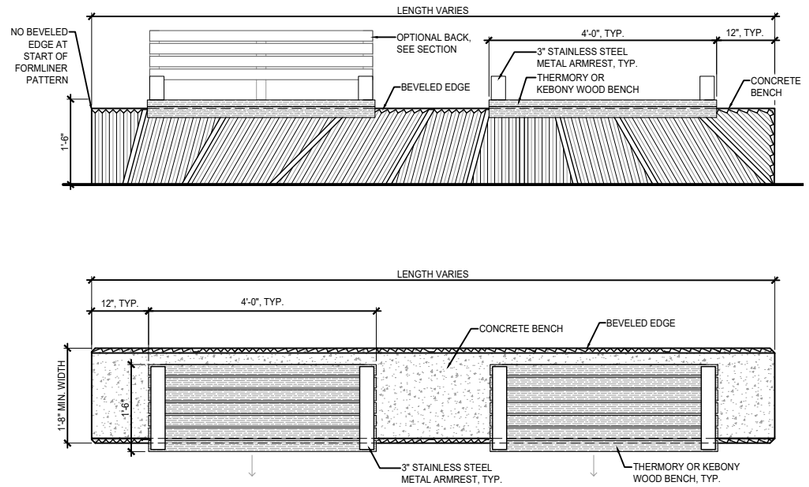
- For portions of the trail within the McCoys Creek Watershed, design teams should use the McCoys Creek pattern. In the Hogans Creek Watershed, design teams should use the Hogans Creek pattern. This reinforces a sense of place and orientation across the trail network.



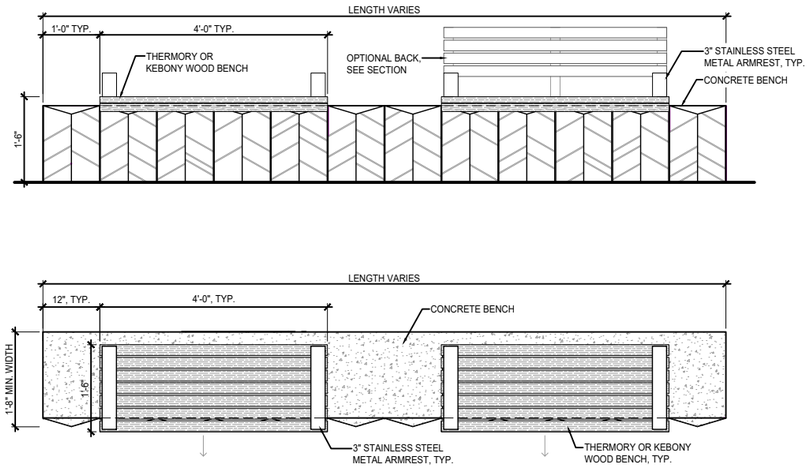
McCoys Creek Custom Bench Axonometric

Hogans Creek Custom Bench Axonometric

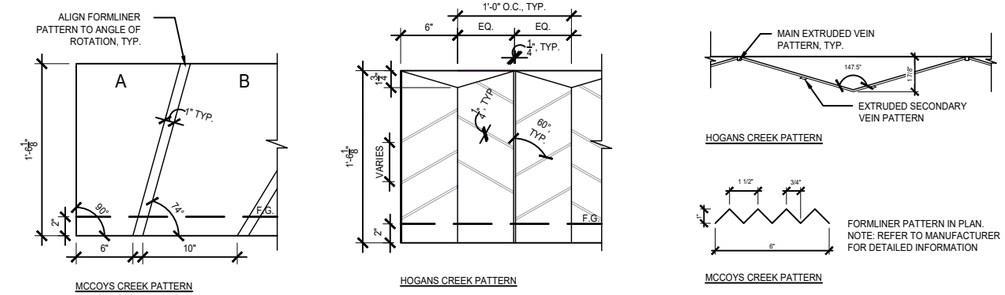
CUSTOM CONCRETE BENCH DETAILS



McCoys Creek Bench Plan and Elevation

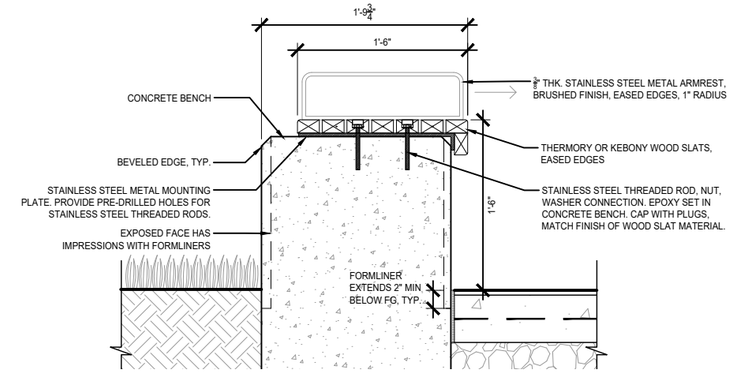


Hogans Creek Bench Plan and Elevation

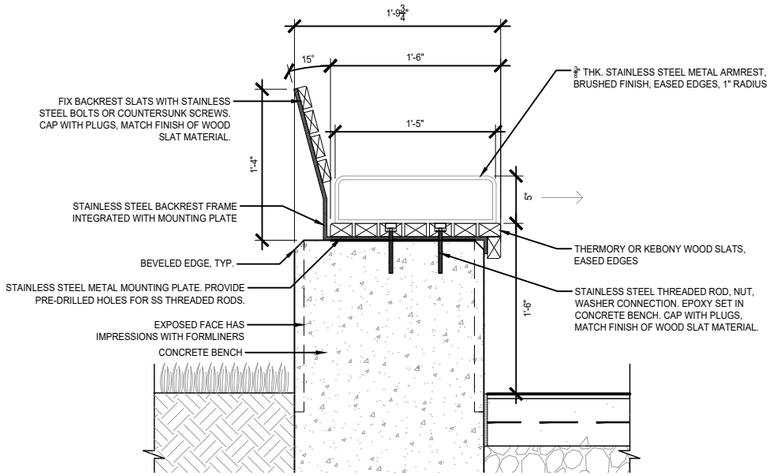


Pattern Enlargements - Elevations

Pattern Enlargements - Plan



Section Detail Enlargement - Bench Without Back



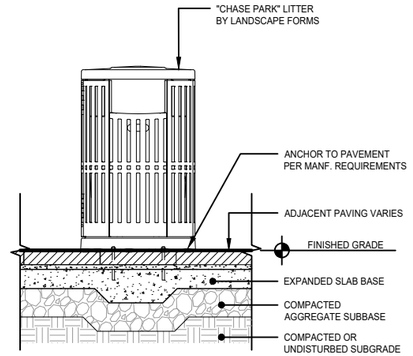
Section Detail Enlargement - Bench With Back

WASTE RECEPTACLES

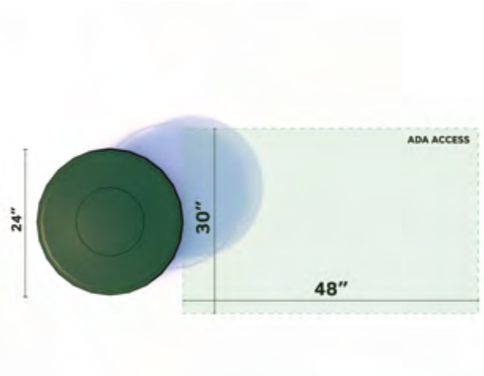
Standard Waste Bin

- The standard waste-bin for the Emerald Trail is the Landscape Forms Chase Park Litter, side-loaded with a 35 gallon capacity.
- Waste bins should be placed at regular intervals along the trail, at trail entrances and trailheads, and in trail seating areas.
- The standard waste bin should be powder coated in RAL 6005 - Moss Green.

Landscape Forms Chase Park Litter (35-gal)



Landscape Forms Chase Park LItter Typical Section

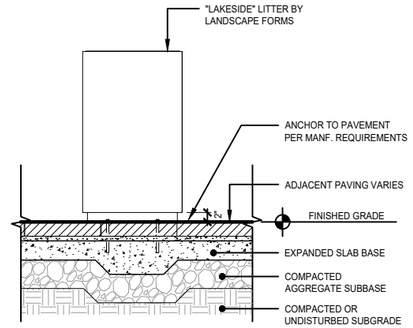


Landscape Forms Chase Park Litter Typical Plan

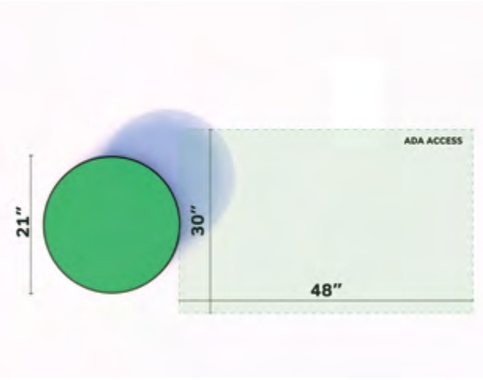
Alternative Custom Waste Bin

- As an alternative to the standard waste bin, design teams may elect to use the Landscape Forms Lakeside Litter with a custom perforation pattern (shown at right).
- Design teams should consider trail context and operations when selecting the custom waste bin design; custom bins will be most appropriate in active, high-visibility areas.
- As with the standard waste bin, the Lakeside Litter should be powder coated in RAL 6005 - Moss Green. The interior liner may be powder coated with RAL 6024 - Traffic Green

Landscape Forms Lakeside Litter (35-gal)



Landscape Forms Lakeside Litter Typical Section

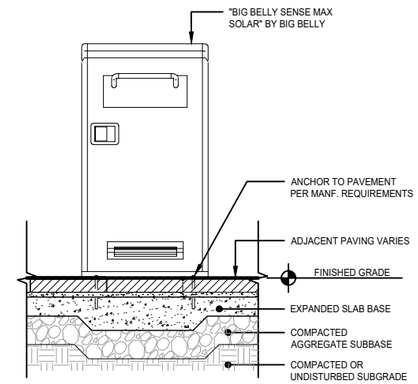


Landscape Forms Lakeside Litter Typical Plan

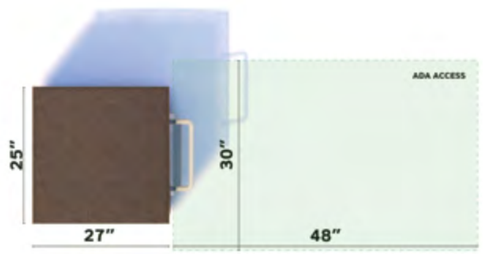
Alternative Bin for Trailheads and Parks

- At trailheads and park entrances where high traffic volumes are anticipated, design teams may consider deploying 50-gallon compacting waste bins manufactured by Bigbelly.
- Bigbelly bins should be used sparingly and only in high-traffic areas where regular maintenance and emptying may be a challenge.
- Special care and consideration should be given to potential impacts to site character when these bins are used.

Bigbelly Waste Bin (50-gal)



Bigbelly Waste Bin Typical Section



Bigbelly Waste Bin Typical Plan

BICYCLE FACILITIES

Bicycle Parking

- The preferred bicycle parking rack is the Monoline Core Bike Rack by Site Pieces.
- Bicycle Racks may be placed individually or in groups. Bicycle Racks should be placed to provide a minimum clear space for adequate clearance for maneuvering bicycles and wheelchairs in their vicinity.
- Bike racks should not be placed in locations that would obstruct prevailing pedestrian traffic patterns, such as in front of building entrances.
- Bike racks should be powder coated in RAL 6005 - Moss Green.

Bicycle Repair Stations

- The preferred bicycle repair station is the FixIt Plus Repair Station by Dero. Repair stations should always be paired with a public bicycle pump. The Air Kit 4 or Air Kit Prime pumps by Dero are both acceptable options.
- Bicycle repair stations should be powder coated in RAL 6005 - Moss Green.
- Bicycle repair stations may be specified at select moments along the trail, such as at trailheads and park entrances.

Intersection Lean-Rails

- Bicycle lean rails may be provided at signalized intersections along the trail. Lean rails make waiting for a signal more comfortable, encourage adherence to signals, and clarify where cyclists should stop at an intersection.
- The Biker Bar by Dero is the preferred off-the-shelf lean rail.
- Custom fabricated lean rails may also be considered. Designs should follow the general form-factor and dimensions of the Dero Biker Bar.
- Lean Rails should be powder coated steel, RAL 6005 - Moss Green.

Site Pieces Monoline Core Bike Rack

Dero FixIt Plus Bike Repair Station

Dero Biker Bar

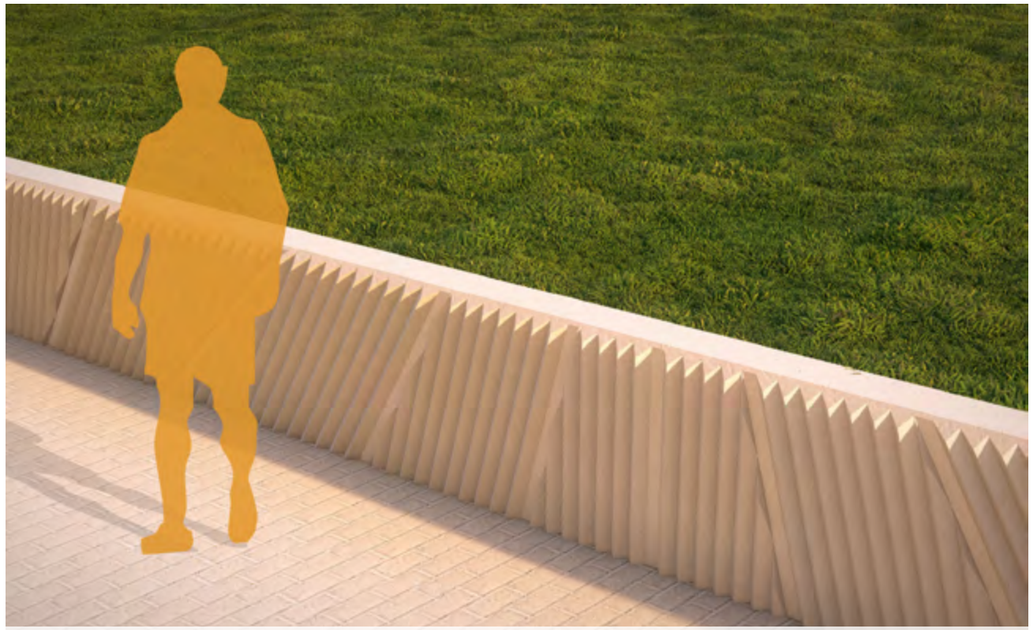
WALLS

Walls may be required at certain moments along the Emerald Trail. Retaining walls may be needed to hold back soils and prevent erosion, while protective walls can be used to safeguard trail users from motorized vehicles on high speed and high volume roads.

Wall Design

- Walls along the Emerald Trail may be constructed from regionally-sourced limestone block (preferred) or cast-in-place concrete.
- Cast-in-place concrete walls taller than 12” should use either the McCoys Creek or Hogans Creek textural formliner (see page 63), depending on the location of the wall.

Limestone Block



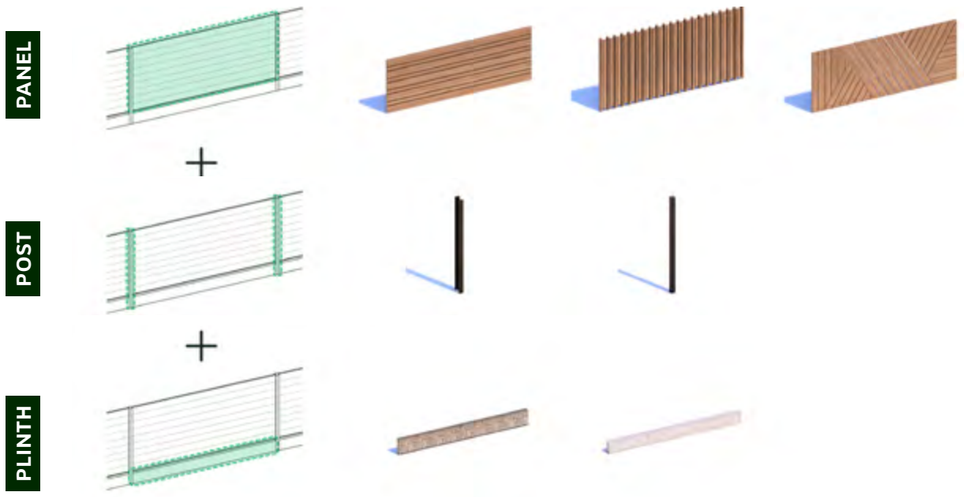
Typical Retaining Wall with McCoys Creek Concrete Formliner

TRAIL FENCING

Fencing may be necessary at various points along the Emerald Trail alignment to screen adjacent property or facilities, and will require coordination with adjacent property owners. Along the Green Alleys, in particular, privacy fencing will be critical. The modular approach illustrated here provides optionality for design variations across different moments along the trail. Specific fence designs will need to be further developed by individual design teams in consultation with adjacent property owners.

The modular fence system illustrated here consists of three elements: **plinths**, **posts**, and **panels**.

Plinths provide vertical separation between wooden fence elements and the ground, preventing contact with soil and prolonging the life of the fence. They also provide a clean, solid base for the fence, which simplifies maintenance and creates a visual datum that reinforces the linearity of the trail. Plinths may be made from cast-in-place concrete, which may have a formliner finish similar to that of the Custom Concrete Benches (page 63), or from gabion baskets filled with materials such as local limestone or oyster shells. When designing fences, design teams should take care to ensure plinths do not create drainage impoundments or obstructions. Underdrains, weep holes, or alternative assemblies may be considered to mitigate this risk.



Plinth + Post + Panel Diagram

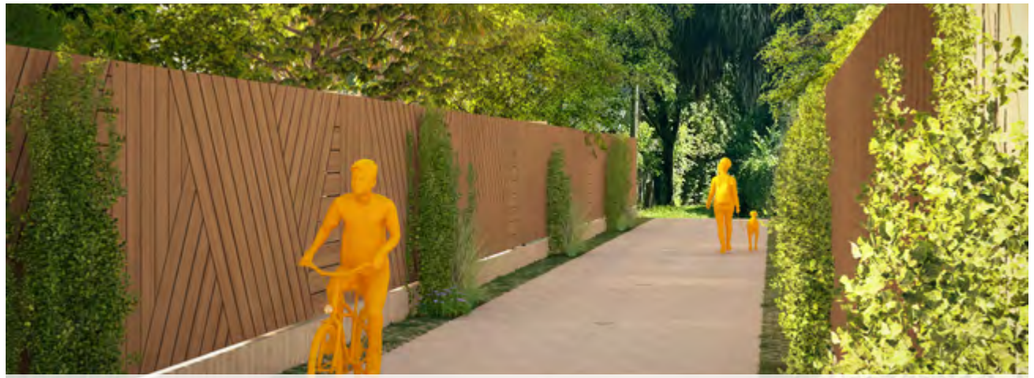
Posts provide the structural support for the fence panels. They may be wood or steel, and may be visible or obscured by the panels. If steel posts are used, they should be painted or powder coated with a 90% black to match with other dark-colored metals along the trail and surface mounted to the underlying plinth or footing with anchor bolts. If wood posts are used, they should be mounted in post-base brackets embedded in the fence plinth and allow for the replacement of a post without requiring the demolition or reconstruction of the entire fence assembly. Where possible, the spacing of posts should align to the jointing rhythm of the adjacent trail surface.

Panels are modular elements consisting of wood boards, creating an opaque screen. These guidelines provide illustrative examples of three different panel module design concepts.

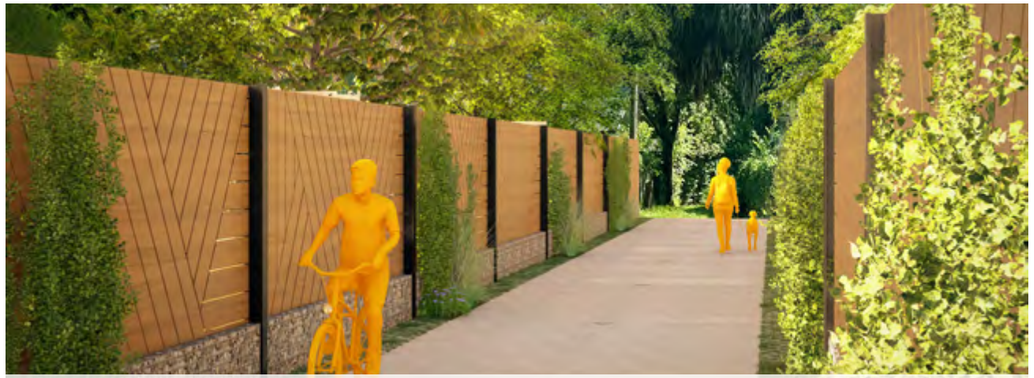
Design teams incorporating fences into a trail segment should coordinate early and often with adjacent property owners to understand preferences, use, access considerations, and other constraints. Where gates are required, they must not swing out into the Emerald Trail itself. Rather, cantilevered, sliding, or inward-swinging gate designs should be used.

Example Alley Fence Design using Post + Panel assembly

EXAMPLE FENCE CONFIGURATIONS



“Fan” Panel, Concealed Post, Concrete Plinth



“Fan” Panel, Wide Flange Beam Post, Gabion Plinth

Horizontal Panel, Vertical Wide Flange Post, Gabion Plinth

Horizontal Panel, Wide Flange Beam Post, No Plinth

Vertical Panel, Hollow Structural Steel (HSS) Post, Gabion Plinth

Veritcal Panel, Hollow Structural Steel (HSS) Post, No Plinth

TRAIL LIGHTING

Lighting along the Emerald Trail is essential to ensure safety and enhance the user experience.

Lighting and the On-Trail Experience

Trail lighting plays a key role in shaping the user experience on the Emerald Trail. Thoughtful lighting design not only improves visibility and security but also integrates harmoniously with the surrounding environment. The lighting approach should promote an enjoyable experience for trail users while minimizing disruption to the neighboring communities the trail passes through.

Safety

The safety of trail users is the primary concern when designing trail lighting. Proper lighting improves visibility, reducing the probability of an accident and making the trail safer for pedestrians and cyclists. Consistent illumination helps users feel secure, especially in areas with lower foot traffic or at night. When designating lighting locations, ensure that all key areas, such as intersections, alleys, and potential blind spots, are well-lit.

Light Pollution

While lighting is important to promote safety, it is important to minimize light pollution that might impact the environment and the neighbors of the trail. Excessive or poorly designed lighting can interfere with wildlife habitats, particularly in areas with sensitive ecosystems.

DarkSky and the Illuminating Engineering Society (IES) have identified five principles for responsible outdoor lighting:

1. Use light only *if* it is needed.
2. Direct light so it falls only *where* needed.
3. Light should be no brighter than necessary.
4. Use light only *when* it is needed.
5. Use warmer color lights where possible.

In summary: all lighting along the Emerald Trail should be useful, targeted, low level, controlled, and warm-colored.[9]

All lighting fixtures and installations along the Emerald Trail must be DarkSky Compliant.

9 DarkSky, Five Principles for Outdoor Lighting, https://darksky.org/resources/guides-and-how-tos/lighting-principles/

Example of Dark Sky Compliant lighting along a pedestrian path; Tom Lee Park, Memphis, TN

Landscape Forms Alcott

Landscape Forms Alcott (Elevation)

Luminance

- AASHTO recommends an average luminance of one-half to two (0.5 to 2) footcandles, noting that higher lighting levels may be required in some locations.
- Sidewalks, shared use paths, or similar facilities along FDOT facilities should have a an average luminance of two and a half horizontal footcandles (2.5 HFC).
- Lighting shall have an average illumination uniformity of 4:1, and maximum of 10:1.[10]
- The preferred lighting temperature along the Emerald Trail is 2200 Kelvin.[11] Lighting temperatures up to 3000 Kelvin are permissible where necessary due to manufacturer constraints.

Primary Pole-Mounted Lighting

- The primary pole-mounted lighting along the trail shall be the Alcott Light by Landscape Forms, twelve feet (12') tall, Version 3.
- Light fixtures should be powdercoated RAL 9011 - Graphite Black.

