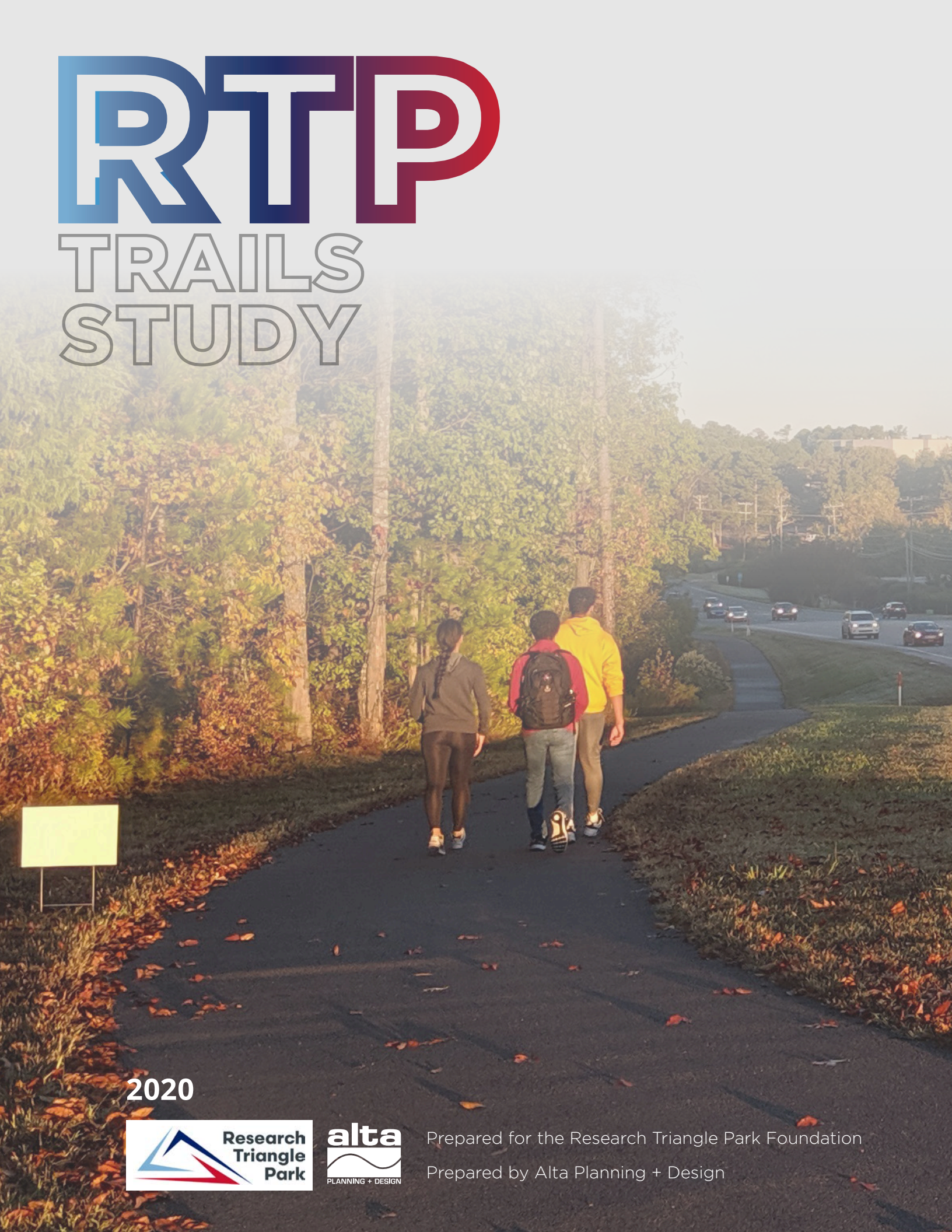


RTP

TRAILS STUDY



2020



Prepared for the Research Triangle Park Foundation

Prepared by Alta Planning + Design

ACKNOWLEDGMENTS

Thank you to the Research Triangle Foundation, RTP businesses, and local government entities that participated in the development of this Plan through meetings, field work, and plan review. Special thanks to those who participated as RTP Trails Committee members, listed below.

RTP TRAILS COMMITTEE

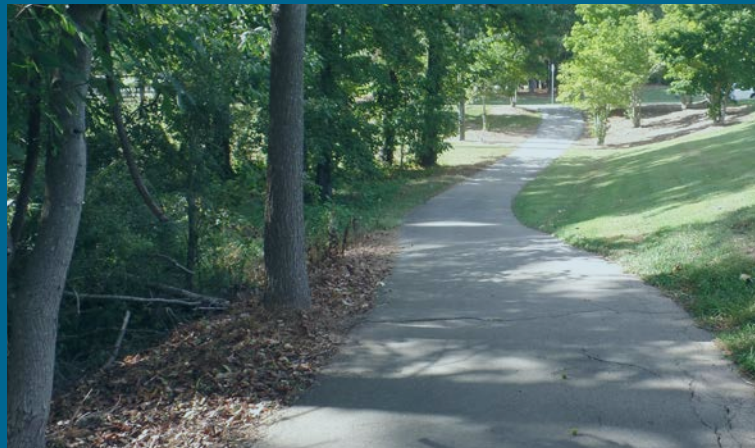
Ellen Beckmann, City of Durham
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Chapter 1:

Existing Conditions

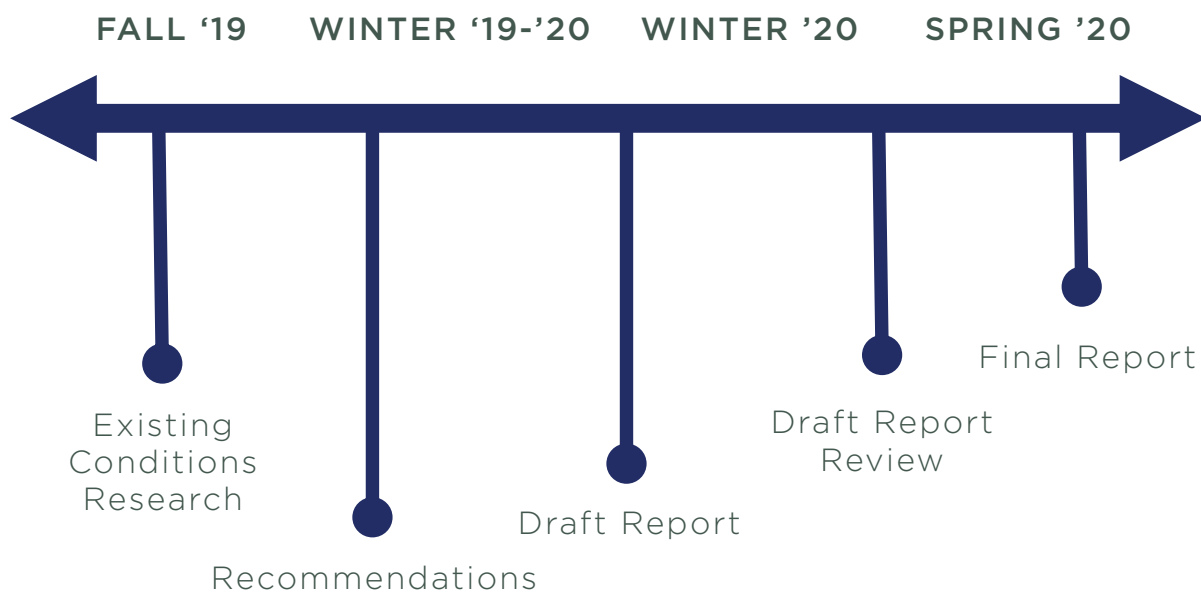
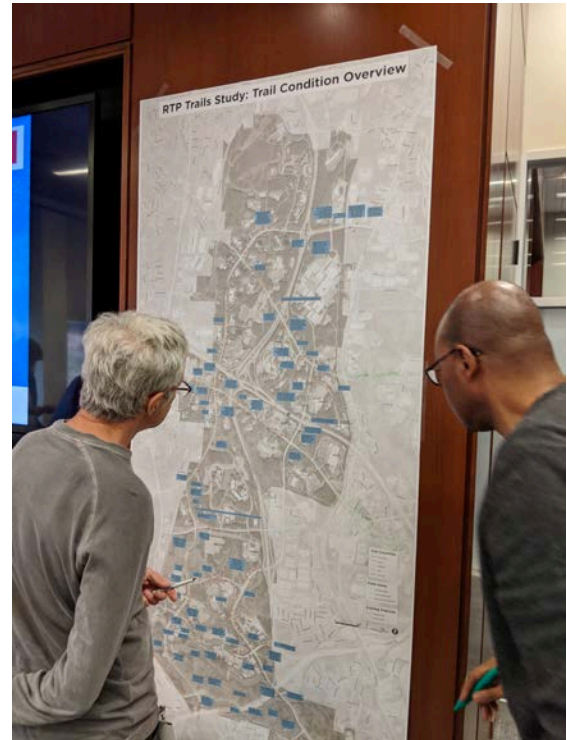
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Introduction

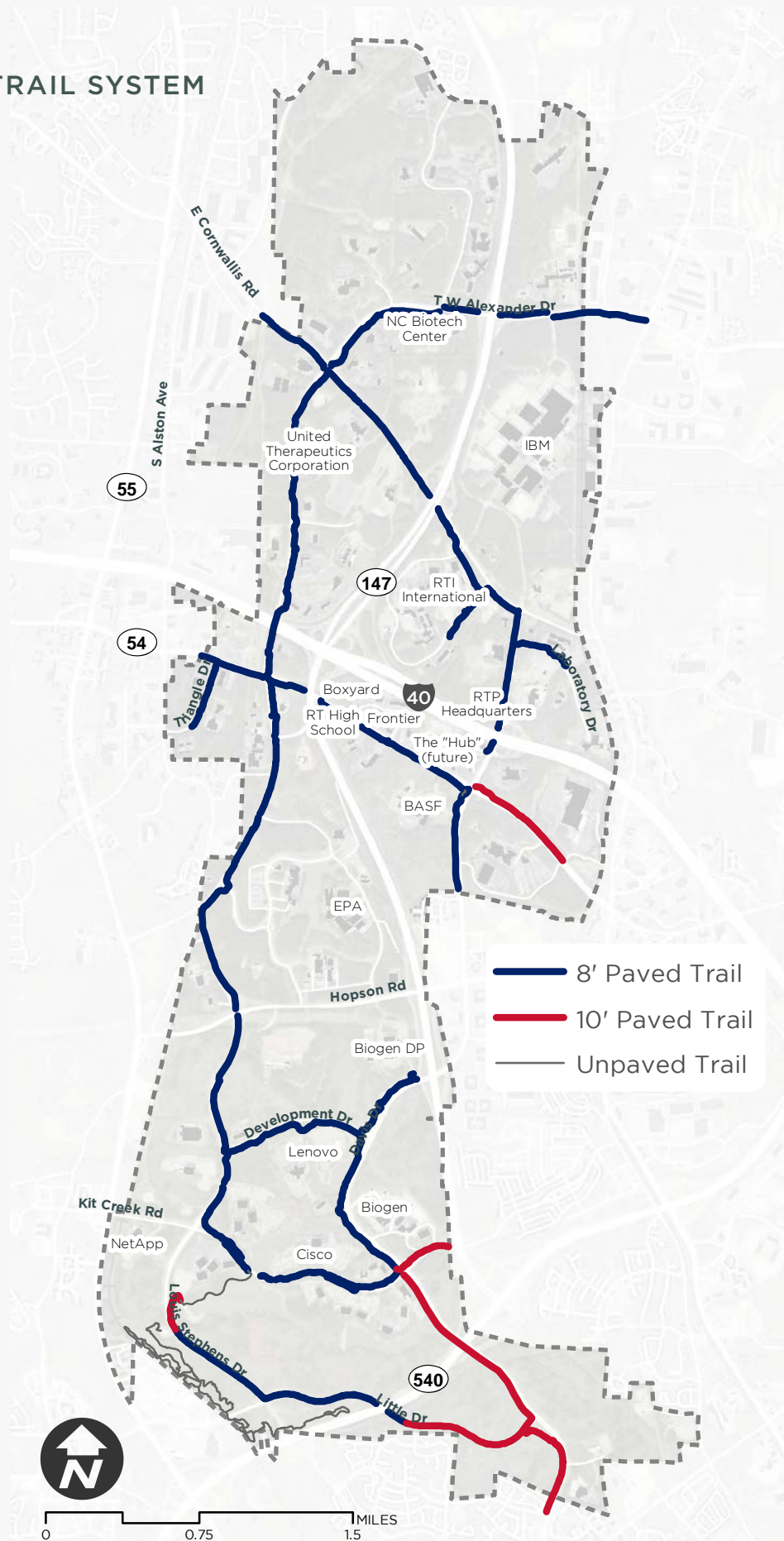
The first sections of the RTP trail system were constructed in the 1980's, and segments have been added in the 1990's, 2000's, and 2010's. In the fall of 2019, the project team evaluated the 19 miles of existing RTP trails, on foot and on bike, and recorded detailed notes on trail condition and opportunities and challenges related to trail improvements. Notes from the fieldwork were compiled in a supplemental document for reference.

The project was guided by a committee of representatives from several RTP businesses, local government entities, and RTP Foundation staff.

This document shares a summary of findings from this analysis and recommendations for strategically improving and maintaining the trail network over time, one that can continue to serve an important recreational function, but also as an integral component of a truly multimodal transportation system as RTP continues to grow.



MAP 1.1:
EXISTING TRAIL SYSTEM

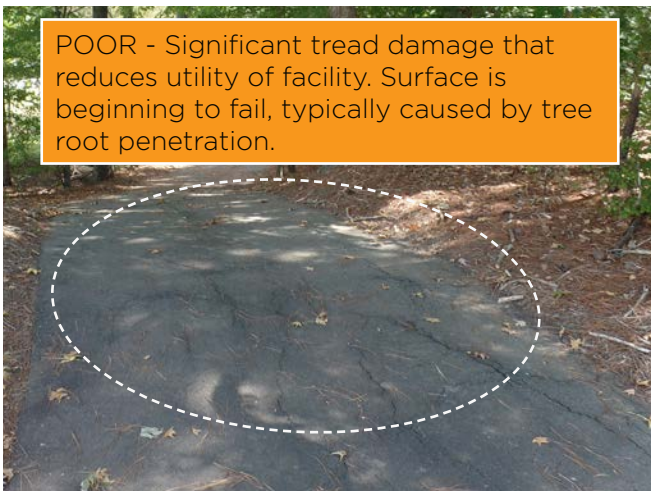


Trail Condition

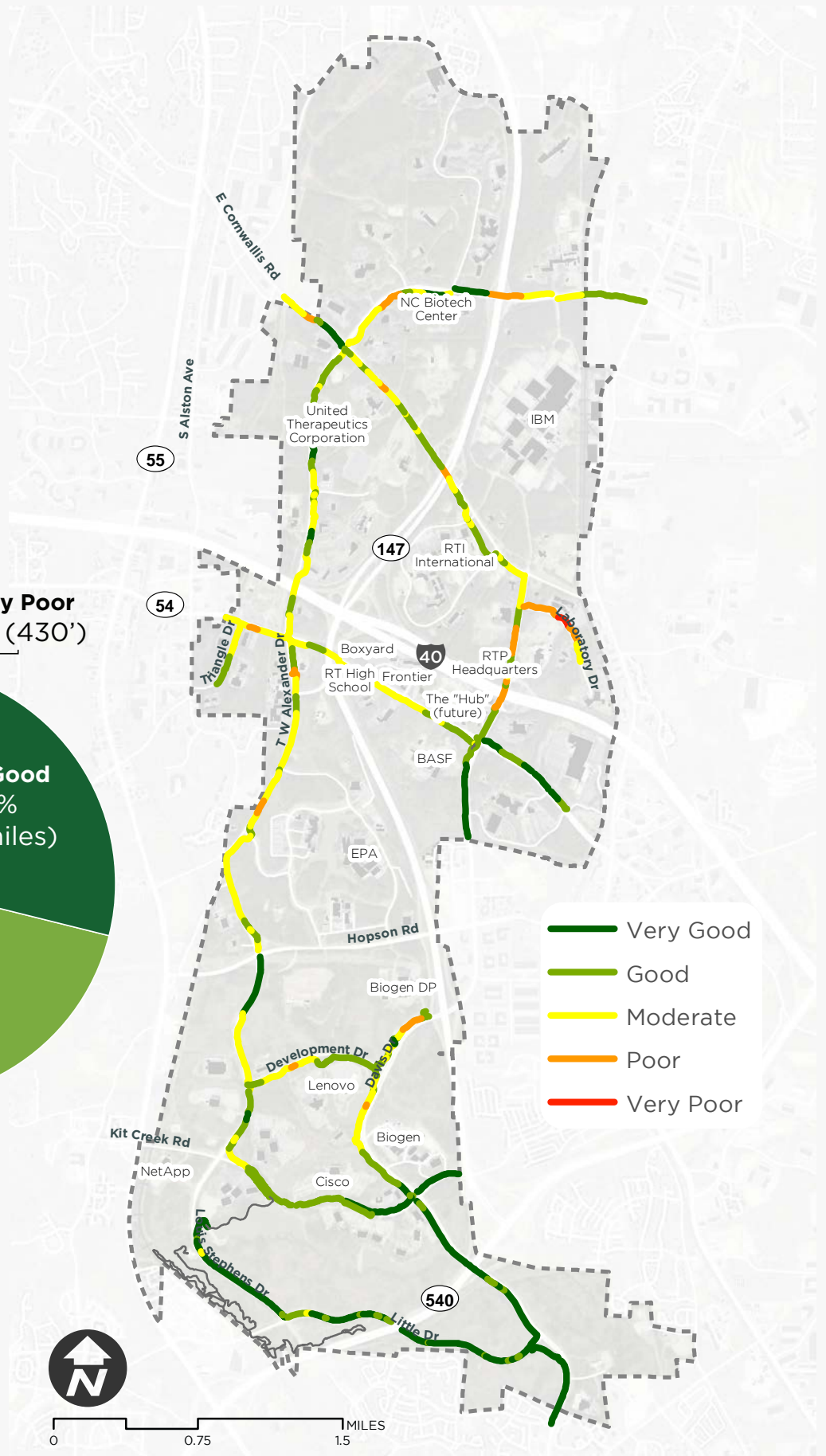
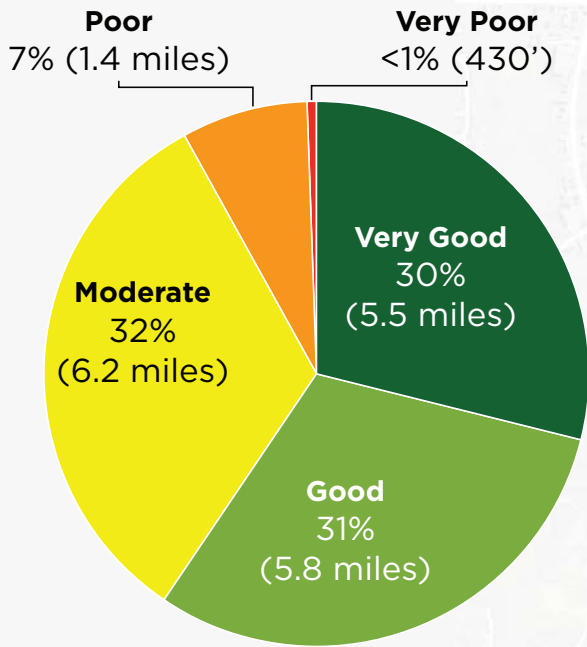
The majority (61%) of the trail system in RTP is in “Good” or “Very Good” condition. This level of condition means that the trail is in new condition or showing very little sign of deterioration.

Intuitively, a majority of the “Very Good” trail sections are the newest trail segments at the southern portion of the Park, and the “Moderate” and “Poor” condition areas are found along older sections of trail.

The trail condition map can help prioritize improvements. Fortunately, there is only a small amount of “Poor” or “Very Poor” trail in the network, but these areas may pose a safety risk and should be addressed as soon as possible



MAP 1.2:
TRAIL CONDITION



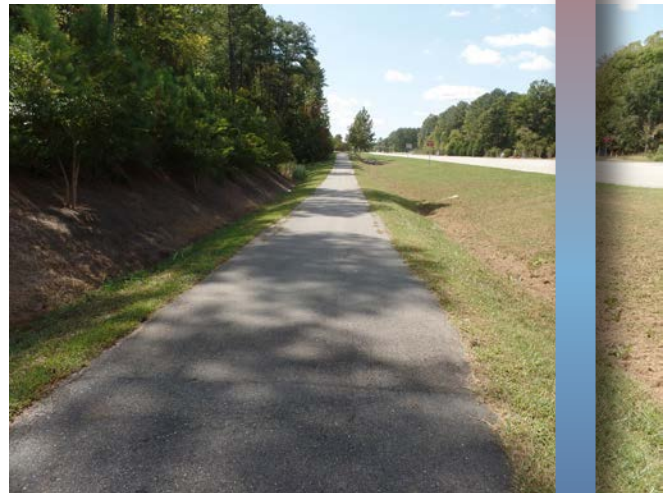
Shade Inventory

The RTP trail network includes trails that experience a wide range of shade. The newest sections of trail, many of which are found in the southern portion of the Park; this includes trails along Kit Creek Rd, Louis Stephens Dr, and Little Dr. East/West trail segments that follow along the north side of a road tend to be the most exposed. East/West segments along the south side of a road as well as most north/south trails tend to experience more shade differentiation.

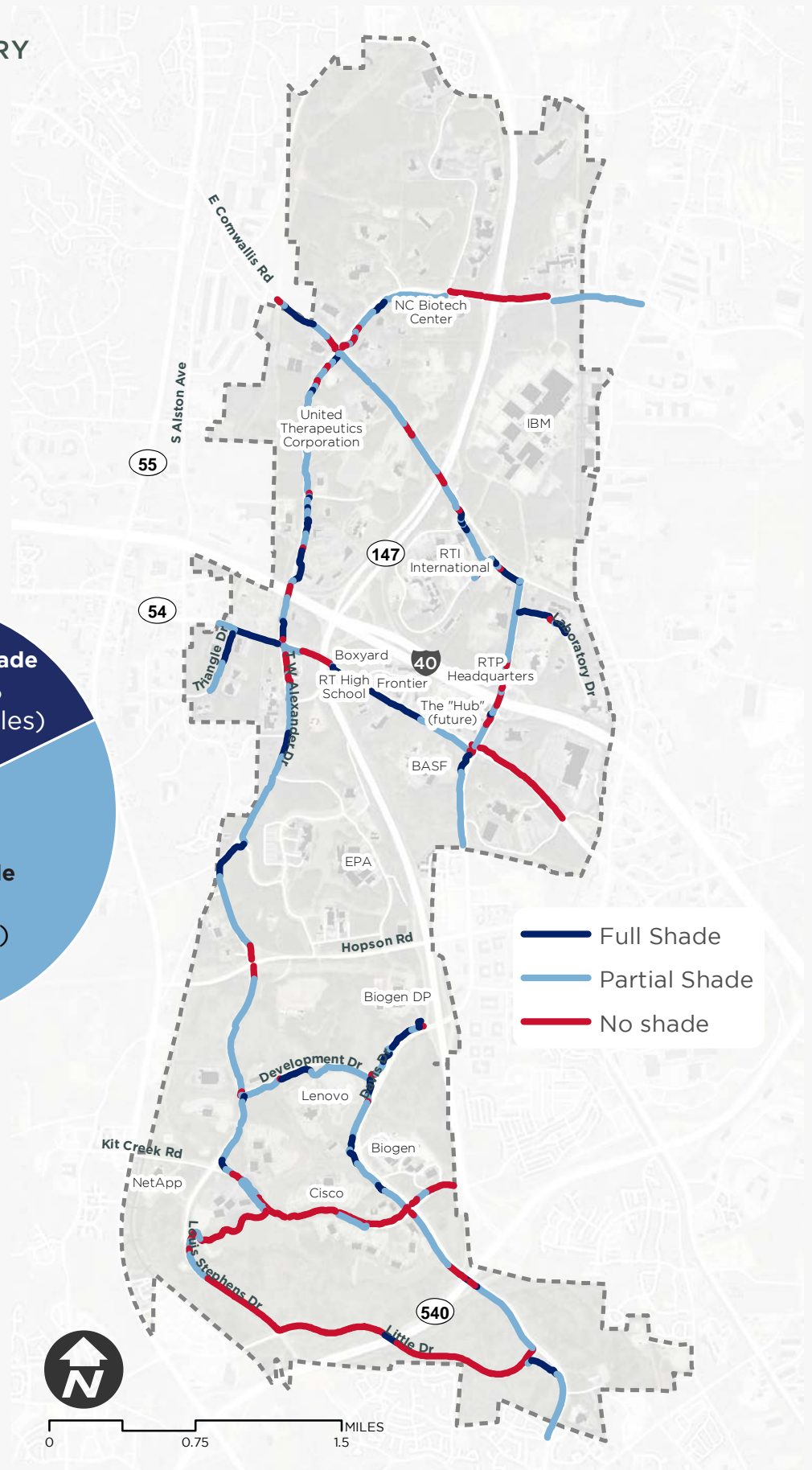
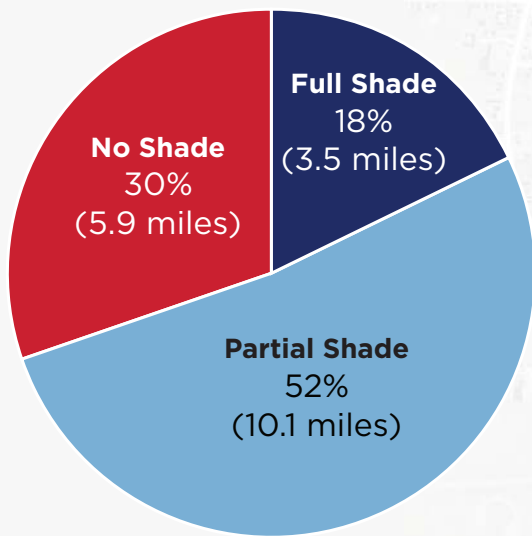
Full shade can mitigate temperature extremes, especially on very hot summer days. Conversely, sun-filled trail sections may be more desirable during the cooler weather months.

Long stretches of fully exposed trail should generally be avoided if possible. These stretches can leave trail users exposed to very warm temperatures in the summer months.

Having consistent variation in the amounts of shade available along the trail network may be optimal.



MAP 1.3:
TRAIL SHADE INVENTORY



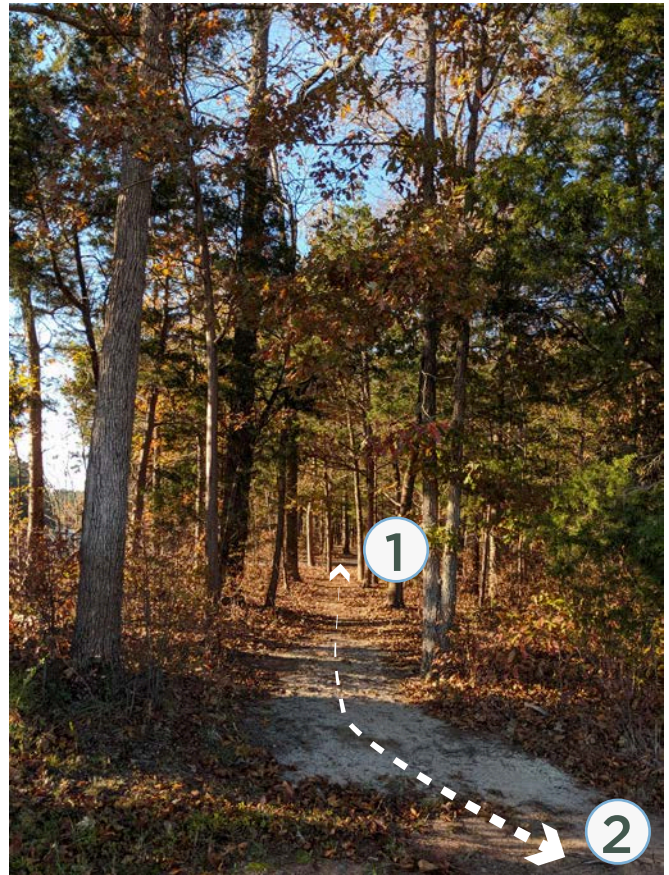
Slope Measurements

Paved shared use paths that have minimal change in grade are able to accommodate a wider range of ages and abilities of trail users. Geographical challenges and other constraints can make this difficult to achieve during trail implementation, and the RTP trail system has numerous steep slopes.

Map 1.4 shows slope measurement points from fieldwork. The Kit Creek Loop, NC 54 segment between TW Alexander and Davis Dr, and the section of TW Alexander from the NC 54 area north toward United Therapeutics are the sections of trail with the most significant changes in grade.

As sections of older trail are widened/replaced, these are opportunities to create gentler slopes as part of future improvements.

This user-created pathway (image to the right and illustrated as the dotted white line in the image below) allows trail users to avoid the steep slopes down to the intersection of Davis Dr and NC 54. During fieldwork and trail counts, many trail users chose to utilize the flatter informal pathway.



A point of extreme slope at the southwest corner of Davis Dr and NC 54. The angle and stopping distance at the bottom of the slope creates a challenging and potentially dangerous point for wheeled users.

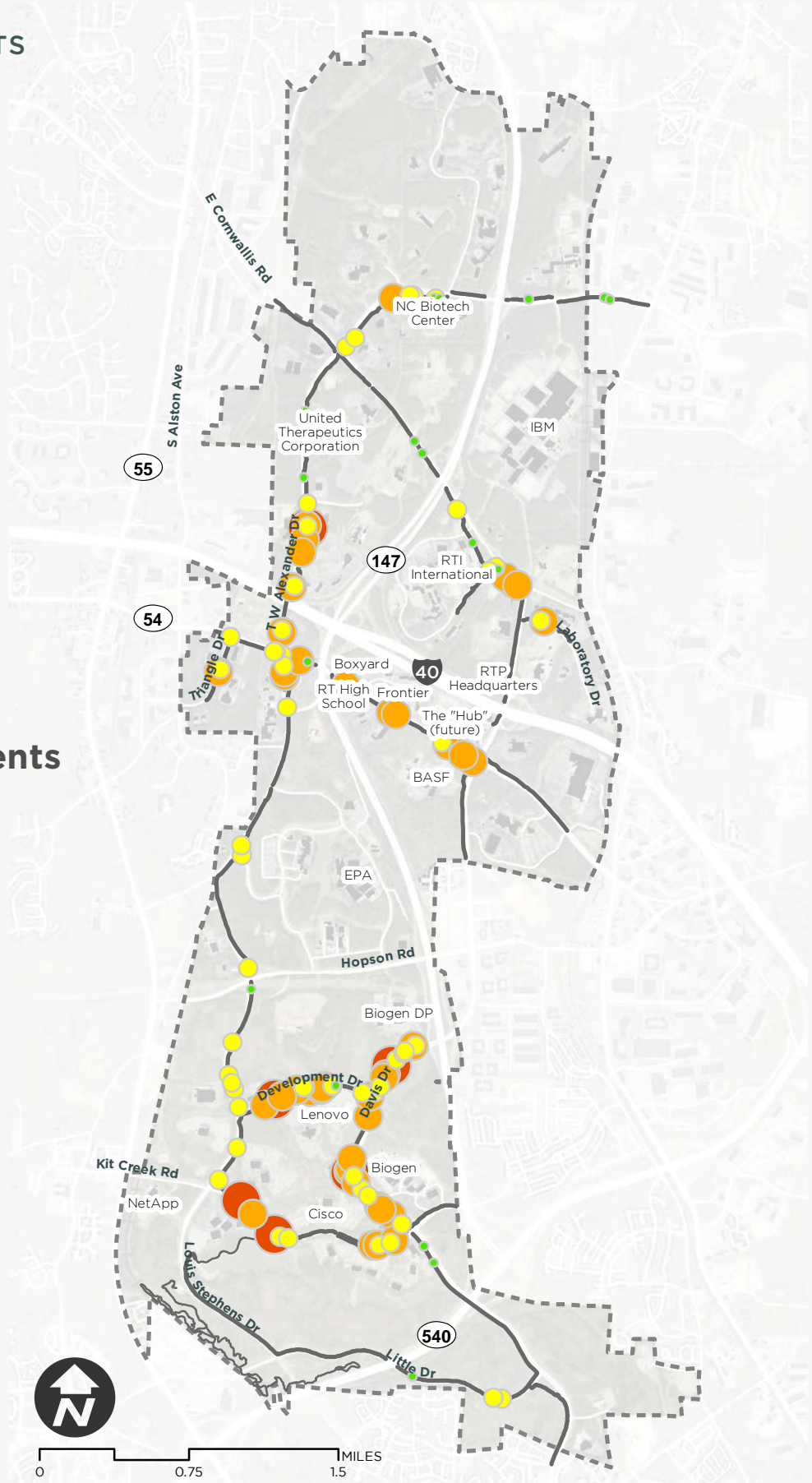
MAP 1.4:
SLOPE MEASUREMENTS

Slope Measurements

- 0 - 5%
- 5 - 10%
- 10 - 20%
- 20%+

RTP Trails

- Unpaved Trail
- Paved Trail



Wayfinding Inventory

The RTP Trail System is officially named for Elizabeth Rooks, former Chief Operational Officer and Executive Vice President who led the development of the trail system for more than two decades. The trail system includes wayfinding features and a naming system. Map 1.5 on the following page shows where pavement distance markers are blazed every 1/4 mile for each trail segment.

Three colors are used for five different trail names. Yellow blazes mark the Park Center Extension Trail; white blazes mark the Park Center Loop (north) and Kit Creek Loop (south) as well as the Kit Creek Extension Trail at the very southern end of RTP. Green blazes mark the RTP Connector Trail that connects the northern and southern sections of RTP.



Wayfinding map found along the Kit Creek Loop Trail



Wayfinding sign example found along the Kit Creek Extension Trail




Yellow pavement marker blaze found every 1/4 mile (Park Center Ext Trail)




White pavement marker blaze found every 1/4 mile (Park Center Loop Trail)




MAP 1.5:
WAYFINDING INVENTORY

Wayfinding Inventory



 Wayfinding Sign

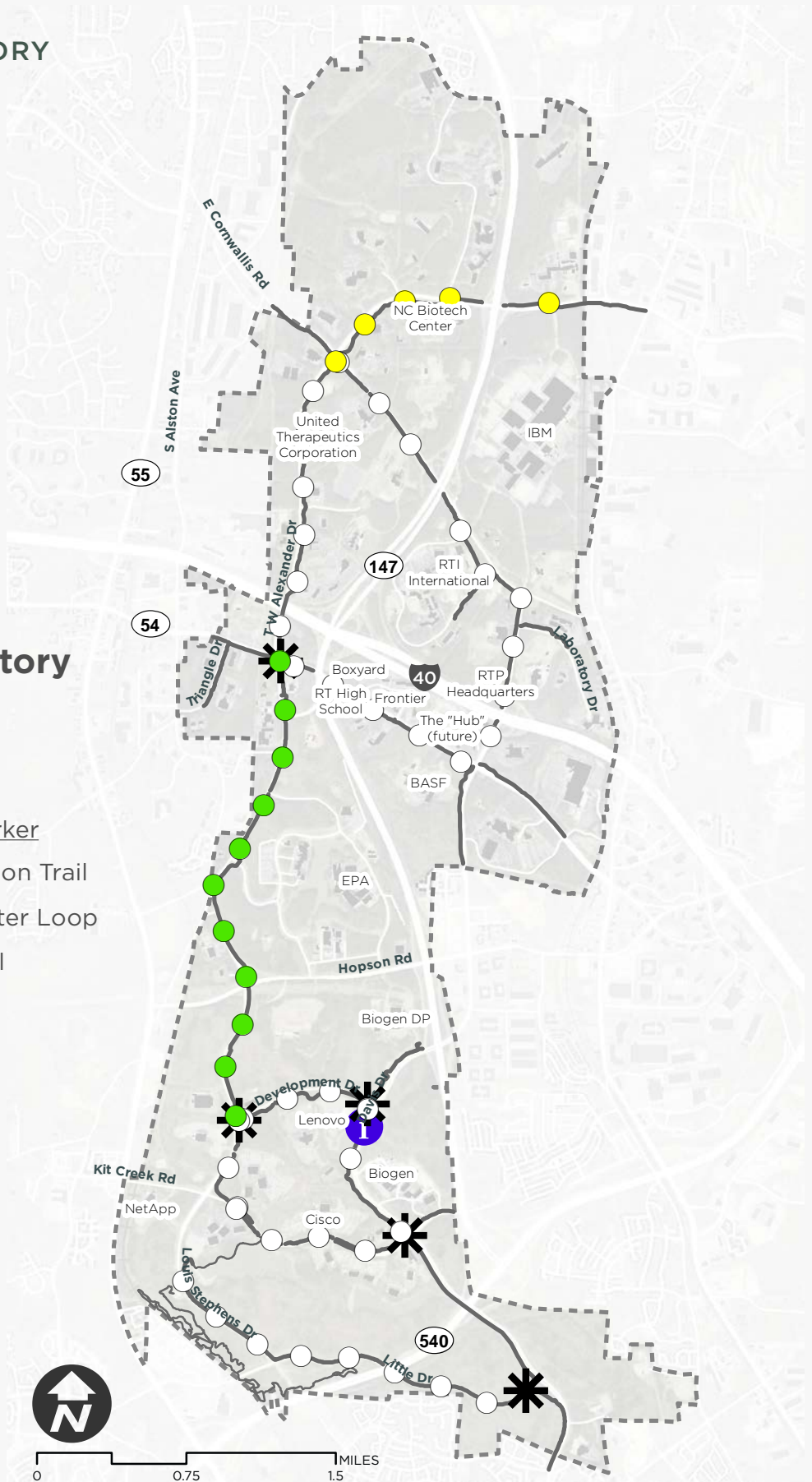
 Wayfinding Map

Wayfinding Pavement Marker

-  Park Center Extension Trail
-  Kit Creek/Park Center Loop
-  RTP Connector Trail

RTP Trails

-  Unpaved Trail
-  Paved Trail



Regional Connectivity

MAP 1.6

-  Paved Trail
-  Unpaved Trail
-  Existing Bike Lane
-  Existing Sidewalk

Cornwallis Rd bike lanes connect RTP to Durham and the American Tobacco Trail

Sidewalks along Miami Blvd connect to RTP trail system.

Cornwallis Rd bike lanes connect RTP to the IBM campus at Miami Blvd.

Sidewalks link the RTP trail system toward NC 55 along NC 54 (sidewalks incomplete).

Sidewalk connects RTP trail system along NC 54 to Slater Rd and Miami Blvd.

RTP mountain bike trails connect to sidepath along O'Kelly Chapel Rd to commercial and residential development in the Town of Cary municipal limits.

Sidewalk links RTP trail system spurs along Davis Dr through City of Durham municipal limits.

Sidewalk connects the Kitts Creek neighborhood to the RTP trail system along Kit Creek Rd.

RTP sidepath links into Morrisville sidepath along the west side of Davis Dr, connecting to McCrimmon Pkwy as well as adjacent residential neighborhoods.



The Hub

The Hub will be the heart of RTP with the introduction of world class amenities and facilities including a hotel, flexible greenspaces, office space, residences, restaurants, and a walkable town center providing a range of services. With the Boxyard and Frontier, the Hub will exemplify innovation and modern living.

The Hub will implement walkable urban design principles with a focus on multi-modal connectivity across scales.

Regional Opportunities:

- » Seamless RDU link
- » Current and future Regional Transit Center
- » Triangle Bikeway

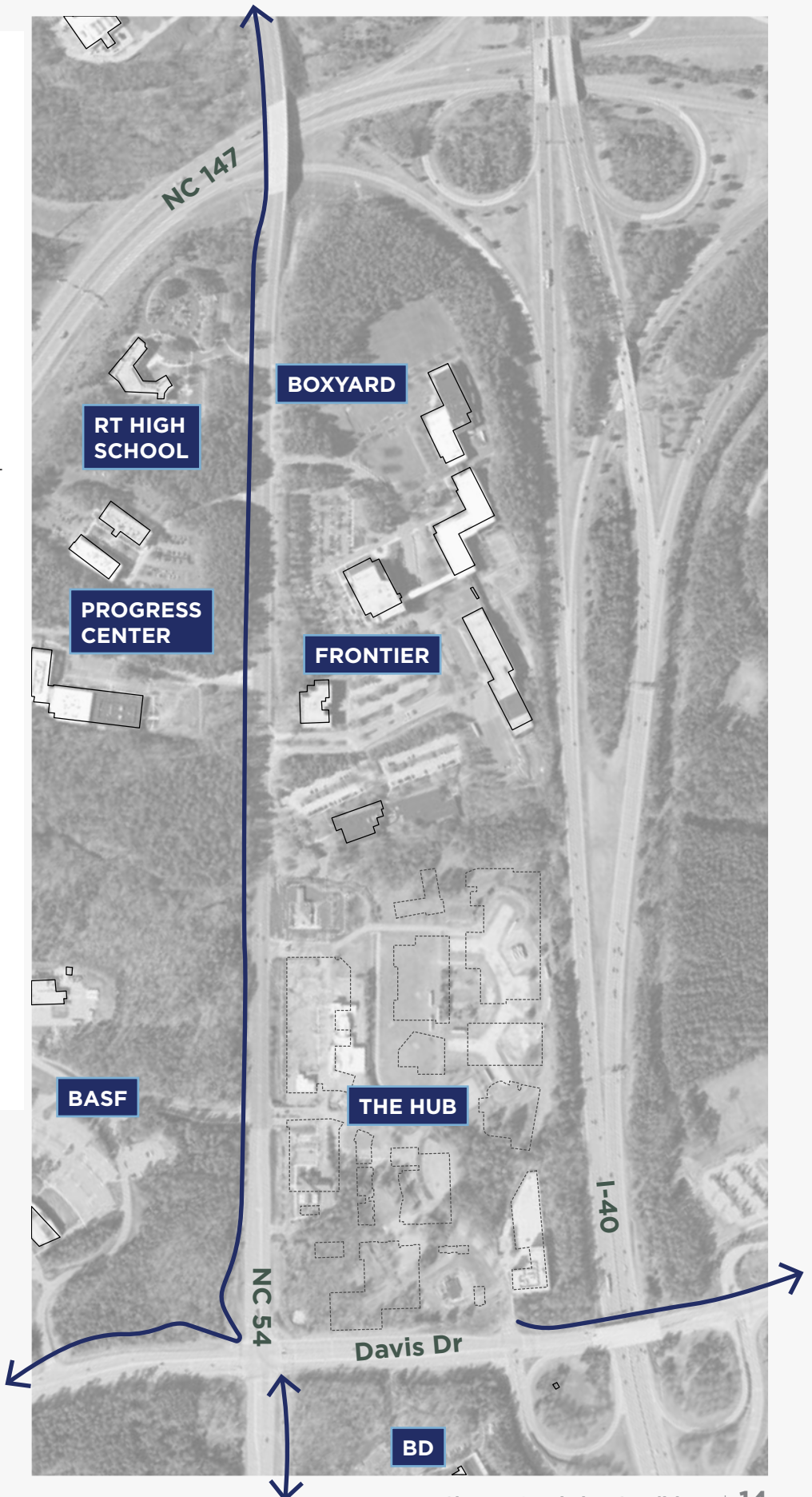
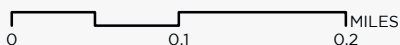
Inter-RTP:

- » Improve RTP trail network
- » New mobility planning

Hub Internal:

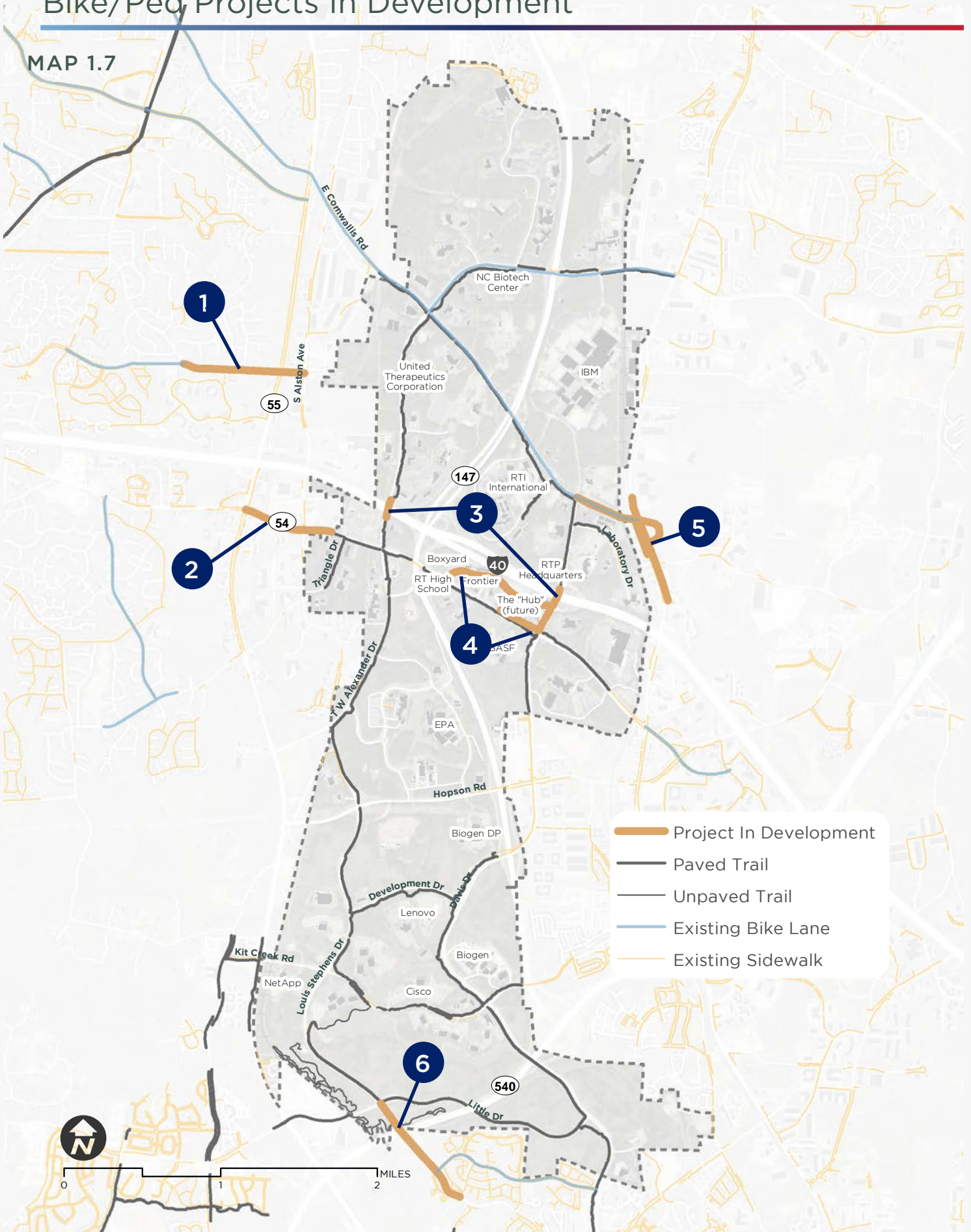
- » Dense new mobility coverage
- » Sidepath
- » On-street bike facilities
- » Walkability
- » Limited surface parking
- » Pursue internal transit stops

-  Existing Building
-  Conceptual Future Footprint
-  Existing Trail



Bike/Ped Projects In Development

MAP 1.7



Map
ID

Bike/Ped Projects In Development

1

Bike lanes/sidewalks are to be constructed along Carpenter Fletcher Rd in 2020 from E. Woodcroft Pkwy to the eastern terminus of Carpenter Fletcher Rd at Alston Ave - (City of Durham Project number: U-4726HO).

2

Sidewalk project (STIP: EB-5708) will fill in sidewalk gaps along NC 54 west of RTP to the NC 55 intersection.

3

The RTP Foundation is currently improving the Davis Dr/I-40 and TW Alexander/I-40 bridge crossings. The design of both projects includes the creation of a physical buffer (flexible bollards and a small curb) as well as higher fencing along the bridge edge.

4

The Hub site development will include a 10' shared use path along the north side of NC 54 to Davis Dr, and along Davis Dr to the I-40 bridge (replacing the existing sidewalk). An internal, 10' shared use path will be constructed along a new road through the site that will connect over Burdens Creek to Frontier and Boxyard.

5

East Cornwallis Rd - STIP (P-5717) includes a grade separation at the Cornwallis Road rail crossing of the Norfolk Southern and N.C. Railroad line in Durham County. This project will include buffered bike lanes from the Cornwallis Rd/Davis Dr intersection to Miami Blvd. Also as part of this project, a sidepath will be constructed along Miami Blvd from Guardian Dr to a few hundred feet north of the current Cornwallis Rd/Miami Blvd intersection at IBM.

6

Louis Stephens Dr extension - STIP (U-5827) will extend Louis Stephens Dr from Little Dr under NC 540 to Louis Stephens Dr on the south side of NC 540. Design for this project includes a 10' sidepath along the north/east side.

Survey & Count Results

In an effort to understand current trail user patterns throughout RTP, the project team conducted trail counts and surveys at six key points along the trail system. The count locations were staffed for a total of 22 daylight hours over the course of two days.

Unless specifically noted, the data summarized below includes all non-motorized transportation users, including those using sidewalks and roadways visible from the counting station.

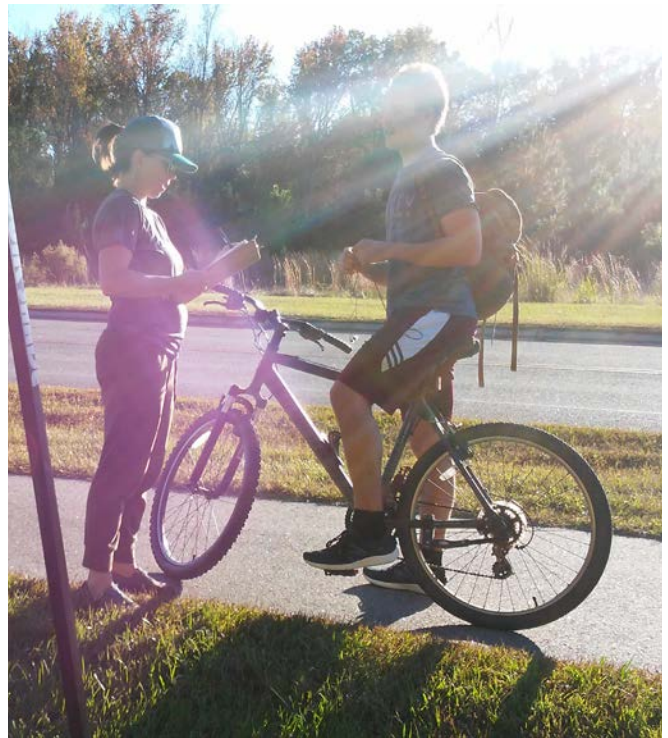
The staffed dates were:



Wednesday 10/23/2019
7:30 am to 6:30 pm
676 TOTAL COUNTS



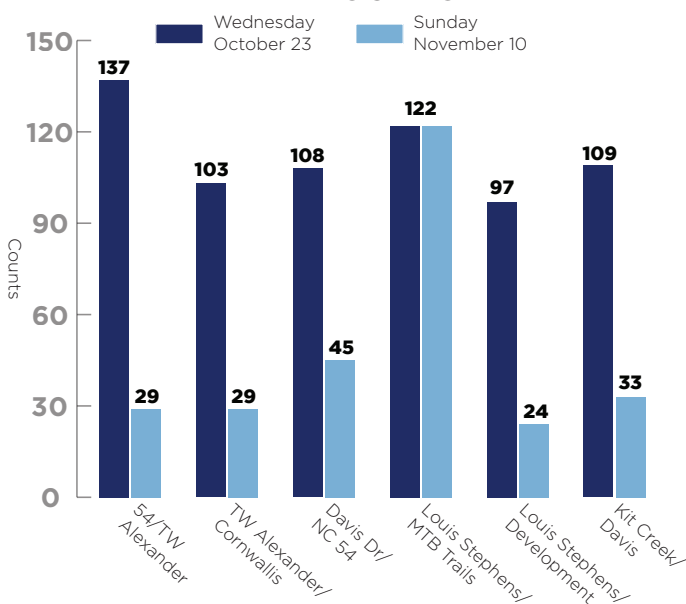
Sunday 11/10/2019
6:30 am to 5:30 pm
282 TOTAL COUNTS



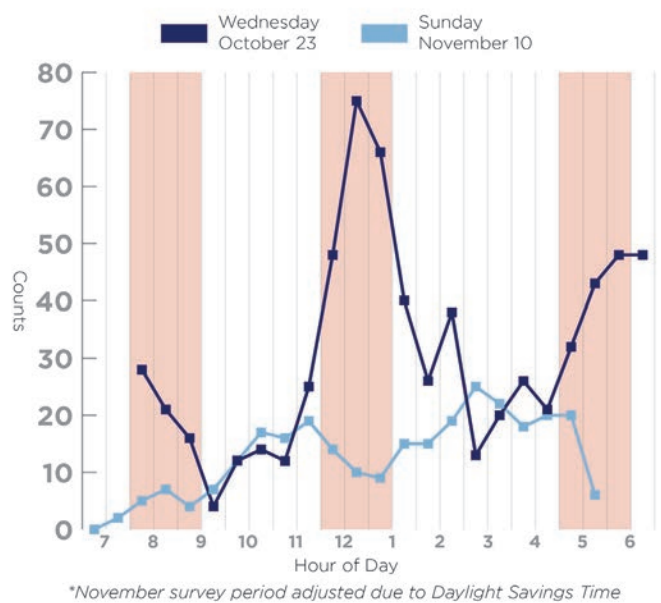
958 TOTAL NON-MOTORIZED USERS COUNTED

170 TRAIL USERS SURVEYED

TOTAL ACTIVITY BY DATE AND LOCATION

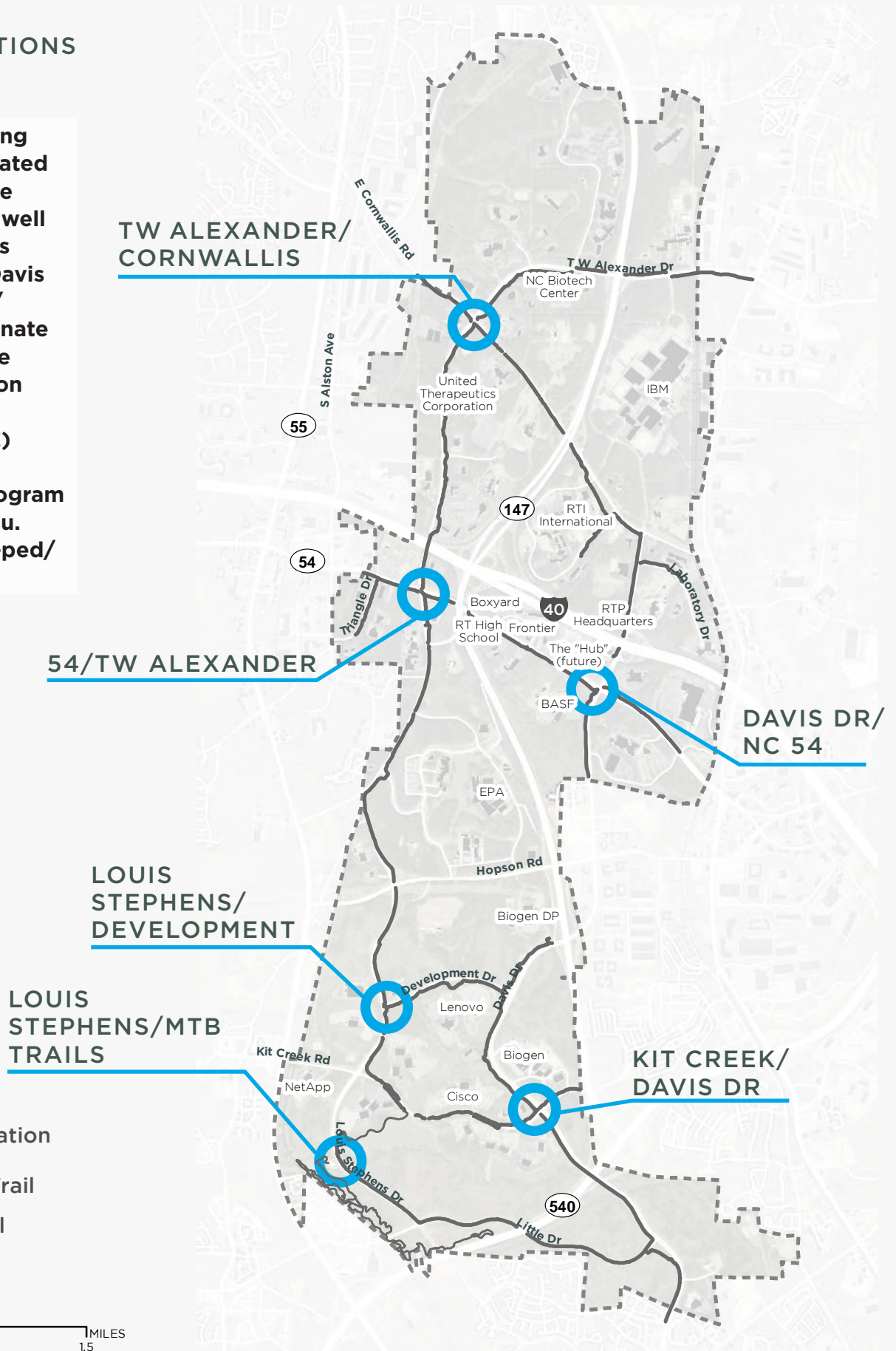


TOTAL ACTIVITY BY DATE AND TIME OF DAY



MAP 1.8:
COUNT LOCATIONS

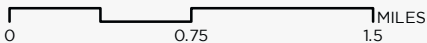
Consider installing bike/ped automated counters at these intersections as well as others such as Cornwallis Rd/Davis Dr and Little Dr/Davis Dr. Coordinate with the Institute for Transportation Research and Education (ITRE) Non-Motorized Volume Data Program - <https://itre.ncsu.edu/focus/bike-ped/nc-nmvd/>.