10 FDOT Design Manual section 231 - Lighting, Table 321.2.1 - Lighting Maintained Values.
11 DarkSky, "Values-centered outdoor lighting" https://darksky.org/resources/guides-and-how-tos/values-centered-outdoor-lighting/

TRAIL LIGHTING (CONTINUED)

Arne Light System

Arne Light System (Detail)

Secondary Pole-Mounted Lighting

- In areas where supplemental pole-mounted lighting and/or directional lighting is required, design teams may consider the Arne S Area Light by Landscape Forms.
  - » Trail lighting meeting minimum footcandle requirements should be provided by the Primary Pole Mounted lighting fixture (Alcott by Landscape Forms) or by bollards and/or wall-mounted lighting where space constraints require. Secondary pole-mounted lighting should be used sparingly, when direct illumination of specific elements, features, or spaces is required.
- Design teams may select the location, pole height, and amount and type of lenses depending on operational and contextual considerations.
- Secondary pole-mounted lighting should be powdercoated RAL 9011 - Graphite Black.

Historic Lighting

- Where communities and residents along the trail express a strong preference for historic ligthing treatments, design teams may consider the “Acorn” light fixture provided by JEA.
- Historic Lighting used along the trail should be modified with an upper shield to prevent uplighting and direct all light downward.
- Historic Lighting should be mounted on JEA standard concrete posts, not cast alluminum.

> Like other pole-mounted lighting, Historic Lighting must comply with all Dark Sky regulations, including luminance and temperature.

JEA “Acorn” Light Fixture

Bollard Lighting

- Bollards 99 058 K3 or 84 749 K3 by BEGA provide shielded asymmetric light distribution for visual comfort while illuminating the ground.
- Design teams may design the placement and height of the fixtures depending on operational and contextual considerations.
- Bollard lighting may be used to meet minimum illuminance requirements along Green Alleys, Neighborhood Greenways, or other areas where additional illuminance is required.
- Bollard light fixtures should be powdercoated RAL 9011 - Graphite Black.

Bollard 99 058 K3 by BEGA

Wall-Mounted Lighting

- Wall mounted lighting may be provided by the Lira 1.0 or 2.0 by Designplan.
- Wall-mounted lighting will be used on walls, fences, or on steps. Recessed lighting options may also be utilized where necessary.
- Wall-mounted lighting is the preferred lighting strategy along Green Alleys.
- Design teams may design the placement of the fixtures depending on operational and contextual considerations.
- Wall-mounted light fixtures should be powdercoated RAL 9011 - Graphite Black.

Lira by Designplan

OTHER FURNISHINGS

Water Fountains

- The Elkay ADA Water Fountain and Filling Station is the preferred water fountain along the Emerald Trail. The model provides ADA accessible drinking and bottle filling attachments.
- Dog bowls may also be included on water fountains.
- Water fountains should be strategically placed along the Emerald Trail, and are most appropriate at trailheads, park spaces, and at major intersections and destinations.
- On long segments with no obvious strategic placement, providing water fountains at a regular spacing may be desireable. In these instances, design teams should use their judgement as to an appropriate spacing considering context, segment length, and use.
- Drinking fountains should be powder coated matching RAL 6005 - Moss Green.

Elkay ADA Water Fountain and Filling Station

Bollard

- The R-8460 Stainless Steel Bollard by Reliance Foundry is preferred.
- Crash rated bollards are not required for all instances but should be considered at intersections to protect trail users from cars.
- Consider removable bollards for areas of the trail that may need vehicular access for maintenance.
- Bollards shall be a brushed stainless steel finish with white reflective striping.

Reliance Foundry Stainless Steel Bollard

Pet Waste Stations

- The DOGIPOT by Belson is the preferred pet waste station.
- Pet Waste Stations should be placed where needed, taking into consideration context, use, and maintenance.

Belson Parts DOGIPOT Pet Waste Station

SHADE STRUCTURES

In Jacksonville's hot, humid climate, shade is critical for creating a trail environment that is comfortable and inviting year-round.

Ideally, shade will be provided by trees; however, there may be instances along the trail where trees are not feasible. In these instances, design teams may consider shade structures.

- The preferred shade structure system for the Emerald Trail is the Rough&Ready Shade system by Streetlife. This system provides extensive optionality for different structure configurations, sizes, and amenities and can be adapted for different trail conditions and sites.
- Shade structures may be placed above a rest stop or furnishing zone to the side of the trail. Shade structures should not be placed directly above the trail itself.
- Shade structure siting and placement should take into consideration all required trail clearances and offsets.
- The shade structure frame should be powder coated steel matching RAL 6005 - Moss Green.
- Climbing vines and plantings may be incorporated into the shade structure to create additional shade, habitat, and aesthetic value.

Example configuration of Rough&Ready Shade Structure with integrated bench, by Streetlife

TRAIL PULLOFFS

Rest and stopping areas along the trail are key to providing a comfortable trail experience year round.

Layout and Materials

- Trail pulloffs should be directly connected to the Emerald Trail with a flush transition along the entirety of the connection.
- Trail pulloffs should be paved using Paver Type 2.
- The side of the pulloff area facing oncoming trail traffic should be angled so as to create a beveled transition area between the trail and the pulloff area (see plan on opposite page).
- Pavers should be restrained with steel edging bolted to a concrete subslab.
  - » Steel edging should be painted or powder coated to match RAL 9011 - Graphite Black.
- The depth and length of trail pulloffs will vary depending on the spatial requirements of the elements and furnishings located within the pulloff.
- A 2' clear should adjacent to the trail must be maintained when determining the placement of furnishings within a trail pull off.

Elements

Trail pulloffs may include any combination of trail elements mounted in paved areas, including:

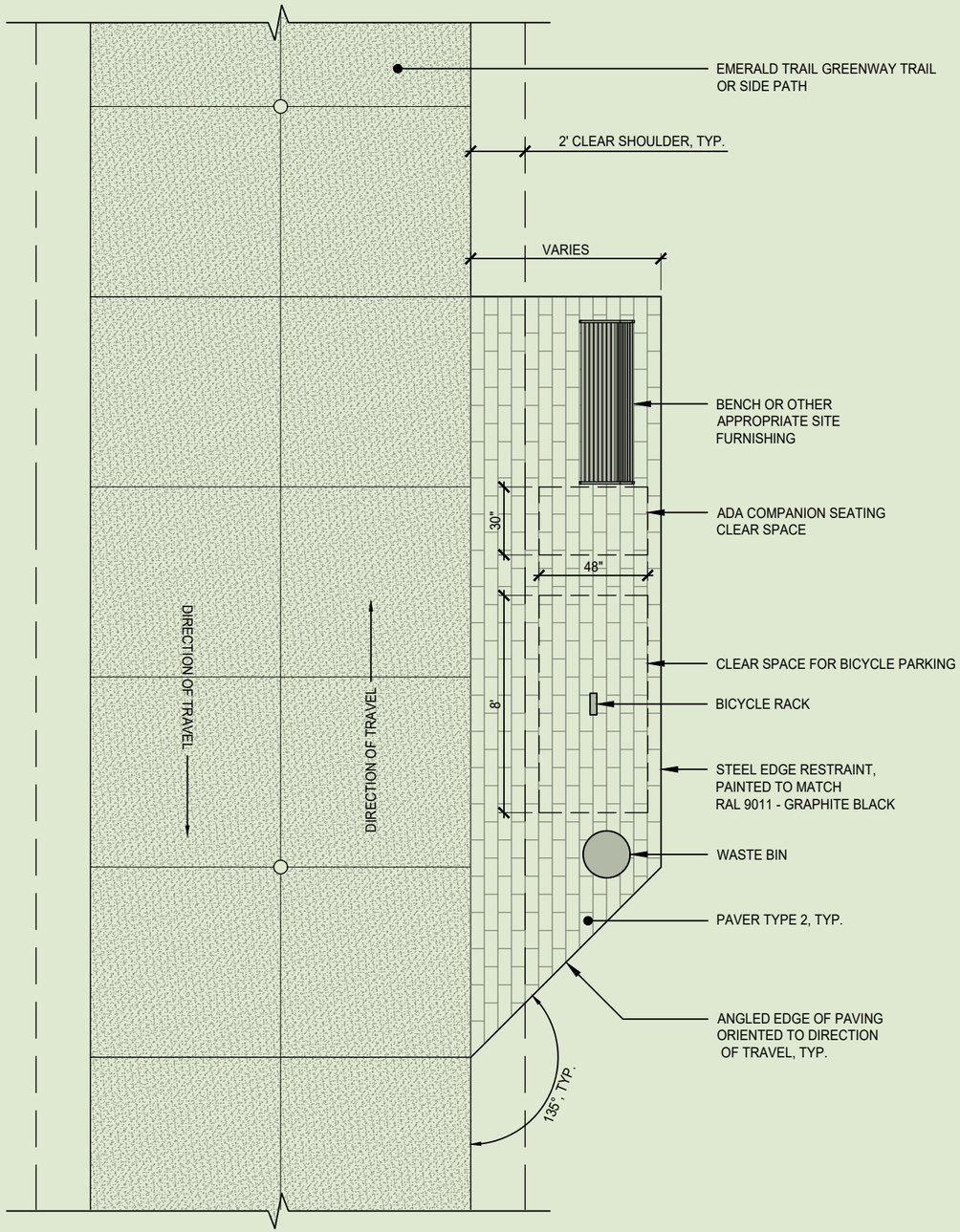
- Benches, tables, and chairs
- Waste bins
- Water fountains
- Bicycle parking and bicycle repair stations
- Intepretive, informational, or directional signage
- Shade structures

When combining different elements in one furnishing zone, design teams should consider program and use compability. Furnishings should be located and spaced within the pull off taking into account any required or recommended clearances or offsets. This includes clearances for ADA companion seating adjacent to provided benches, and clear space for ease of wheelchair manuvering.

Spacing

Spacing of both trail pulloffs and the elements within them will be highly dependent on context. Basic parameters for some specific furnishings are provided below; design teams should use their judgement and place design elements and pulloffs based on context, use, and community input.

- Seating elements should be provided at least every quarter mile (0.25 mi).
- Water fountains should be placed at key intersections and destinations such as trailheads, park entrances, and plazas. On long stretches of trail where these obvious desitnations do not exsit, water fountains may provided every half-mile to mile, depending on the surrounding context and user volumes.
- Waste bins should be placed at trailheads, destinations, gathering places, or any other high traffic areas along the trail. Beyond these points, waste bins should be placed according to trail traffic, need, and maintenance capacity.
- Bicycle parking should be provided at major desitnations along the trail.



TRAIL SIGNAGE AND WAYFINDING

SIGNAGE AND WAYFINDING APPROACH

The 2019 Emerald Trail Master Plan provides branded signage and wayfinding concepts that have since been further developed and modified in the course of early trail implementation. This section clarifies and codifies a system of different sign types used along the Emerald Trail.

Design Language: Panels, Poles, Frames

The signage and wayfinding system presented here (see following spread) uses panels, poles, and frames to create a flexible, modular system capable of accomodating a wide variety of signage needs while complying with accessibility requirements. The system consits of four primary signage types:

- **Trail Information Signs** are large format, kiosk-style signs large enough to provide multiple forms of information, such as maps, park rules, or local history. They may be placed at trailheads, key intersections, or at destinations along the trail.
- **Interpretive Signs** are small-format panel-based signs that provide information on local history, ecology, culture, or other features of interest. They may be either freestanding or rail-mounted.
- **Pole-Mounted Signs** primarily provide directional information, such as the directions to nearby destinations. They may also provide information such as trail rules, maps, or trail segment names. Pole mounted signs are constructed from interlocking lengths of pole to create a flexible, modular system capable of hosting multiple forms of information.
- **Directional Bollards** provide additional directional guidance to trail users at intersections and moments where the trail alignment may be unclear.

Materials and Color

Powder coated steel is the preferred material for Emerald Trail signage components, however signs may also be constructed from aluminum provided aluminum with a high-recycled content is used.

Panels containing information may be engraved and/or painted metal or printed on high-pressure laminate board.

- Structural components of Emerlad Trail signage (posts, frames, etc.) should be powder coated matching RAL 9011 - Graphite Black.
- Panels containing information such as text or maps should match RAL 6024 - Traffic Green.
- All text on Emerald Trail signs should be white.

Text and Graphic Design

Text layout and graphic design standards are beyond the scope of this document. Design teams should consult with Groundwork Jacksonville on development of graphics and layouts for individual sign panels, and refer to the Emerald Trail Branding Standards as needed.

Accessibility

When placing signage, design teams should take care to ensure compliance with all accessibility requirements, including requirements regarding clear space, circulation paths, protruding objects, and considerations for those with visual impairments.

All wayfinding signs along the Emerald Trail must comply with the Americans with Disabilities Act (ADA).

All signage should be secured to footings designed by an engineer licensed in the state of Florida.

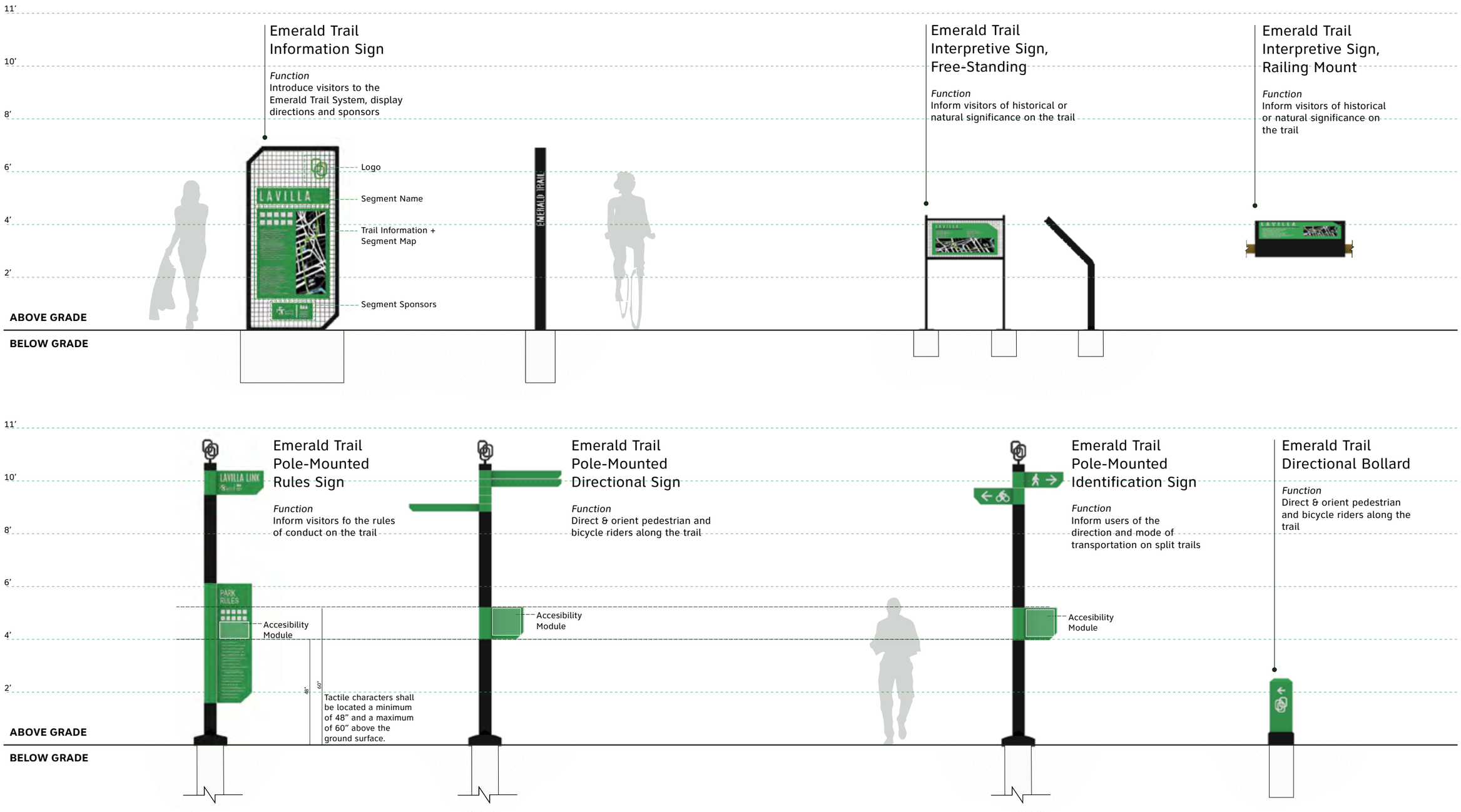
Trail Information Sign

Pole-Mounted Sign

Interpretive Sign

Directional Bollard

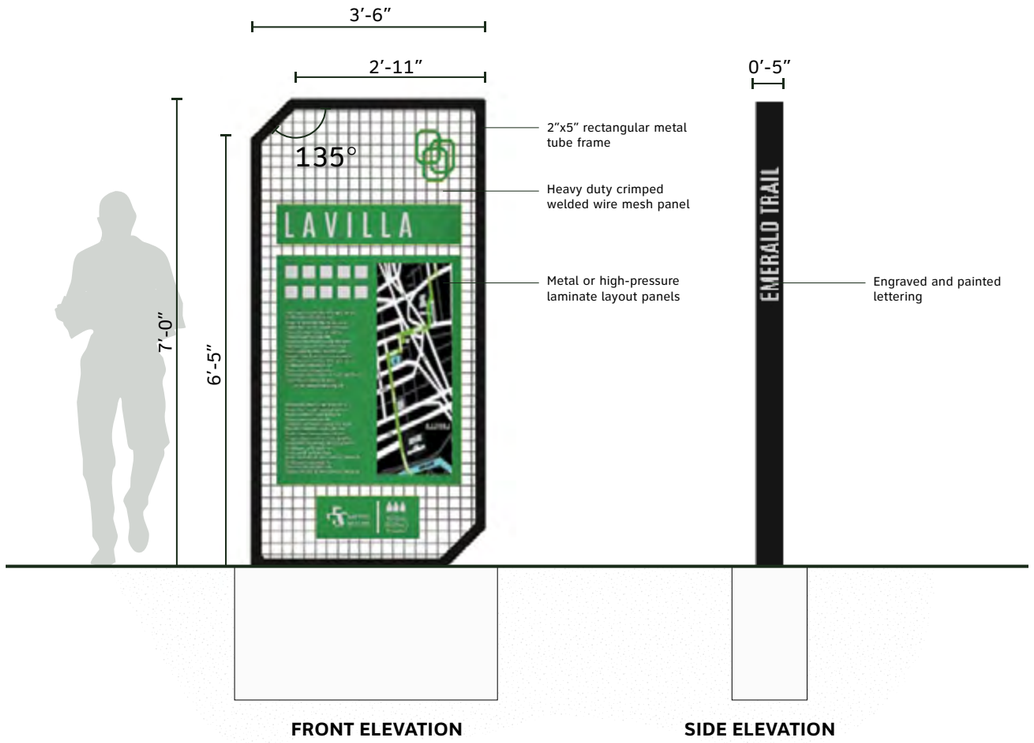
EMERALD TRAIL SIGN TYPES



TRAIL INFORMATION SIGNAGE

Kiosk-style Informational Signs host a wide range of trail information with a flexible modular panel system.

- The Informational Sign consists of a two inches by five inches (2” x 5”) steel or aluminum rectangular tube frame and a heavy duty crimped welded wire mesh mounting panel.
  - » The frame and welded wire mesh panel should be powder coated matching RAL 9011 - Graphite Black.
- All metal components should have eased edges to remove burrs or other sharp angles.
- Information is included on signage panels mounted to the welded wire mesh panel. Signs can include trail and segment information information, trail and park rules, maps, notices, interpretive information, donor information, or other content.
  - » Sinage panels should match RAL 6024 - Traffic Green.
- Informational signs should be mounted in paved areas adjacent to the trail to allow trail users to approach and interact with the sign.



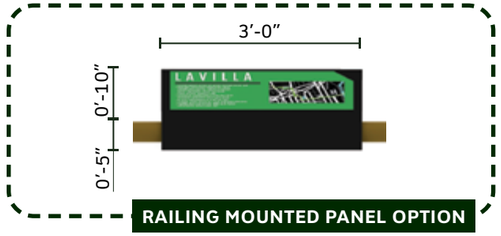
FRONT ELEVATION

SIDE ELEVATION

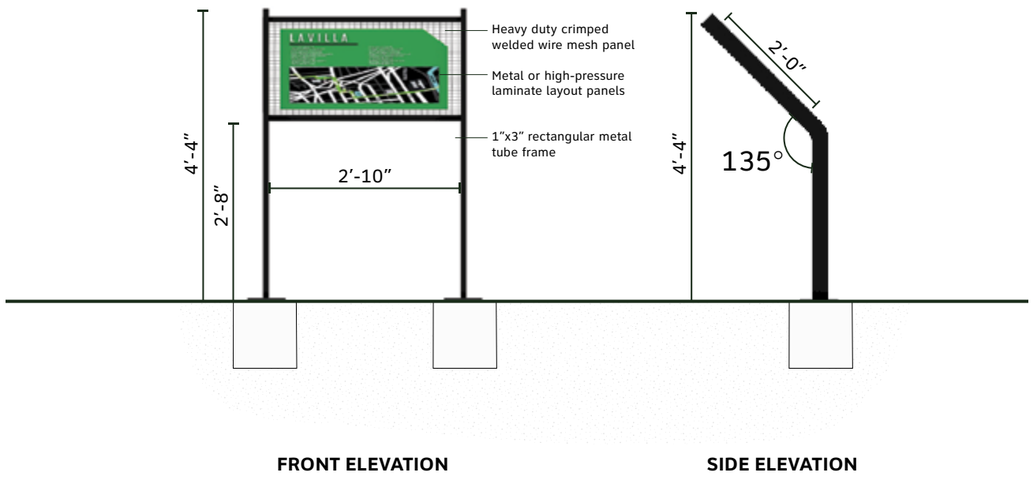
INTERPRETIVE SIGNAGE

Interpretive Signs highlight local history, culture, ecology, or other features of interest along the trail.

- Interpretive Sign frames consists of a steel or aluminum frame and heavy duty crimped welded wire mesh.
  - » The cross sectional dimensions of the support posts are one inch by three inches (1” x 3”).
  - » The cross sectional dimensions of the horizontal cross bars are one inch square (1” x 1”).
- All metal components should have eased edges to remove burrs or other sharp angles.
- Signage panels are mounted to the welded wire mesh frame.
  - » Sinage panels should match RAL 6024 - Traffic Green.
- Interpretive signage panels may also be mounted to railings.
- The width and configuration of Interpretive Signs may vary depending on the needs of the information being communicated and the constraints of the site, however a minimum of thirty inches (30”) clear should be maintained between the two support posts to provide clear knee space for those using wheelchairs.
- Interpretive Signs should be mounted in paved areas adjacent to the trail to allow trail users to approach and interact with the sign.



RAILING MOUNTED PANEL OPTION



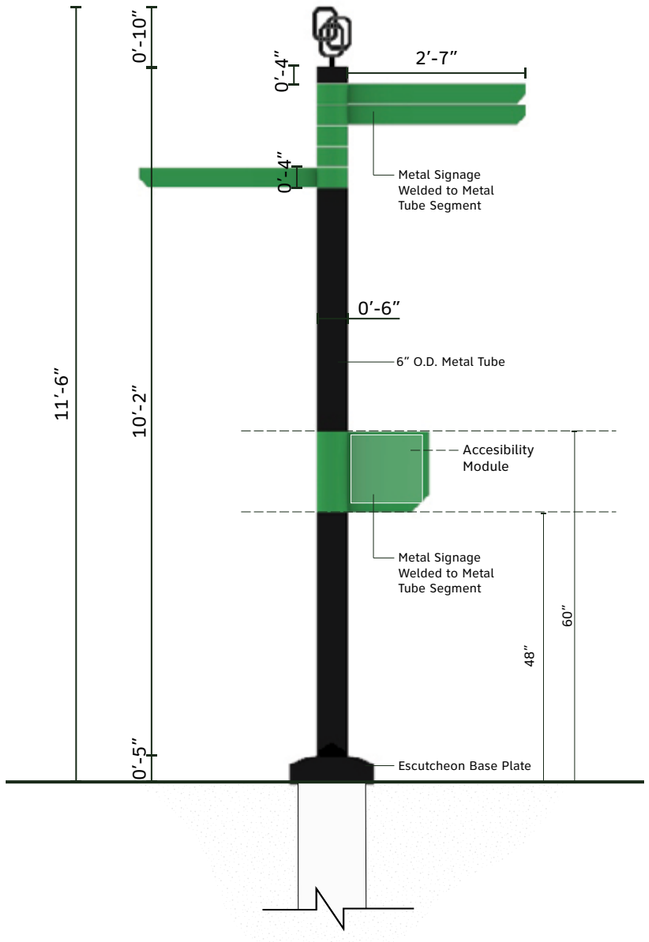
FRONT ELEVATION

SIDE ELEVATION

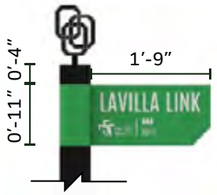
POLE-MOUNTED SIGNAGE

Pole-Mounted Signage provides directional cues to trail users. A modular kit of different directional panels may be mixed and matched as needed.