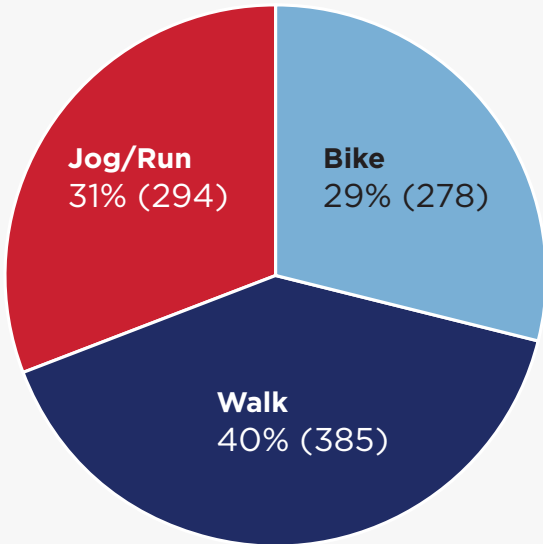
 Count Location

 Unpaved Trail

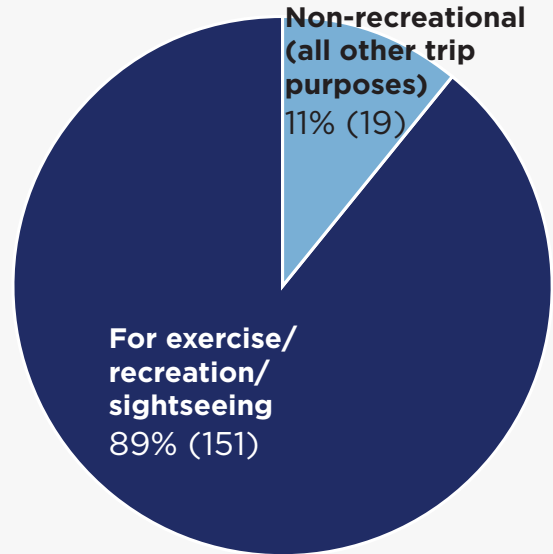
 Paved Trail



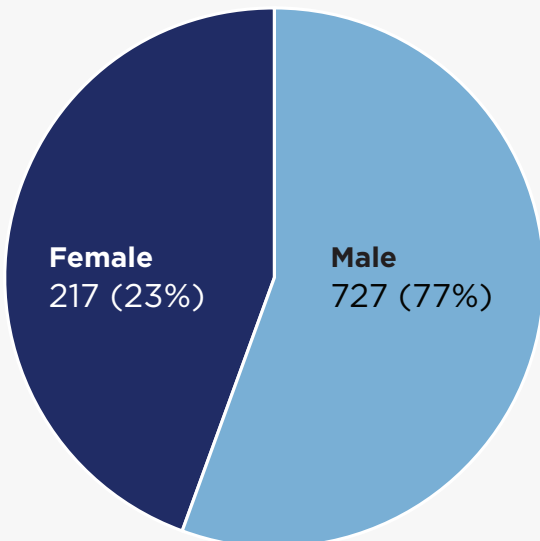
MODAL SPLIT FOR ALL USERS DURING ENTIRE SURVEY PERIOD



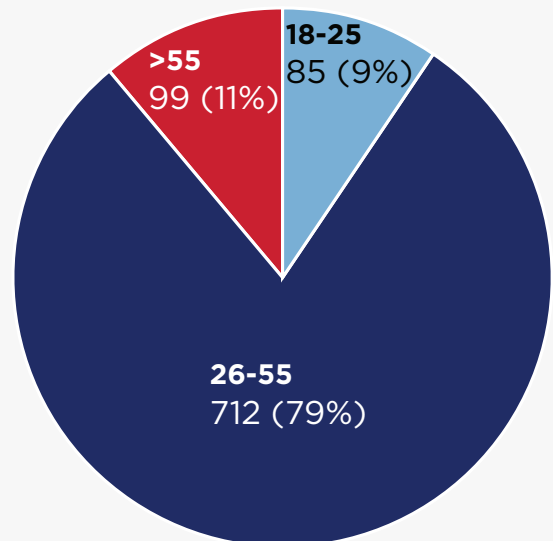
PURPOSE (RECREATIONAL OR OTHER) OF SURVEYED USERS



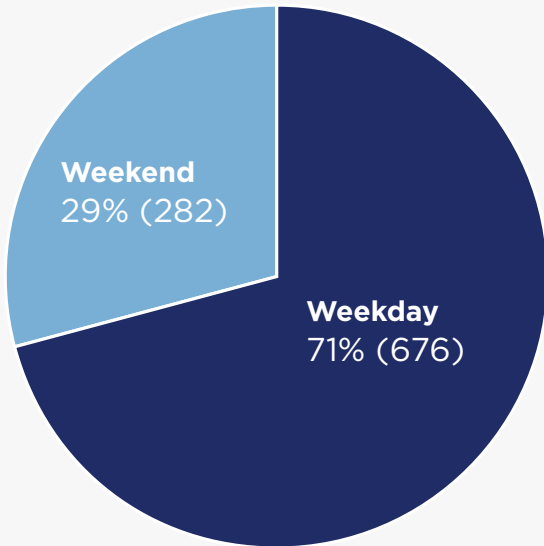
TRAIL USER COUNT DEMOGRAPHICS - GENDER (N)



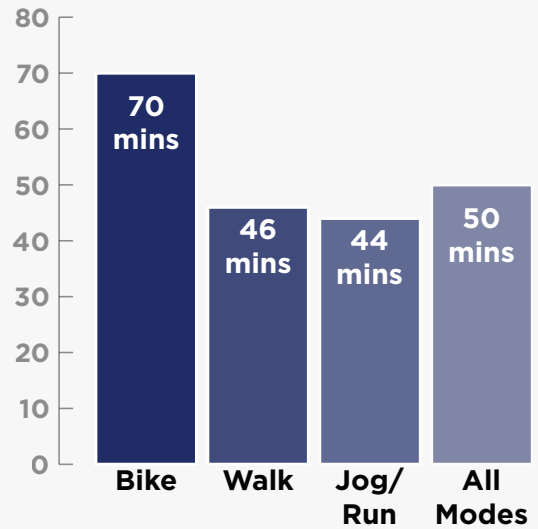
TRAIL USER COUNT DEMOGRAPHICS - AGE (N)



WEEKDAY VS WEEKEND TRIPS

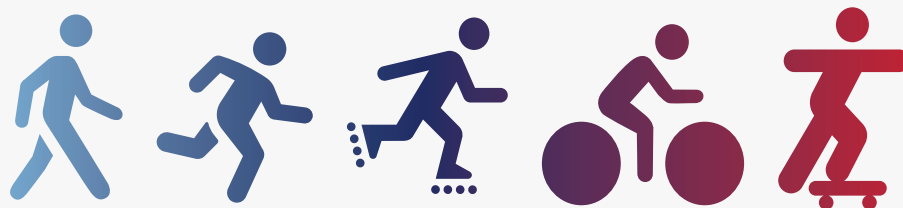


AVERAGE DURATION (IN MINUTES) OF THE ACTIVE PORTION OF USER'S TRIP (N)



55% 

of survey-takers' exercise, over the last 2 weeks, was met using the RTP trail system









Chapter 2:

Recommendat

ions

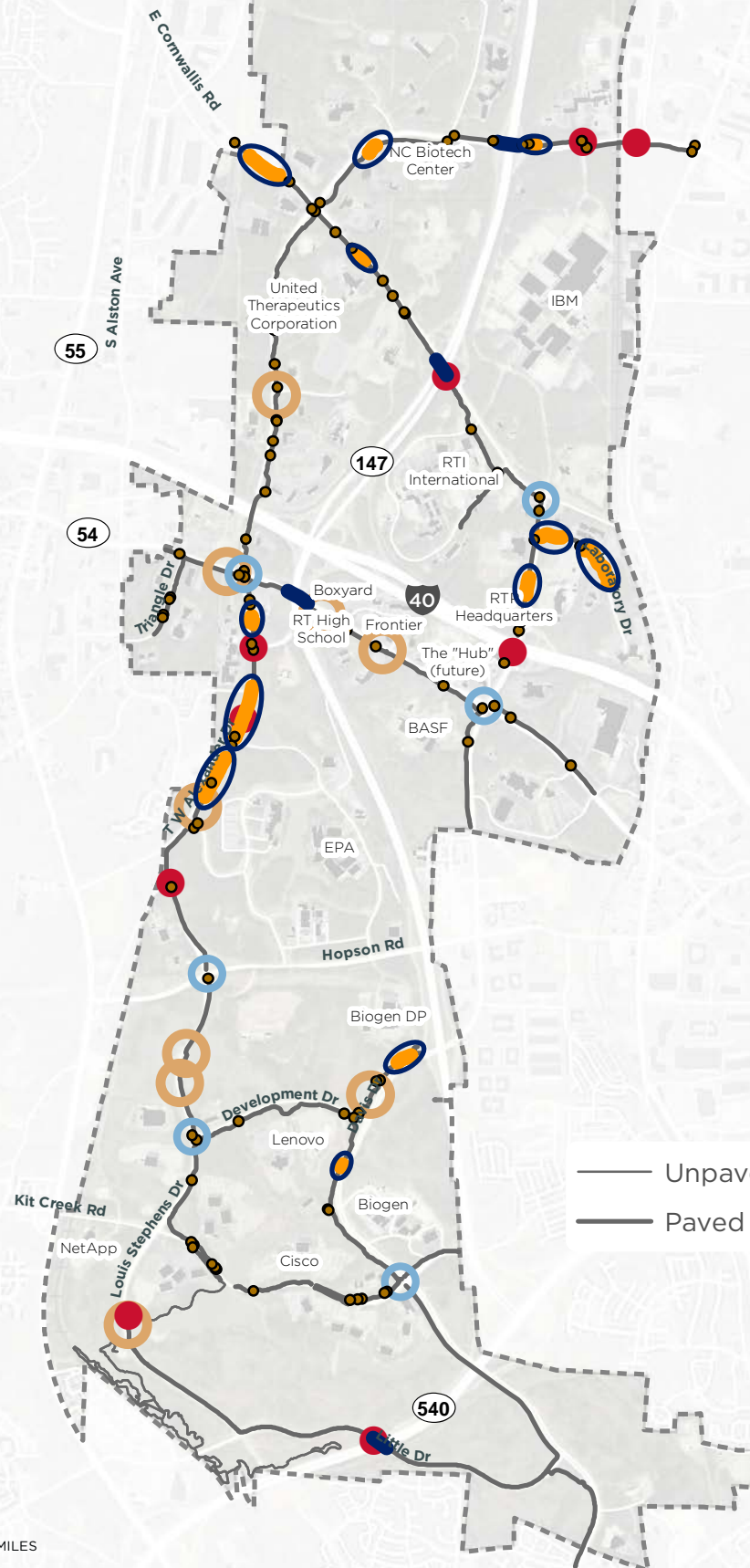
TOPIC	PAGE
Spot Improvements	23
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SPOT IMPROVEMENTS

-  **MISCELLANEOUS HAZARDS** - These are nine unique, relatively small/low-cost projects that can have a high impact on trail user safety at these locations.
-  **TRAIL BRIDGES** - The RTP trail system includes nine trail bridges, eight of which are wooden, that can be slipping hazards for trail users under certain conditions.
-  **FAILING PAVEMENT** - These are sections of pavement that have begun to fail. The majority of these trail sections have been damaged by tree roots from trees located very close to the pavement tread - significant cracking and pavement upheaval has taken place. 12 locations were identified, of various lengths, that should be reconstructed in the near term.
-  **HIGHWAY BRIDGES** - In six locations, the RTP trail system currently crosses over (or under) highway bridges without a physical barrier between the trail user space and automobile traffic.
-  **KEY INTERSECTIONS** - These six intersections have the most pressing need for bike/ped crossing facility improvements. Trail approach modification, turning movement radii, and pedestrian signal installation (where missing) are some of the key aspects of improvements needed.
-  **ADA IMPROVEMENTS** - 92 observations were made identifying ADA improvements that are needed at roadway intersections and minor driveway crossings. These are all relatively low cost projects that include missing ADA features such as standard curb ramps, appropriate landing area space, and/or truncated domes.

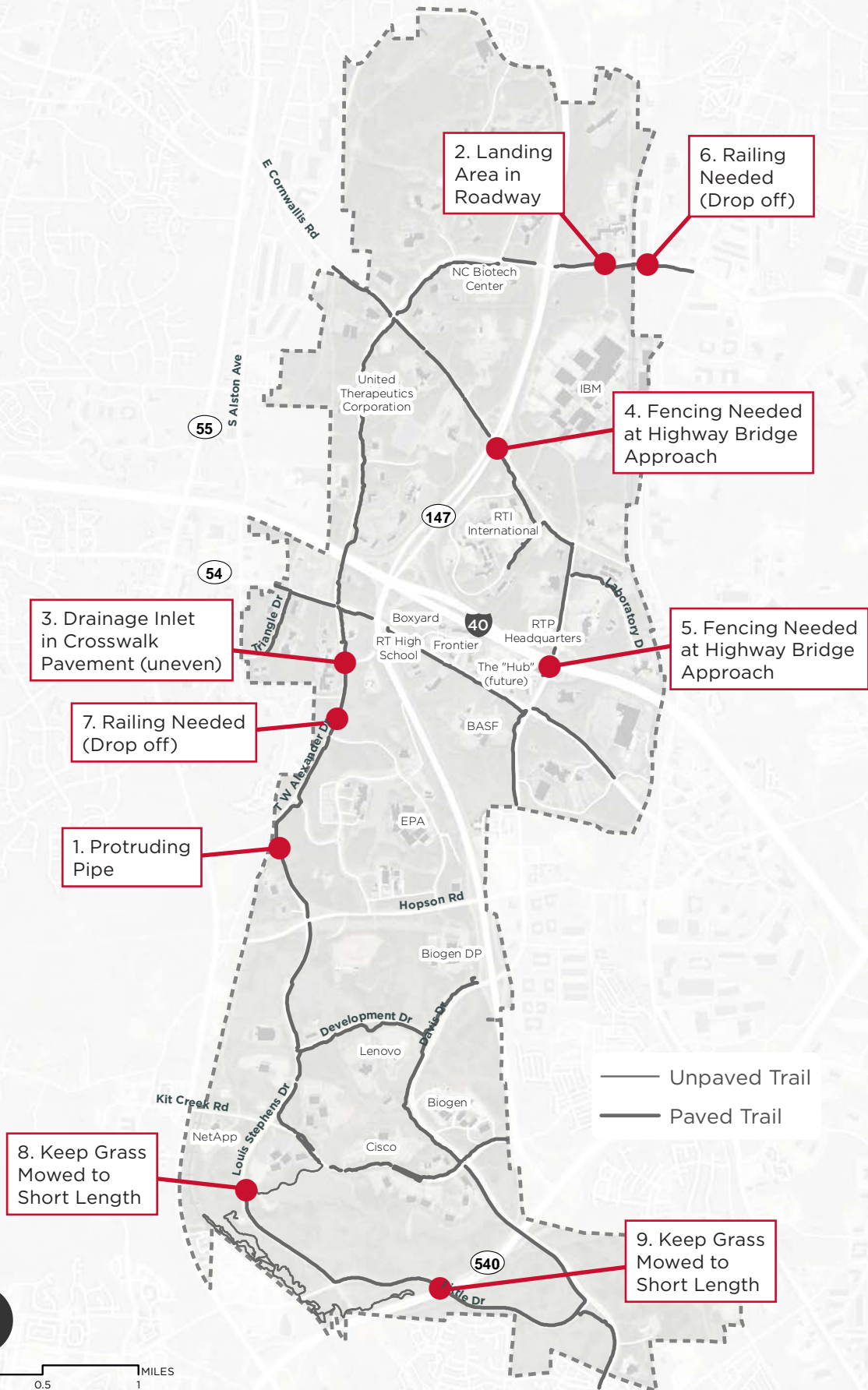
SPOT IMPROVEMENTS

MAP 2.1



Miscellaneous Hazards

MAP 2.2



1. Protruding Pipe



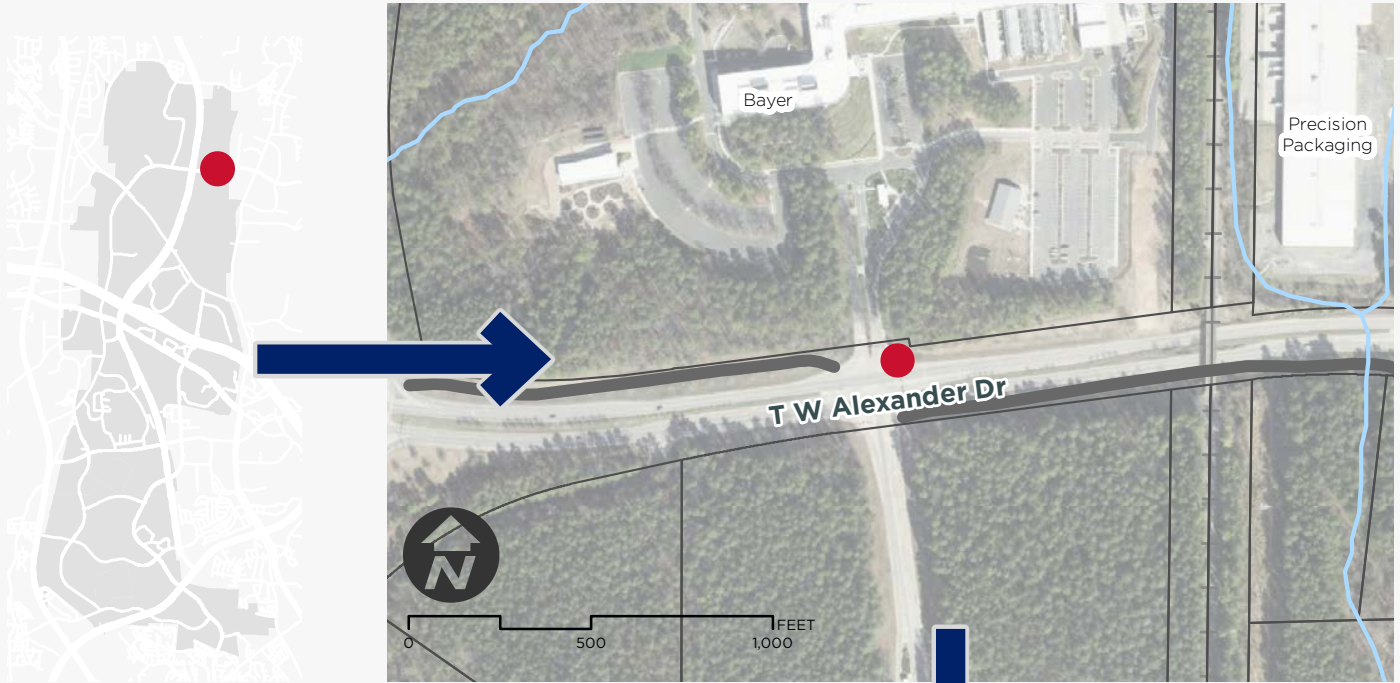
Location: RTP Trail Connector, north of the Solutions Dr/Louis Stephens Dr intersection

Description: Metal water pipe protruding above and in the center of trail pavement. Pavement surface near pipe is in poor condition from past utility work and subsequent resurfacing.

Recommendation: Reconstruct pavement surface and adjust water pipe such that the pipe head is flush with the pavement and the pavement surface has a smooth transition to the undisturbed pavement.



2. Landing Area in Roadway



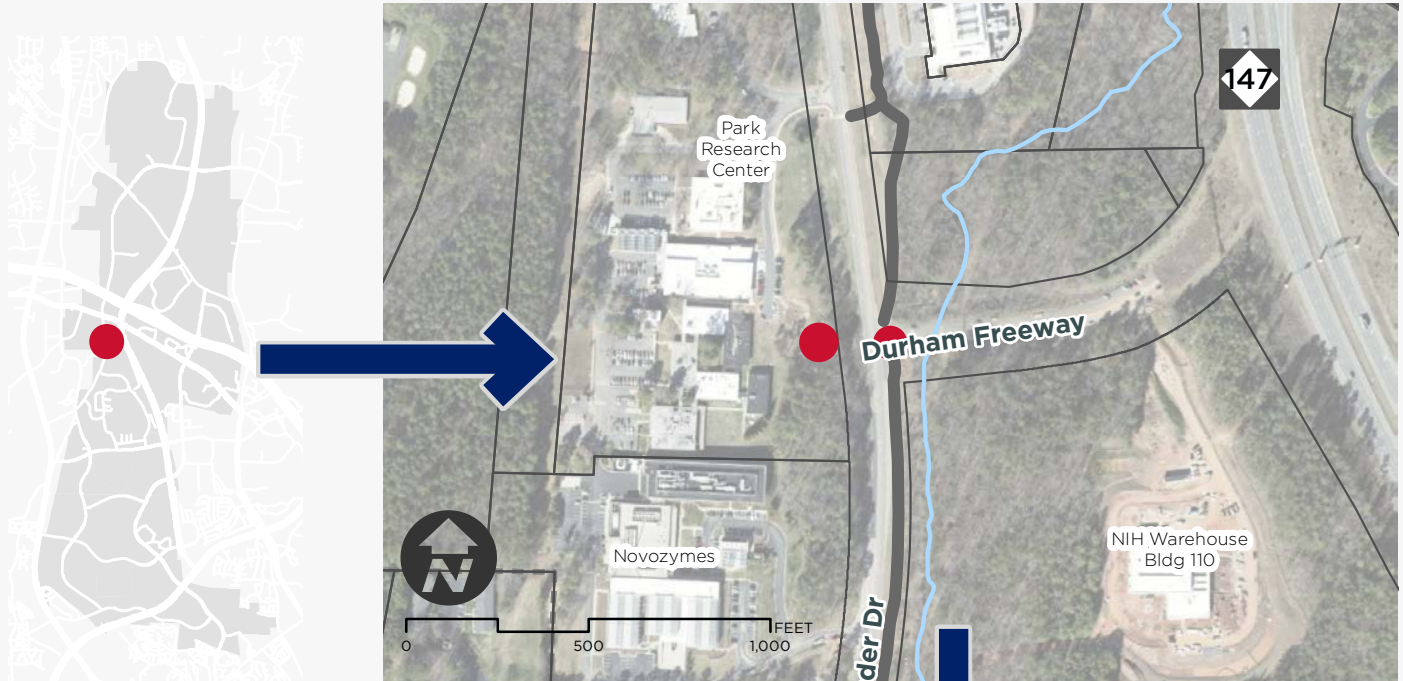
Location: Park Center Extension Trail, Bayer driveway.

Description: Curb ramp is flush with roadway pavement and is in roadway.

Recommendation: Construct physical barrier defining the curb ramp/pedestrian space separate from the roadway - also opportunity to minimize turning radii to slow vehicular turning movements.



3. Drainage Inlet in Crosswalk



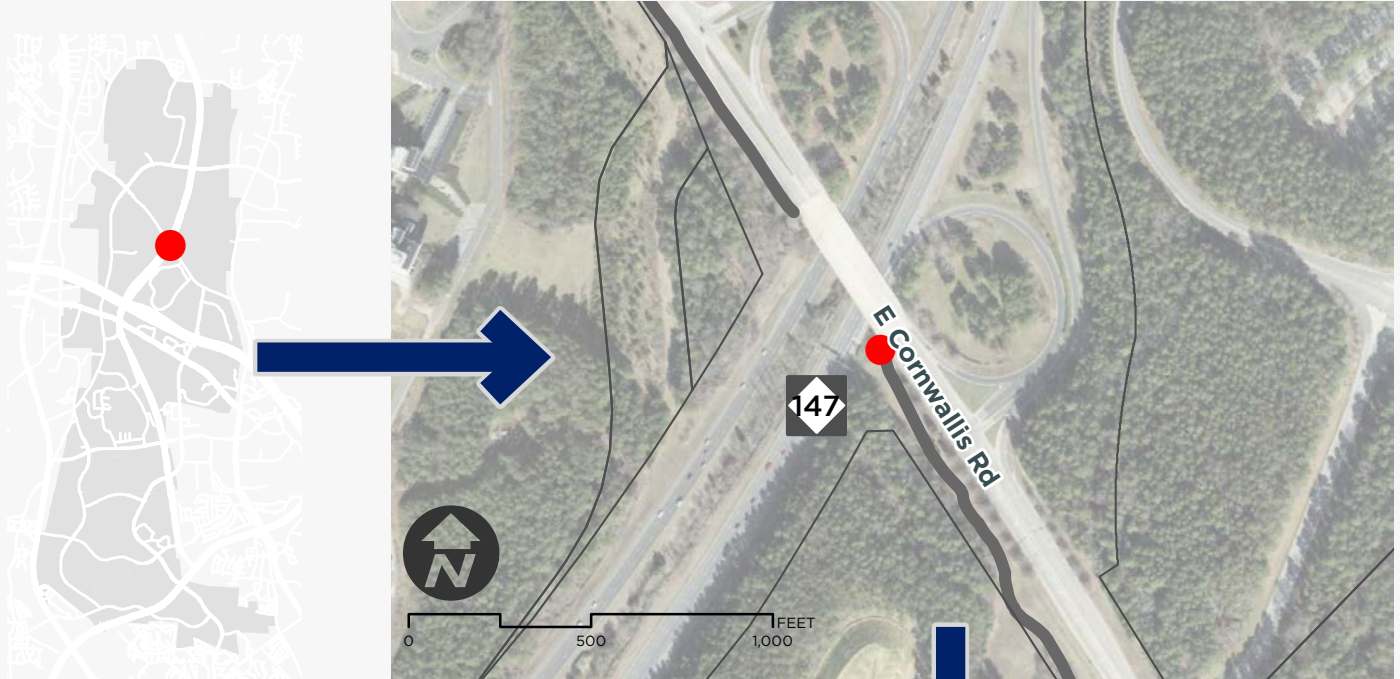
Location: RTP Trail Connector, NIH Warehouse Bldg 110 driveway.