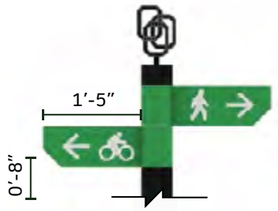
- Pole placement and construction should follow any applicable MUTCD requirements for poles within the clear zone. If required, a breakaway base may be concealed beneath an escutcheon plate.
- Design teams should place pole-mounted signs to avoid the creation of ADA conflicts related to protruding objects or pole-mounted signs.



FRONT ELEVATIONS



Pole-mounted Trail Identification Panel



Pole-mounted Traffic Delineator Panel

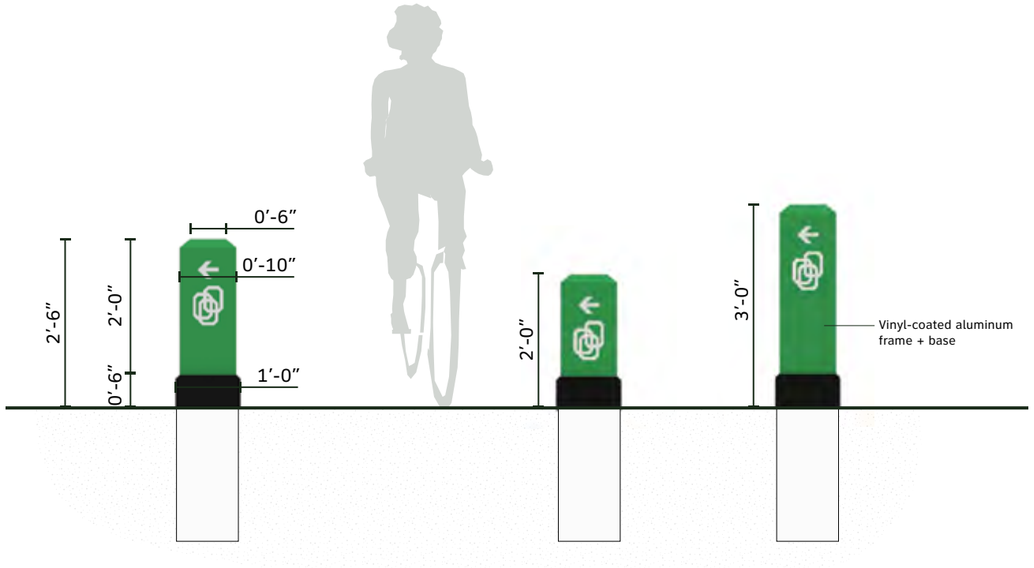
Pole-mounted Sign Panel

DIRECTIONAL BOLLARDS

Directional bollards reinforce and clarify trail wayfinding at the ground plane. They may be especially useful in settings where the trail alignment is unclear or where space or visibility constraints prevent the installation of larger sign types.

- Existing installations of these bolllards along the LaVilla Link serve as a model for Directional Bollard design.
- Directional bollards are fabricated from vinyl-wrapped aluminum.
  - » The green used for bollards should match RAL 6024 - Traffic Green.
- Directional bollards should be placed in planting areas adjacent to the trail, at least twenty four inches (24”) from the nearest edge of paving.
- The height of the bollard may be modified to ensure visibility above planting.
- Directional bollards may be particularly appropirate at intersections and in Neighorhood Greenways.

Directional bollards should not be installed within the trail circulation path or in any clear shoulders or buffer zones required by the trail configuration.



FRONT ELEVATIONS

SIGN PLACEMENT STRATEGIES

Considerations for Sign Placement

The Emerald Trail Signage and Wayfinding System's primary goal is to direct and orient trail users along the trail. Design teams should consider destination locations and common decision points along the trail when siting different sign types.

All regulatory signage along the Emerald Trail must comply with the Manual on Uniform Traffic Control Devices (MUTCD)

Placement Requirements for Directional Signs

In order to reduce sign clutter, directional signs must be strategically placed to consider the needs of bicyclists and pedestrians. When placing directional signs, destination locations will determine the sign location and messaging.

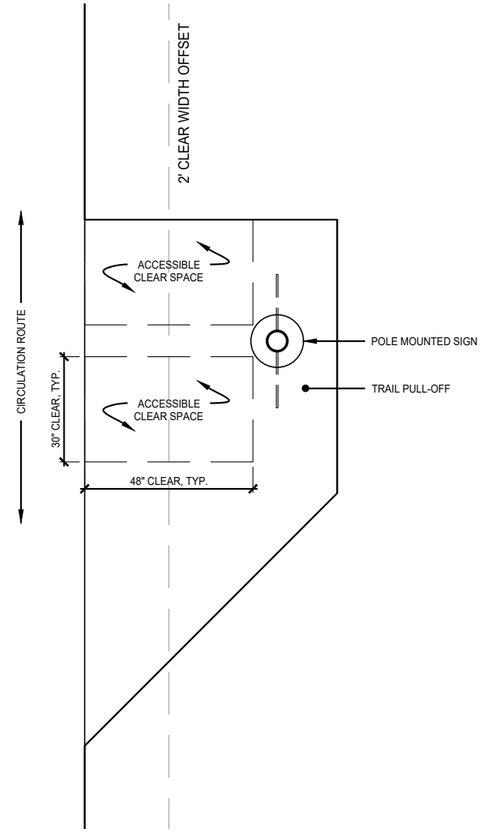
Bicycle and Pedestrian directional signs on the Emerald Trail should be placed no farther than one-and-a-half (1.5) miles from the identified destination.

MUTCD Distance Regulations

- **Distance From Trail:** The nearest edge of any potential obstruction including signs should be a minimum of two feet (2') from the edge of the trail.
- **Distance from Regulatory Signs**: Regulatory signs hold a higher priority over wayfinding signs. Trail signs must be no less than seventy five feet (75') away from regulatory signs.
- **Distance from Road:** The nearest edge of any potential obstruction including signs should be a minimum of two feet from the edge of the road. Signs must also be placed one hundred feet (100') away from turn lanes and road entrances.

ADA Distance Regulations

- **Distance From Trail:** Signs must be placed a minimum of two feet (2') from the trail's circulation path.
- Directional and Interpretive Signs should be centered at the back of a 30" by 48" minimum clear ground space. This ensures adequate clearance for people who use wheelchairs or other mobility devices. The clear space may not overlap with the trail width but may overlap with a resting space.



ADA Clear Space and Sign Placement

SIGN TYPE	FUNCTION	PLACEMENT
Emerald Trail Informational Signage	Direct and orient pedestrians of the segment's name, points of interest, map, amenities, and trail rules	Trailheads, trail entrances, trailside plazas and park entrances, key destinations and high traffic areas.
Emerald Trail Interpretive Signage	Inform trail users of moments of historical, culutural, or ecological significance along the trail	At or near locations of historical, culutural, or ecological significance. May be freestanding or rail mounted.
Pole-Mounted Trail Identification Panels	Identify the trail segment currently being traveled	At intersections, trail entry points, or other locations where deemed appropriate.
Pole-Mounted Directional Panels	Direct and orient trail users to nearby destinations	Directional Signs may be strategically placed 0.5, 1.0, and 1.5 miles from the destinations indicated in the signs and at decision points along trail.
Pole-Mounted Traffic Delineator Panels	Communicate and reinforce modal separation and use	Between the bicycle and the pedestrian path on Cycle Tracks and other split-trail conditions. Use at intersections, trailheads, where the trail transitions to a split-trail condition.
Pole-Mounted Signage Panels	Provide trail rules, maps, or other information	Secondary trail entrances, or other contexts where Trail Information Signs are not apporpriate or feasible. Note: Accessibility panels must not protrude into circulation paths. See ADA §307.2 and §307.3
Pole-Mounted Accessibility Panels	Provide trail information in Braille for users with visual impairments	Wherever pole-mounted signage is provided, to the greatest possible extent. Note: Accessibility panels must not protrude into circulation paths. See ADA §307.2 and §307.3.
Directional Bollards	Clarify and reinforce trail alignment and wayfinding	Intersections, decision points, and along continuous trail segments. Frequency and quantity will vary based on trail conditions.

Sign Placement Matrix

ACCESSIBILITY NEEDS

Designing for accessibility for all is essential for the Emerald Trail. The signs included in these guidelines align with MUTCD and ADA requirements and strive to provide even greater accessibility across the Emerald Trail. Design teams must follow the considerations and guidelines outlined below:

1. High Contrast Messaging
For signs to have appropriate readability, there must be a 70% contrast between the background and messages.

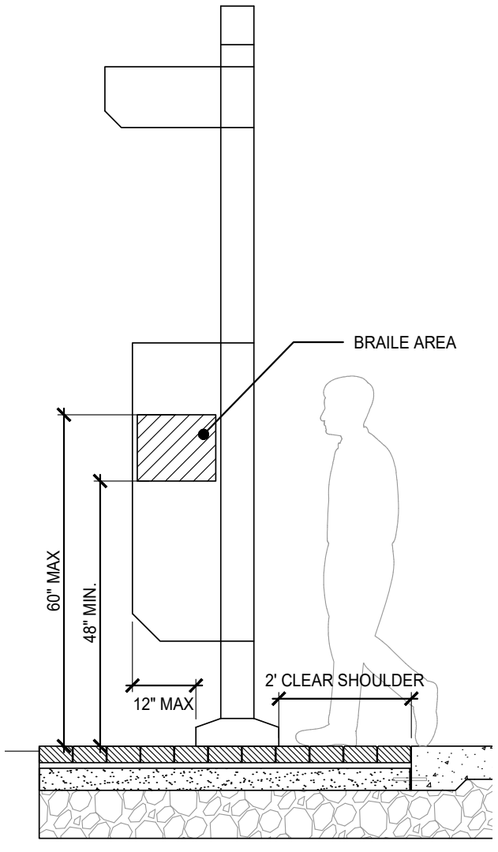
2. Raised Copy and Braille
Pedestrian signs, including Interpretive signs, along the Emerald Trail must have raised tactile copy and accompanying Grade 2 braille translation. Raised copy must be at a minimum of 1/32” in depth and be an uppercase, sans serif font.

3. Height and Clearance Considerations
Pedestrian signs must be centered to the back of a 30” by 48” minimum, clear ground space to ensure adequate clearance for people who use wheelchairs.

Tactile characters on signs shall be located a minimum of 48“ above the ground surface, measured from the baseline of the lowest tactile character, and a maximum of 60” above the finish floor or ground surface, measured from the baseline of the highest tactile character.

4. Text Size
Signs intended for bike users must have text that is at minimum 2” in height. Pedestrian signs may have text that ranges from 5/8” to 2” in height.

5. Icons for Universal Readability
Using icons that are approved by the MUTCD ensures that universal readability is maintained along the trails.

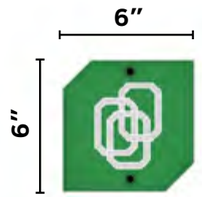


Sign distance from Trail

RETROFITTING

Due to the nature of the Emerald Trail passing through existing urban environments, it will often utilize sidewalks, boardwalks, and paths already in place. In these cases, existing elements can be retrofitted with small Emerald Trail-branded signage, helping to integrate them into the larger trail system.

BRANDED TRAIL EMBLEMS
Small Emerald Trail emblems may be surface mounted to existing signs or other suitable surfaces, such as posts, walls, or railings. These emblems serve as visual markers, helping users identify existing areas as part of the trail, reinforce wayfinding, and enhancing overall cohesiveness.



Surface Mounted Sign on Retrofitted Trail

MUTCD GUIDANCE

Other than sign placement, the Manual on Uniform Traffic Control Devices (MUTCD) has regulations that are incorporated in the Emerald Trail Signage and Wayfinding System. While laying out destinations on directional signs and throughout future design phases, implementing agencies will need to consider MUTCD regulations to provide trail users with a safe environment.

LIST OF REGULATIONS

1. Bicycle Symbol
A bicycle symbol indicates to trail users that they are on a bike route. On bicycle birectional signs, a bicycle symbol shall be placed next to each destination or at the top of the sign to a group of destinations.

2. Sign Face
MUTCD signs must use retroreflectorization.

3. Arrow Direction
An arrow pointing to the right, if used, shall be at the extreme right side of the sign. An arrow pointing left or up, if used, shall be at the extreme left side of the sign. Only MUTCD approved arrows may be used on bicycle directional signs. Arrow directions always are ordered up, right, then left.

4. Distance Numerals
The distance numerals shall be placed to the right of the destination names. When adding travel time to signs, a “no-sweat” pace of 10 mph or six minutes per mile should be used.

5. Typefaces & Text Height
Messages must be 2.5” in height. Only MUTCD approved typefaces may be used on directional signs. These guidelines use ClearviewHwy 2-W.

6. Height of Sign Panel
Lowest sign panel edge must be seven feet above finish grade.

7. Breakaway Base
MUTCD signs must have a breakaway base.

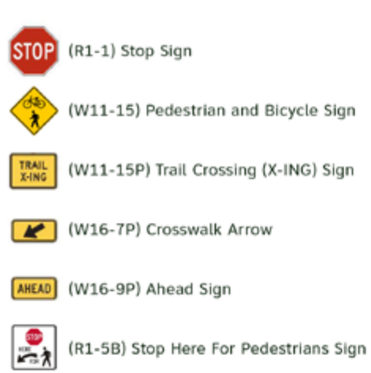
REGULATORY SIGNS
The MUTCD, published by the Federal Highway Administration (FHWA), is a compilation of national standards for traffic control devices on all public streets, bikeways, and private roads created to help people navigate roadways and bikeways safely. The following briefly summarizes signs typically used as part of a shared-use trail system.

(R1-1) Stop
Stop signs indicate that drivers must come to a stop and yield to pedestrians and approaching vehicles before proceeding. They should be used in locations where a minor road or trail intersects with a main road or trail, unsignalized intersections, or locations with high speeds, restricted views, or as determined by crash records.

(W11-15) Pedestrian and Bicycle
The W11-15 sign is a vehicular traffic warning sign and may be used to alert road users to locations where unexpected entries into the roadway by bicyclists and pedestrians may occur.

(W11-15P) Trail Crossing (X-ING)
TRAIL X-ING is a supplemental plaque that may be mounted below the W11-15 sign. The sign may be used where both bicyclists and pedestrians will be crossing the roadway, such as at an intersection with a multi-use trail.

(W16-7P) Crosswalk Arrow
The downward pointing arrow is a supplemental plaque that may be mounted below the W11-15 and W11-15P signs to point to where pedestrians and bicyclists might be crossing the roadway. Left and right options are to be utilized depending on the crossing orientation.



MUTDC Signage

(W16-9P) Ahead
The AHEAD plaque may be used to supplement W11-15 and W11-15P signs to provide advance warning of pedestrian and bicyclist crossings. When used with a warning sign, the W16-9P sign shall have the same legend, border, and background color as the warning sign with which it is displayed.

(R1-5B) Stop Here For Pedestrians
R1-5B signs are to be utilized if stop lines are used in advance of a marked crosswalk that crosses an uncontrolled multi-lane approach.

(R4-7, R4-8) Keep Right and Keep Left
R4-7 or R4-8 signs should be placed where it is necessary for traffic to pass only to the right- or lefthand side of a roadway feature or obstruction, such as a raised pedestrian refuge island.

(R10-15) Turning Vehicles Yield to Pedestrians
R10-15 signs are to be utilized to remind drivers making a turn to yield to pedestrians.

(R10-3) Pedestrian Signal Information
The R10-3 series of signs may be used to improve pedestrian experience at signalized intersections by highlighting the pedestrian signal types and information.

(W10-2, W10-3) Adapted Railroad Grade Crossing Warning
Some states (Colorado and Virginia) have adapted forms of the parallel railroad grade crossing signs (W10-2 and W10-3) to warn road users making turns that they will encounter a shared-use trail crossing soon after making the turn.

- Note: The MUTCD requires oversized signs at some locations where there are multiple lanes, high speed limits, or high traffic volumes.

PLANTING & GREEN INFRASTRUCTURE

PLANTING APPROACH

In recent decades, climate change, biodiversity loss, and design innovation have ushered in new approaches to planting design in urban contexts. These approaches ask more of both planting designs and their designers than ever before.

Planting along the Emerald Trail should be functional, low-maintenance, regionally appropriate, and clearly defined. The guidelines outlined here draw inspiration from the historic landscapes and indigenous plant communities of northeast Florida, translating wild plant communities into horticultural plant communities that can thrive in Jacksonville's urban conditions.

Functional Planting

Planting should be beautiful, but it should also be designed to meet sustainability and performance goals. Diverse, native plantings can provide lifecycle benefits for a wide range of native wildlife. Planting and green infrastructure facilities can support management of both stormwater quality and quantity. Trees can and should be selected to maximize shade and thermal comfort in both hot and cool seasons. Design teams should consider the performance needs and opportunities of each trail segment in developing planting designs.

Low-Maintenance

At more than 30 miles, the sheer scale of the Emerald Trail system demands that planting designs be self-sustaining and easily maintained with limited resources. Planting strategies should rely on durable and robust grasses, trees, and shrubs that can endure in harsh urban soils and environments with limited care. Plantings should also be resilient to climate shocks and stresses, and care should be taken to select species that can withstand extreme heat, disease, and flooding. Special consideration should be given to planting in areas potentially exposed to brackish floodwaters, which can kill plant species not specifically adapted to saltwater inundation.

Enhancing Jacksonville's urban tree canopy is key to maximizing trail comfort and usability year-round

Regionally Appropriate

Planting design should be inspired by the regional ecology of northeast Florida, and planting combinations should draw cues from self-organizing plant communities in undisturbed, ecologically healthy spaces in and around Jacksonville. Such regionally-inspired planting design supports the use of plant species that are well-adapted to the local climate and soil conditions that can meet resilience and sustainability performance goals, as well as reinforces regional identity and sense of place. Native plant species should be prioritized at all times.

Clearly Defined

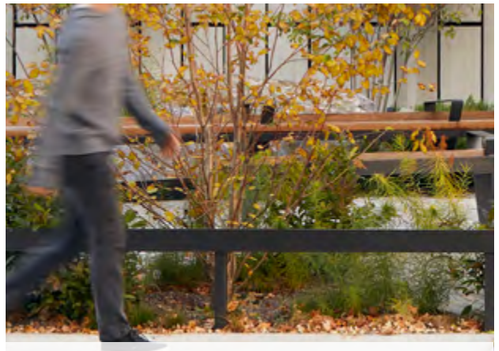
At the same time, planting designs along the Emerald Trail should not try to mimic or imitate naturally-occurring plant communities and landscapes. Rather, planting designs should abstract and translate the patterns and structures of self-organizing plant communities into legible, easily understood designs, taking into account factors such as maintenance, urban context, and spatial and functional requirements. Most importantly, planting designs and planting areas should have obvious "cues to care" that signal that the planted area is an intentionally designed, cared for space. These cues can include clear edges and bedlines reinforced by elements such as curbs and plant railings, simplified plant palettes with evident structural layers and strong textural contrasts, and designing for four-season interest.

Recommended Reading

- *Planting in a Post-Wild World*, Claudia West & Thomas Rainer, 2015.

Regional landscapes like Timucuan National Park can provide inspiration for planting designs

Florida-native plant species are well adapted to Jacksonville's climate and provide multiple benefits for urban ecosystems



Plant railing and thoughtful edge treatments enhance the legibility of planted areas

PLANTING DESIGN CONSIDERATIONS

Planting design begins from the ground up, from soils to thoughtfully layered, densely spaced functional plant groupings and combinations.

Soils

Urban soils are notoriously ill-suited for horticultural use, and are often heavily compacted, low in organic matter, and often laden with debris, rubble, and contaminants. At the same time, many native plant species are adapted to thrive in poor, nutrient-starved soil environments. Judicious selection of stress-tolerant native plant species may reduce the need to import nutrient-rich horticultural soils, although proper remediation measures should be taken where contaminants are present.

- All planting soils should be covered by a two-inch (2") layer of pine-straw mulch at the time of installation.

Layering

Planting designs should consist of multiple vertical layers, each performing a different function within the overall design.

Groundcover or **matrix layers** consist of low-growing, evergreen or semi-evergreen species planted at a high density. These plants act as a "green mulch" that "hold the ground," minimizing erosion and washout and suppressing the establishment of competing weed species.

Theme or **seasonal interest** layers consist of mid-level perennials, grasses, and shrubs that provide interest such as flowers, foliage, and seedheads. Theme layers should be selected and combined to provide visual interest and wildlife value through all four seasons.

Structural layers consist of clumping grasses, shrubs, and/or trees that define spaces and create fixed, year-round structural elements in the landscape.

A successful planting design will include all three of these layers, each serving its different functional role within the composition. Together, these layers support and reinforce one another, provide year-round visual interest, and reduce maintenance demands.

Plant Spacing & Installation

- Generally, grasses and perennials should be planted at 12"-18" on-center in triangular spacing to ensure complete ground coverage and minimize competition from wind-borne weeds. Tree and shrub species will be planted at much wider spacings depending on growth habit, context, and functional requirements.
- Plants should be sized and spaced to minimize bare earth or mulch exposure from day one.

Sourcing

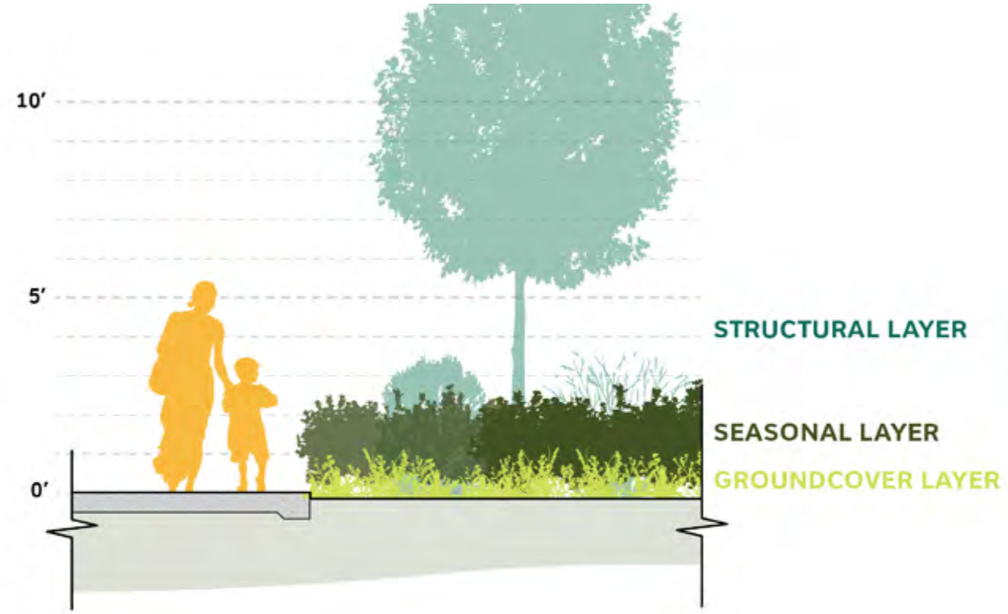
Not all plant species are identical, especially native species grown from seed. Considerable genetic variation can exist across species populations from different parts of the country.

- Wherever possible, plant species should be sourced from licensed growers and nurseries in Florida, Georiga, South Carolina, or the Gulf Coast to ensure the procurement of ecotypes that are regionally-adapted to Jacksonville's climate.

> All plants sourced for the Emerald Trail should comply with the 2022 Florida Grades and Standards for Nursery Plants published by the Florida Department of Agriculture and Consumer Services.

Plant Protection

Plant protection sends a visual cue to trail users that the planting area is a separate, cared for space that should not be walked on or trampled through.

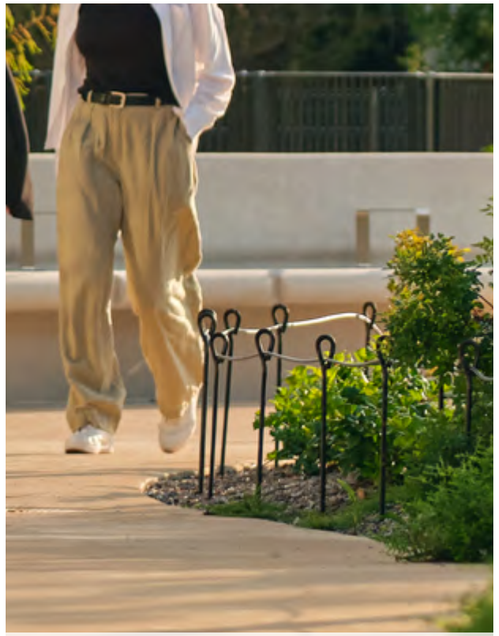


Layered Approach to Planting Design

This is especially important during the first few years after a planting design is installed, when young plants are still establishing and developing their root systems.

A stake-and-cable plant protection system consisting of helical earth anchors and steel cable should provide an adequate protection in most instances along the Emerald Trail. Alternatively, rollout dune-style fencing may be used to create a clean edge between planting and lawn spaces in park spaces where a more naturalistic aesthetic is desired. In more heavily trafficked areas, a sturdier plant rail system comprised of steel bars and tube sections may be required.

- Planting areas created as part of the Emerald Trail should be clearly delineated from pedestrian areas through the use of vertical protective elements such as plant rails or low fencing.



Plant protection is critical in high-traffic areas

CONSTRAINTS

Planting design in urban contexts is defined by constraints such as poor soils, limited space, and regulatory considerations. Design teams developing planting plans for the Emerald Trail should be mindful of these constraints early in the design process.

Minimum Planting Areas and Soil Volumes

Urban street trees need access to approximately one-thousand cubic feet (1,000 ft^3) of continuous uncompacted soil to thrive and reach full maturity.[1] Design teams should consider available soil volumes when proposing new tree plantings. In highly urban context or paved settings, design teams should consider the use of suspended paving or structural soil systems to provide adequate soil volume.

Planting areas along the Emerald Trail should be a minimum of three feet (3') in their shortest dimension.

- Tree pits along the Emerald Trail should be a minimum of five feet (5') in their shortest dimension. Tree pits in paving should be sized to be as large as possible, and the use of continuous tree pits with multiple trees per planting area is encouraged.

Buildings and Structures

Design teams should exercise discretion when placing street trees near buildings. In urban contexts, it may be desirable to place large canopy trees within a short distance to a building footprint. In less developed or more residential contexts, design teams should provide more space between smaller structures and canopy trees expected to grow to a mature height. Design teams should also consider the foundation type, age, and condition of adjacent buildings.

1 See James Urban, *Up By Roots: Healthy Soils and Trees in the Built Environment*, 2008.

Trees need access to approximately 1,000 ft^3 of uncompacted soil to reach their full potential[1]

Trees and planting areas should not be placed in front of building entrances or in a locations that block clear egress from buildings to the curb.

Utilities

All above- and below-ground utilities should be documented on base surveys at the beginning of segment design and should be indicated in all planting plans prepared for the Emerald Trail. Design teams should coordinate early and often with JEA to understand site and facility-specific restrictions on plant placement with respect to above- and below-ground utilities that may be present at a given site.

- Generally, trees should never be planted beneath overhead electric lines and should be kept at a distance from utility infrastructure.
- The use of suspended pavement systems can help manage in-ground utility conflicts. See page 111.

Sightlines and Vision Triangles

Planting designs must provide clear sightlines between motorists and trail users to ensure pedestrian and cyclist safety, as well as between motorists and other motorists.

Design teams should refer to FDOT and COJ guidance and regulations when preparing planting plans near and around streets and intersections Planting may still be possible within clear sight triangles if it provides a "clear sight window" between the top of ground-level planting and the bottom of the tree canopy; see FDOT Design Manual Section 212.11.6 for more information.

Irrespective of the proximity to an intersection, planting plans for areas between roadways and segments of the Emerald Trail should provide clear sightlines so that trail users may be visible to motorists at all times, and vice-versa.

Environmental Constraints

Design teams should assume that planting areas along the Emerald Trail will receive no irrigation past initial establishment and design planting plans accordingly. Design teams should also consider small-scale reflections and urban heat impacts when planting in the vicinity of buildings with highly reflective or emissive surfaces such as glass or brick. Proximity to these surfaces can create unexpected heat stresses that lead to plant failure.

Safety and Crime Prevention

Overly-large vegetation can block sightlines, create enclosed spaces, and disrupt street lighting. Design teams should consider the safety implications of spaces created through planting design and ensure that planting designs support safe and comfortable trail use.

An Evolving Regulatory Context

As of the writing of these guidelines, the City of Jacksonville is actively updating its guidance and design standards for street trees as part of the development of an Urban Forestry Management Plan. There may be recommendations or requirements that emerge from that plan that these Design Guidelines cannot predict. Design teams should coordinate with the City of Jacksonville to ensure that the most up-to-date guidance is followed.

Relevant Guidance Documents:

- City of Jacksonville Land Development Procedures Manual
- JEA Tree Planting Requirements
- FDOT Design Manual
  - » Section 212 - Intersections
  - » Section 228 - Landscape Design
  - » Section 270 - Planting Designs

CANOPY TREES

Healthy trees are a critical component of Jacksonville's urban infrastructure. They provide cooling shade, capture rainfall, sequester carbon, support wildlife, and beautify the urban landscape. For this reason, design teams should identify and pursue every opportunity to maximize new tree plantings alongside the Emerald Trail.

When selecting tree species, design teams should consider factors such as mature size, context, space contraints, and canopy goals. Generally, trees should be selected to maximize shade, canopy cover, and biodiversity, and for their suitability for a given context. For example, Sweetgums (*Liquidambar styraciflua*) would be a poor choice for a heavily trafficked urban area due to their propensity to drop a large volume of round seed capsules in autum.

Design teams should pay special attention to soils. Trees need adequate soil volume to thrive. Large canopy trees require a minimum of 1,000 cubic feet of continuous soil volume to ensure health and longevity. Furthermore, soils should be uncompacted and provide adequate pore space for water and oxygen to travel to and around the tree's root system. When preparing planting designs, design teams should assess available soils and ensure adequate tree soil volume is provided. In heavily paved areas, suspended paving systems or horticultural structural soils that provide access to larger volumes of continuous, uncompacted soil beneath paving systems may be considered.

Palm Trees and Lethal Bronzing

Cabbage Palms (*Sabal palmetto*) are iconic northeast Florida native trees that provide unique textures and sculptural forms. Sadly, they are impacted by the spread of Lethal Bronzing Disease (LBD), a bacteria-borne illness that causes irreversible, fatal decline in infected palms. LBD cannot be treated, only prevented with costly antibiotic treatments. For these reasons, it is recommended that design teams avoid use of Cabbage Palm or any other palm species along segments of the Emerald Trail, save for circumstances where the risks of LBD are well understood and deemed acceptable in pursuit of a desired design effect.

Canopy Tree Species

Red Maple (*Acer rubrum*)*†
River Birch (*Betula nigra*)*†
Pignut Hickory (*Carya glabra*)*
Catalpa (*Catalpa bignonioides*)*
Southern Hackberry (*Celtis laevigata*)
Persimmon (*Diospyros virginiana*)*
Southern Red Cedar (*Juniperus virginiana var silicicola*)*
Sweetgum (*Liquidambar styraciflua*)*
Tulip Poplar (*Liriodendron tulipifera*)*†
Southern Magnolia (*Magnolia grandiflora*)*
Tupelo (*Nyssa sylvatica*)*
Slash Pine (*Pinus elliotii*)*
Longleaf Pine (*Pinus palustris*)*
American Sycamore (*Platanus occidentalis*)*†
Black Cherry (*Prunus serotina*)
White Oak (*Quercus alba*)
Southern Red Oak (*Quercus falcata*)
Overcup Oak (*Quercus lyrata*)*
Swamp Chestnut Oak (*Quercus michauxii*)*
Nuttall Oak (*Quercus nuttallii*)*
Willow Oak (*Quercus phellos*)
Swamp Red Oak (*Quercus shumardii*)†
Post Oak (*Quercus stellata*)
Live Oak (*Quercus virginiana*)*†
Bald Cypress (*Taxodium distichum*)*†
American Elm (*Ulmus americana*)†

*On City of Jacksonville Tree Commission approved tree planting list

†Recommended for tree planting within rights-of-way per COJ Land Development Procedures Manual


Red Maple (Acer rubrum)


Tulip Poplar (Liriodendron tulipifera)


Southern Magnolia (Magnolia grandiflora)


American Sycamore (Platanus occidentalis)


Live Oak (Quercus virginiana)


Bald Cypress (Taxodium distichum)

UNDERSTORY TREES

In space-constrained settings where it may not be possible to plant new canopy trees, smaller understory trees may provide many of the same benefits. Understory trees often have the added benefit of providing flowering interest in the spring and summer months and attractive leaves, fruits, and seeds in the fall and winter months. Finally, many Florida native understory trees are well adapted to urban conditions.

As with canopy trees, care should be taken to ensure adequate soil volume and pore-space for drainage and gas exchange at the root zone. Understory trees require less soil volume than canopy trees; they should be planted no less than 500 cubic feet of continuous soil volume where planted.

Understory Tree Species

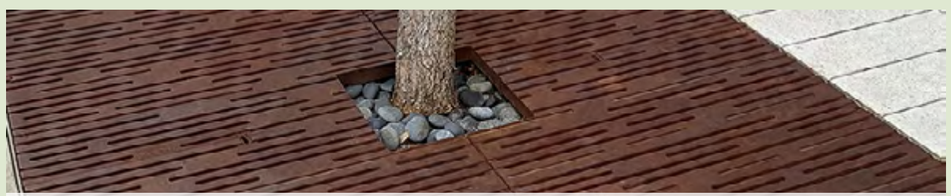
American Hornbeam (*Carpinus caroliniana*)*
Fringetree (*Chionanthus virginicus*)*
Hawthorn (*Crataegus opaca*)*
Carolina Silverbell (*Halesia carolina*)
Silverbell (*Halesia diptera*)
Dahoon Holly (*Ilex cassine*)*
American Holly (*Ilex opaca*)
Little Gem Magnolia
(*Magnolia grandiflora* 'Little Gem')*
Sweetbay Magnolia (*Magnolia virginiana*)
Hop Hornbeam (*Ostrya virginiana*)*
Chickasaw Plum (*Prunus angustifolia*)
Sassafras (*Sassafras albidum*)
Sparkleberry (*Vaccinium aroboreum*)

*On City of Jacksonville Tree Commission approved tree planting list

Tree Planting in Paving

Tree planting in constrained settings or in plazas with high volumes of pedestrian traffic presents special considerations and techniques to provide adequate soil volume and prevent soil compaction.

- Trees in paving areas should be installed in conjunction with suspended paving systems or structural soils that mitigate compaction. Soil volumes should extend below adjacent paving to ensure sufficient volume for healthy tree growth.
- The soil surface in constrained settings or high-traffic areas should be protected with cast ductile iron tree grates.
  - » The "Rain" tree grate pattern manufactured by Iron Age Designs is the preferred standard tree grate along the Emerald Trail. Design teams may also elect to use a custom grate pattern to respond to local architectural or cultural context, if desired.
  - » Tree grate openings should be sufficiently sized to allow for ample tree growth to prevent girdling of the trunk as the tree matures.



Rain Tree Grate by Iron Age Designs

American Hornbeam (*Carpinus caroliniana*)

Fringetree (*Chionanthus virginius*)

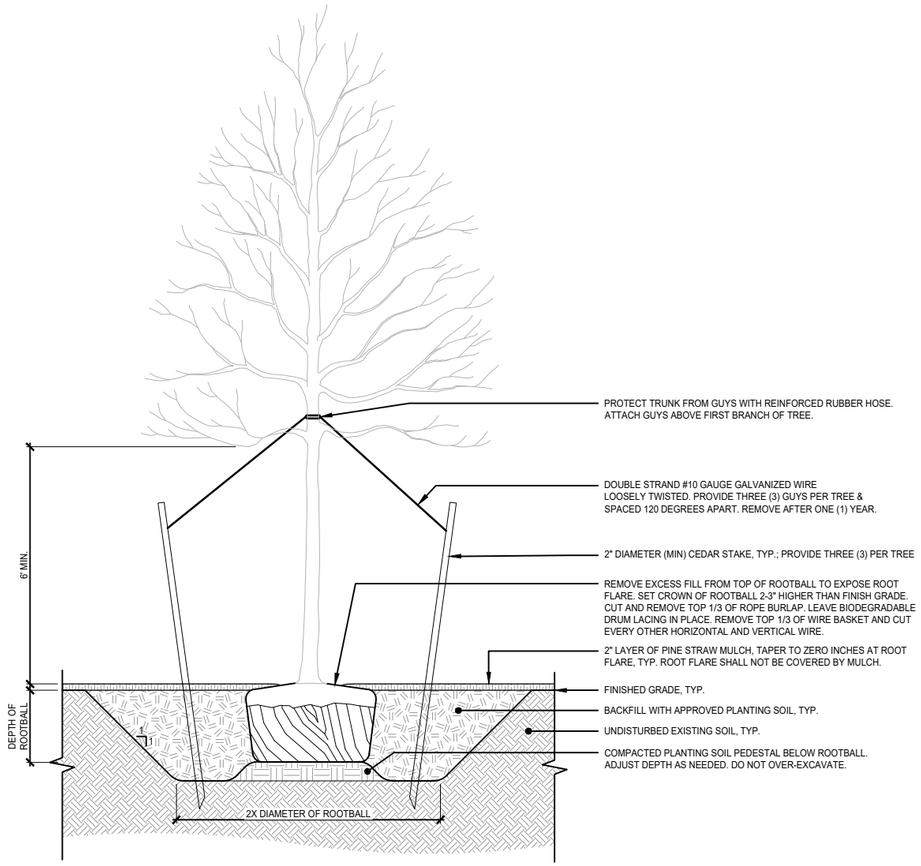
Carolina Silverbell (*Halesia carolina*)

American Holly *(Ilex opaca*)

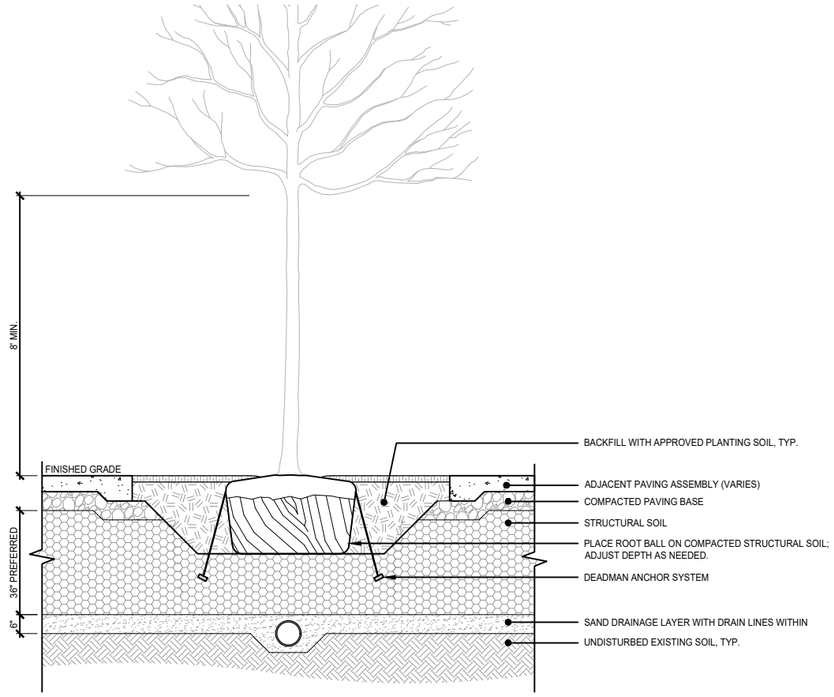
Sweetbay Magnolia (*Magnolia virginiana*)

Chickasaw plum (*Prunus angustifolia*)

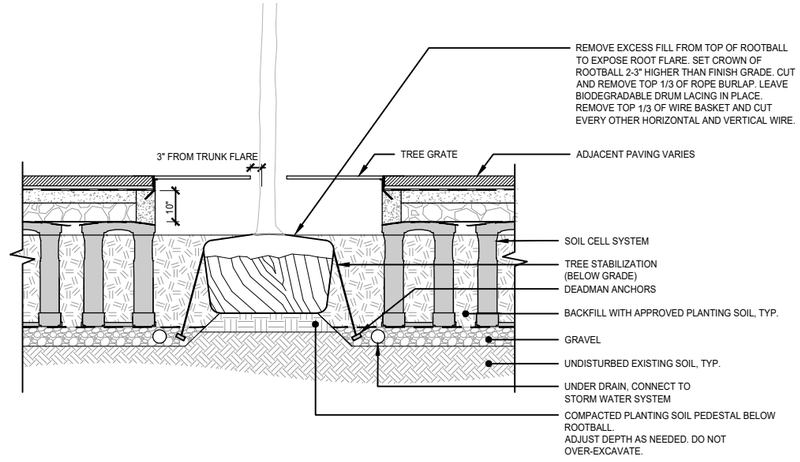
TREE PLANTING DETAILS



Typical Tree Planting Detail



Tree in Tree Pit Detail - Structural Soil



Tree in Paving Detail - Silva Cells

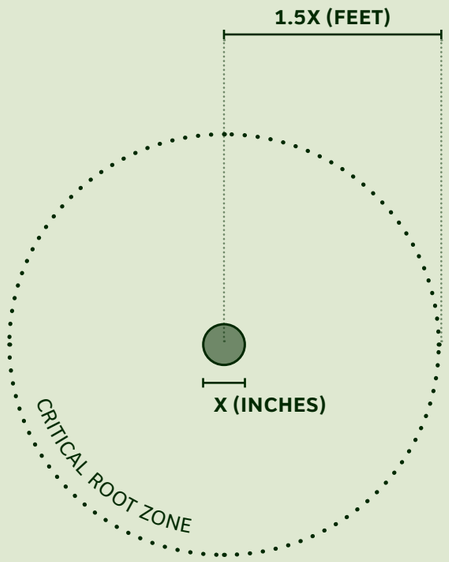
TREE PROTECTION AND PRESERVATION

Existing canopy trees along the Emerald Trail are significant assets to the trail system. Design and construction teams should take care to avoid removal of existing canopy trees wherever possible.

Trail Alignment for Tree Preservation

Where possible, the trail should be aligned to avoid existing trees that are mature and healthy. Depending on the available right-of-way, this may require more creative or intensive approaches such as curb extensions, additional right-of-way acquisition, the pursuit of easements, or reducing the trail width to avoid an existing tree. Even so, there will be moments along the trail where avoiding existing trees will not be possible. In these instances, design teams will be required to mitigate tree removals with additional new tree plantings.

- In moments where trees must be removed, design teams should prioritize removals of small, unhealthy, and non-native or invasive trees, replacing them with long-lived native tree species.



Critical Root Zones and Root Bridging

The Critical Root Zone (CRZ) of a tree can be calculated as a one-and-a-half feet (1.5') in radius for every inch of the tree's diameter at breast height (DBH). For example, an existing tree with a DBH of twelve inches (12") could be assumed to have a CRZ with a radius of eighteen feet (18') from the center of the trunk, or a total diameter of thirty-six feet (36)'.

- When the trail alignment comes within the critical root zone of an existing tree, the trail design should use root bridging to avoid compaction or damage to the existing tree roots. This involves pneumatic excavation of the existing soil from around the roots, backfilling with an approved fill, and "bridging" the trail over the root area with spot footings, curbs, or platforms that prevent the weight of the trail and its users from directly bearing on the roots below.

Design teams should consult with a licensed arborist whenever the trail alignment moves through a tree's critical root zone or root bridging is required.

Tree Protection During Construction

Construction activities are often highly damaging to established trees. Grading, earthmoving, and heavy vehicle traffic with tree root zones can be fatal. These impacts can take years to manifest, making it challenging for contractors and the public to recognize the risk and act accordingly. Tree protection during construction is vital to preventing tree damage and preserving existing mature canopy trees.

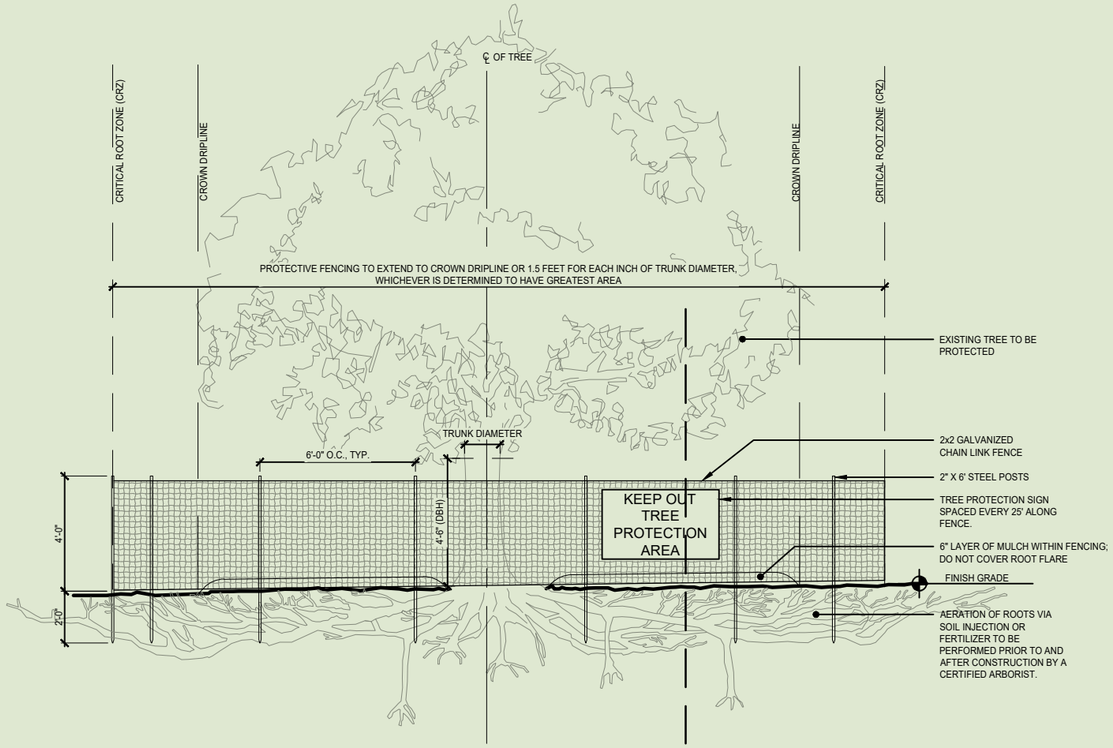
All construction documents prepared for the Emerald Trail should have an existing tree protection plan documenting trees to be protected, their critical root zones, and the location and extent of protective construction fencing.

Tree protection fencing should be constructed of fixed stakes and netting; movable fence panels and barricades shall not be used for tree protection.

Tree protection fencing should extend to the dripline of the canopy or one-and-a-half (1.5) times the tree's DBH in feet from the center of the tree's trunk, whichever is greater. In urban areas where trees are placed in tree pits or planting areas, protective fencing should be installed around the entirety of the tree's planting area.