Description: Drainage inlet in crosswalk pavement is not flush with pavement, forces trail users toward road.

Recommendation: Raise drainage inlet such that it is flush and level with adjacent pavement.



4. Fencing Needed at Highway Bridge Approach



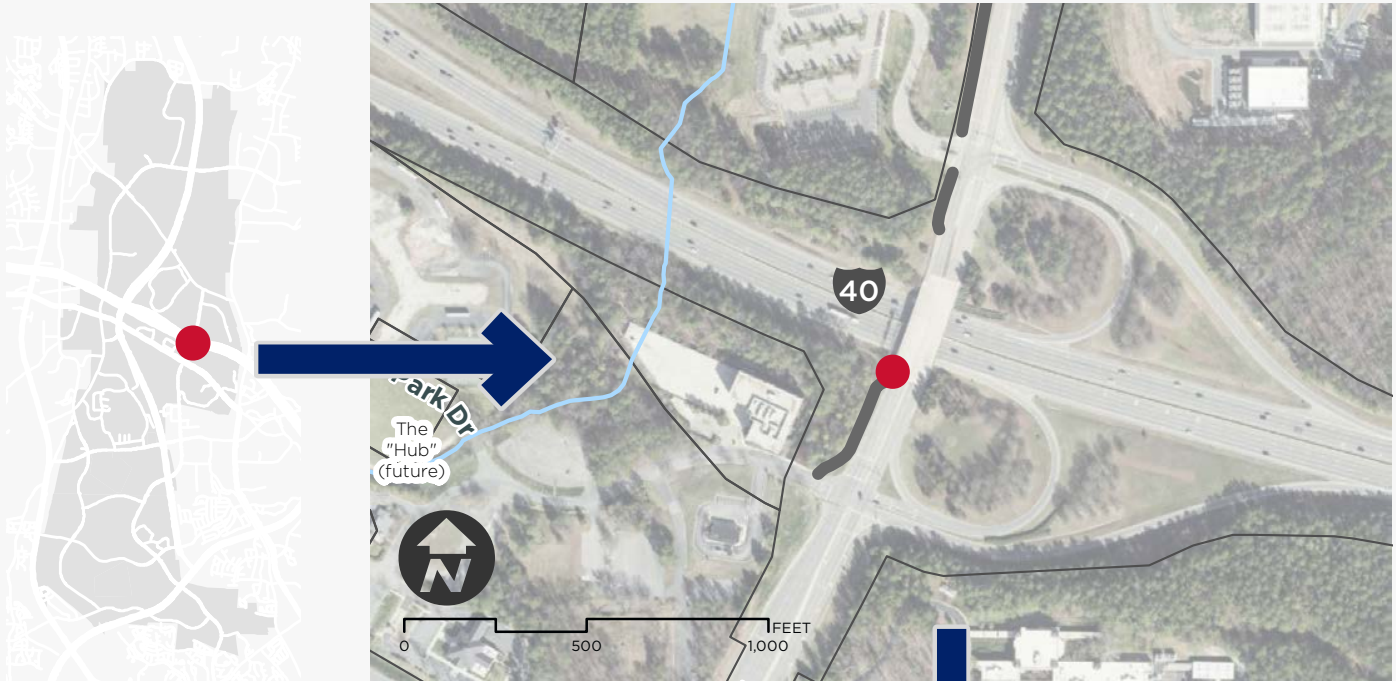
Location: Park Center Loop Trail, Cornwallis Rd approach to NC 147 bridge crossing from the east.

Description: Facing northwest, upon transition from trail to bridge shoulder - no fencing in gap left of highway railing upon entering the bridge - could accidentally trip or ride off bridge onto NC 147 (especially dangerous when dark).

Recommendation: Install fencing to seal gap at highway drop off.



5. Fencing Needed at Highway Bridge Approach



Location: Park Center Loop Trail, Davis Dr approach to I-40 bridge crossing from the south.

Description: Facing north, upon transition to bridge shoulder - no fencing in gap left of highway railing upon entering the bridge - could accidentally trip or ride off bridge onto I-40 (especially dangerous when dark).

Recommendation: Install fencing to seal gap at highway drop off.



6. Railing Needed (Drop off)



Location: Park Center Extension Trail, 375' east of train tracks' bridge crossing of TW Alexander Dr.

Description: Facing west; railing barrier needed along south side section (drop off at Stirrup Iron Creek culvert). Vertical drop off into creek is high enough and close enough to trail to be a potential hazard.

Recommendation: Install railing along south side of trail edge at the Stirrup Iron Creek culvert drop off.



7. Railing Needed (Drop off)



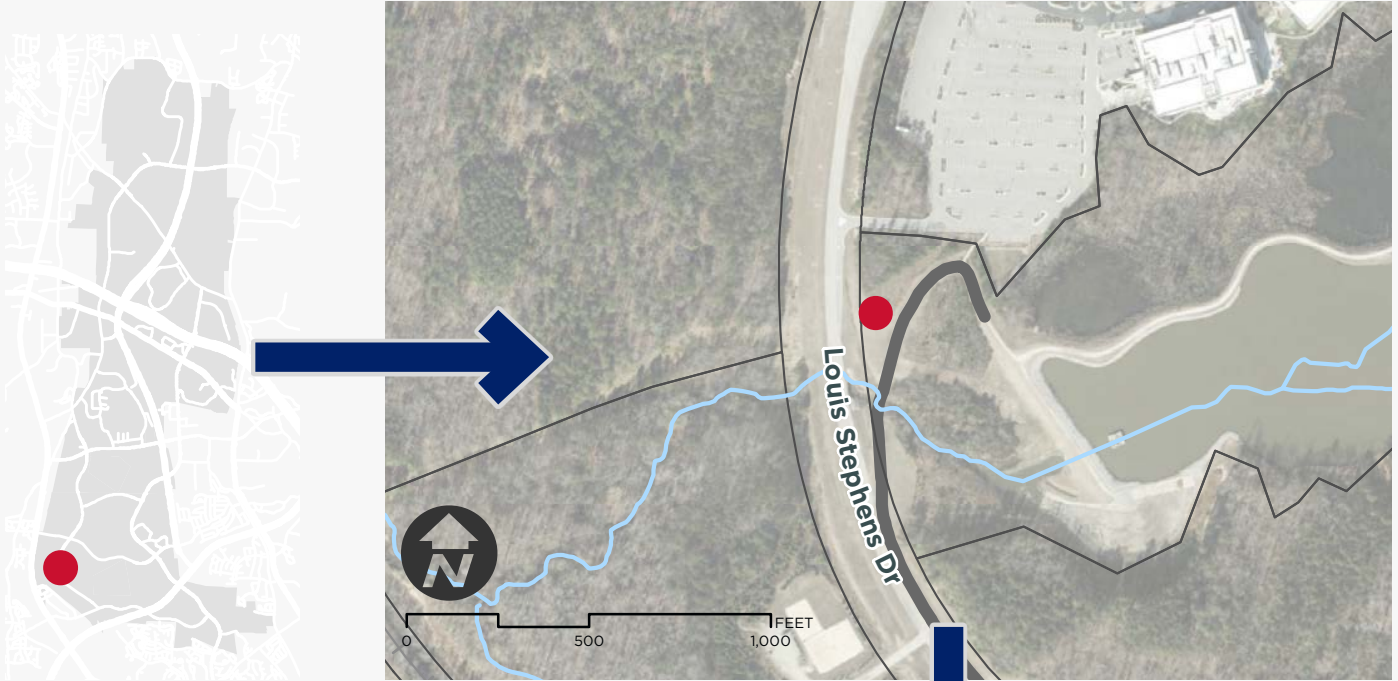
Location: RTP Trail Connector, Burdens Creek culvert at TW Alexander Dr under-crossing.

Description: Facing west; railing barrier needed along east side of trail (drop off at Burdens Creek culvert). Vertical drop off into creek is high enough and close enough to trail to be a potential hazard.

Recommendation: Install railing along east side of trail edge at the Burdens Creek culvert drop off.



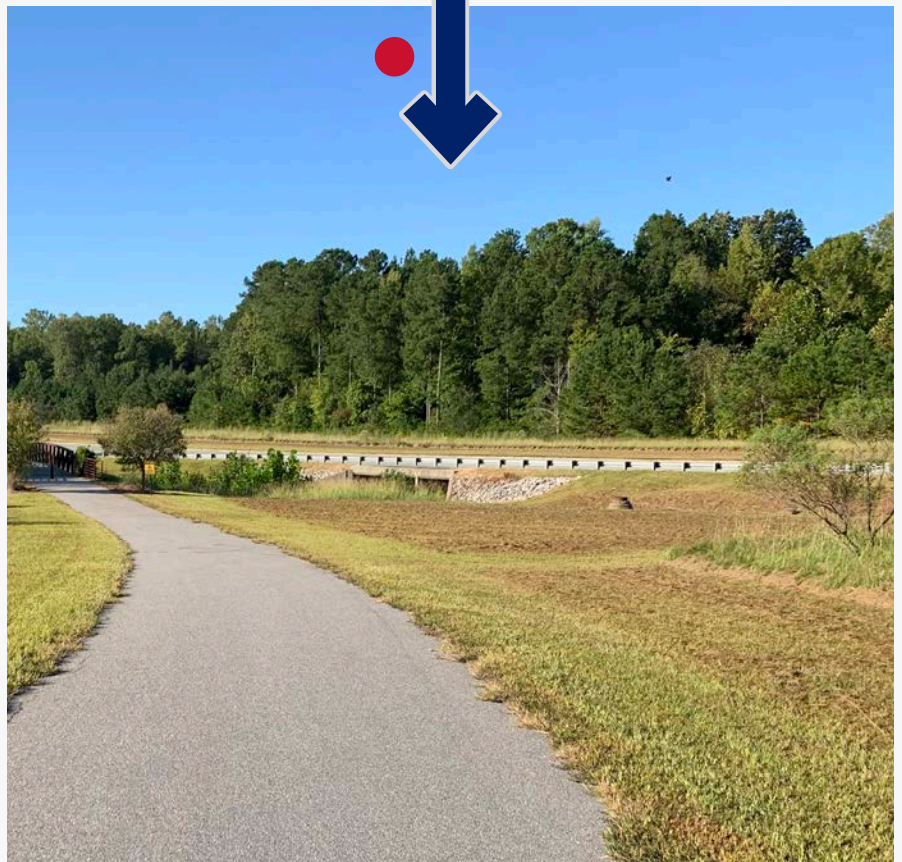
8. Keep Grass Mowed to Short Length



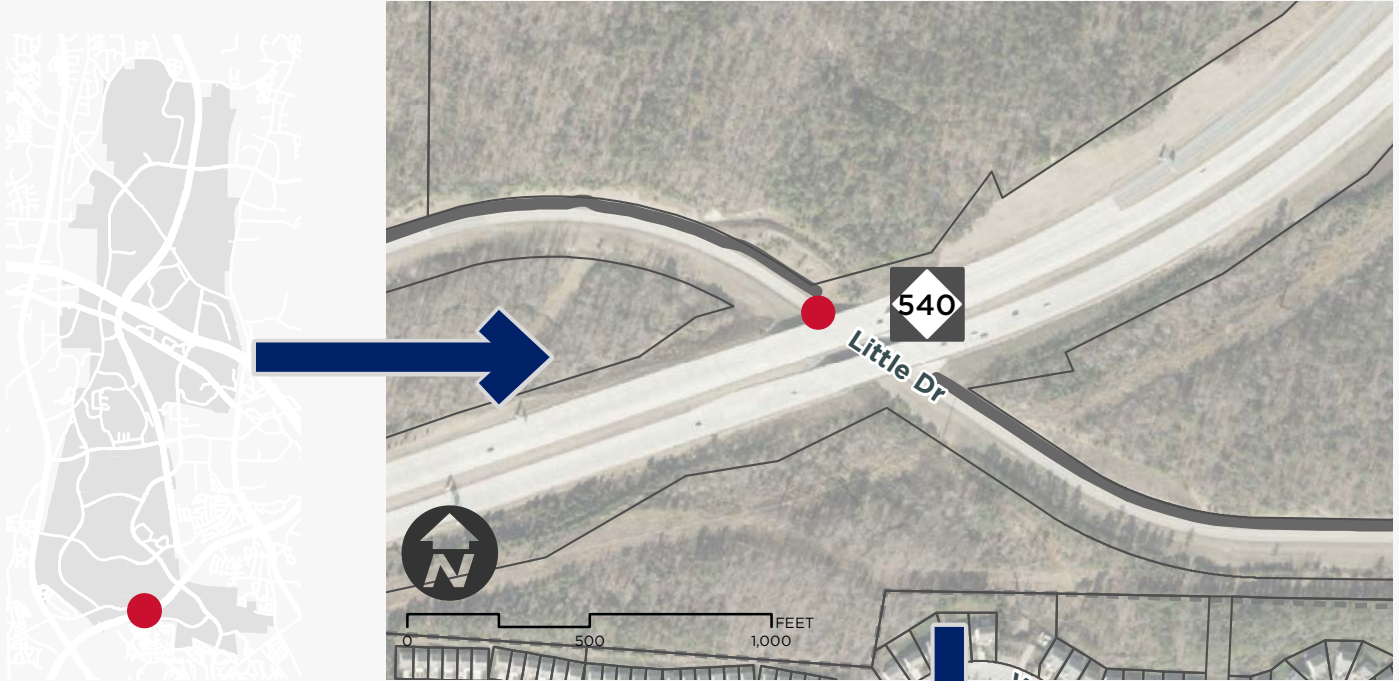
Location: Kit Creek Extension Trail, south of NetApp

Description: Grassy area between road and trail (right hand side of photo) is used by bicyclists heading south from the NetApp driveway to connect to trail (pedestrian connection from parking lot has stairs). Grass gets very high one or two times per year and there is a concern for ticks for bicyclists riding through here.

Recommendation: Keep grass mowed short at all times.



9. Keep Grass Mowed to Short Length



Location: Kit Creek Extension Trail, west side of NC 540 bridge

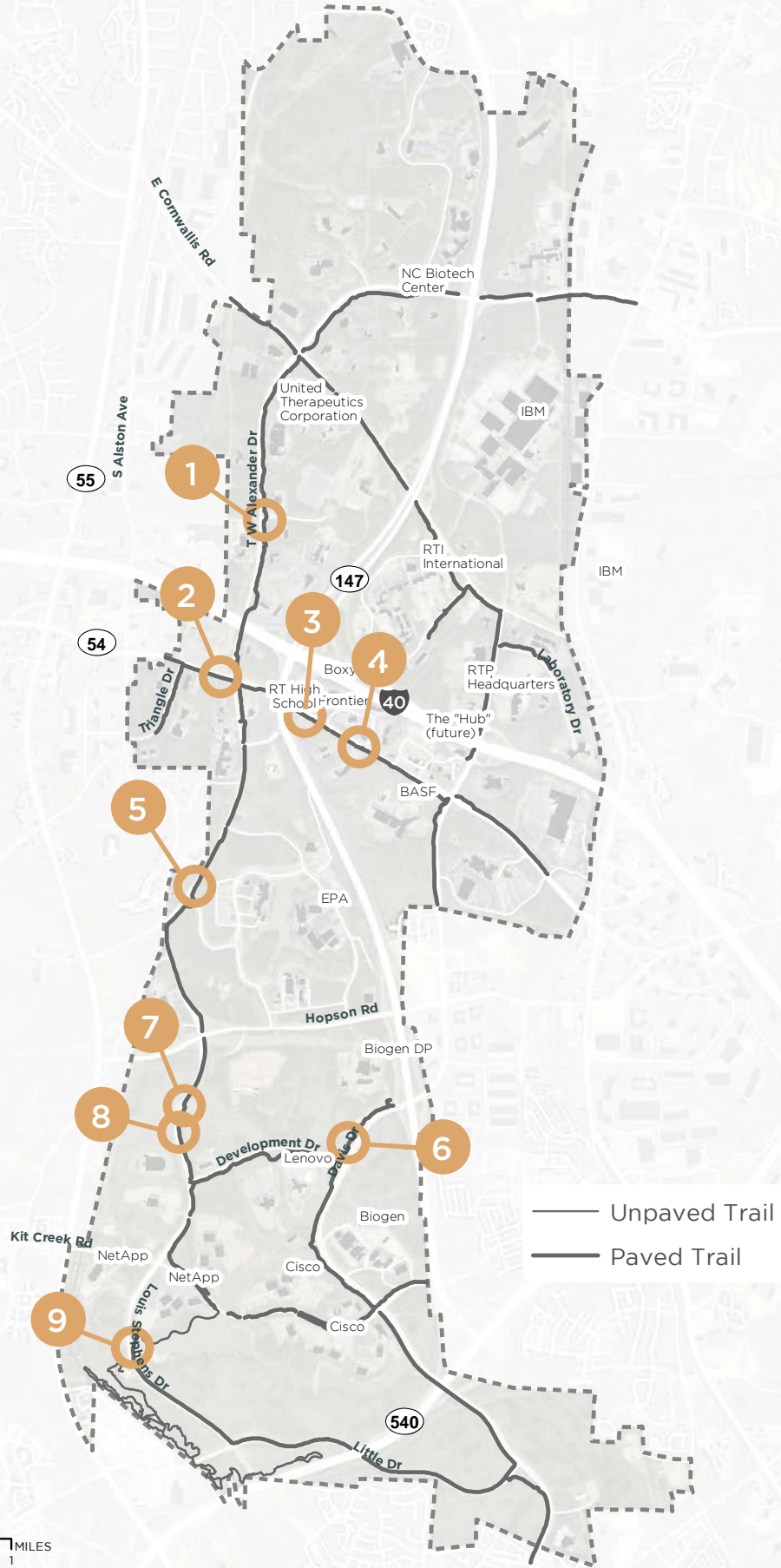
Description: Grassy area between road and trail (right hand side of photo) is used by bicyclists wishing to cross under NC 540 bridge to/from trail. The ultimate goal is to complete the paved trail connection under the bridge (see page 56). In the meantime, the grass gets very high one or two times per year and there is a concern for ticks for trail users connecting through this area.

Recommendation: Keep grass mowed short at all times.



Trail Bridge Recommendations

MAP 2.3



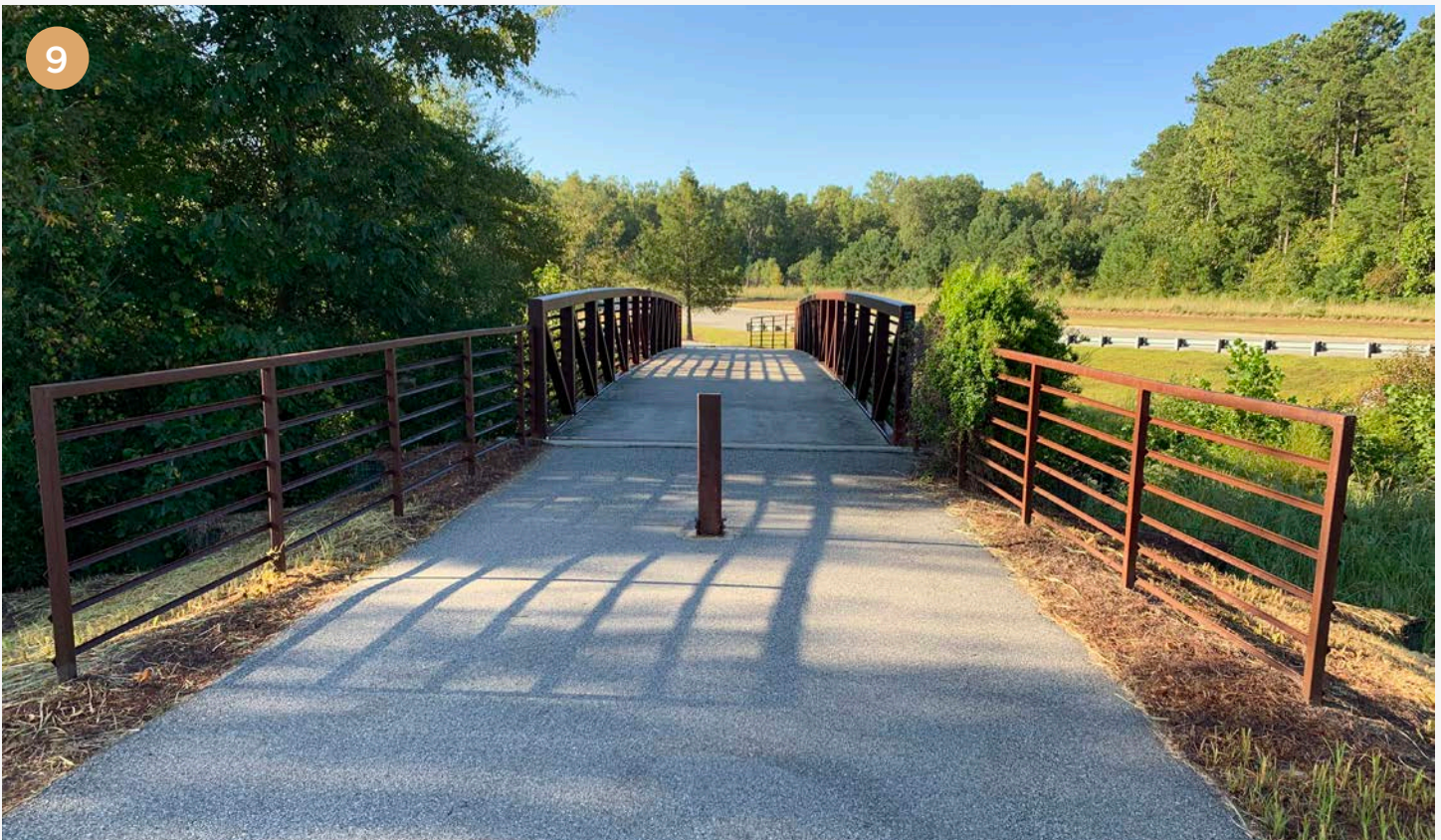
Trail Bridge Recommendations

The RTP Trail system includes nine short bridges that cross small creeks or drainages. Eight of these are wooden. The ninth and most recently constructed bridge is south of NetApp along the Kit Creek Extension Trail, and is constructed with a concrete decking (see below).

The Trails Committee discussed a concern for slippery surfaces along the wooden bridges, especially when wet. Bridges with mold and mildew growing on the surface can be particularly prone to having a slippery surface, and most of the bridges in the RTP system currently have this condition to some degree (especially numbers 2, 3, 4, 5, and 6 in the corresponding map). Furthermore, bridge approaches from an angle can further exacerbate this problem, forcing trail users to make turning movements on the bridge deck - this is an issue especially for numbers 1, 7, and 8.

For existing wooden bridges, 1) removing the mold and mildew and 2) applying paint with a grit substance can be a simple way to address this issue without replacing the bridge itself, and should be implemented on the wooden bridges that will not be replaced in the near future. For further information, see the American Trails website - <https://www.americantrails.org/resources/faq-slippery-boardwalks-and-bridges> as well as the East Coast Greenway “Greenway Criteria and Design Guide” page 13.

When bridges are replaced, a similar design as bridge 9 that uses a concrete decking, and a direct trail approach from both sides to minimize turning movements on the bridge, should be utilized (see photo below for example). Mold/mildew growth can still take place on concrete decking, and regular maintenance should be conducted to ensure the surface remains mold/mildew free.



Trail Bridge Recommendations



Bridge Location: Park Center Loop Trail, south of Maughan Dr.
Dimensions: W - 8', L - 25', H - 45"
Key Notes:
- Decent bridge condition
- Trail approaches bridge at an angle
Recommendation: Apply paint with a grit substance to improve traction.



Bridge Location: Spur Trail (NC 54), west of TW Alexander Dr.
Dimensions: W - 8', L - 36', H - 36"
Key Notes:
- Some mold/mildew growth noted, older bridge
Recommendation: Remove mold/mildew and apply paint with a grit substance to improve traction.



Bridge Location: Park Center Loop Trail, west of the Research Triangle High School driveway.
Dimensions: W - 8', L - 180', H - 0"
Key Notes:
- Some mold/mildew growth noted, older bridge, no railings; bollards located at bridge entrance, should be painted brighter color for visibility
Recommendation: Remove mold/mildew and apply paint with a grit substance to improve traction. Paint bollards a brighter color for visibility.



Bridge Location: Park Center Loop Trail, east of the Progress Center driveway.
Dimensions: W - 8', L - 85', H - 45"
Key Notes:
- Some mold/mildew growth noted, older bridge; bollards located at bridge entrance, should be painted brighter color for visibility
Recommendation: Remove mold/mildew and apply paint with a grit substance to improve traction. Paint bollards a brighter color for visibility.

Trail Bridge Recommendations



Bridge Location: RTP Connector Trail, north of the NIEHS driveway.

Dimensions: W - 7', L - 14', H - 45"

Key Notes:

- Some mold/mildew growth noted, older bridge

Recommendation: Remove mold/mildew and apply paint with a grit substance to improve traction.



Bridge Location: Spur Trail (Davis Dr) south of the Biogen driveway.

Dimensions: W - 10', L - 22', H - 0"

Key Notes:

- Some mold/mildew growth noted, older bridge

Recommendation: Remove mold/mildew and apply paint with a grit substance to improve traction.



Bridge Location: RTP Connector Trail, 1,800' south of Hopson Rd.

Dimensions: W - 10', L - 65', H - 42"

Key Notes:

- Decent bridge condition
- Trail approaches bridge at an angle

Recommendation: Apply paint with a grit substance to improve traction.



Bridge Location: Park Center Loop Trail, north of the Fidelity Investments driveway.

Dimensions: W - 10', L - 25', H - 42"

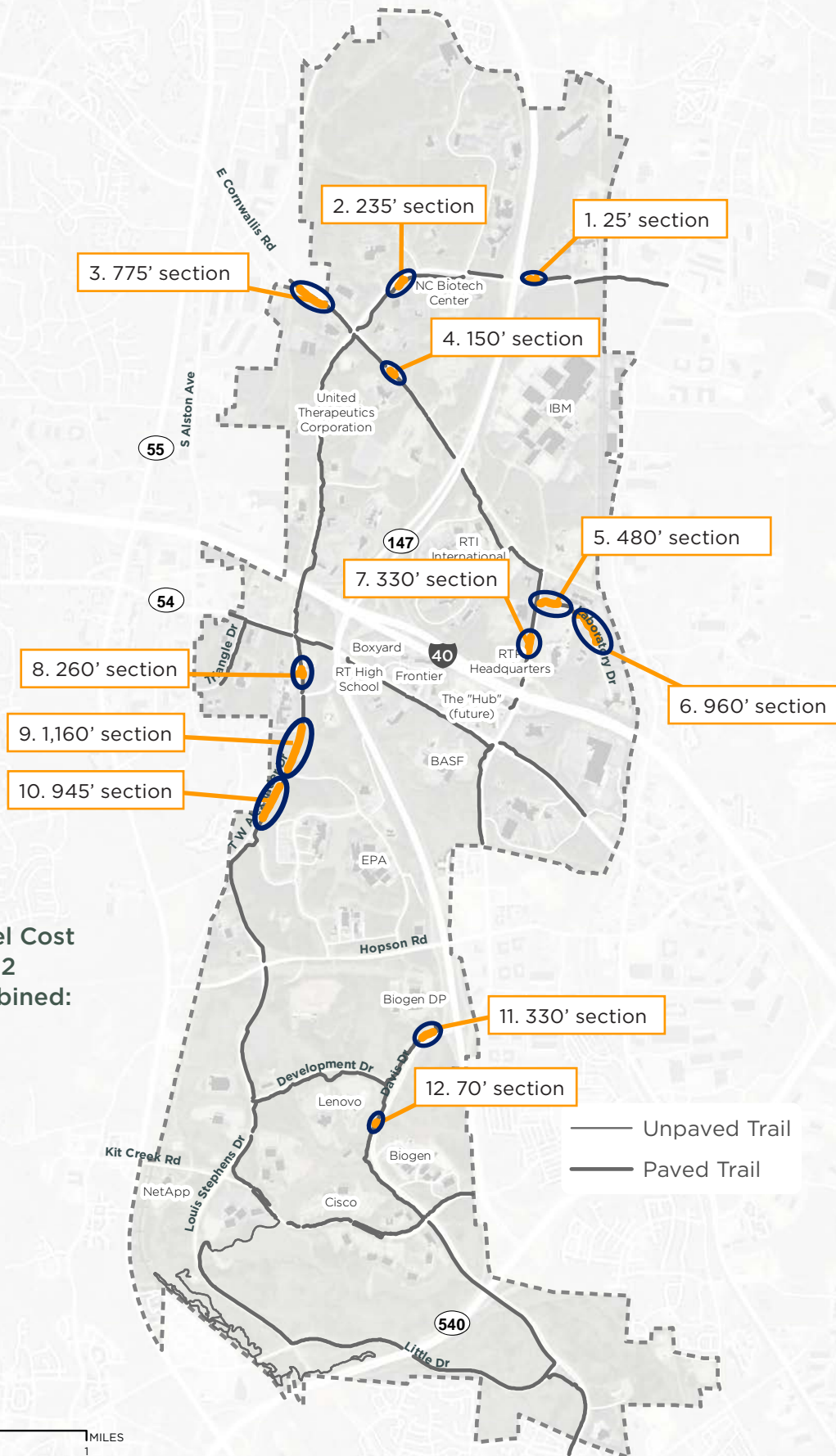
Key Notes:

- Decent bridge condition
- Trail approaches bridge at an angle

Recommendation: Apply paint with a grit substance to improve traction.

Failing Pavement

MAP 2.4



Planning Level Cost Estimate for 12 sections combined: \$590,000



0 0.5 1 MILES

1. Failing Pavement - 25' section



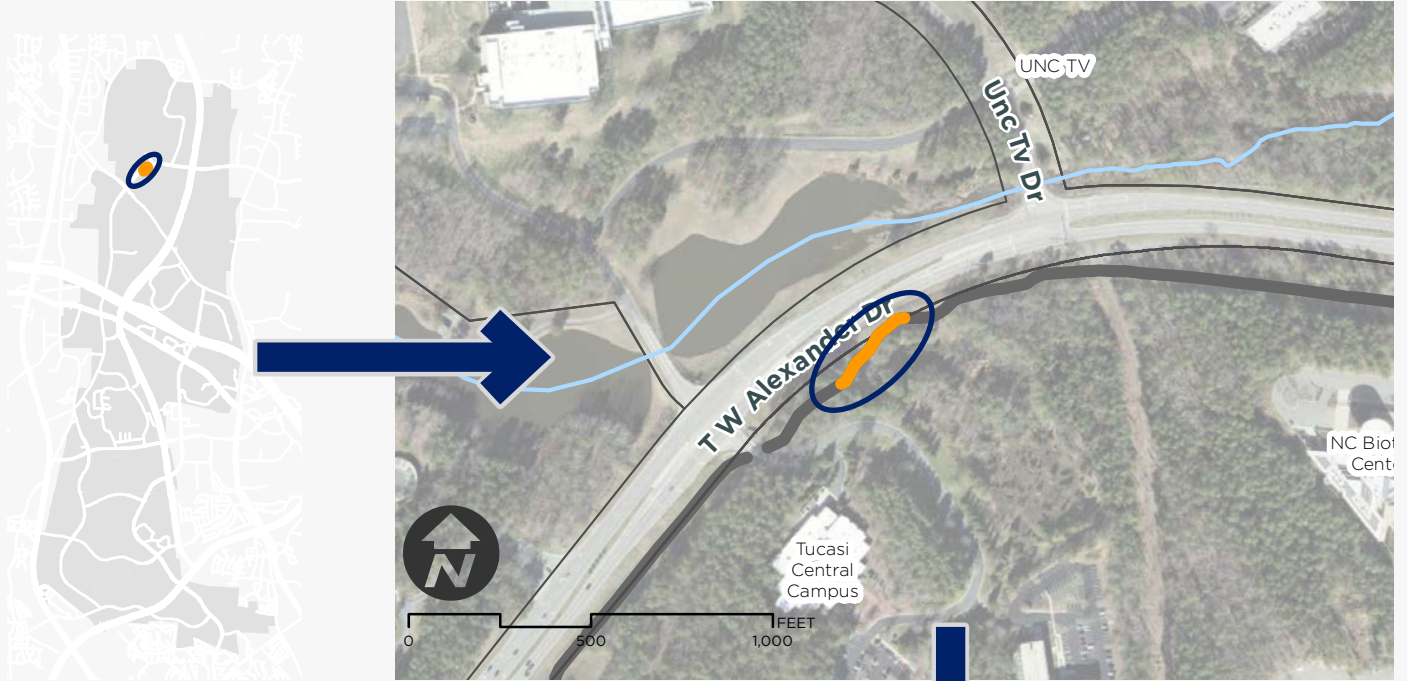
Location: Park Center Extension Trail, 25' section east of the NC 147 northbound on-ramp

Description: 2' unpaved strip with vegetation/soil where utility digging occurred - surface not replaced (photo to the lower right); 25' section of significant cracking and pavement upheaval with vegetation growth in middle of tread from tree root penetration (photo to the upper right).

Recommendation: Pave 2' strip and reconstruct 25' damaged section (see guidance on page 52 regarding options for proximate trees)



2. Failing Pavement - 235' section



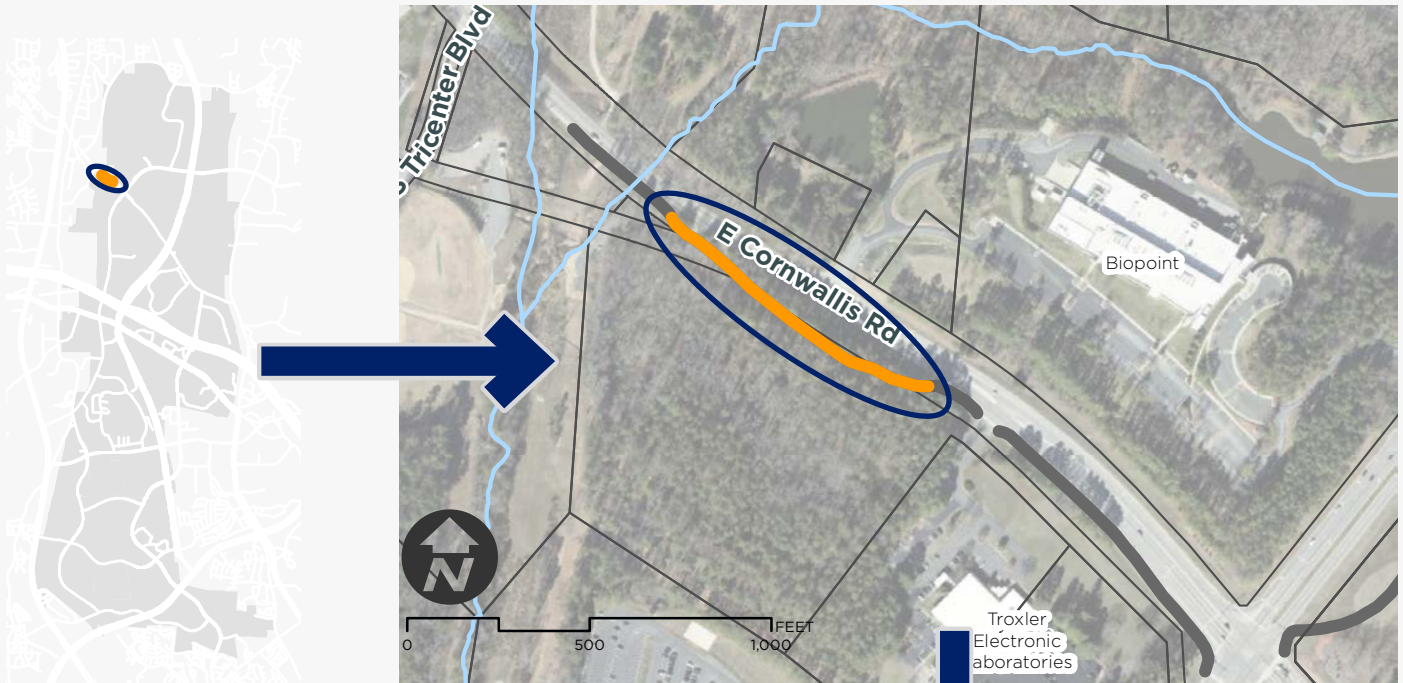
Location: Park Center Extension Trail, 235' section running northeast of the Tucasi Campus driveway

Description: Significant cracking and pavement upheaval from tree root penetration and damage from ponding along this section

Recommendation: Reconstruct 235' section (see guidance on page 52 regarding options for proximate trees)



3. Failing Pavement - 775' section



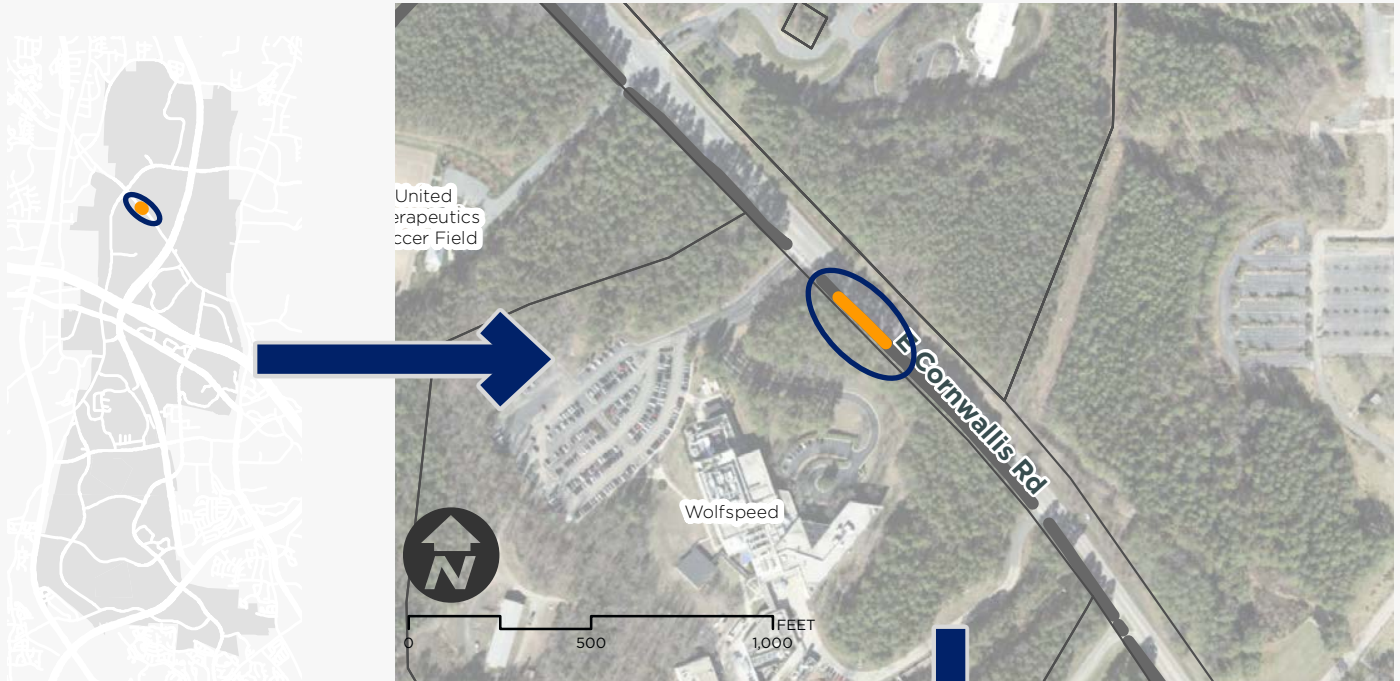
Location: Park Center Extension Trail, 775' section east starting just west of the Troxler Electronic Laboratories' driveway.

Description: Significant cracking and pavement upheaval from tree root penetration

Recommendation: Reconstruct 775' section (see guidance on page 52 regarding options for proximate trees)



4. Failing Pavement - 150' section



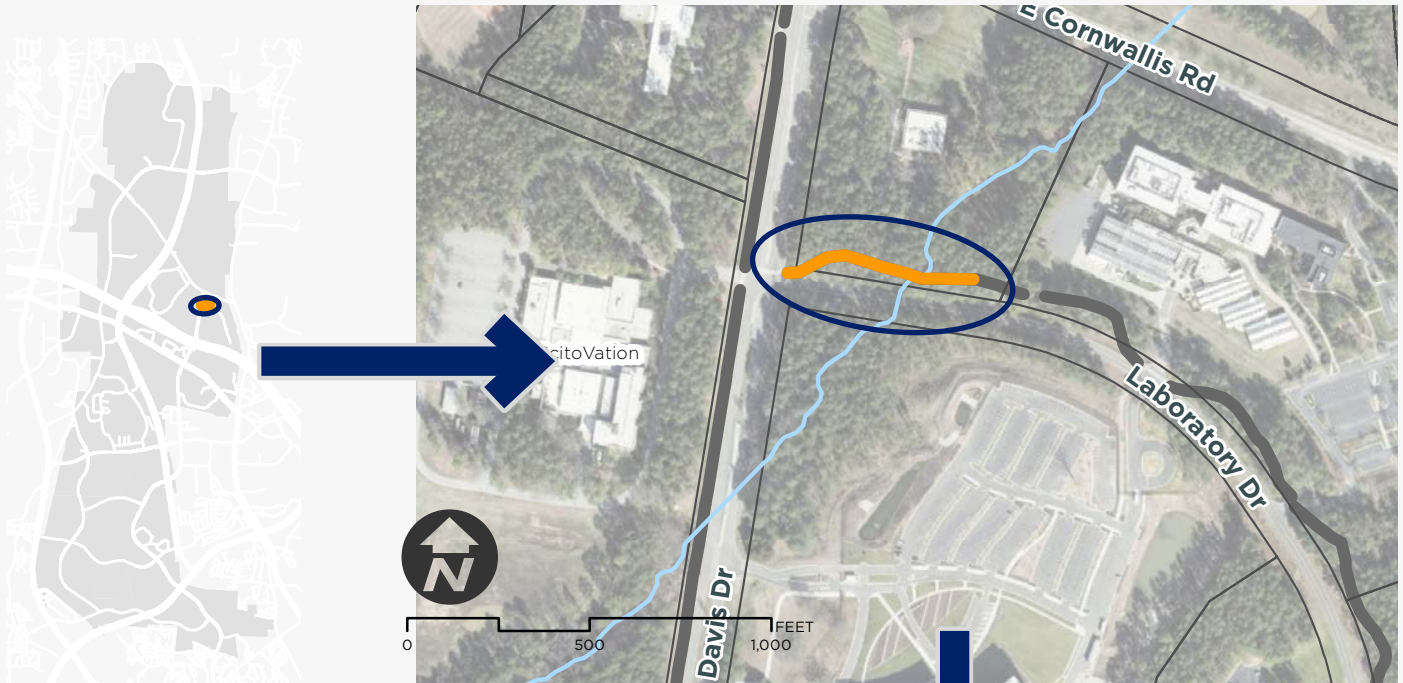
Location: Park Center Loop Trail, 150' section running southeast of the Wolfspeed driveway

Description: Significant slumping and cracking along the southwest edge of the trail.

Recommendation: Reconstruct 150' section



5. Failing Pavement - 480' section



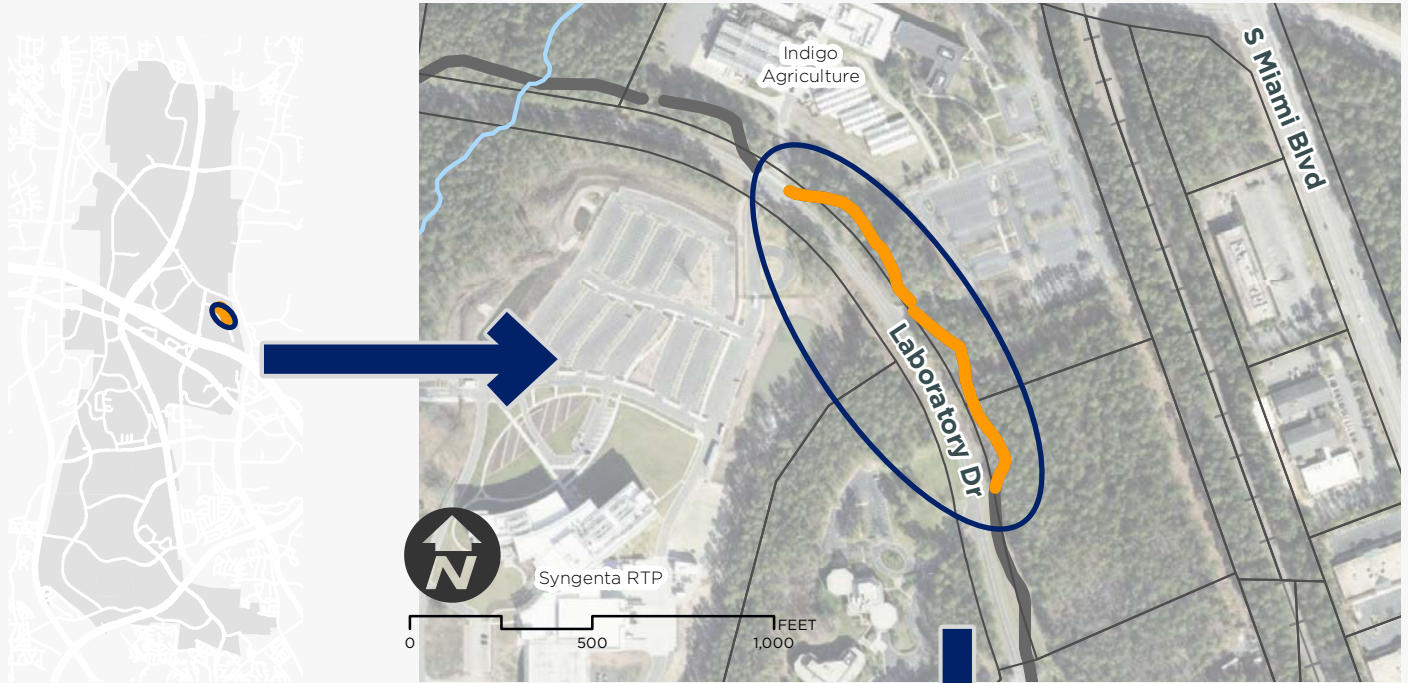
Location: Laboratory Dr Spur Trail, the first 480' of this spur trail east of Davis Dr

Description: Significant cracking and pavement upheaval from tree root penetration

Recommendation: Reconstruct 480' section (see guidance on page 52 regarding options for proximate trees)



6. Failing Pavement - 960' section



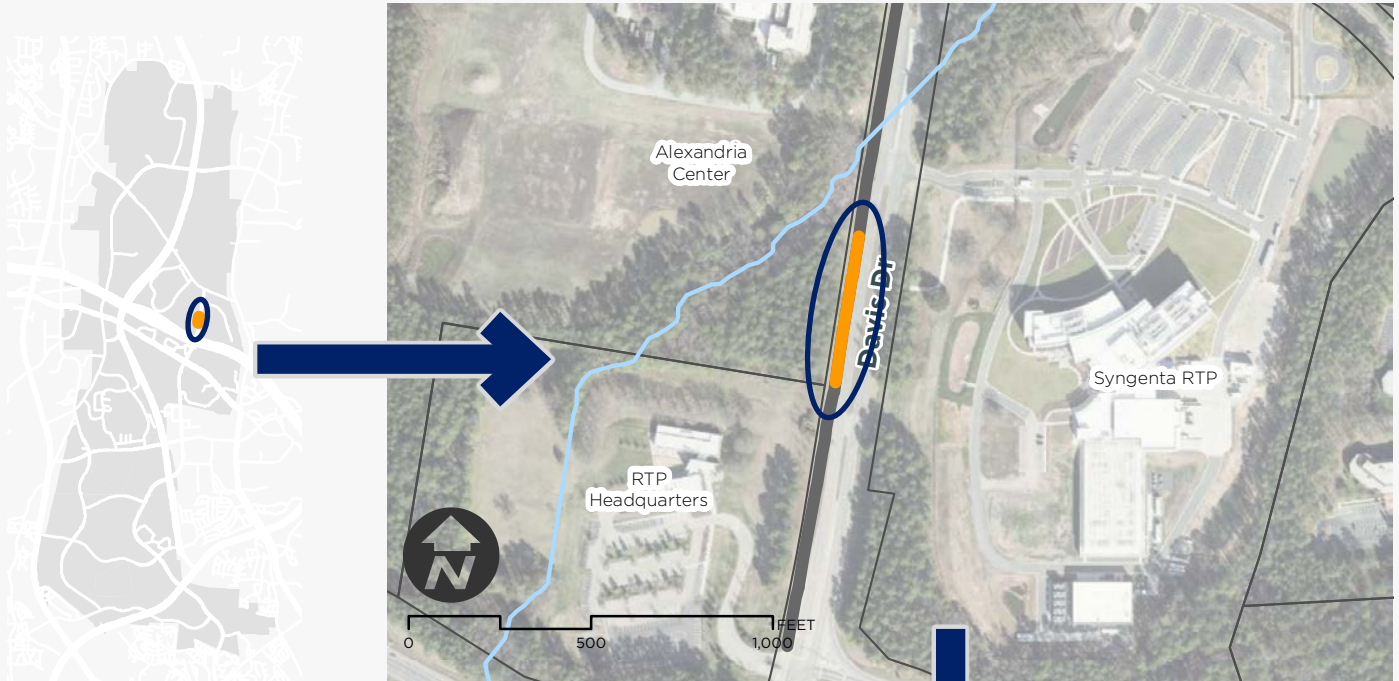
Location: Laboratory Dr Spur Trail, the first 960' of this spur trail east of the second Indigo Agriculture driveway is currently closed due to poor trail condition or trail removal from adjacent site development

Description: Most of this section of trail has been removed as part of the current site development process

Recommendation: Reconstruct 960' section as part of new site before site construction is complete



7. Failing Pavement - 330' section



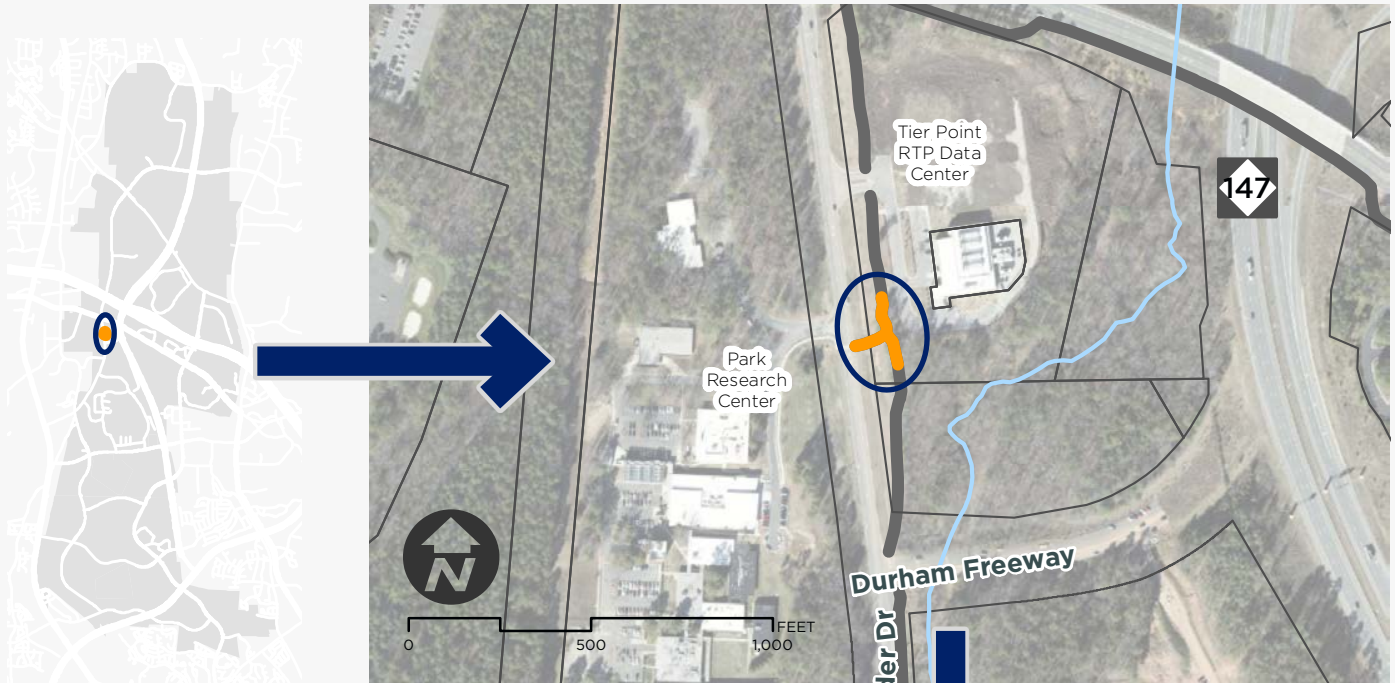
Location: Park Center Loop Trail, 330' section running north of the RTP Headquarters property

Description: Significant slumping and cracking through the trail center

Recommendation: Reconstruct 330' section. With the transition toward 10' in width for the entire trail system, consider widening/upgrading the trail section north of the I-40/Davis Dr bridge to the Alexandria Center driveway in the near term (that would cover this 330' section). As the Alexandria Center is completed toward the end of 2020, work with the developer to match the 10' standard when they reconstruct the short section of trail adjacent to their site.



8. Failing Pavement - 260' section



Location: RTP Connector Trail, 260' section just south of the Tier Point RTP Data Center (includes short spur to TW Alexander crosswalk (connecting to Park Research Center)).

Description: Short section of trail lacking pavement, adjacent sections with significant cracking and pavement upheaval from tree root penetration. Short spur connector to TW Alexander Dr crosswalk (leading to Park Research Center across the street)), also in poor condition and missing curb ramp (mud left from ponding (see photo at lower right))

Recommendation: Reconstruct 260' section. (see guidance on page 52 regarding options for proximate trees). With the transition toward 10' in width for the entire trail system, consider widening/upgrading the RTP Connector Trail in the near term (that would cover this 260' section).