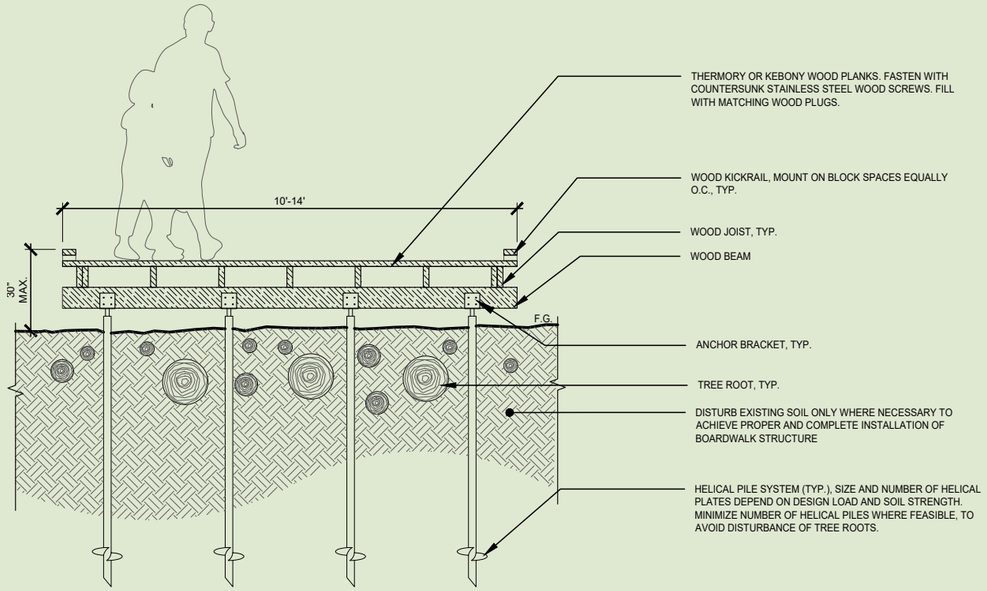
Under no circumstances should cars, trucks, or construction machinery be allowed to park under existing trees before, during, or after construction.

- Where work within the critical root zone is required, design and construction teams should take care that no more than twenty five percent (25%) of the area of the CRZ is disturbed or damaged.

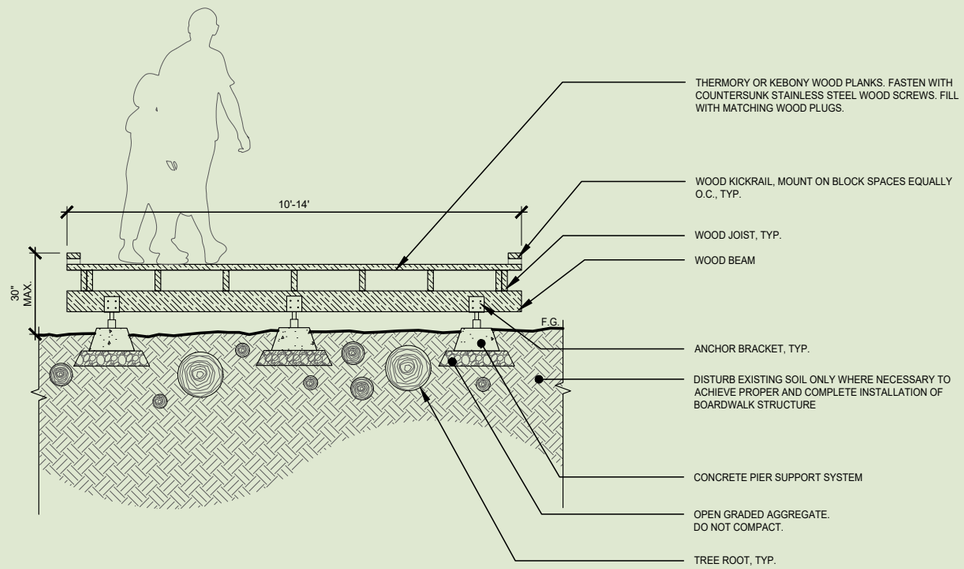


Typical Tree Protection Fencing Detail

EXAMPLE ROOT BRIDGING DETAILS

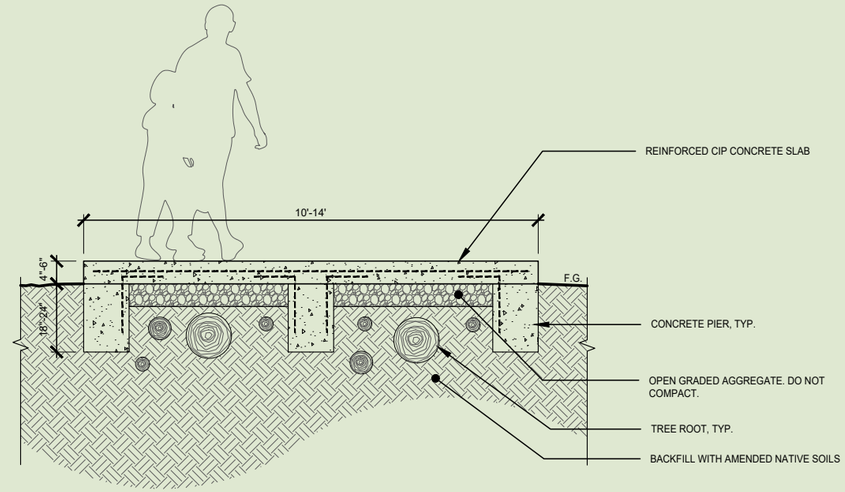


Elevated Deck with Helical Piles Detail

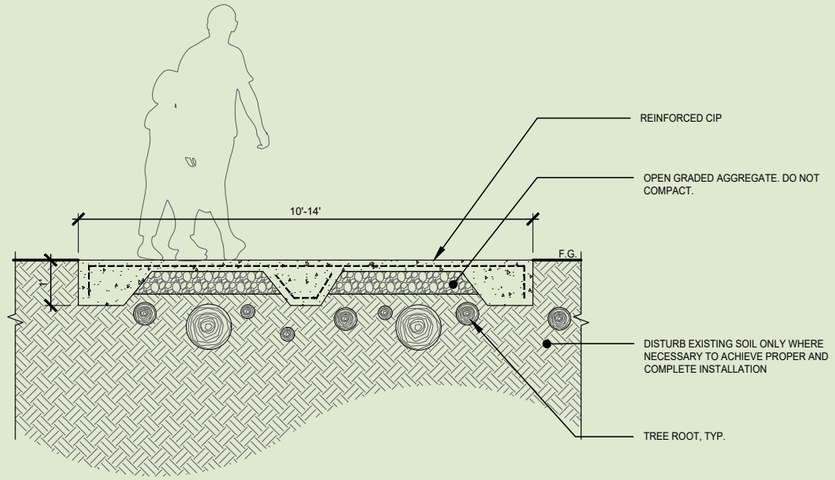


Elevated Deck with Spot Footings Detail

NOTES:
1. DO NOT CUT TREE ROOTS OVER 2" Ø
2. ONLY USE HAND TOOLS AND PNEUMATIC EXCAVATION DURING CONSTRUCTION
3. SYSTEMS WILL NOT HANDLE VEHICLES, ONLY PEDESTRIANS AND BIKES
4. OPTION TO INCLUDE VERTICAL OR HORIZONTAL PERFORATED PIPE TO AERATE THE SOILS AND ROOTS.



Concrete Slab with Spot Footings Detail



Concrete Slab with Turndown Detail

SHRUBS AND FEATURE GRASSES

Shrubs and ornamental grasses can fill similar roles in a planting design as part of structural, theme, or groundcover layers. They have the added benefit of being durable, generally bulletproof options for urban planting designs, providing seasonal interest with minimal maintenance. And, they can be assembled in simple combinations that are surprisingly effective. In the spring, flowering shrubs put on a show while clump forming grasses awake from their winter dormancy. In the summer, grasses and shrubs burst forth, providing a range of textural and color contrasts and options. In the fall, deciduous shrubs glow with yellows, reds, and oranges while grasses flower with whispy, billowy seedheads. And in the winter, tawny foliage from grasses provides striking contrast to evergreen shrub species.

The versatility, diversity, durability, and simplicity of shrubs and grasses make them ideally suited for use along the Emerald Trail. For this reason, understory planting designs for the Emerald Trail should consist primarily of woody shrubs and perennial clumping grasses.

Shrub Species
American Beautyberry (*Callicarpa americana*)
Buttonbush (*Cephalanthus occidentalis*)
Sweet Pepperbush (*Clethra alnifolia*)
Swamp Titi (*Cyrilla racemosa*)
Gallberry (*Ilex glabra*)
Winterberry (*Ilex verticillata*)
Yaupon Holly (*Ilex vomitoria*)
Florida Anise (*Illicium floridanum*)
Virginia Sweetspire (*Itea virginica*)
Coastal Plain Staggerbush (*Lyonia fruticosa*)
Wax Myrtle (*Morella cerifera*)
Winged Sumac (*Rhus copallinum*)
Dwarf Palmetto (*Sabal minor*)
Saw Palmetto (*Serenoa repens*)
Walter's Viburnum (*Viburnum obovatum*)
Coontie (*Zamia integrifolia*)

Feature Grass Species
Pink Muhly Grass (*Muhlenbergia capillaris*)
Switchgrass (*Panicum virgatum*)
Indian Grass (*Sorghastrum nutans*)
Florida Gamagrass (*Tripsacum floridanum*)


American Beautyberry (*Callicarpa americana*)


Buttonbush (*Cephalanthis occidentalis*)


Coastal Plain Staggerbush (*Lyonia fruticosa*)


Zamia (*Zamia integrifolia*)


Pink Muhly Grass (*Muhlenbergia capillaris*)


Florida Gamma Grass (*Tripsacum floridanum*)

GROUNDCOVERS AND PERENNIALS

A robust groundcover layer is an important component of successful urban planting schemes. These layers generally consist of low-growing grasses, sedges, and perennials that can spread and self seed. Together, they act as a "green mulch," filling in the spaces between larger shrubs and trees, stabilizing soil, reducing weed competition and establishment, and providing added ecological benefits and resources for local wildlife. They may also provide stunning seasonal displays, and Individual species may be selected based on aesthetic criteria. However, their primary role is functional: to hold the ground.

- Groundcover layer plants should be planted at 12" O.C. and be evergreen or semi-evergreen.

Groundcover Grass, Sedge, & Fern Species
Broomsedge (*Andropogon virginicus*)
Cherokee Sedge (*Carex cherokeensis*)
Southern Wood Fern (*Dryopteris ludoviciana*)
Elliot's Lovegrass (*Eragrostis elliotii*)
Soft Rush (*Juncus effusus*)
Starrush Whitetop (*Rhynchospora colorata*)
Little Bluestem (*Schizachyrium scoparium*)
Sand Cordgrass (*Spartina bakeri*)
Southern Shield Fern (*Thylepteris kunthii*)

Groundcover Perennial Species
White Swamp Milkweed (*Asclepias perennis*)
Green and Gold (*Chrysogonum virginianum*)
Blue Mistflower (*Conoclinium coelestinum*)
Lanceleaf Coreopsis (*Coreopsis lanceolata*)
Oblongleaf Twinflower (*Dyschoriste oblongifolia*)
Purple Coneflower (*Echinacea purpurea*)
Blanket Flower (*Gaillardia pulchella*)
Prairie Iris (*Iris savannarum*)
Evergreen Blazing Star (*Liatris laevigata*)
Dense Blazing Star (*Liatris spicata*)
Dotted Horsemint (*Monarda punctata*)
Frogfruit (*Phyla nodiflora*)
Obedient Plant (*Physostegia virginiana*)
Beardtongue (*Penstemon multiflorus*)
Brown-Eyed Susan (*Rudbeckia hirta*)
Blue-Eyed Grass (*Sisyrinchium angustifolium*)
Seaside Goldenrod (*Solidago sempervirens*)


Cherokee Sedge (*Carex Cherokeensis*)


Brown-Eyed Susan (*Rudbeckia hirta*)

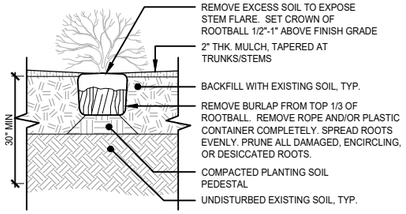

Frogfruit (*Phyla nodiflora*)


Little Bluestem (*Schizachyrium scoparium*)

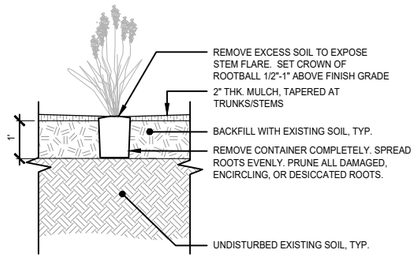

Blue-Eyed Grass (Sisyrinchium angustifolium)


Southern Shield Fern (*Thylepteris kunthii*)

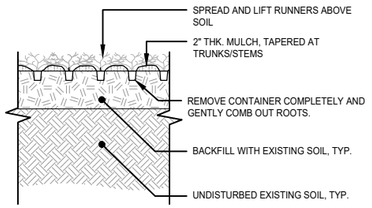
UNDERSTORY PLANTING DETAILS



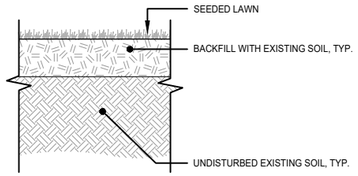
SHRUB TYPICAL PLANTING DTL.



PERENNIAL TYPICAL PLANTING DTL.

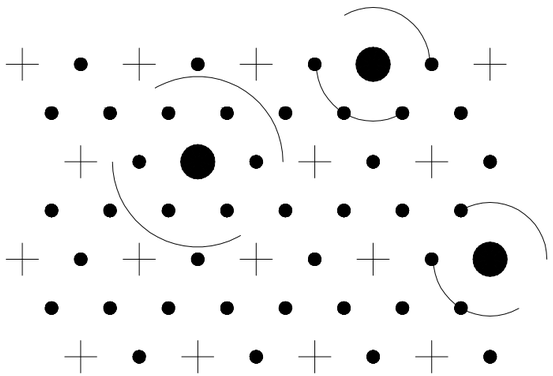


GROUNDCOVER TYPICAL PLANTING DTL.



GRASS TYPICAL PLANTING DTL.

Typical Understory Planting Details

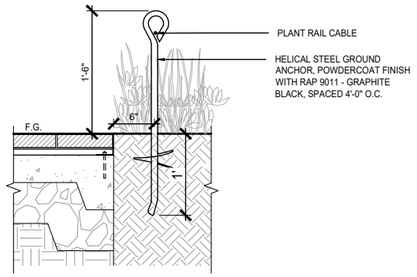


LEGEND

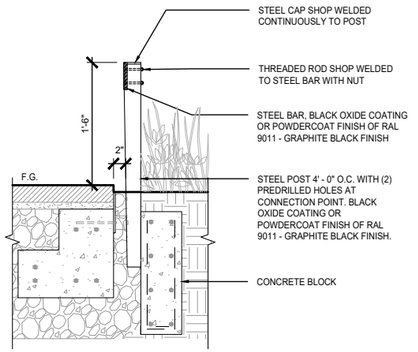
- GROUNDCOVER LAYER PLANTED 12" O.C., TYP.
- SEASONAL THEME LAYER PLANTED 18 - 36" O.C.
- STRUCTURAL LAYER SPACED PER SPECIES, MIN. 24"

Typical Plant Layout and Spacing Diagram

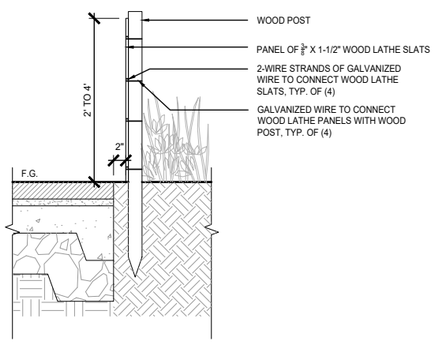
PLANT PROTECTION DETAILS



Steel Stake and Cable Plant Rail System



Steel Post and Bar Plant Rail System



Dune Fencing Plant Protection System

UNDERSTORY PLANTING PALETTES

Planting schemes along the Emerald Trail can support the overall trail identity by using clear, distinctive palettes that consistently repeat across different moments and contexts.

The example planting palettes listed here provide starting points for design teams to develop functional plant communities and planting designs along the Emerald Trail. They focus primarily on the Groundcover and Seasonal Theme layers that provide a base ground plane matrix. These may be combined with tree and shrub plantings, however specific tree and shrub recommendations are not provided here as species selection for these larger structural plants should respond entirely to site-specific conditions and constraints. Design teams should consider these combinations as suggested starting points, and are free to use their judgement to modify, adapt, and expand upon these palettes in response to site-specific constraints and opportunities.

Standard Trail Palette

For use as a standard base matrix along the trail.

- 60% Florida Gammagrass *(Tripsacum floridanum)*
- 20% Coontie Plant (*Zamia integrifolia*)
- 10% Frogfruit (*Phyla nodiflora*)
- 10% Beardtongue (*Penstemon multiflorus*)




Highlight Palette

For use at high-traffic or high-attention locations, such as trailheads, pocket parks, or intersections where bright, eye-catching planting is desired.

- 60% Pink Muhly Grass (*Muhlenbergia capillaris*)
- 20% Brown-Eyed Susan (*Rudbeckia hirta*)
- 10% Dotted Horsemint (*Monarda punctata*)
- 10% Blue-Eyed Grass (*Sisyrinchium angustifolium*)




Bioswale Palette

For use in wet areas of streetside bioswales and green infrastructure features.

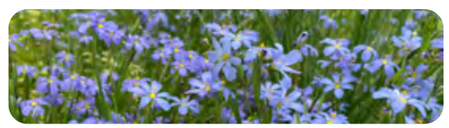
- 60% Soft Rush (*Juncus effusus*)
- 20% Prairie Iris (*Iris savannarum*)
- 20% White Swamp Milkweed (*Asclepias perennis*)



Narrow Planting Area Palette

For use in narrow planting areas where trampling and soil compaction are anticipated.

- Dwarf Gallberry (*Ilex glabra* ‘Gem Box’ or ‘Strongbox‘)
- Blue-eyed Grass (*Sisyrinchium angustifolium*)

Shade Palette

For use in areas receiving full or mostly full shade.

- 50% Southern Shield Fern (*Thylepteris kunthii*)
- 30% Blue Mistflower (*Conoclinium coelestinum*)
- 20% Green and Gold (*Chrysogonum virginianum*)



GREEN STORMWATER INFRASTRUCTURE

The buildout of the Emerald Trail represents a unique opportunity to dramatically increase Green Stormwater Infrastructure (GSI) deployment across Jacksonville's Urban Core. Widespread installation of green infrastructure can help mitigate long-standing flooding and water quality issues in the Hogans Creek and McCoys Creek watersheds, as well as create greener, more aesthetically pleasing streetscapes.

The following pages provide examples of different types of green infrastructure facilities and guidelines for their design. General design considerations for green infrastructure design are discussed below.

- Green infrastructure is preferred when installing new planting areas along the Emerald Trail; conventional planting areas should only be constructed where required by site-specific constraints.

Sizing

Green infrastructure should be sized to accommodate a given design storm scenario to meet the project resilience goals, such as a 50- or 100-year return period event.

Green infrastructure facilities should include overflow mechanisms to ensure that an overwhelmed GSI feature does not contribute to flooding in an event that exceeds the facility's design capacity.

Soil Media

Green infrastructure requires specially designed soils that meet drainage and infiltration requirements while also supporting robust plantings. Design teams should include soils specialists and provide specifications and drawings for designed soil mixes and profiles that meet performance requirements. Thoughtful soils design can also help reduce maintenance demands. For example, free draining, low-fertility soil designs can support robust, stress tolerant native plant species while inhibiting establishment of wind-borne weed species.

Design teams should also pay close attention to the characteristics of existing native soils when designing green infrastructure facilities. Sandy or gravelly soils may facilitate the installation of infiltration facilties, while sites with poor-draining clay soils may require underdrains and connections to storm sewer infrastructure.

Ponding, Freeboard, and Residence Time

Green Stormwater Infrastructure should allow for ponding of no greater than twelve inches (12") in depth and provide an additional six inches (6") of freeboard above the maximum ponding elevation.

To prevent the growth of mosquitos and spread of insect-borne diseases, Green Stormwater Infrastructure should be designed for a maximum drawdown time of twenty-four (24) hours, with a preferable drawdown time of twelve (12) hours.

Additional Resources

- *Bioretention Design Handbook: Designing Holistic Bioretention for Performance and Longevity*, United States Environmental Protection Agency, EPA 841-B-23-002, November 2023.
- *Urban Street Stormwater Guide*, National Association of City Transportation Officials (NACTO), 2017.
- *Duval County Low-Impact Design Manual*, City of Jacksonville, 2013.

Groundwater Interactions

While infiltration of rainwater and stormwater runoff to recharge aquifers is generally desirable, green infrastructure can also contibute to groundwater contamination if not carefully sited and designed. Critical factors include depth to the seasonal high water table elevation and the presence of contaminants such as heavy metals and excess nutrient loads in stormwater runoff. Negative impacts to groundwater can generally be avoided by ensuring sufficient separation between the bottom-most elevation of a green infrastructure facility and the seasonal high water table.

A minimum of five feet (5') of separation should be maintained between the bottom of an infiltrating green infrastructure facility and the seasonal high water table elevation. In areas with shallow depth to groundwater or a high water table, non-infiltrating, closed-bottom features should be used.

Maintenance and Sedimentation

Green infrastructure in urban environments is prone to accumulate trash, debris, and sediment, all of which can limit the facility's effectiveness, as well as create an unsightly streetscape. Green infrastructure should be designed to minimize maintenance requirements, with a realistic understanding of the constraints and challenges of maintaining operational green infrastructure facilities in urban environments.

Presettling Zone

Green infrastructure installations should include presettling zones, forebays, and/or flow dissipation features that slow down fast-moving inflowing water and create concentrated areas for debris and sediment to settle before stormwater moves through the GSI facility. These presettling zones can help reduce maintenance and ensure continued performance of the facility.

Streetside Bioswale in Seattle's High Point Neighborhood. Credit: Seattle Public Utilities

BIORETENTION PLANTERS

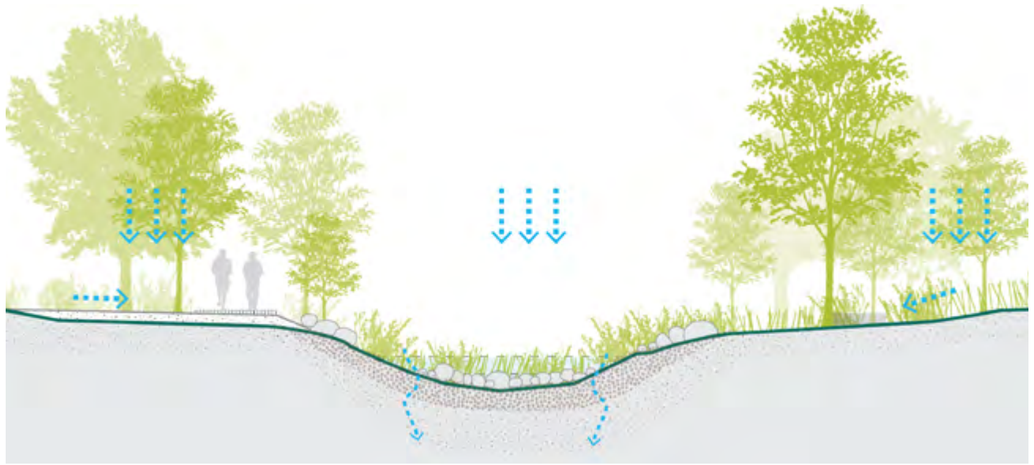
Bioretention planters—sometimes also referred to as “rain gardens”—are low-lying planted areas graded to collect and stormwater runoff from the surrounded area. They have gently sloped sides and a broad low area designed to temporarily store water after a rain event. Park spaces along the Emerald Trail may present opportunities for bioretention areas where space allows and drainage needs warrant.