9. Failing Pavement - 1,160' section



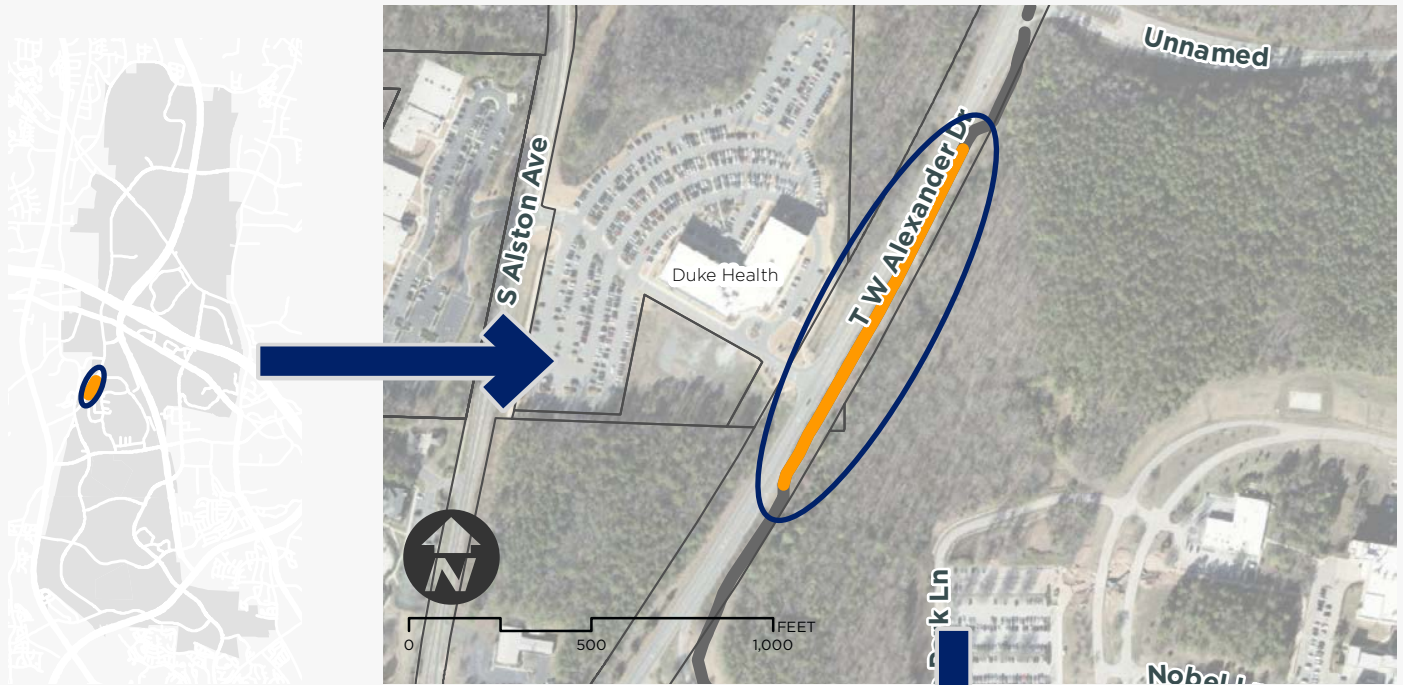
Location: RTP Connector Trail, 1,160 section north of the EPA driveway

Description: Tree root penetration, ponding, and associated cracking and pavement upheaval.

Recommendation: Reconstruct 1,160' section. (see guidance on page 52 regarding options for proximate trees). With the transition toward 10' in width for the entire trail system, consider widening/upgrading the RTP Connector Trail in the near term (that would cover this 1,160' section).



10. Failing Pavement - 945' section



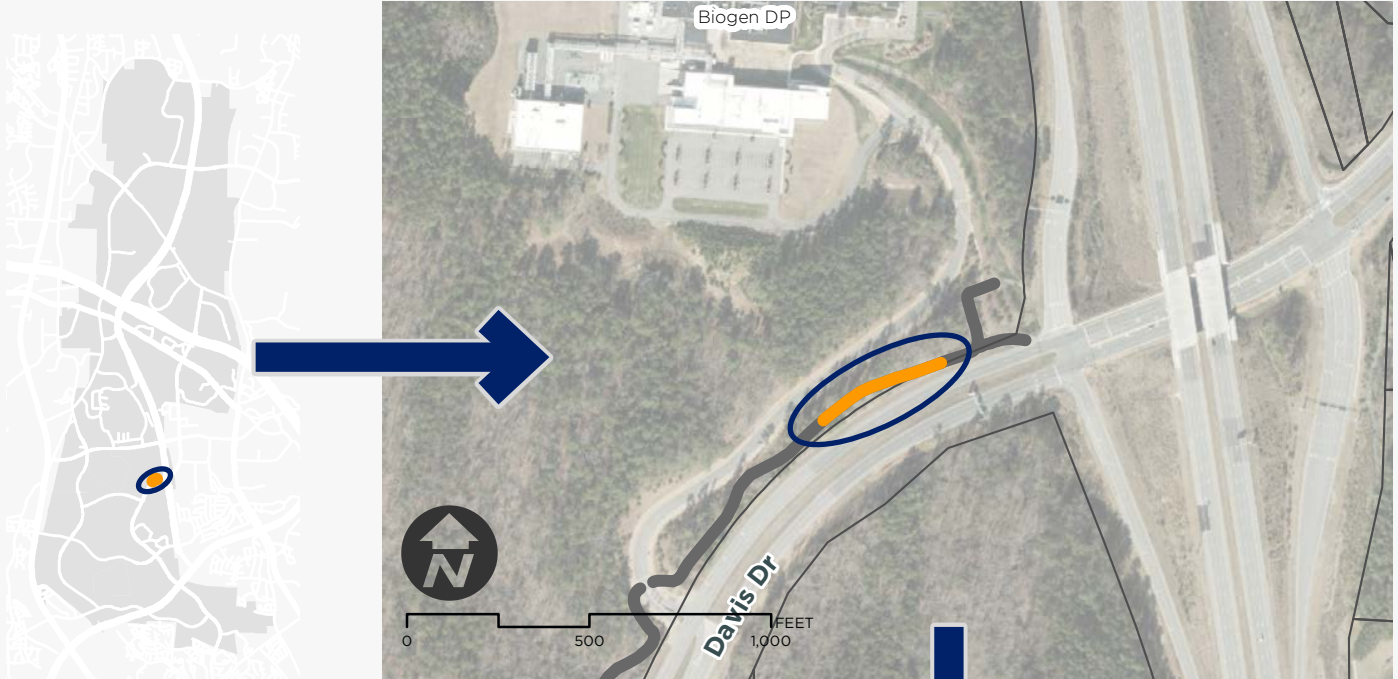
Location: RTP Connector Trail, 945' section across from the Duke Health driveway.

Description: Significant tree root penetration, ponding, and associated cracking and pavement upheaval.

Recommendation: Reconstruct 945' section. (see guidance on page 52 regarding options for proximate trees). With the transition toward 10' in width for the entire trail system, consider widening/upgrading the RTP Connector Trail in the near term (that would cover this 945' section).



11. Failing Pavement - 330' section



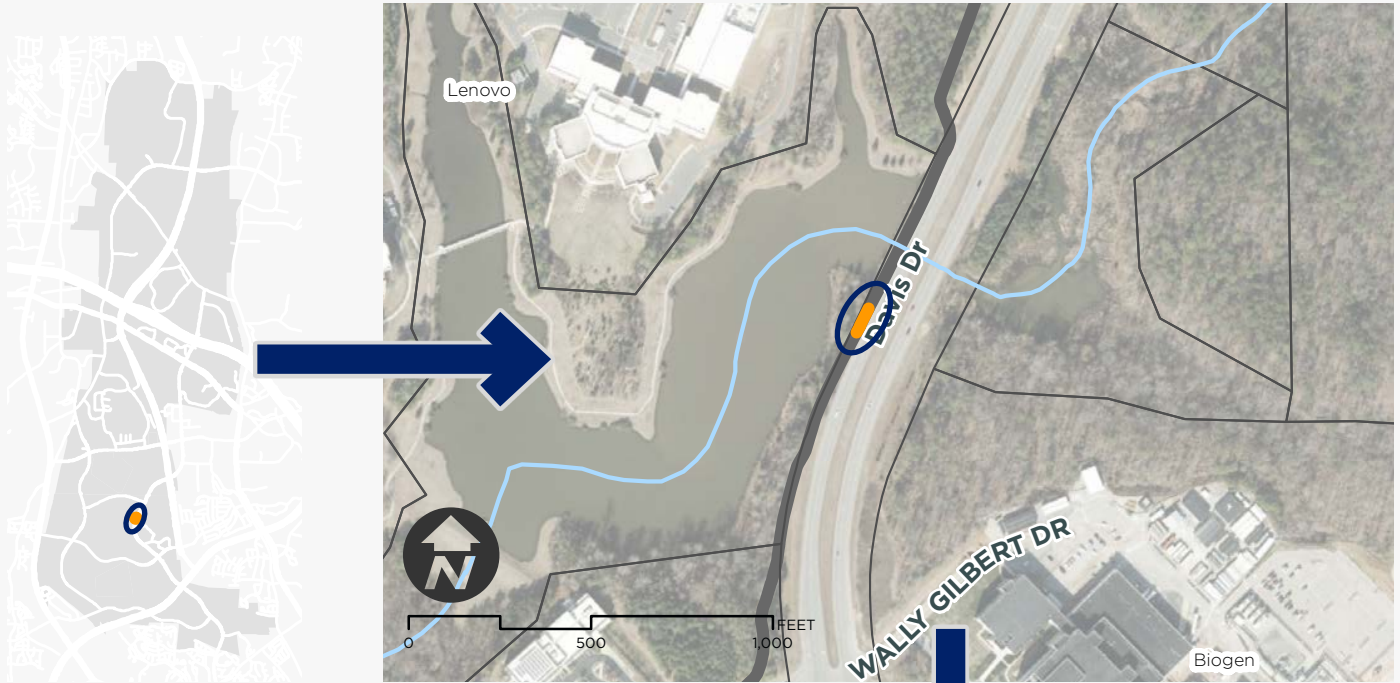
Location: Spur Trail (Davis Dr), 330' section northeast of the Biogen driveway.

Description: Significant cracking and pavement upheaval from tree root penetration

Recommendation: Reconstruct 330' section. (see guidance on page 52 regarding options for proximate trees).



12. Failing Pavement - 70' section



Location: Kit Creek Loop Trail along Davis Dr, 70' section 1000' south of Development Dr.

Description: Significant tree root penetration, ponding, and associated cracking/slumping.

Recommendation: Reconstruct 70' section. (see guidance on page 52 regarding options for proximate trees).



Shade/Tree Design Options

As segments are improved, trees are a critical feature to consider with respect to trail user comfort and trail pavement longevity. Trees provide much needed shade in many locations throughout the RTP Trail system. However, the poorest trail pavement conditions are typically due to tree root penetration from trees located very close to the trail pavement.

To address this issue, two options should be considered during trail design:

1. During reconstruction, install a separator to prevent tree roots from encroaching on/under trail. Reconstruction, of course, will require the removal of tree roots under the trail, which may cause the removal of or death of the adjacent tree.
2. Raising the trail similar to a boardwalk can be done as well (significantly more expensive option) to limit tree removal that would need to take place for asphalt reconstruction.



Above: Boardwalk example that avoids issues with roots from adjacent trees (NC 54 near Research Triangle High School)

Right: Example where the trees appear to have been cut back an intentional distance during construction (Triangle Dr spur), with smaller shrubs placed closer to the trail pavement



Example of significant tree root penetration from proximate trees (TW Alexander Dr section)

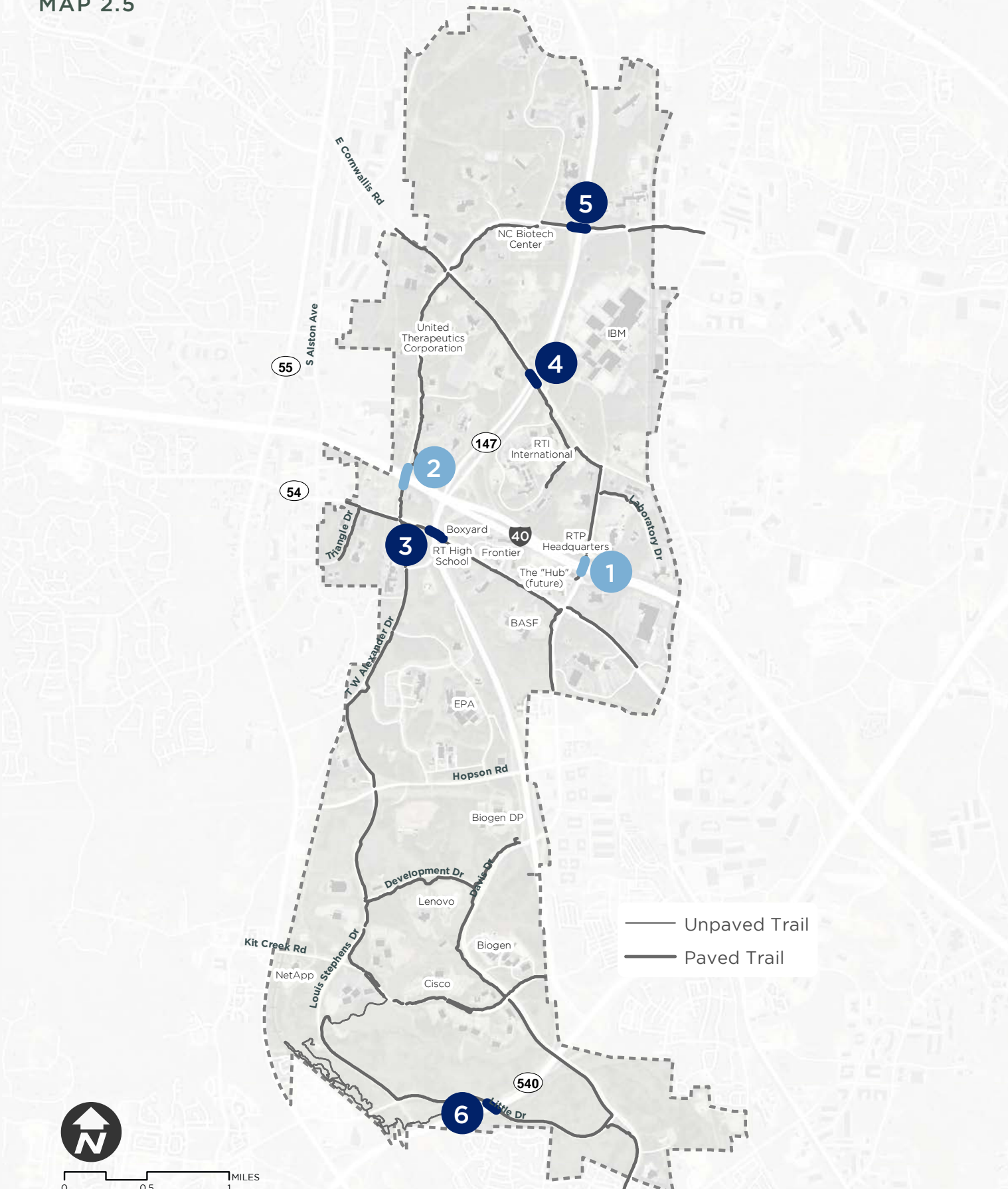


Above: Example where trees were intentionally cut to a distance of 14' from the trail pavement (Wolf River Greenway, Memphis, TN)



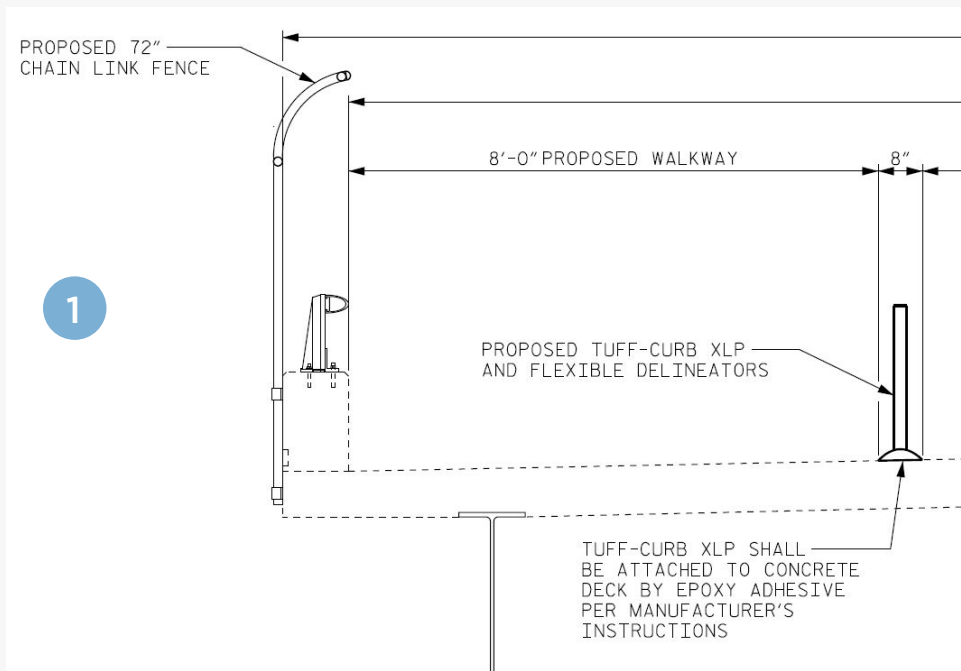
Highway Bridge Recommendations

MAP 2.5

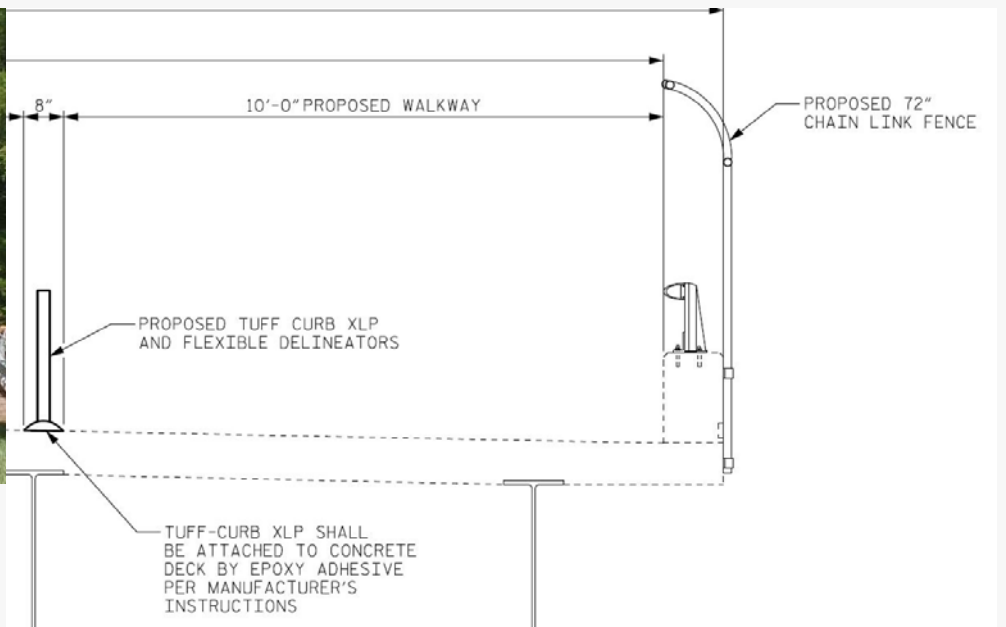


Highway Bridge Recommendations

The RTP Trail system includes five highway bridge crossings that currently utilize shoulder space without any physical separation from automobile traffic. Bridges 1 and 2 on the map on the previous page are currently in the design phase for improving trail safety on the bridge deck. Both designs include the creation of a physical buffer (flexible bollards and a small curb) as well as higher fencing along the bridge edge. See below for the draft features of these two bridges.



Left: Draft design features of the Davis Dr/I-40 bridge trail improvements (above: photo of existing condition)



Right: Draft design features of the TW Alexander/I-40 bridge trail improvements (above: photo of existing condition)

Highway Bridge Recommendations



Bridge Location: Park Center Loop Trail, NC 54/NC 147 bridge

Recommendation: Remove center turn lane to create space for a raised, 10' wide concrete shared use path on both sides of the bridge (adding to the existing 5.5' sidewalk on each side) as recommended in the 2016 RTP Bicycle & Pedestrian Improvements Booklet, page 29. Furthermore, taller fencing should be installed along the bridge railing, similar to the Davis Dr/I-40 and T W Alexander Dr/I-40 projects highlighted on the previous page.



Bridge Location: Park Center Extension Trail, T W Alexander Dr/NC 147 bridge

Recommendation: Bridge design should utilize the same features as the Davis Dr/I-40 and T W Alexander Dr/I-40 projects highlighted on the previous page. The key features are the construction of a physical barrier between trail users and automobile traffic, and a higher fence railing along the bridge edge.

Highway Bridge Recommendations



Bridge Location: Park Center Loop Trail, Cornwallis Rd/NC 147 bridge

Recommendation: Bridge design should utilize the same features as the Davis Dr/I-40 and T W Alexander Dr/I-40 projects highlighted on page 54 - the key features are the construction of a physical barrier between trail users and automobile traffic, and a higher fence railing along the bridge edge.

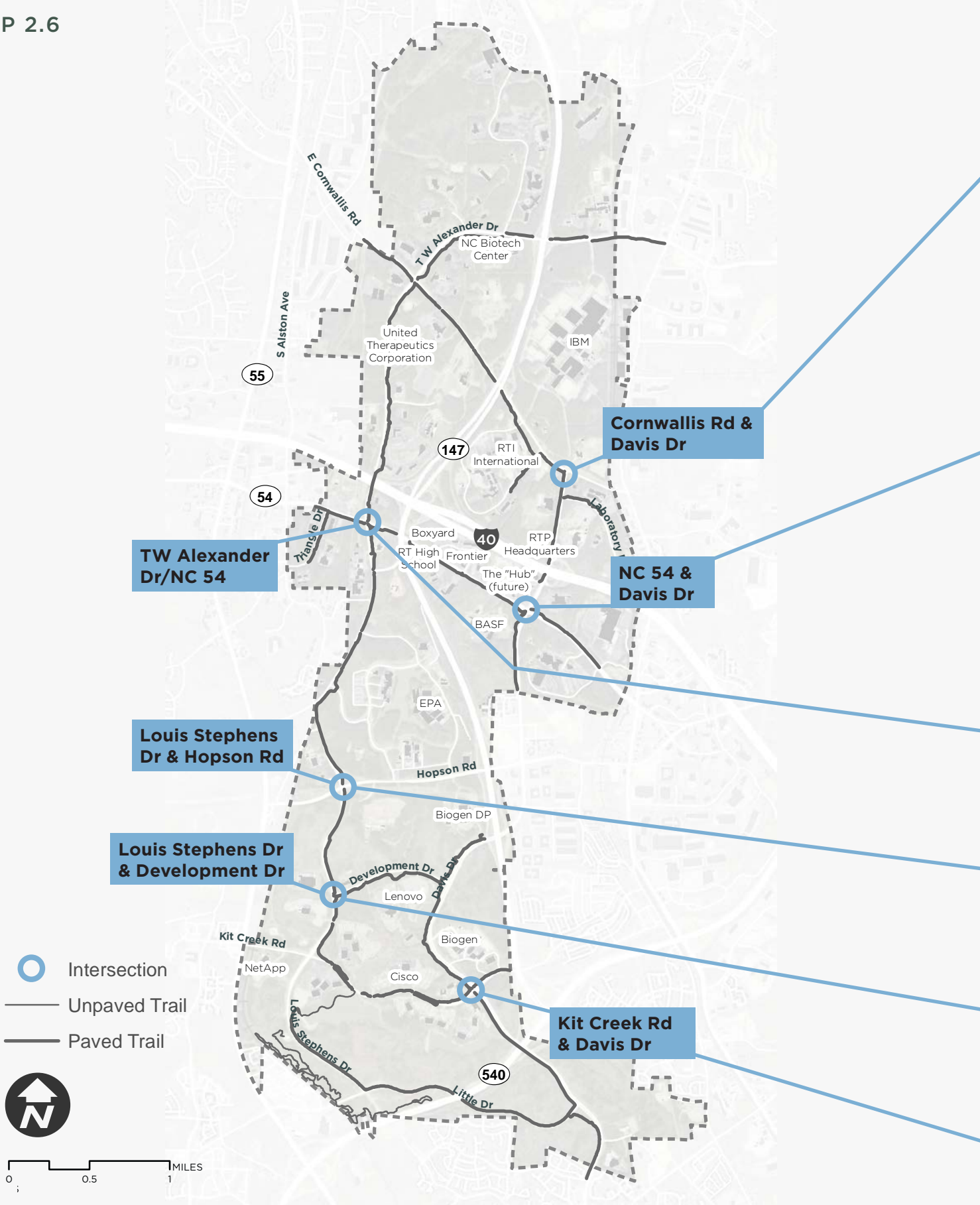


Bridge Location: Kit Creek Extension Trail, Little Dr/NC 540 bridge

Recommendation: Construct trail segment under the NC 540 bridge. Plenty of space exists to fill this gap. Drainage will be a challenge in implementing this connection.

Key Intersections

MAP 2.6



Key Intersection Improvements

Cornwallis Rd future project STIP (P-5717) will include buffered bike lanes and sidewalks east of Davis Dr along E. Cornwallis Rd. Bicycle and pedestrian crossing treatments are needed at this intersection. Recommendations from the 2016 RTP Bicycle & Pedestrian Improvements Booklet should be amended to include high visibility crosswalks on all four sides of the intersection to reflect the desired connectivity to STIP (P-5717). Furthermore, with traffic volumes between 9,400 and 12,000 AADT, the southern most of the two right turn lanes on Cornwallis Rd (east bound) should be removed. Furthermore, turning radii should be minimized to slow turning movements to the extent possible.

The NC 54/Davis Dr intersection has nearly complete crossing infrastructure along the west and north sides of the intersection. Curb ramps are needed at the northeast and southwest corners, as well as a high visibility crosswalk along the north side of the intersection. Even with these improvements, this intersection is still not ideal for trail users. This intersection has the highest traffic volumes of any intersection in RTP (the closest traffic counters show 18,000 - 23,000 AADT), the distances of the crosswalks are 115', and the large turning radii allow fast automobile turning movements.

As the property at the southeast corner of the intersection is developed over the next few years, crossing infrastructure should be completed along the east side of the intersection as well as the south side of the intersection. Further study is needed to identify and implement crossing improvements for trail users at this intersection. Due to the significance of this intersection as a connector to the Hub development as well as the future Triangle Bikeway corridor, consider 'visionary' design options such as a bike/ped bridge(s) at this intersection. For at-grade crossing improvements, turning radii should be minimized to the degree possible to slow automobile speeds during turning movements. Traffic analysis will be needed to examine the possibility of removing a turn lane in each direction of this intersection to shorten the crossing distance for trail users.

The TW Alexander Dr/NC 54 intersection currently has crossing infrastructure but needs several improvements. The trail approach at the three corners of the intersection directs trail users toward the center of the intersection. Trail approaches should be reconfigured directly toward the opposite side of the intersection. Furthermore, turning radii should be minimized to slow turning movements to the extent possible.

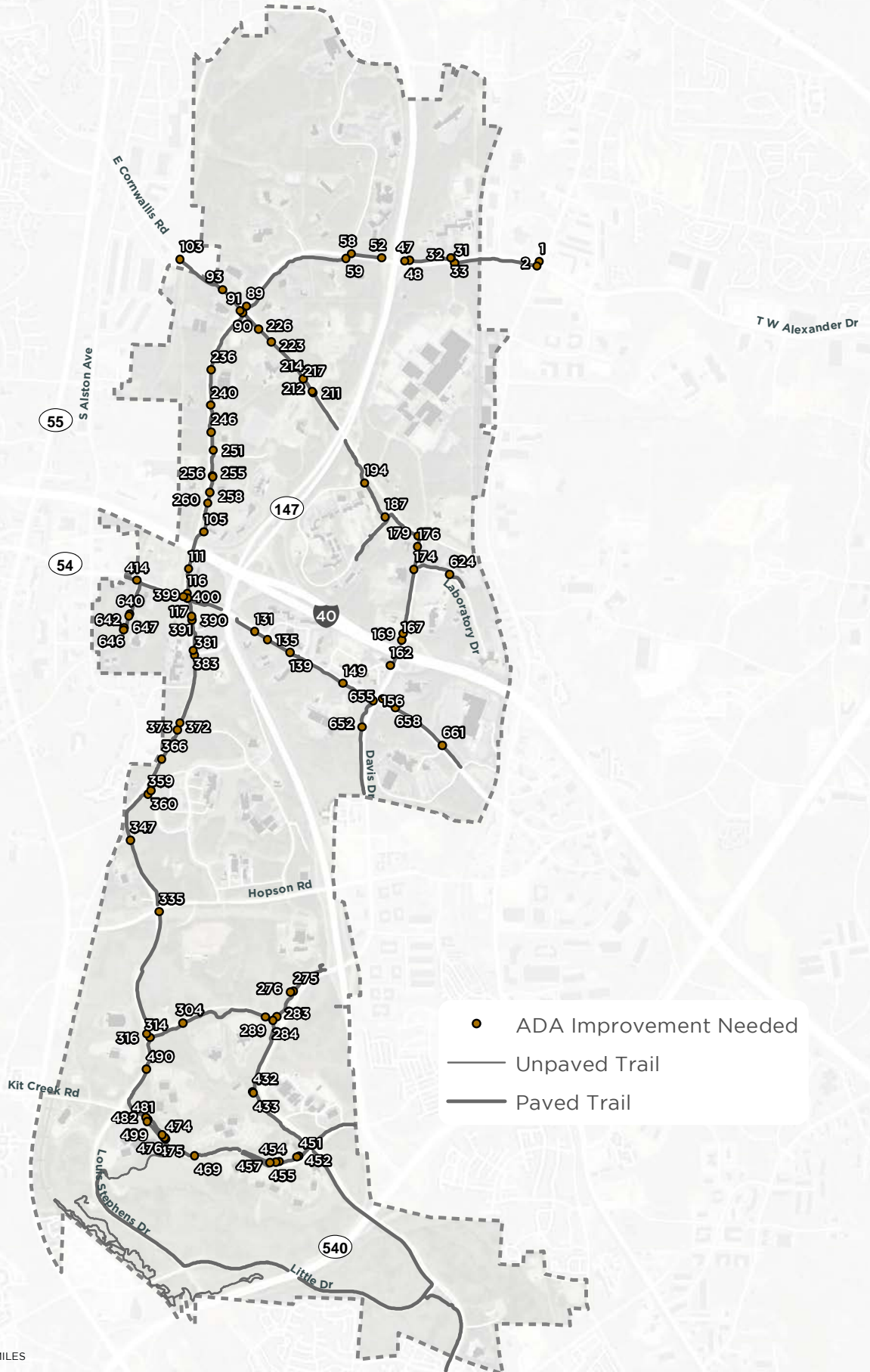
Crossing infrastructure is missing at the Hopson Rd trail crossing, and could be implemented as part of the RTP Connector Trail widening project/upgrade. A high-visibility crosswalk, pedestrian signals, and curb ramps are needed at this intersection. Turning radii should also be minimized to slow turning vehicle movements and improve trail user visibility.