The sides of bioretention areas along the Emerald Trail should not exceed one unit vertical for every four units horizontal (1V:4H, or a 25% slope). Where possible, a gentler side slope is preferred.

Bioretention areas along the Emerald Trail should be connected to the city stormwater system via an overflow drain. This overflow should be situated to limit bioretention ponding to a maximum depth of twelve inches (12”).

Bioretention soils should allow for infiltration, and prevent ponding for more than twenty-four (24) hours.

- Plants used in bioretention planters should be both drought tolerant and able to withstand flooding. Florida native plants are ideally suited for these conditions.



Typical Cross Section of a Bioretention Planter

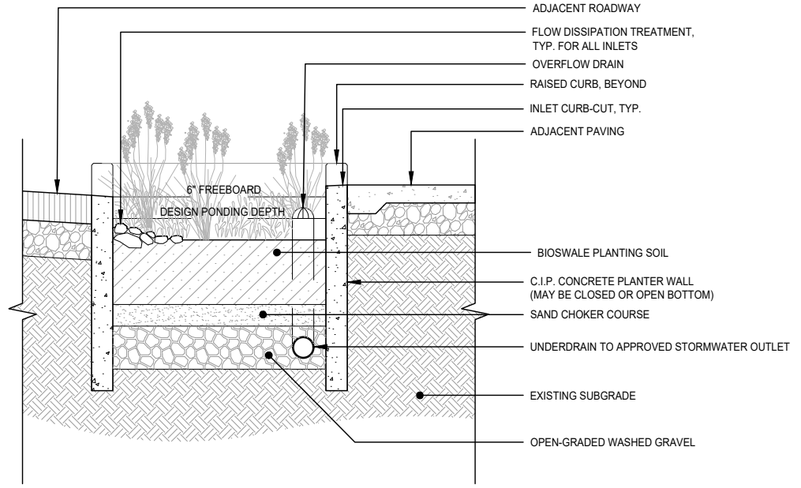
RIGHT-OF-WAY STORMWATER PLANTERS

Integrating bioretention features into urban contexts and rights-of-way generally requires the use of curbs, walls, and scuppers due to space constraints. They may also include closed bottoms and underdrains instances where infiltration is not possible due to soil conditions, below ground utilities or structures, or other constraints. These modified bioretention facilities are often called right-of-way bioswales or stormwater planters.

All stormwater planters should have presettlement and flow dissipation zones to minimize erosive forces from inflowing stormwater runoff.

Stormwater planters should be designed with a maximum ponding depth of six to eight inches (6-8”) and a maximum residence time of twenty-four (24) hours.

- Stormwater planters may be integrated with curb extensions and bulb-outs.



Stormwater Planter Typical Cross Section

PERMEABLE PAVING

Paved surfaces are among the primary drivers of urban stormwater issues such as flooding and impaired water quality. Permeable paving systems can help reduce the negative impacts of conventional paving by storing and slowing down stormwater.

Design teams should identify opportunities for permeable paving in pocket parks, furnishing zones, rest areas, and trailheads along the Emerald Trail, however permeable paving should not be used for the trail material itself. Permeable paving is most desirable in heavily paved areas. In areas with extensive existing permeable surfaces such parks, permeable paving may be less necessary.

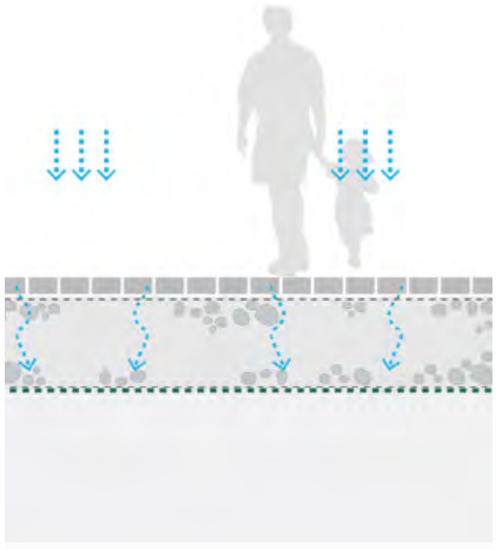
Aggregate fill used for permeable paving bases must be open-graded and washed to maximize pore space for water storage and minimize the introduction of fine sediments into the system.

Permeable paving installations along the Emerald Trail should always include perforated under-drainage connected to an approved stormwater outfall, with subgrades beneath the paving pitched to these drains.

A non-woven geotextile filter fabric should always be placed between native soils and the paving subbase to prevent the upward migration of clay and other fine soil particles into the gravel pore area. Woven geotextile fabrics should never be used in green infrastructure applications.

- Paver Type 2 (page 27) may be used in permeable applications along the Emerald Trail. Paver Type 1 (Green Glass Aggregate Pavers) should not be used for permeable paving applications. In Green Alleys, open-cell grass pavers are used along the trail shoulders to improve drainage.
- Permeable paving systems require regular maintenance to ensure continued performance.

Open-Cell Permeable Grass Pavers

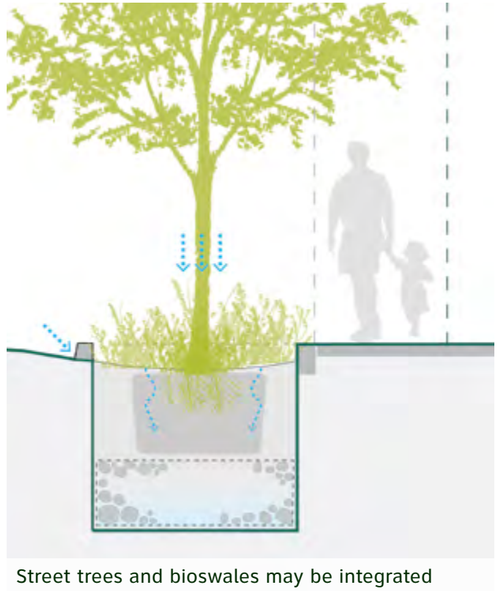


Typical Permeable Paving Diagram

TREE PLANTING FOR STORMWATER MANAGEMENT

Trees are critical for managing urban stormwater runoff and should be integrated into green stormwater infrastructure such as right-of-way bioswales when space allows. They capture as much as one-quarter of falling rain in their leaves and branches, slowing it down before it can hit the ground and enter the drainage system. Their extensive root systems absorb rainwater and release it back into the atmosphere as water vapor. And they provide shade and cooling for nearby roads, sidewalks, and buildings.

As with typical street tree plantings, access to large soil volumes is critical. Large, continuous tree pits with connected soil volumes and the use of suspended paving systems can help meet this requirement and ensure strong, healthy, long-lived trees that provide maximum stormwater benefits.



Street trees and bioswales may be integrated

A street tree integrated into a right-of-way bioswale in New York City. Credit: Chris Hamby / CC BY-SA 4.0

TRAIL CROSSINGS

TRAIL CROSSINGS

The design and treatment of trail intersections, especially where trails meet roadways, is an important component of the overall Emerald Trail network.

In designing crossings, the vulnerability of all trail users must be considered, including pedestrians, bicyclists, pedestrians, scooter users, those in walkers or wheelchairs and more, especially in moments where these different users interact. This section provides guidance on the design of various types of crossings and intersections with suggestions rooted in existing regulations and best practices.

> All crossings, intersections, signage, and markings shall comply with MUTCD and AASHTO standards and all other applicable regulations.

- Design teams should refer to NACTO resources for additional guidance on intersection design.

Pedestrian Safety & Accessibility

Intersection design and signage should prioritize pedestrians and other trail users over vehicles. Pedestrians should have the right-of-way or appropriate signalization, and measures should be taken to slow or stop cyclists and vehicles in advance of mixing zones.

Trail crossings should be safe, comfortable, and intuitive for those with disabilities and comply with all ADA requirements. Accessible pedestrian signals and detectors complying with MUTCD standards should be used wherever appropriate.

Curb Extensions & Medians

Where road width allows, curb extensions and/or medians should be employed to shorten crossing distances and calm traffic. Curb extensions and medians may take up portions of parking lanes, turning lanes, or excess road width by narrowing travel lanes. They should incorporate landscape buffers and expanded areas for pedestrian and cyclist mixing and waiting zones.

Raised Crossings & Speed Tables

Where vehicle speeds are low and the trail does not cross a critical emergency vehicle route, raised crossings and/or speed tables should be incorporated to help slow vehicular speeds, increase yielding rates, and clarify road user priority. Raised crossings should be flush with the curb and incorporate high visibility markings and signage. Speed tables may be employed along slower streets in advance of trail crossings or along Neighborhood Greenways to slow overall vehicular traffic.

Sightlines & Visibility

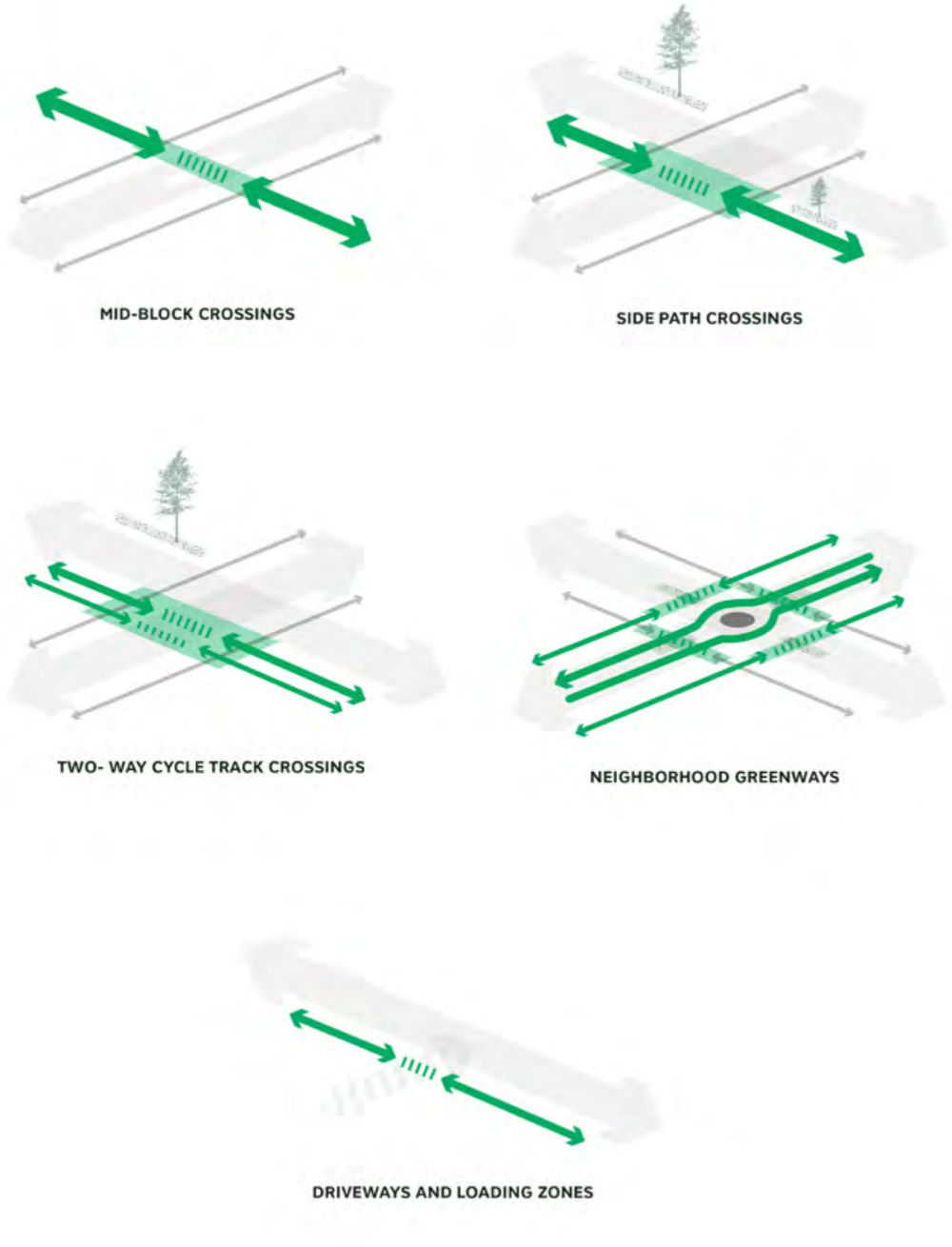
Sightlines must be considered carefully to maintain visibility of approaching trail users to cars, and visibility of intersections ahead of trail users, especially cyclists moving at a higher speed. Landscaping, signage, wayfinding, and furnishing elements should be placed to avoid obstructing view angles, and parking should be limited alongside the roadway immediately ahead of crossings per MUTCD guidance.

Use of Paving & Surface Markings

Textured paving bands at approaches to trail crossings or mixing zones signal users to slow down and be alert for a crossing ahead. (See page 35). Pavement markings should be used where necessary to communicate or reinforce appropriate trail use. Pavement markings should be high visibility and comply with MUTCD standards.

Signage

Signage implementation should adhere to MUTCD standards and best practices. Signage should clearly communicate user priority to all user groups while avoiding signage clutter.



Intersection Conditions along the Emerald Trail

MID-BLOCK GREENWAY TRAIL CROSSINGS

Where Greenway Trails intersect roadways, traffic islands and signalization strategies can help create a safe, seamless trail experience that prioritizes trail users while minimizing disruption for drivers.

Traffic Calming and Crossing Distances

Crossing designs should aim to keep crossing distances for trail users as short as possible. At multi-lane crossings or at roadways with high vehicle speeds, raised pedestrian refuge islands should be used to slow traffic and reduce crossing distances for trail users. When roads have on-street parking lanes, curb extensions may also be used.

The minimum width of a pedestrian refuge island is six feet (6’).

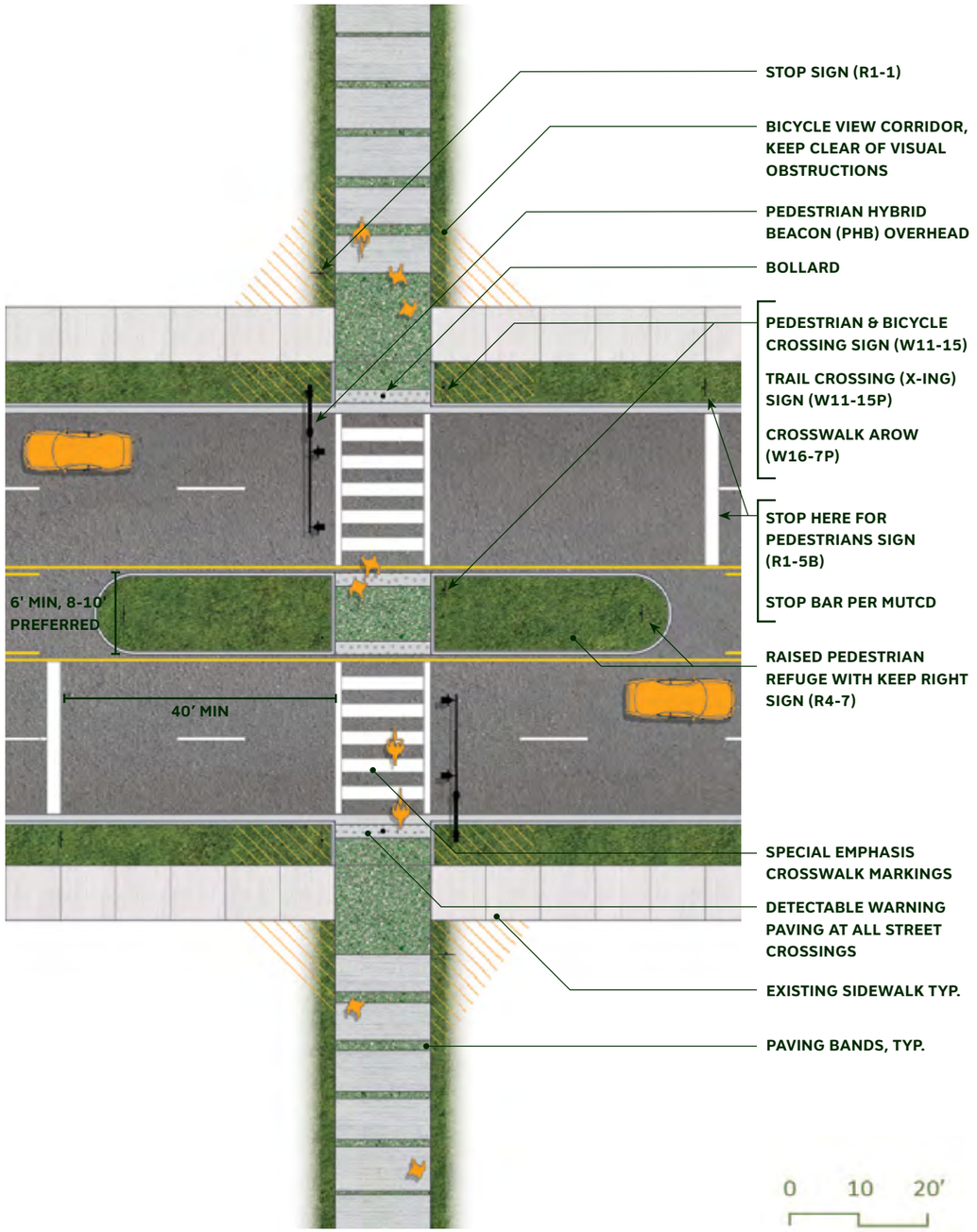
Signage and Signalization

Pedestrian Hybrid Beacons (PHBs) are used to slow and stop motorists when bicyclists and pedestrians are present. Push button activation allows pedestrians to safely cross once traffic has stopped, and allows vehicular traffic to resume normal flows once the pedestrian has cleared the travel lane.

- Pedestrian Hybrid Beacons (PHBs) will supplement post mounted signs, at least two W11-15 crossing signs with the addition of W11-15P and/or W16-7P where appropriate to be installed at the crosswalk, one on the right-hand side of the roadway and one on the left-hand side of the roadway. On a divided highway, the left-hand side assembly should be installed in the median rather than on the left-hand side of the highway.
- Special emphasis ladder-style crossing markings per MUTCD and FDOT Guidelines are preferred.
- Crosswalk striping should be as wide or wider than the walkway it connects to.
- Stop lines at mid-block signalized locations should be placed at least forty feet (40’) in advance of the nearest signal indication, paired with an R1-5B stop here for pedestrians sign located at the stop bar.
- Stop signs (R1-1) should be placed along the trail in advance of the existing sidewalk crossing to alert pedestrians and cyclists to stop prior to the crossing.

Other Considerations

- Clear sightlines between motorists and trail users are critical for trail safety. Design teams should also consider clear sightlines between trail users and intersecting sidewalks to avoid potential bicycle/pedestrian collisions.
- Installation of required curb ramps at all crossing locations must meet ADA standards and regulations.
- Minimum pedestrian volume, speed limit, nearest controlled crossing, and other important traffic data should be considered.
- Place vehicular bollards and consider “No Motor Vehicles” signs at trail entrances to reinforce the trail is for non-motorized vehicles.
- Apply paving bands in a gradual spacing pattern on the approach to the trail crossing. (See page 35.)
- For crossings at moderate to slow-speed streets, consider the application of a raised crossing level with the sidewalk to help slow vehicular speeds, increase yielding rates, and clarify road user priority.
- Parking should be prohibited in the area between the yield or stop line and the crosswalk.
- While landscape buffer planting should be implemented alongside the trail and in the median, ensure bicycle and vehicular view corridors are kept clear of visual obstructions.



Mid-Block Greenway Trail Crossing

MID-BLOCK GREEN ALLEY CROSSINGS

Mid-block crossings along Green Alleys present unique design considerations to ensure trail safety and mitigate the risk of bicycle-pedestrian collisions.

Sightlines and Fencing

Along Green Alleys, existing fencing and vegetation on adjacent private property may obstruct sightlines at intersection approaches. Where required vision triangles are obstructed by existing features, STOP or YIELD signs (MUTCD R1-1 or R1-2) may be required along the trail to mitigate the risk of cyclist-pedestrian collision at the sidewalk intersection.

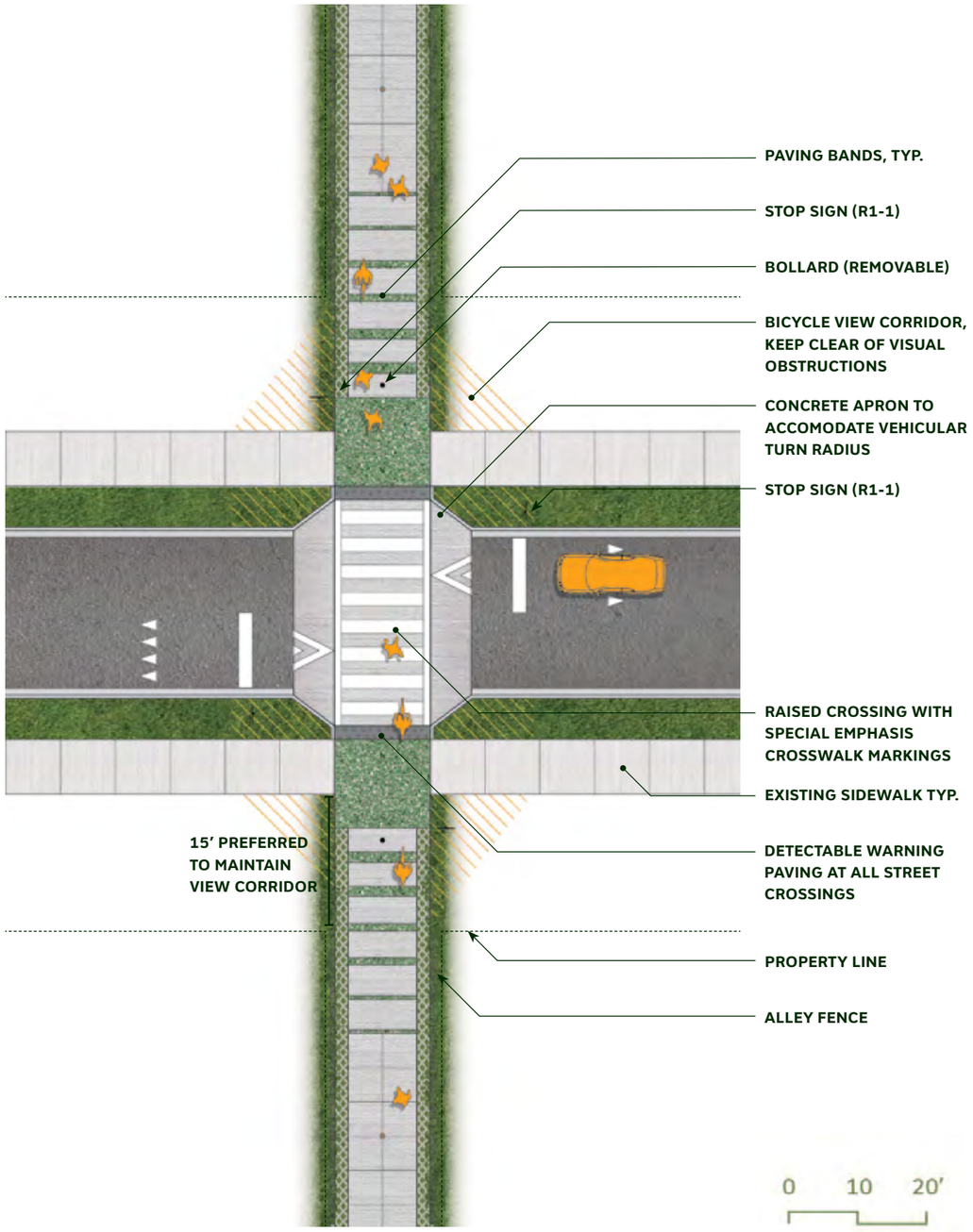
Raised Crossings

As the trail crosses an intersecting road, a raised crosswalk can help to visually reinforce the presence of pedestrians and cyclists, slow vehicular traffic, and create a seamless experience for trail users. Crossings should be STOP controlled for motor vehicles and prioritize low-friction travel for cyclists and pedestrians.

- Design teams should ensure that raised crossings are coordinated with street drainage patterns and infrastructure and do not impede stormwater collection or conveyance.