Improvements to the Louis Stephens Dr/Development Dr intersection could be implemented as part of the RTP Connector Trail widening project/upgrade. A high-visibility crosswalk and curb ramps are needed at this intersection. The trail approach directs trail users toward Louis Stephens Dr. The trail approach to each side of the intersection should be reconfigured directly toward the opposite side of the intersection on Development Dr. Furthermore, turning radii should be minimized to slow turning movements to the extent possible.

The trail crossing of the northwest side of the Kit Creek Rd/Davis Dr intersection includes a crosswalk, but is missing a pedestrian signal. Davis Dr carries very high traffic volumes (27,000 AADT) at this location and high speeds. A pedestrian signal is needed at this location.

ADA Improvements

MAP 2.7



ADA Improvements

The Map ID numbers below correspond to the Map ID numbers in the “RTP Trails Study: Field Notes” document. For further detail on the exact location of each point featured below, please reference the “RTP Trails Study: Field Notes” document.

Map ID	ADA Improvements
1	facing south; curb ramps needed both sides (no ramp on north side, old-poor ramp on south side); high vis crosswalk needed
2	facing east; updated curb ramp needed
31	facing west; traffic light pole on right (north), trail widening would need to take place on left (south); curb ramp/truncated dome needed, needs to be aligned with north side
32	facing south; need bollards or concrete curb to demarcate space between turning traffic and curb ramp; high vis markings needed for crosswalk; existing ped signal; space exists to construct median island
33	facing west; high vis markings should be used; existing ped signal
47	facing west; large crack with vegetation where utility digging occurred - surface not replaced; truncated domes needed at intersection (4 total); existing ramps and ped signal; need high vis markings; turning radii allows for fast car movements
48	facing east; truncated domes needed at intersection (4 total); existing ramps and ped signal; need high vis markings
52	facing east; curb ramp on west side needs landing area, redo curb ramp and make directional; need curb ramp and landing on east corner
58	facing west; wayfinding pavement marker; curb ramp needs landing area; domes needed for pork chop island; need green conflict markings for bike lanes through intersection; existing ped signal; SE corner also needs landing area; lots of space for trail expansion here
59	facing east; ramp needs landing area
89	facing southwest; landing area needed for curb ramp; existing ped signal and high vis crosswalks
90	facing north; poor ramp alignment
91	facing southeast; existing ped signal and high vis crosswalks; west corner needs landing area, would need redone
93	facing northwest; good pavement condition, a couple cracks behind photo; curb ramps at intersection need landing areas and need to be configured parallel
103	facing west; ramp at driveway at end needs replaced
105	facing south/west; nice shade; cracking; crossing needs smoother ramps, truncated domes; tree root penetration on opposite side of crosswalk
111	facing south; need truncated domes
116	facing south/west; curb ramp needs replaced and better aligned; need high visibility crosswalk markings
117	facing north; curb ramp needs replaced; vegetation encroachment; need high visibility crosswalk markings
131	facing west; ramps need domes; cracking
135	facing east; need truncated domes
139	facing east; truncated domes needed
149	facing east; truncated domes needed
156	facing north; ramp is too steep, spills to center of intersection - on north side, ramps need landing areas
162	facing south; need ramp on south side of intersection
167	facing north; poor pavement condition for this short section; crosswalk needs re-striped (recent resurfacing); existing ped signal; curb ramps need truncated domes
169	facing south; curb ramp needs truncated dome, cracking on east side
174	facing north; need truncated domes and high vis crosswalk markings need repainted (recent resurfacing)
176	facing north; significant edge cracking; need truncated domes on ramps (need to be flush)
179	facing northeast; curb ramp goes directly into intersection - very difficult to cross here - two continuous right turn lanes (remove one?)
187	facing east; need truncated domes
194	facing northwest; shade; edge cracking; truncated domes needed at intersection
211	facing northwest; curb needs realigned, high vis crosswalk; existing ped signal

ADA Improvements

Map ID	ADA Improvements
212	facing northeast; existing ped signal and high vis crosswalk; ramp on northeast side needs curb radii minimized and truncated dome; also bike lane crossing on north side (some what of a rudimentary protected intersection)
214	facing northwest; truncated domes needed
217	facing northwest; trail alignment needs modified on northwest side of intersection
223	facing southeast; truncated domes needed
226	facing northwest; ramps need truncated domes; high vis crosswalk also needed
236	facing north; truncated domes needed
240	facing north; truncated domes needed; lots of space along trail
246	facing south; truncated domes needed
251	facing south; significant cracking and vegetation encroachment; truncated domes needed at crossing
255	facing north; truncated domes needed
256	facing south; truncated domes needed; consider realigning this section to avoid steep sloop - align closer to road and cut into hill
258	facing north; truncated domes needed; steep slopes
260	facing north; truncated domes needed
275	facing south; steep hill; truncated domes needed at intersection
276	facing northeast; truncated domes needed
283	facing southwest; truncated domes needed
284	facing north; truncated domes needed
289	facing west; truncated domes needed and high vis crosswalk
304	facing east; truncated domes needed; high visibility cross-walk needs re-painted
314	facing northwest; truncated domes needed; intersection approach and crossing needs reconfigured
316	facing south; high vis crosswalk markings needed; trail crossing at intersection needs reconfigured
335	facing north; need high vis crosswalk, ped signals, truncated domes; space exists for median safety island
347	facing west; crosswalk and curb ramp needed; need bollards to protect landing area on new curb ramp opposite side of street
359	facing north; truncated domes needed
360	facing south; truncated domes needed
366	facing south; partial shade; crosswalks needed to development across the street; concrete ditch along east side; tree root penetration
372	facing north; sediment; intersections need high vis crosswalk markings, truncated domes
373	facing south; high vis crosswalks needed, truncated domes
381	facing north; intersection needs new curb ramps with landing area; crossing needs to be configured further to east
383	facing south; new curb ramps needed; high vis crosswalk needs restriped (crosswalk needs to be configured so that it's further away from road)
390	facing north; new ramps needed; steep incline into driveway; cracking
391	facing south; new ramps needed; steep incline into driveway
399	facing northwest; large vegetation growth in middle of pavement; intersection crossings need reconfigured; slope directions trail users to middle of intersection; existing pedestrian signal
400	facing east; replace ramp
414	facing east; new curb ramp needed - needs landing area and truncated dome
432	facing south; truncated domes needed

ADA Improvements

Map ID	ADA Improvements
433	facing north; truncated domes needed
451	facing west; truncated domes needed
452	facing east; truncated domes needed
454	facing west; steep slope to driveway; truncated domes needed
455	facing east; truncated domes needed
457	facing south; trail intersection with segment across the street (crossing); truncated domes needed; traffic is high speed here
469	facing west; ramp leads into roadway, need better alignment, truncated domes, high vis crosswalks
474	facing west; high vis crosswalk needed, truncated domes
475	facing west; high vis crosswalk needed, truncated domes and landing area on east side
476	facing east; truncated dome needed along with high vis crosswalk - median safety island would be helpful
481	facing south; curb ramp needed; high speed traffic
482	facing east; curb ramps need landing area and truncated domes
490	facing north; truncated dome needed
499	facing northwest; no crossing facilities along west or south side of intersection
624	facing east; truncated dome needed
640	facing south; ramps too narrow; high vis crosswalk needed
642	facing north; ramps too narrow; high vis crosswalk needed
646	facing south; poor ramp alignment, needs to be redone
647	facing north; poor ramp alignment, needs to be redone
652	facing north; truncated domes needed
655	facing west; truncated dome and high vis crosswalk needed
658	facing east; truncated dome needed
661	facing east; curb ramp on west side needs landing area

TRAIL SEGMENT UPGRADES

PHASE 1 SEGMENT UPGRADES

- 1A** NC 54/T W Alexander Dr Option
- 1B** Burdens Creek (New Trail) Option
- 1** RTP Connector Trail
- 2** Davis Dr

HOW WIDE SHOULD A SHARED USE PATH BE? EXPANDING THE RTP TRAIL WIDTH FROM 8' TO 10' AND IN SOME LOCATIONS, 12'.

As RTP continues to grow and evolve, it is important to ensure that the trail system grows and evolves along with it. With commercial and residential growth comes higher numbers of trail users. Additionally, with the growing popularity and accessibility of e-bikes and e-scooters and a range of mobility options, the RTP trail system will become an even more integral component of the RTP transportation system. Many trail segments are approaching 20 years or more, and aging pavement can serve as an opportunity for widening sections of trail as they are repaired.

Best practices in trail design identify general parameters for when to consider certain pavement widths for trails. While 10' widths will be appropriate as a next step as trail segments are upgraded, trail segments with potentially very high volumes, such as the Hub Site/Frontier/Boxyard internal system, should be in the 12'-14' range.

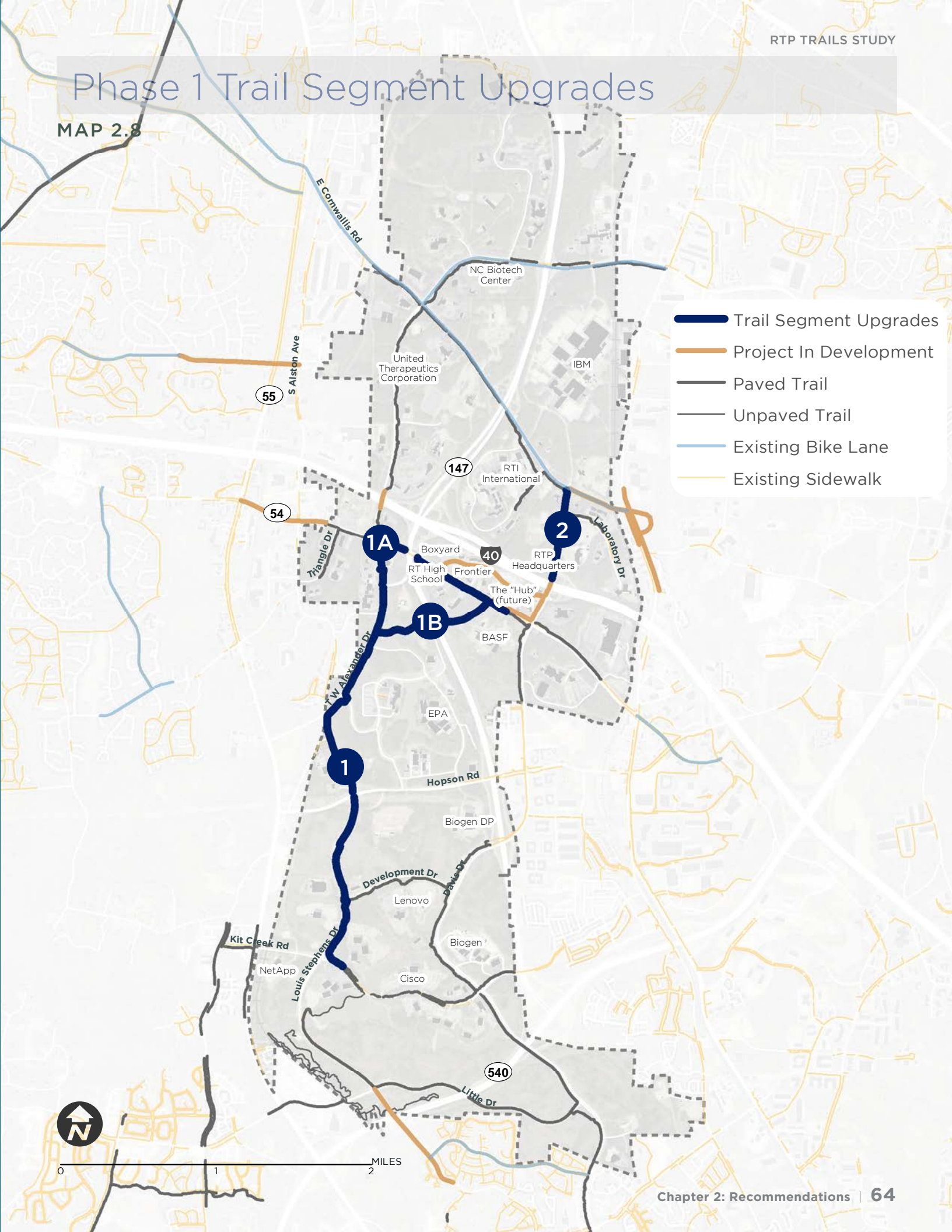
VOLUME AND USER MIX (Table calculated based on a target level of service 'B' from the FHWA Shared Use Path Level of Service Calculator)

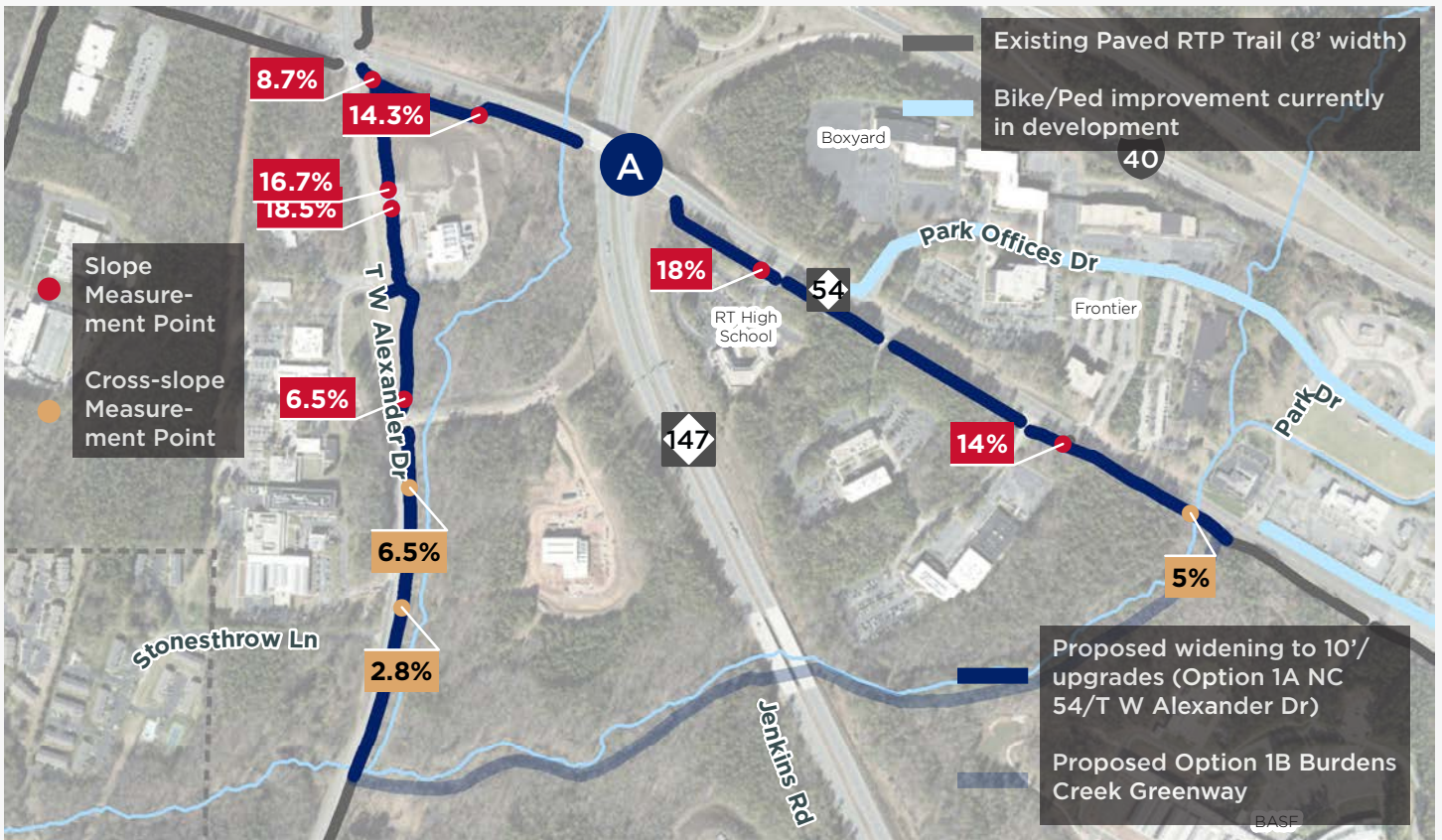
RECOMMENDED MINIMUM PATHWAY WIDTH

Low volume (less than 50 users in one direction per hour), low mix (75 percent bicyclists, 25 percent pedestrians).	8-10 ft (2.4-3.0 m)
Low volume (less than 50 users in one direction per hour), heavy user mix (50 percent bicyclists, 50 percent pedestrians).	12 ft (3.6 m)
High volume (150 or more users in one direction per hour), low mix (75 percent bicyclists, 25 percent pedestrians).	12-14 ft (3.6-4.2 m)

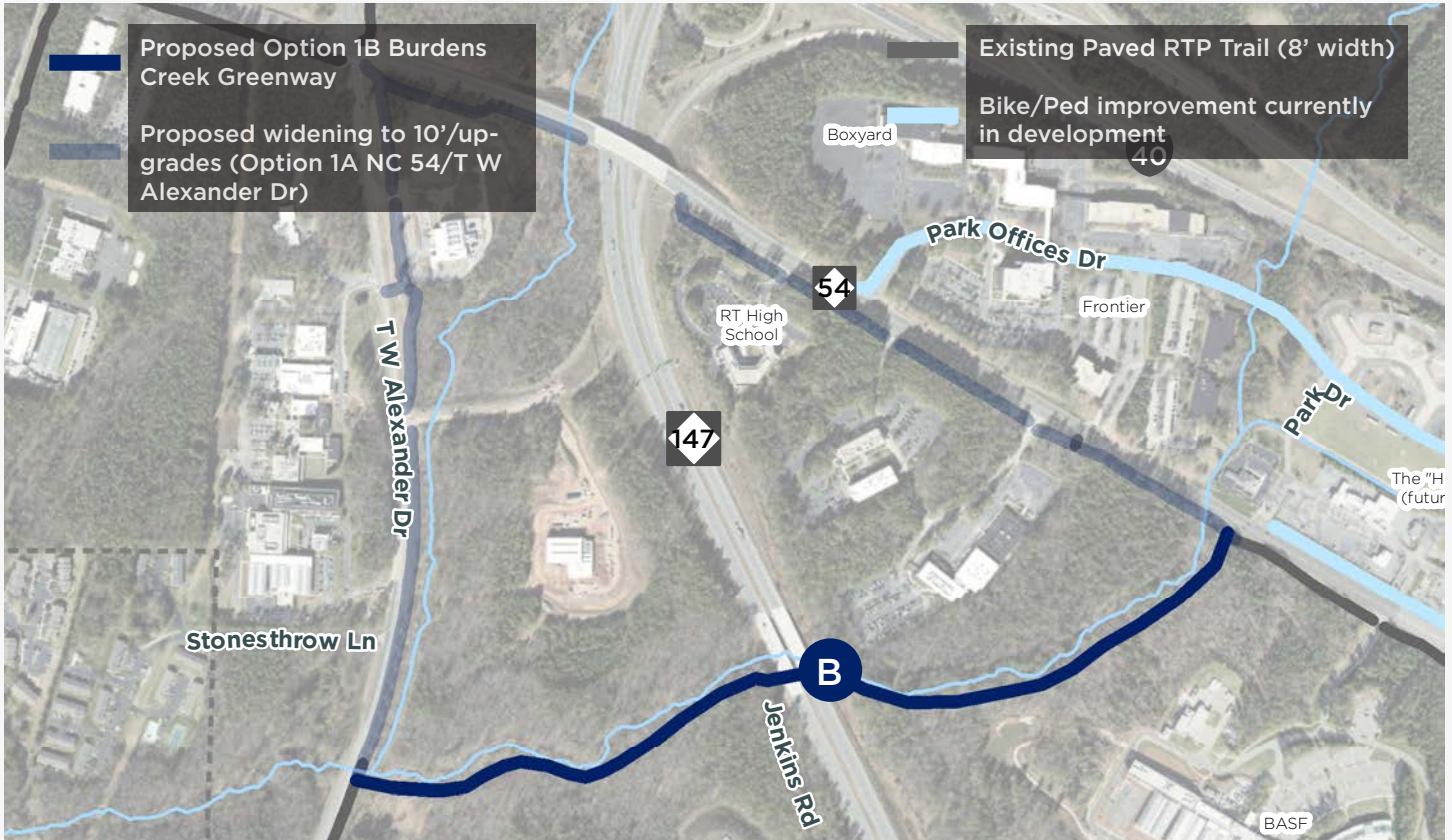
Phase 1 Trail Segment Upgrades

MAP 2.8





Above: The 1A NC 54/T W Alexander Dr option has several steep slopes. The Burdens Creek option would allow trail users from the south to make a more direct and flatter connection to the future Hub site.



Above: The 1B Burdens Creek option is flat and offers a direct connection to the Hub site. The wooded setting along Burdens Creek also provides an additional opportunity for trail users to experience a forested/riparian section away from the RTP roadway system.

Southern RTP Trail Connectivity

Trail connectivity between the southern part of RTP and to the future Hub site is currently achieved by the RTP Connector Trail and a segment of the Park Center Loop Trail that, combined, is 3.5 miles in length (See 1 and 1A from the map on page 64). The option for constructing a greenway connector along Burdens Creek would make a flatter, lower stress, and more direct connection to the Hub, and should be considered. While options 1A and 1B are both valuable elements of a comprehensive trail system for RTP, and should both be implemented, understanding the opportunities, challenges, and costs associated with each option can aid in prioritization and phasing decisions.

Below is a comparison of options 1A and 1B for connecting the southern part of RTP to the northern part of RTP and the Hub site.

1A. NC 54/TW Alexander Dr Widening/Upgrade



The NC 54 Highway bridge over NC 147 is a significant deterrent for bicyclists and pedestrians. The bridge includes a 5.5' sidewalk with little buffer space to NC 54 traffic. Furthermore, the existing railing is low.

Project: Widen trail from 8' - 10'
Distance: 7,500 ft (1.42 miles)
Elevation: +/- 111'
Grade: Several locations with +5% grade
Shade: Partial
Conflict points: NC 54/NC 147 bridge; five driveways
Trail Bridges: Two
Planning Level Cost Estimate: \$2,310,000 (not including any improvements to 5' sidewalk along NC 54 bridge over NC 147)
Experience: Roadway Sidepath
Phasing: Design (2020-2021); Construction (2021-2023)

1B. Burdens Creek Greenway Construction



Plenty of space and clearance exists for the proposed Burdens Creek Greenway to cross under NC 147.

Project: Construct Greenway (10' width)
Distance: 4,200 ft (0.8 miles)
Elevation: +/- 25'
Grade: Opportunity to create trail without +5% grade
Shade: Full
Conflict points: None
Trail Bridges Needed: Likely two short bridges, depending on alignment
Planning Level Cost Estimate: \$1,160,000
Experience: Greenway (forest/riparian)
Phasing: Design (2020-2021); Construction (2021-2023)

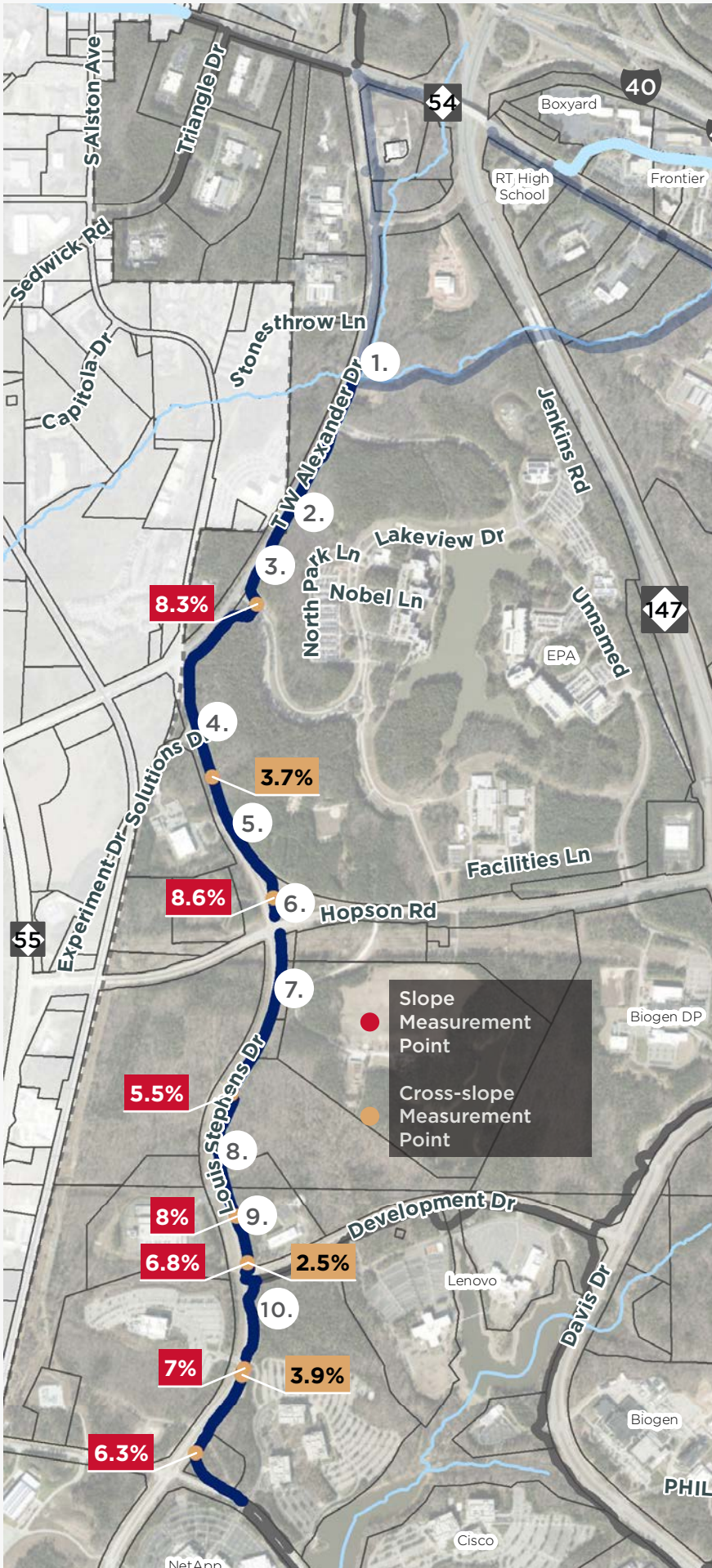
1. RTP Connector Trail Widening/Upgrade

The RTP Connector Trail is the best trail connection from the southern part of RTP to the northern part of RTP (and the Hub site). Davis Dr, beyond the RTP boundary, does offer a sidewalk link from southern RTP to the north/Hub site, although the RTP Connector Trail provides a more direct and lower stress link.