Vehicle Access

Vehicle access to Green Alleys should be limited to access for residents whose properties abut the trail. Design teams should engage alley residents to understand access needs and considerations and develop a limited-access strategy that satisfies all neighbors and trail use requirements. Removable or retractable bollards may be viable options for managing vehicular access if operation can be successfully coordinated among neighbors.



Mid-Block Green Alley Crossing

SIDEPATH CROSSINGS

Sidepath crossings place cyclists out of direct view of turning vehicles, presenting the greatest risk of bicycle-motor vehicle collisions along the Emerald Trail. Signalization and design strategies can help mitigate, but not eliminate, this risk.

Two-way and counterflow traffic adjacent to a vehicular roadway, as occurs on Sidepaths, creates inherent risks for bicyclists. Turning drivers are primarily focused on obstacles in front of them, not to the side or behind, creating large effective blind spots where cyclists are likely to be traveling. Design teams should be aware of this risk when designing sidepath crossings and incorporate design features that help to reduce the risk of collision.

Signalization & Signage

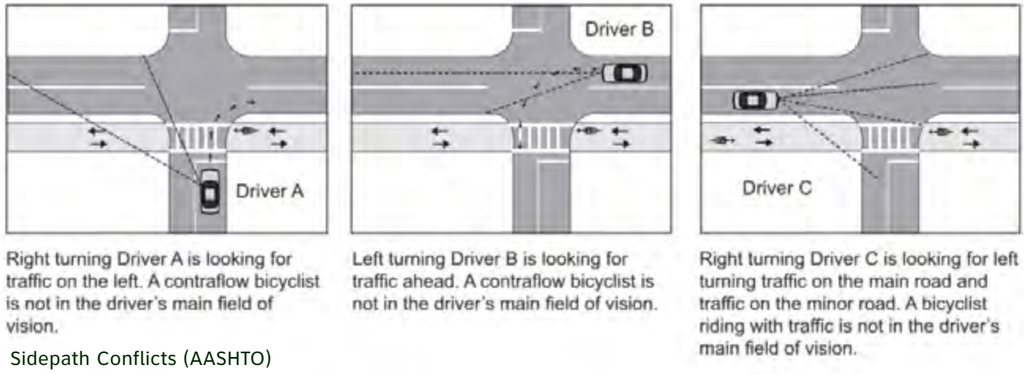
A dedicated bicycle signal phase or leading interval for cyclists may be used to separate cyclist crossings from turning vehicular traffic. Warning signage can alert motorists to the risk of conflict, while special emphasis crosswalk markings can further alert motorists to the presence of pedestrians and cyclists. At signalized intersections, MUTCD R10-15b may be used to warn motorists of potential counterflow cyclist conflicts.

Traffic Calming

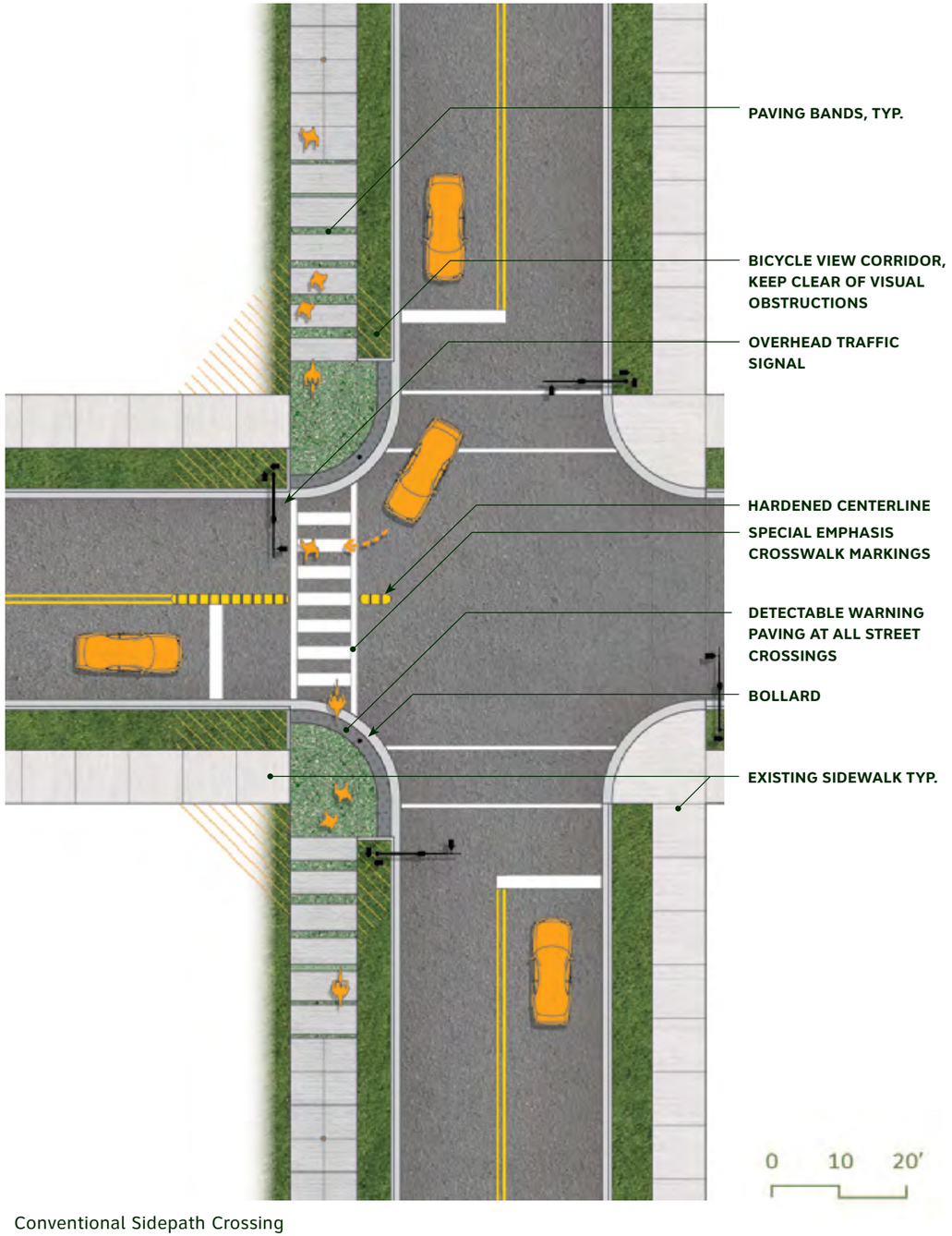
The risk of turning vehicles colliding with cyclists in the crossing is heightened when drivers make large-radius turns at a high rate of speed. Smaller curb radii can help reduce the effective turning radius of right-turning vehicles, reducing vehicle speeds and placing trail users within the driver's field of vision. The same effect can be achieved for left turning vehicles by implementing centerline hardening measures. On wider roadways, a pedestrian refuge island may be designed to achieve the same effect while shortening crossing distances for trail users.

Other Design Considerations

- See the following page for enhanced sidepath crossing design strategies.
- Where on-street parking lanes exist, curb extensions can be used to reduce turning radii and place cyclists in drivers' field of vision.



Sidepath Conflicts (AASHTO)



Conventional Sidepath Crossing

SIDEPATH CROSSING ENHANCEMENTS

Where space allows, the risks of Sidepath crossings can be mitigated through modifications to intersection geometry that slow traffic and place trail users within the field of vision of turning vehicles.

General Principles for Reducing Turn Conflicts

Turning vehicle conflicts are the primary source of risk for cyclists using Sidepaths. NACTO outlines three general principles for reducing turn conflicts that can be applied to Sidepath intersections to reduce this risk:[1]

- **Reduce turn speed.** Lower speeds lead to more frequent yielding, increase driver reaction time, and reduce the severity of collisions when they do occur.
- **Make bikes visible.** Implement intersection designs that make it easier for motorists to see cyclists without encouraging higher speeds.
- **Give bikes the right of way.** Give cyclists clear priority over turning motor vehicles with signage and signalization strategies.

Alignment

One of the most effective strategies for improving Sidepath intersection safety is to create distance between the Sidepath and the roadway intersection by modifying the path alignment. This changes the position of trail users with respect to motorists' field of vision, making them more likely to be seen by turning drivers. It also provides drivers more time to see and react to pedestrians and cyclists as they turn, and may encourage cyclists as they approach the intersection in order to navigate the curve in the path. Where rights-of-way are constrained, it may be possible to provide a similar effect with curb extensions or roadway narrowing.

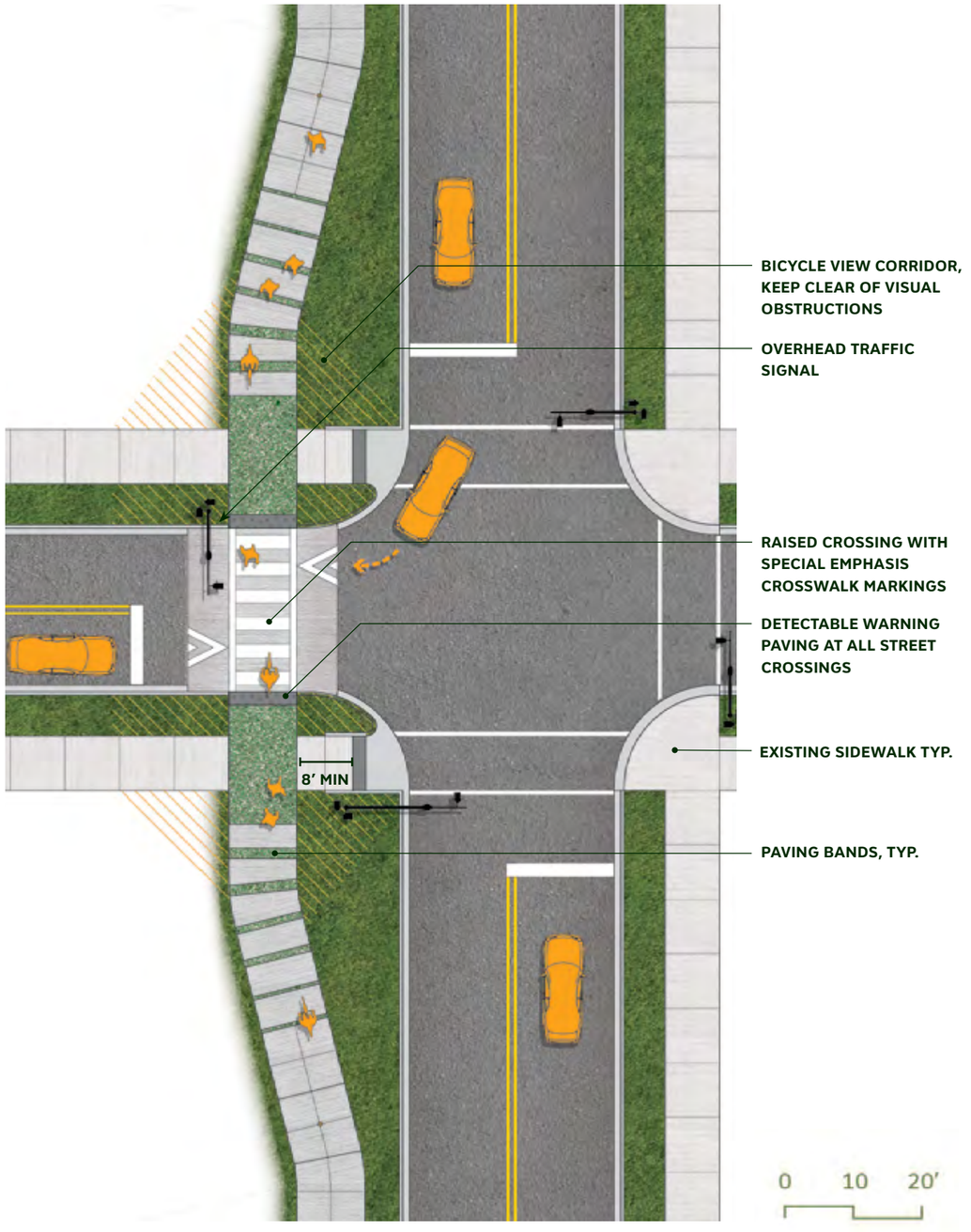
Raised Crossings

Moving the Sidepath crossing away from the roadway intersection also creates the opportunity to raise the crosswalk. When combined with special emphasis crosswalk markings, raised crossings greatly increase the visibility of pedestrians and cyclists on the trail and reinforce that drivers should slow down and exercise caution when crossing the trail alignment.

Additional Resources

- 5.3.4 Sidepath Intersection Design Considerations, *Guide for the Development of Bicycle Facilities, Fourth Edition,* American Association of State Highway Transportation Officials (AASHTO), 2012.
- *Urban Bikeway Design Guide, Third Edition*, National Association of City Transportation Officials (NACTO), 2025.
- *Don't Give up at the Intersection!*, National Association of City Transportation Officials (NACTO), 2019.
- *Sidepath Intersection & Crossing Treatment Guide*, Michigan Department of Tranpsortation, 2018.

1 NACTO, *Don't Give Up at the Intersection*, 7.



Enhanced Sidepath Crossing

DRIVEWAY CROSSINGS

Driveways and curb cuts that intersect the trail present heightened risk for conflict between trail users and turning vehicles, especially when the trail is a Sidepath.

Driveway Use

The Emerald Trail alignment traverses numerous driveways and curb cuts providing access to a wide diversity of property types with different considerations for trail design. Residential driveways, for example, should be treated differently from large commercial driveways with high traffic volumes. Design teams should consider use and context of driveways encountered along the trail when evaluating the potential risk they may pose to trail users.

Driveway Consolidation

The challenge of driveway and curb cut intersections is amplified when multiple high-volume driveways occur along the trail in quick succession. This condition creates heightened stress for trail users, interrupts the continuous trail experience, and increases the likelihood of collision. For these reasons, one of the most effective methods for minimizing driveway conflicts is to favor alignment options with fewer driveways. In instances where intersecting driveways are attached to businesses or commercial properties, it may be possible to consolidate or remove unnecessary driveways to further reduce the number of intersections.

Path Alignment

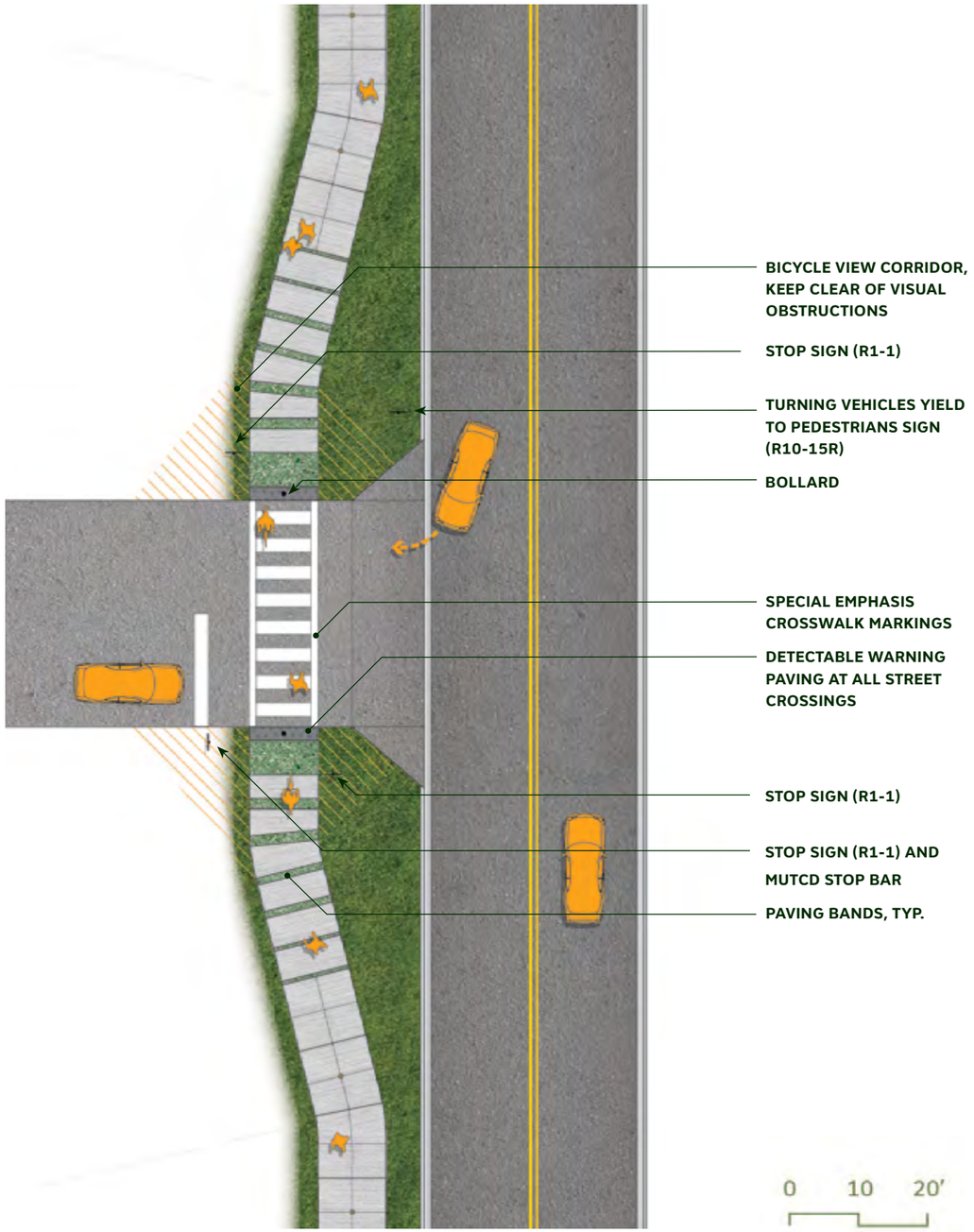
Similar to standard Sidepath intersections, crossing designs should seek to pull the trail back from the main road as much as feasible to improve sightlines and increase the visibility of trail users.

Coordination with Property Owners

Trails that cross private driveways and curb cuts will require coordination with nearby property owners to create clear, safe crossings. Groundwork Jacksonville may consider pursuing easements or agreements with property owners to pull the trail into their lot for the purposes of creating a safer intersection. The trail construction may also trigger reconstruction of some driveways to ensure the trail itself meets all applicable regulations and requirements, such as those required by the Americans with Disabilities Act (ADA).

Other Design Considerations

- As with other trail intersections, bollards will be required at trail entrances to prevent unauthorized vehicular access to the trail itself.
- Cars exiting the driveway should be STOP or YIELD controlled (MUTCD R1-1 or R1-2) prior to crossing the trail intersection.
- Where space allows, traffic islands or vertical delineators may be used along the centerline of the driveway to slow down turning cars and improve cyclist visibility.
- Raised crossings may be considered in settings where the trail is vertically separated from driveway by a curb.
- High-volume driveways may be signalized; in these cases the trail should be incorporated into the signal cycle to provide dedicated or privileged crossing windows.



Sidepath Driveway Crossing

TWO-WAY CYCLE TRACK CROSSINGS

Two-Way Cycle Track intersections present many of the same design considerations as Sidepaths, however the separation of cyclists into a dedicated facility increases cyclist visibility and provides more options for safe, protected intersections.

Traffic Calming Measures

As with Sidepath intersections, traffic calming measures can help slow down turning vehicles and make cyclists more visible to drivers. Curb radii may be reduced with mountable curb edges, slowing down right turning vehicles and creating a protected queuing area for cyclists and pedestrians waiting for their signal. Hardened centerlines slow down left turning vehicles and improve cyclist and pedestrian visibility.

Signalization

Two-Way Cycle Track intersections should be signalized with dedicated cycles for trail users. Where feasible, pedestrian and bicycle signals should be push-button activated and equipped to minimize waiting times for trail users.

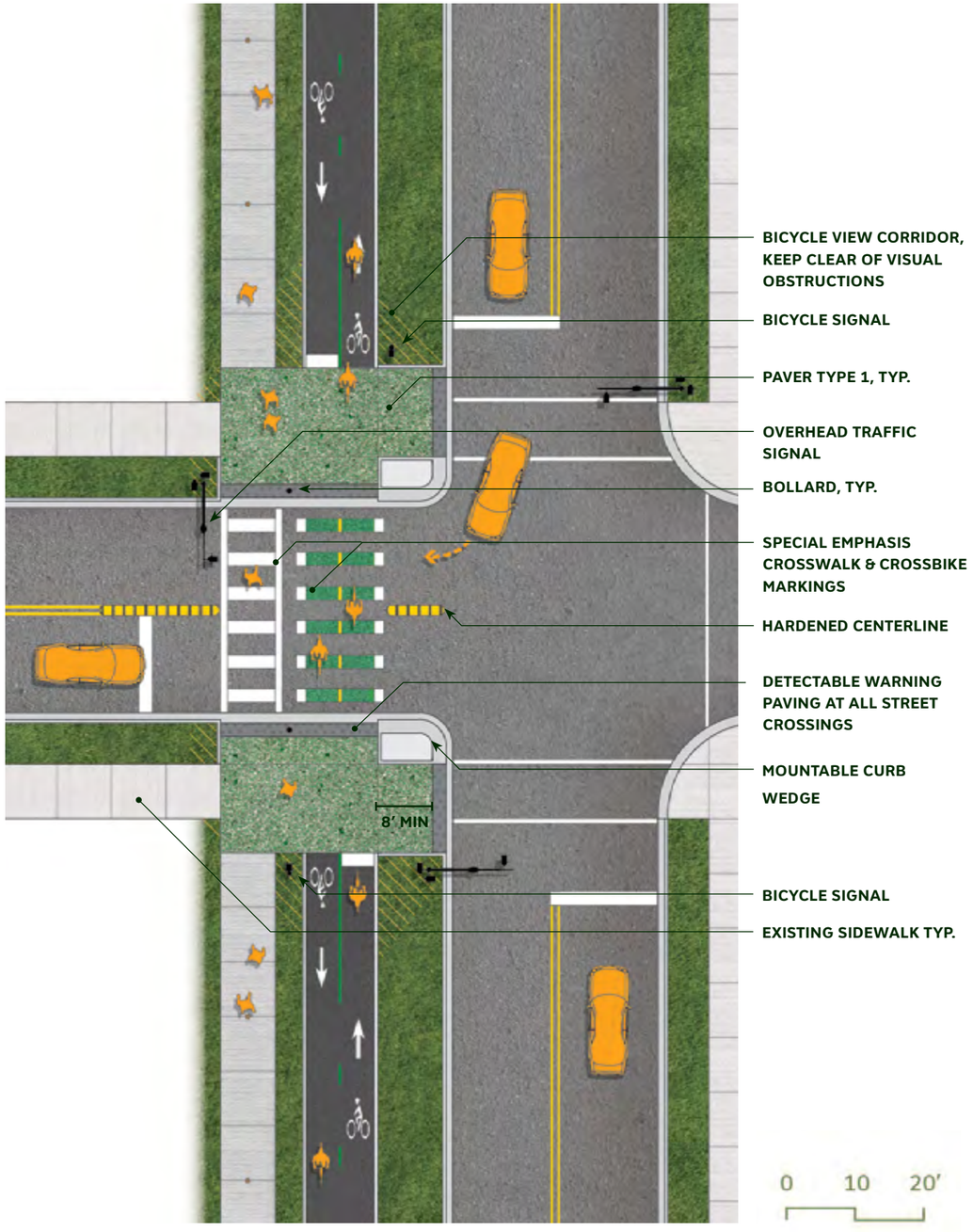
Placement of traffic signal push buttons must comply with the Americans with Disabilities Act.

Crosswalk Markings

For the dedicated pedestrian portion of the trail, special emphasis crosswalk markings should be used to highlight the presence of pedestrians. The bicycle portion of the crosswalk should include green colored pavement between dashed white lines as a continuation of the two-way cycle track in accordance with MUTCD Interim Approval IA-14 for Optional Use of Green Colored Pavement for Bike Lanes.

Green Colored Pavement

Green Colored Pavement applications should follow FDOT guidance for implementation and material selection. For more information, see ***Green-Colored Pavement Markings for Bicycle Facilities: Facilities, Materials, Application, and Performance***, Florida Department of Transportation (FDOT), February 2023.



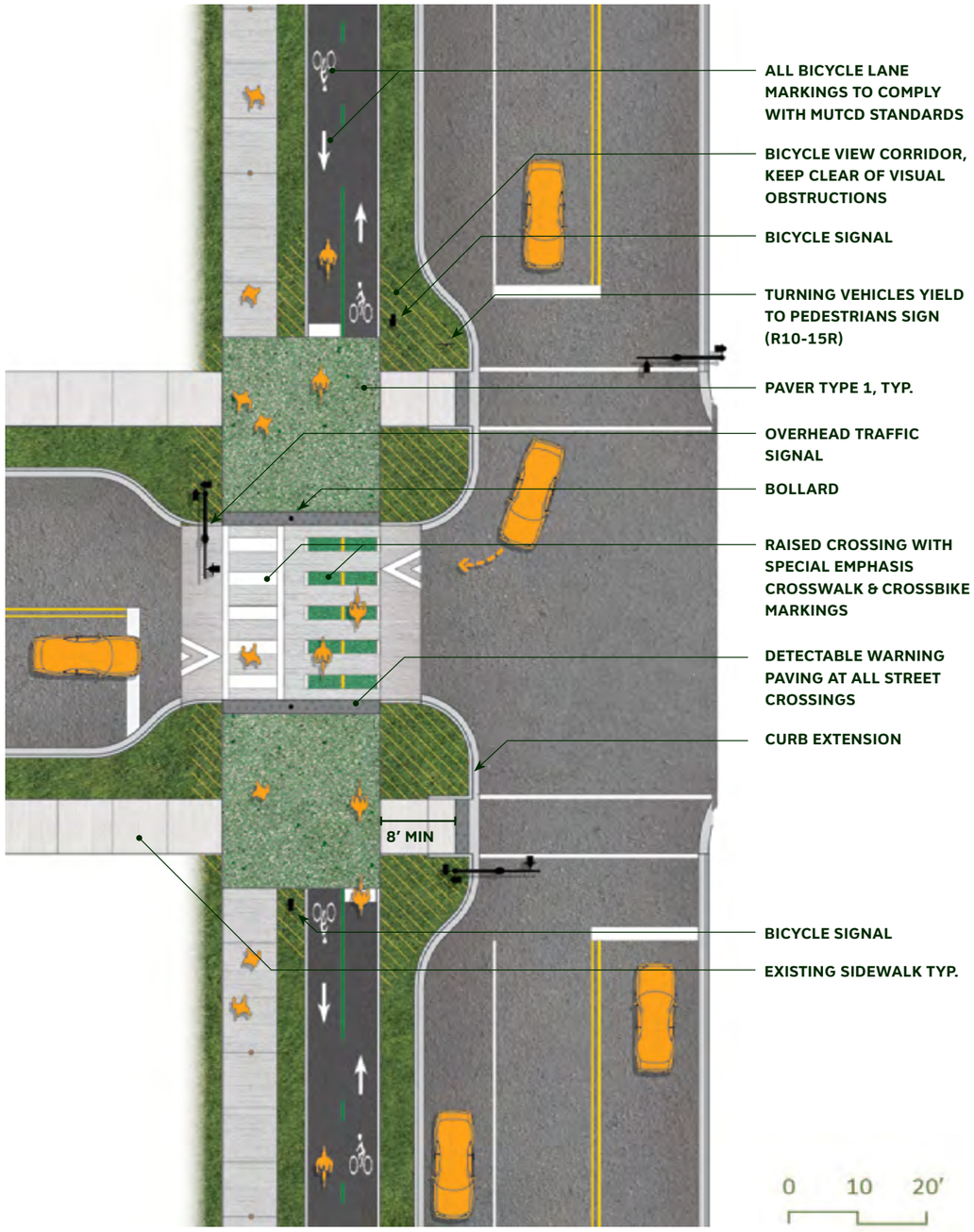
Two-Way Cycle Track Intersection

TWO-WAY CYCLE TRACK ENHANCEMENTS

Where space permits, additional traffic calming measures can enhance Two-Way Cycle Track intersection safety and trail user experience.

As with Sidepaths, Two-Way Cycle Track intersections benefit from the implementation of enhancements that slow down traffic and prioritize trail users. Where the adjacent roadway includes an on-street parking lane, curb extensions reduce motor vehicle turning radii, slow down turning vehicles, decrease crossing distance for trail users, and increase trail user visibility.

Raised crossings can similarly improve visibility of trail users and slow down turning vehicles. Bollards should be included at the flush transition between the raised crossing and the trail to deter unauthorized vehicular access. As with a typical Two-Way Cycle Track intersection, the crosswalk should be marked with a special emphasis crosswalk for the pedestrian crosswalk and with dashed green colored pavement in compliance with MUTCD Interim Approval IA-14.



Enhanced Two-Way Cycle Track

LOADING ZONES AND PARKING GARAGES

Operational Challenges

Loading zones and parking garage entrances may interrupt the trail experience along more industrial or urban portions of the Emerald Trail. Active loading zones in particular present considerable challenges to trail use. Large trucks with wide turning radii may temporarily block trail access as they enter and exit the adjacent facility. Trucks and vehicles may need to park within the crossing itself, blocking travel along the trail for extended durations. Vehicles queuing to enter parking garages may also form lines that block travel along the trail.

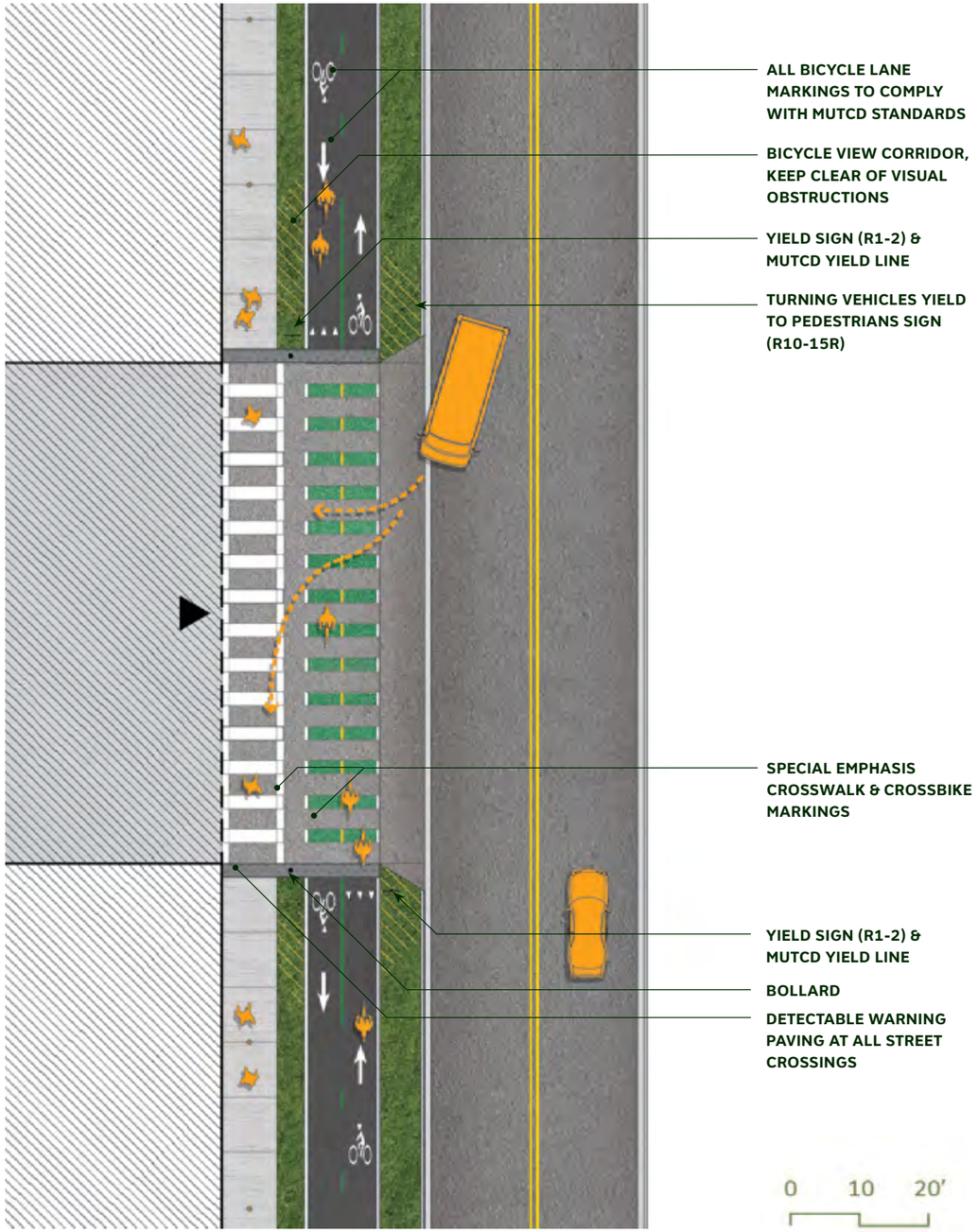
The best way for trail design to avoid these obstacles is to select trail alignments that avoid interactions with loading zones and curb cuts where possible. Where this is unavoidable, high-visibility trail markings should extend the full length of the loading zone to reinforce the presence of the trail for vehicles entering and exiting the facility.

Curb Cuts and Driveway Ramps

The trail alignment should not overlap with curb ramps, driveway aprons, or curb flares. In space-constrained contexts where there is limited room for a buffer or curb cut between the two-way cycle track and the adjacent street, mountable curbs should be used in lieu of a driveway apron. This approach maintains vehicle access while reinforcing the priority of trail users.

Property Owner Coordination

As with driveway intersections, design teams should coordinate trail design in front of loading zones and parking garages with the respective property owners to discuss operational needs, traffic, and other considerations that may impact trail design.



Loading Zone Entrance

NEIGHBORHOOD GREENWAY INTERSECTIONS

Neighborhood Greenways rely on low motor vehicle volumes and speeds to create a safe and comfortable on-street experience for cyclists. Traffic calming measures at intersections can help enhance the trail experience for cyclists, pedestrians, and motorists alike while adding green space to neighborhood streetscapes.

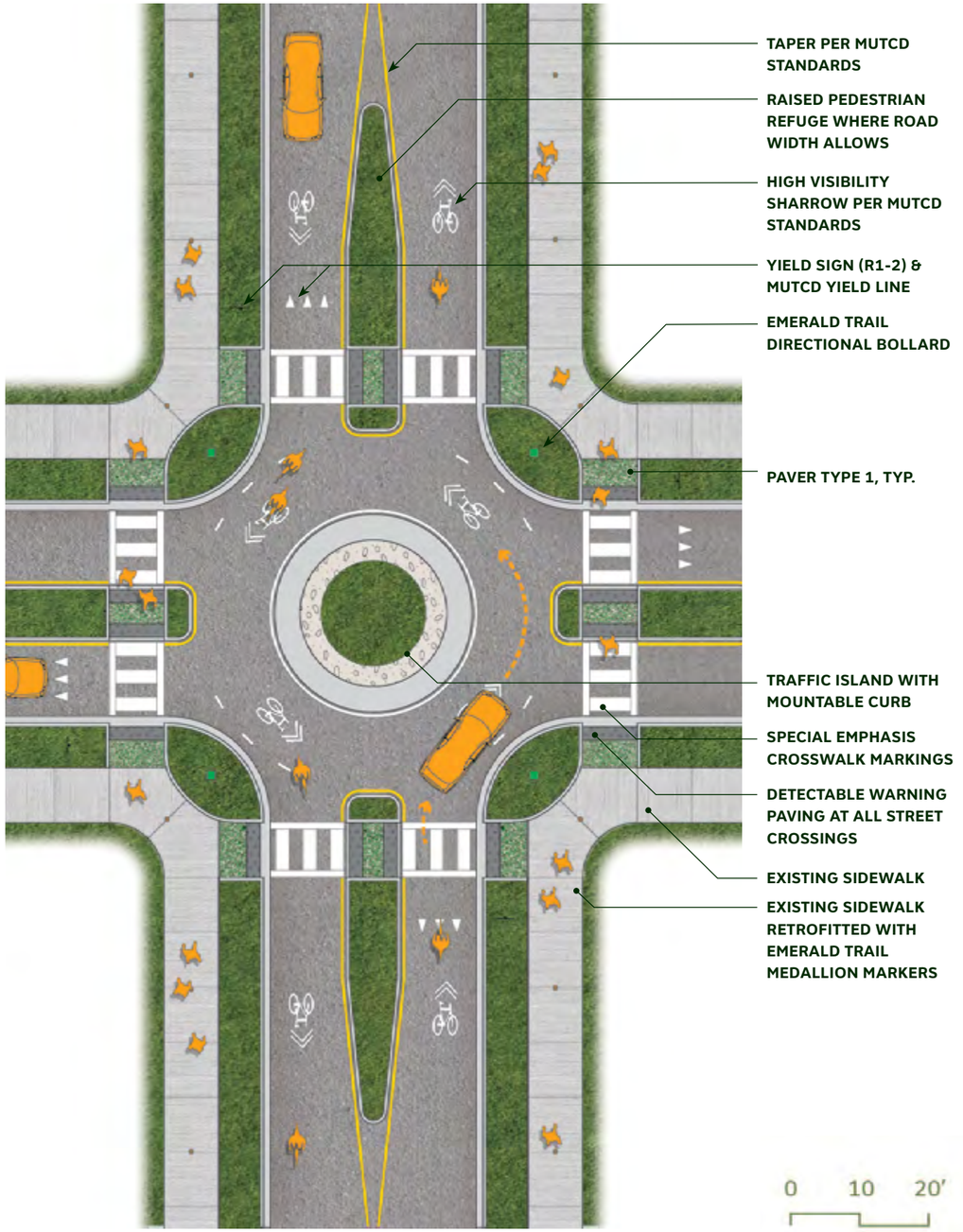
Traffic Calming Measures

Traffic calming measures are particularly important at neighborhood greenway intersections where cars on intersecting roads may enter, exit, or cross the Emerald Trail alignment. Traffic calming measures that may be considered include:

- **Mini-roundabouts:** Mini-roundabouts replace a stop controlled intersection with a yield controlled intersection around a central traffic island, forcing drivers to slow down and navigate through the intersection. They are effective at slowing traffic speeds and discouraging speeding through intersections.
  - » Mini-roundabouts should be designed with emergency vehicle and large vehicle access in mind. For example, traffic circles at the center of roundabouts should be designed with mountable curbs and vehicular-rated paving aprons to facilitate travel by vehicles with larger turning radii, such as school busses.
  - » Traffic circle size can be scaled to respond to the dimensions of a given intersection. NACTO recommends a minimum distance of fifteen feet (15') from an intersection corner to the traffic circle.
  - » Shared-lane markings (MUTCD 9C-C) for cyclists should continue through the roundabout to clarify that cyclists have right-of-way within the intersection.
- **Traffic islands:** At intersection approaches and crosswalks, traffic islands can reduce lane widths, encouraging slower travel, as well as reduce crossing distances for pedestrians.
- **Curb extensions (not shown):** Curb extensions may be used as an alternative to crossing islands where roadway geometries allow.

In addition to slowing and mitigating neighborhood traffic, these traffic calming measures present opportunities to integrate additional low-lying planting into the intersection, and enhance the neighborhood streetscape.

A mini-roundabout in Austin, TX (Image credit: NACTO)



Neighborhood Greenway Intersection

RAILROAD CROSSINGS

Significant risks, especially for cyclists, in crossing railroads at-grade can be reduced with trail alignments that support slower speeds, perpendicular crossings, and clear sight-lines.

Alignment

Cyclists crossing railroad tracks at a diagonal can face steering dificulties and significant fall risks from a bicycle wheel becoming caught in the railroad flangeway opening. Fall risks are greatly reduced where the trail crosses the tracks at a skew angle of 60 to 90 degrees between the centerline of the tracks and the bikeway.[1]

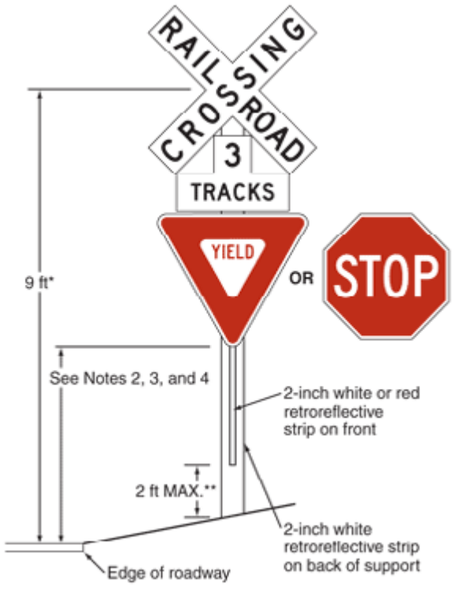
A common approach to achieving a perpendicular crossing is a 'jughandle' configuration that utilizes narrow radii to re-orient the trail approaching the crossing. This configuration further improves cyclist safety by slowing trail users as they approach the tracks, though care should be taken to maintain clear sight-lines and provide adequate warning signage ahead of the crossing.

Signage

The MUTCD 'Crossbuck' Assembly should be placed along the trail ahead of railroad crossings in accordance with MUTCD requirements and best practices. Specific components of the crossbuck assembly, additonal warning signage, and pavement markings should be determined by a traffic engineer.

Materials

Detectable warning paving should be placed at all railroad crossings in accordance with PROWAG R305.2.5. Cast-in-place concrete to match the trail should be used to cross the track assembly and comply with PROWAG R302.6.4. Emerald Trail Medallions and accent paving should not be placed within rail envelope.

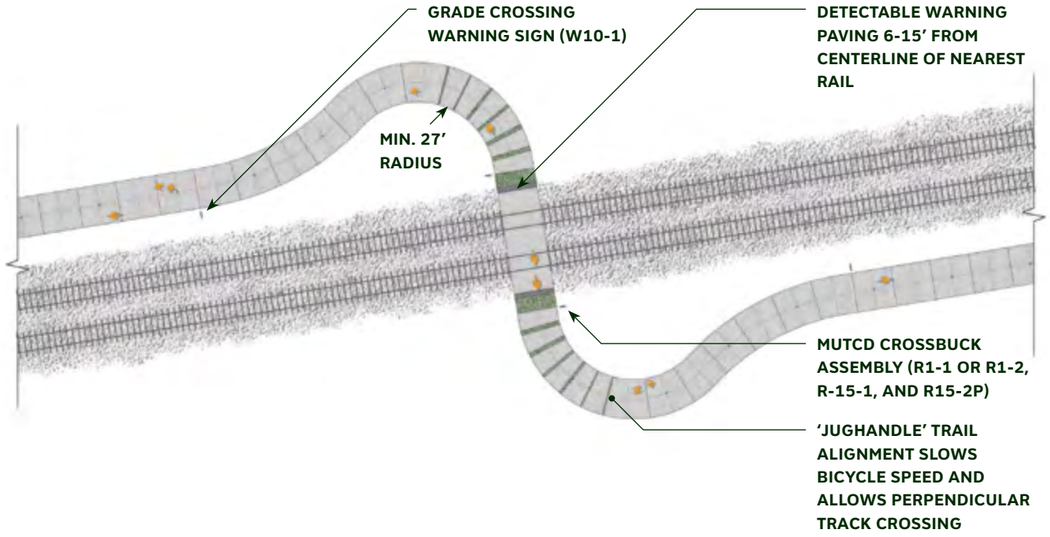


Crossbuck Assembly, MUTCD Fig. 8B-2

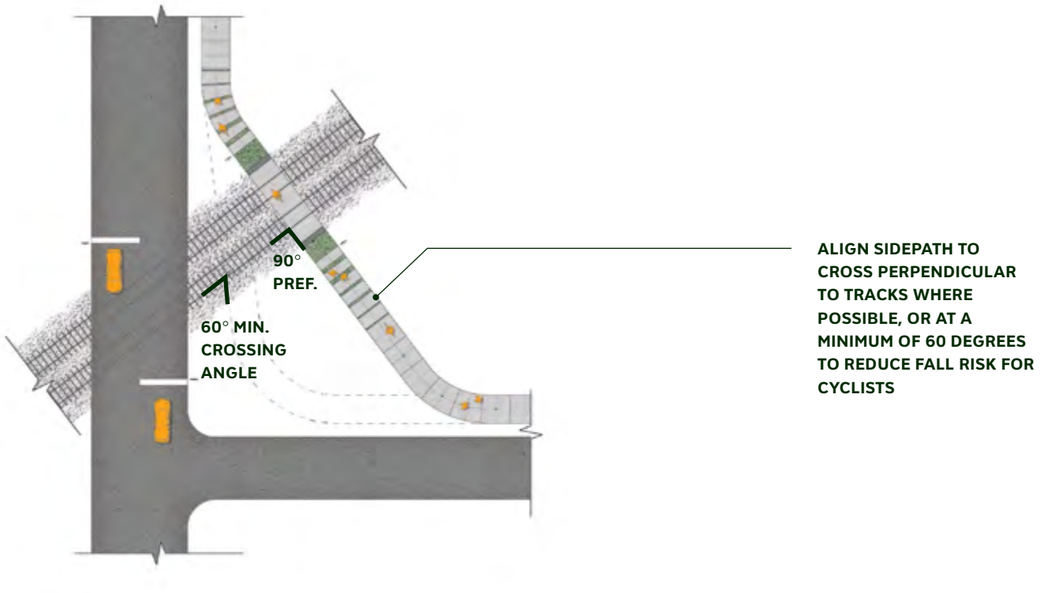
Additional Resources

- R302.6.4 Surfaces at Pedestrian At-Grade Rail Crossings and R302.2.5 Pedestrian At-Grade Rail Crossings, U.S. Access Board Public Right-of-Way Accessibility Guidelines (PROWAG), 2024.
- 4.12.1 Railroad Grade Crossings, *Guide for the Development of Bicycle Facilities, Fourth Edition,* American Association of State Highway Transportation Officials (AASHTO), 2012.

1 AASHTO *Guide for the Development of Bicyle Facilities,* 4.12.1 Railroad Grade Crossings.



Example Trail Alignment - Jughandle



Example Trail Alignment - Perpendicular Crossing

ADDITIONAL MATERIAL CONSIDERATIONS FOR INTERSECTIONS

Detectable Warning Surfaces

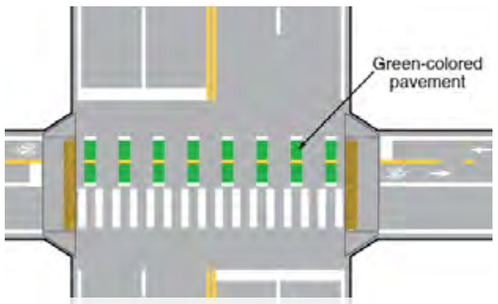
- Detectable warning surfaces should be used where the trail crosses a vehicular route or railway at-grade.
- The preferred detectable warning surfacing is cast iron. Gray precast concrete unit pavers with truncated domes are an acceptable alternate.

All detectable warning surfaces shall comply with PROWAG R305.

Cast Iron Detectable Warning Surface

Crosswalks & Crossbikes

- Crosswalk and crossbike pavement markings should be placed in accordance with MUTCD and may be made with thermoplastic methyl methacrylate (MMA) or other surface-applied treatments appropriate for use on vehicular surfaces.
- Crossbike markings should only be used where pedestrian and bicycle travel lanes are separated.
- Crossbikes should utilize dotted white lines with high-friction green surfacing in the space between each pair of dotted lines. Yellow dotted centerlines should delineate the direction of travel.
- Crosswalks and crossbike pavement markings must be separated.



Crossbike & Crosswalk Markings (MUTCD)

Raised Crossings

- Raised crossings should be set at the same height as the sidewalk, flat on top, and include markings for crosswalks / crossbikes and speed tables or speed humps compliant with MUTCD. Advance warning markings for speed humps may be used within the roadway compliant with MUTCD 3B-31.
- Raised crossings should be constructed of cast-in-place concrete to match the primary trail paving.
- Drainage, traffic volume and speed, and emergency vehcile routes must be considered in the design of a raised crossing.

CIP Concrete Raised Crosswalk

- All raised crossings should comply with U.S. DOT Federal Highway Administration guidance (Module 3.14).

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