Because some sections of this trail are close to 20 years old with significant deficiencies in pavement quality, widening the tread from 8' to 10' and improving key intersections will provide a true multimodal connection between southern RTP toward the northern sections of RTP, especially the future Hub Site.

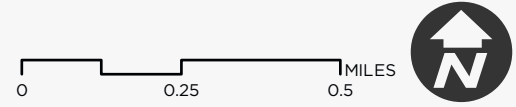
- Project:** Widen trail from 8' - 10'
- Distance:** 13,200 ft (2.5 miles)
- Elevation:** +/- 235'
- Grade:** Several locations with +5% grade
- Shade:** Partial
- Conflict points:** Three driveways, two intersections
- Trail Bridges Needed:** Two (and a third that is very short)
- Planning Level Cost Estimate:** \$3,510,000
- Experience:** Roadway Sidepath
- Phasing:** Design (2020-2021); Construction (2021-2022)





1. Link to the proposed Burdens Creek Greenway (see Option 1B on page 63-64)
2. Poor pavement condition here due to tree root penetration
3. Short trail bridge will need to be replaced here
4. Protruding water pipe in pavement
5. Large concrete retaining wall along east side of trail, constraint
6. Bicycle and pedestrian crossing treatments needed at the Hopson Rd intersection and should be coordinated with this project
7. Trail adjacent to guardrail along this side, expansion will need to utilize space along the east side of the trail
8. Two trail bridges would need replacement here
9. Protruding ROW markers in pavement
10. The Development Dr crossing should be better aligned, and should be improved with this project

- Proposed RTP Connector Trail widening to 10'/upgrades
- Proposed Options 1A & 1B (see pages 65-66)
- Existing Paved RTP Trail
- Bike/Ped improvement currently in development



2. Davis Dr Widening/Upgrade

This section of the Davis Dr trail fills the gap between two bike/ped projects that are in development 1) The Davis Dr/I-40 bridge improvements that connect into the future Hub Site trail system and 2) The E. Cornwallis Rd grade separated railroad crossing project (STIP: P-5717), that will include buffered bike lanes and sidewalks from Davis Dr to Miami Blvd, will improve connectivity to IBM campuses as well as residential and commercial development along Miami Blvd.




Longer-term, this will likely be the future Triangle Bikeway segment that connects the American Tobacco Trail and downtown Durham via Cornwallis Rd bicycle facilities.

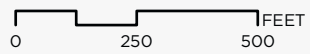
Project: Widen trail from 8' - 10'
Distance: 3,100 ft (0.59 miles)
Elevation: +/- 51'
Grade: Flat (no locations with +5% grade)
Shade: Partial
Conflict points: Four driveways
Trail Bridges Needed: None
Planning Level Cost Estimate: \$600,000
Experience: Roadway Sidepath
Phasing: Design (2020-2021); Construction (2021-2023)
Misc: Large traffic pole in tread at RTP Foundation driveway





1. Future project STIP (P-5717) will include buffered bike lanes and sidewalks east of Davis Dr along E. Cornwallis Rd. Bicycle and pedestrian crossing treatments needed at this intersection, and should be implemented in tandem with this trail improvement project.
2. Significant slumping and cracking through the trail center. Site development has also closed/removed part of this section of trail (Fall 2019).
3. Traffic Pole located in trail pavement
4. Future improvements to the I-40 crossing include the construction of a physical barrier (flexible bollards) between automobile traffic and trail users. A higher fence will also be installed along the bridge railing over I-40.
5. The Hub will include 10' trail connections to the Davis Dr/I-40 bridge crossing.

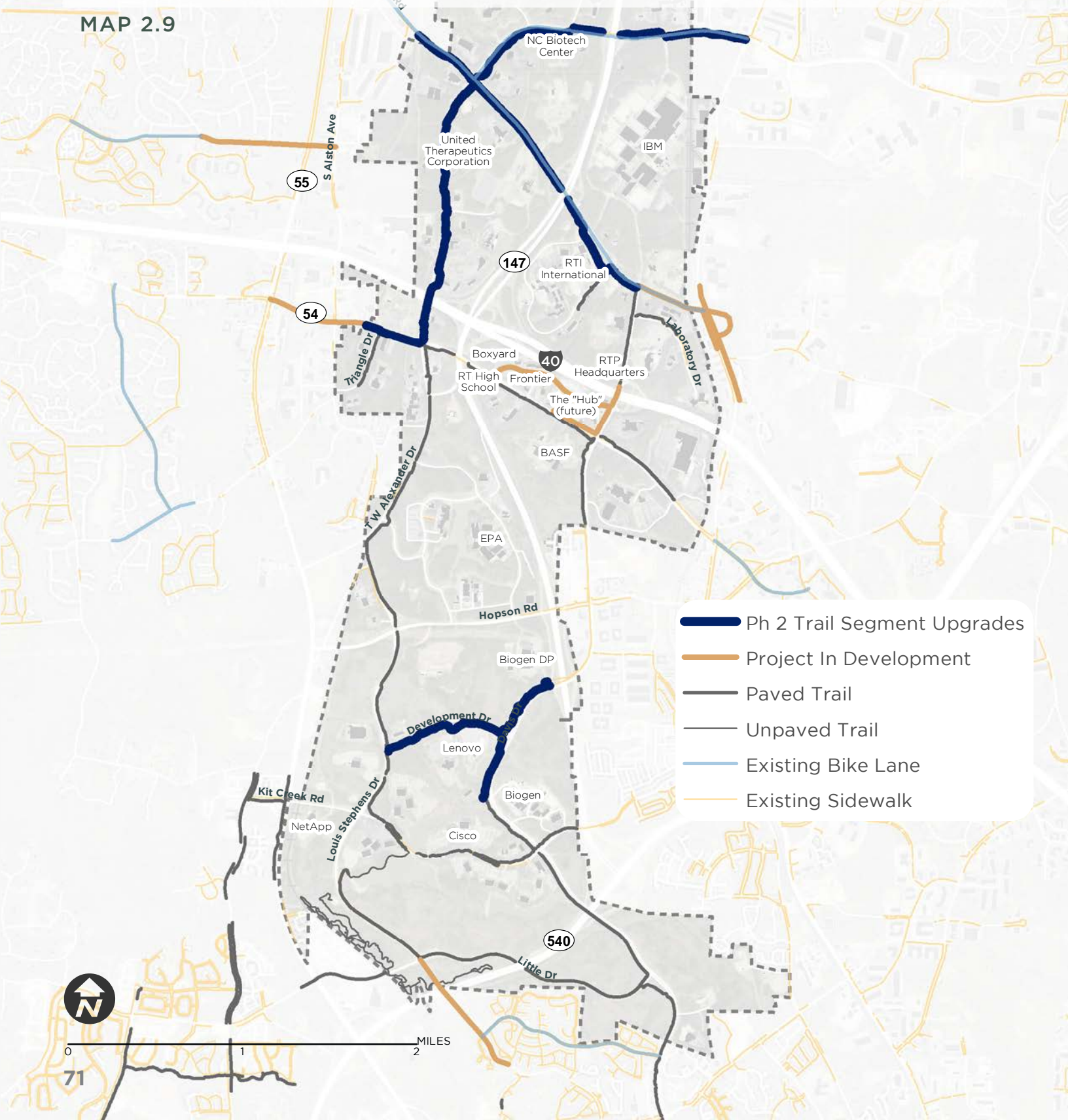
-  Proposed Davis Dr widening to 10'/upgrades
-  Existing Paved RTP Trail
-  Bike/Ped improvement currently in development



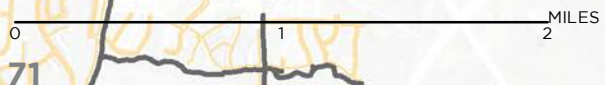
Phase 2 Trail Segment Upgrades

The rest of the Kit Creek and Park Center loop trails, the Park Center Extension Trail, and the spur trails should be widened to 10' as part of a Phase 2 widening/upgrade program. These trails currently exhibit moderate wear and tear, as some of these sections are nearing 20 years in age or older. There are several small sections of these trails that are currently in poor trail condition, and these locations should be resurfaced in the short-term.

MAP 2.9



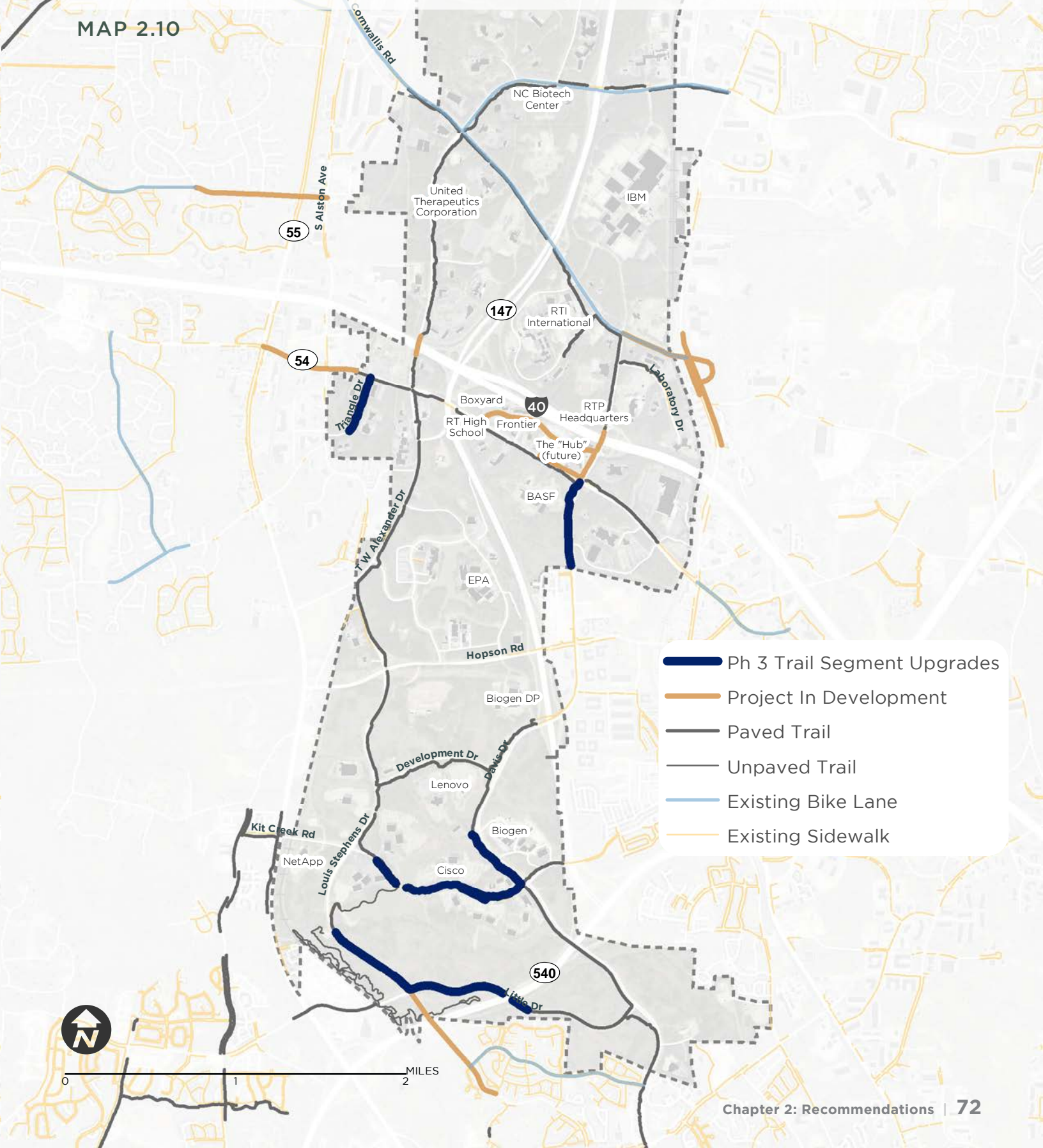
- Ph 2 Trail Segment Upgrades
- Project In Development
- Paved Trail
- Unpaved Trail
- Existing Bike Lane
- Existing Sidewalk



Phase 3 Trail Segment Upgrades

These segments are generally in good condition today and were mostly constructed in the past 8-12 years. These are 8' sections that, in the longer-term, should be expanded to 10' to match Phase 1 and Phase 2 segment upgrades.

MAP 2.10



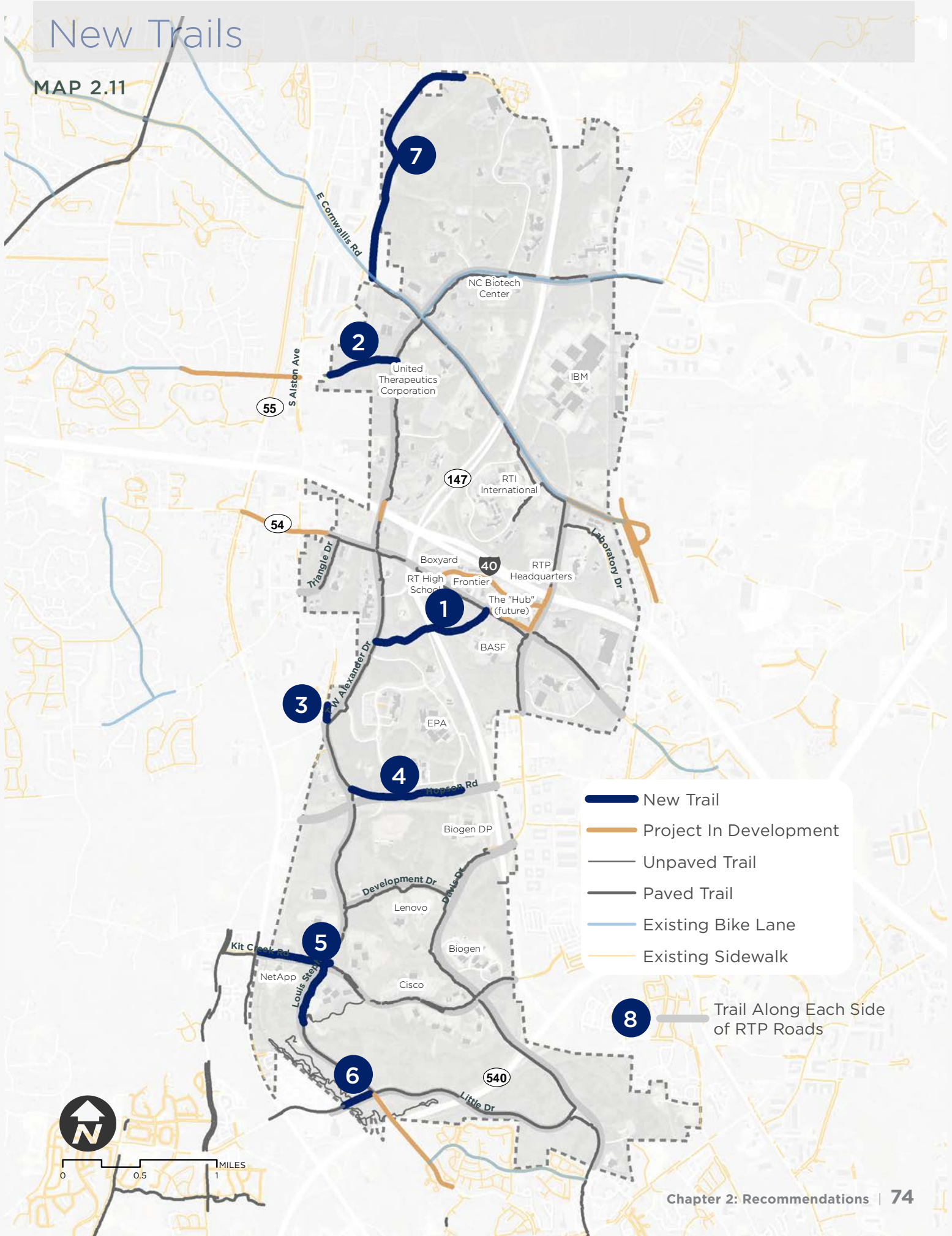
NEW TRAILS

While most of these projects are part of a longer-term vision for comprehensive connectivity within and beyond the RTP boundaries, it is important to identify these projects in preparation for unknown opportunities (and challenges) in the future.

- 1 BURDENS CREEK GREENWAY (4,200' (0.8 MILES))** - The proposed Burdens Creek Greenway is detailed as a priority option for improving connectivity between the southern part of RTP and the northern part of RTP, especially to the Hub site. See pages 63-64 for further detail. If constructed, this greenway would be one of the few sections of trail that does not principally follow a roadway corridor.
- 2 ISENHOUR ST LINK (2,300' (0.45 MILES))** - A greenway link from the Park Center Loop trail section along TW Alexander Dr to the eastern terminus of Isenhour St in should be constructed (the RTP boundary connects to the eastern terminus of the Isenhour St ROW). Buffered bike lanes/sidewalks are scheduled to be constructed along Carpenter Fletcher Rd in 2020 from E. Woodcroft Pkwy to the eastern terminus of Carpenter Fletcher Rd at Alston Ave - (City of Durham Project number: U-4726HO). The western terminus of Isenhour St is 100' north of the eastern terminus of Carpenter Fletcher Rd at Alston Ave. Isenhour St is a short (700'), unpaved, residential street, that could be utilized as a shared roadway for bicyclists and pedestrians connecting between Carpenter Fletcher Rd and this proposed greenway connector.
- 3 S. ALSTON AVE LINK (525' (0.1 MILE))** - This short connection makes a link between the RTP Trail system and a GoDurham bus stop for the #12 route, as well as a residential neighborhood.
- 4 HOPSON RD (3,900' (0.73 MILES))** - This project would fill the gap along Hopson Rd between the RTP Connector Trail and the existing sidewalks leading over the NC 147 highway bridge toward Davis Dr (beyond the RTP boundary).
- 5 KIT CREEK LINK (4,600' (0.88 MILES))** - These two segments would fill the gap between the RTP Connector Trail and the Kit Creek Loop Extension Trail, as well as connect to the Alston Ridge Elementary School shared use path (in addition to residential and commercial development along NC 55 in the Town of Cary municipal limits).
- 6 O'KELLY CHAPEL RD LINK (1,000' (0.19 MILES))** - This project fills a gap between the RTP trail system and sidepaths connecting residential and commercial development along O'Kelly Chapel Rd in the Town of Cary municipal limits.
- 7 NORTH RTP LINK (8,700' (1.65 MILES))** - This project partially follows along a utility corridor as well as Northeast Creek, and it connects to residential development along Ellis Rd, with future connectivity potential to the City of Durham's developing greenway system. This project could be integrated into future development in this northernmost section of undeveloped RTP land.
- 8 TRAILS ALONG EACH SIDE OF RTP ROADS** - Longer term, trails should be constructed on both sides of each roadway corridor in RTP. This can be accomplished over time as opportunities arise, such as new RTP business development.

New Trails

MAP 2.11



THE HUB RECOMMENDATIONS

MOBILITY HUBS

Mobility hubs provide an integrated suite of mobility services, amenities, and technologies to bridge the first and last mile distance (the symbolic distance between destinations and transit service).



THE HUB AT RTP

The Hub will be the heart of RTP with the introduction of world class amenities and facilities including a hotel, flexible greenspaces, office space, residences, restaurants, and a walkable town center providing a range of services. With the Boxyard and Frontier, the Hub will exemplify innovation and modern living.



WHY NOW

Now is the time to go big on bringing a fresh new transportation and mobility vision to RTP. The region is undergoing massive growth and cultural shifts, technology is constantly disrupting the status quo, and mobility systems are in a remarkable state of experimentation and transition. RTP stands to be a leader in facing these issues by fostering innovation and aiming to become a living lab of urban sustainability.



User Typologies

Introducing mixed uses into RTP will radically reshape the culture and dynamics of the space. The transportation network will need to adapt from prioritizing rush hour flow to creating a safe, comfortable, and flexible network that meets the needs of both a modern workforce and family.

The characters below illustrate how the Hub can meet the needs of diverse users with a multi-modal strategy that encourages active trips.

Visitor on Business Trip



Regional connectivity (transit, TNC, wayfinding)

Internal mobility (micro-mobility, wayfinding)

Employee and Commuter



TDM programs

Mobility hubs at parking garages

Improved rush hour transit service

EV charging stations

Employee and Resident



TDM programs

Safe and comfortable walking/biking routes

Improved weekend transit service

EV charging stations

Hub Market Employee



Transit pass/ carpooling programs

Safety features for evening/morning workers to parking areas and transit stations

Programming Considerations

Change RTP culture and user behavior through individualized marketing that educates, motivates, and incentivizes. Consistent outreach and gamification are fun and impactful ways of establishing new routines and rewarding behavior.

Promotional Campaigns



Community Events



Discounts on Shared Micromobility Services



Mobility Hub Opening Celebration



Geo-Targeted Social Media and/or Digital Ads



Location Maps, Wayfinding, & Branding

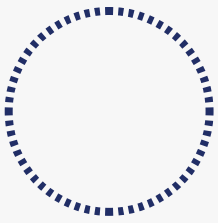


Infrastructure Needs

Mobility hubs can take on many shapes and sizes. The table below will help stakeholders customize features based on their context and needs. It is recommended that transportation managers develop an evaluation process to periodically re-assess the value of features used at the sites. The introduction of new developments, services, and/or technologies can and should alter the design over time. These facilities are relatively low-cost and should be thought of as iterative. Integrating flexibility is an asset, especially with consistent innovations in mobility.

MOBILITY HUB FEATURE	SITE CONTEXT		
	HUB - PRIMARY	HUB - SECONDARY	NODE
STREET FEATURES			
Shelters	●		
Benches	●	○	○
Lighting	●	●	○
Safety/Security (officers/staff/ambassadors present, surveillance cams)	○		
Area Branding	●	○	
Wayfinding	●	○	○
Real-time Transit Service Arrival Information	○		
Water Fountain	○	○	
PED/BIKE INFRASTRUCTURE			
Pedestrian-focused design (I.e. Sidewalks, waiting areas, plazas)	●	●	
ADA Accessible Design (I.e. ADA Ramps, elevators)	●	●	
Bicycle facilities and amenities (I.e. FixIt Station)	○	○	○
Short-Term bicycle/scooter parking and storage (bike racks)	●	●	○
Long-Term bicycle/scooter parking and storage (lockers, indoor storage)			○
Bike Share (Pedal Bikes)	○	○	○
Micro Mobility (e-scooters, e-bikes)	○	○	○
Showers			○
VEHICLE/PARKING INFRASTRUCTURE			
Preferential parking for car or vanpool vehicles			○
Electric Vehicle Charging		○	○
Car Share		○	○
Passenger Loading Zones (Ridehailing)	●	○	○
TRANSIT PASSENGER INFRASTRUCTURE			
Services and Retail	●		
Public WiFi	○		
Public USB/Charging Ports	○		

● Required ○ Recommended



HUB - PRIMARY

This site will act as a multi-modal gateway to RTP. Here, the highest level of branding and customer experience should be established. Placement will be in a high demand area that is also a nexus of trip types and modes, i.e. near transit, parking garage, and a trail.

gateway to RTP. Here, the highest level of branding and customer experience should be established. Placement will be in a high demand area that is also a nexus of trip types and modes, i.e. near transit, parking garage, and a trail.



HUB - SECONDARY

These supporting mobility hubs can be found in areas of high demand. These sites will not have transit access but could pair with EV infrastructure for micromobility charging.



MOBILITY NODE

The nodes will be placed at primary entrances of participating corporate and retail partners throughout RTP. These sites are highly customizable but are generally less prominent.



Existing Trail



Potential/Future Trail



Potential Future Transit Route



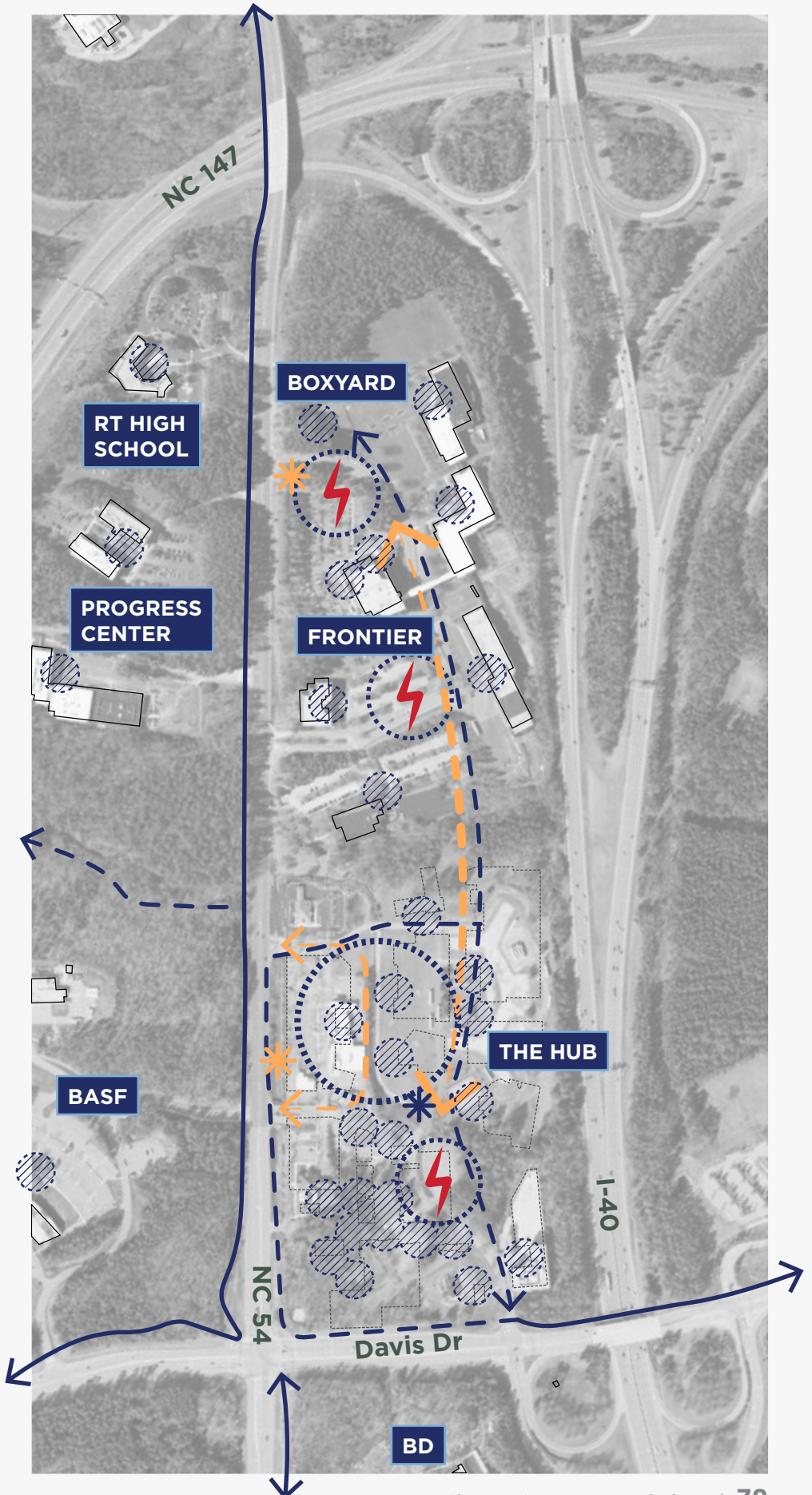
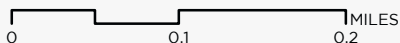
Existing Bus Stop



Flagship Public Space



Electric Vehicle Charging Station



Regional Connectivity

CASE STUDY: RIVERSIDE, NEWTON

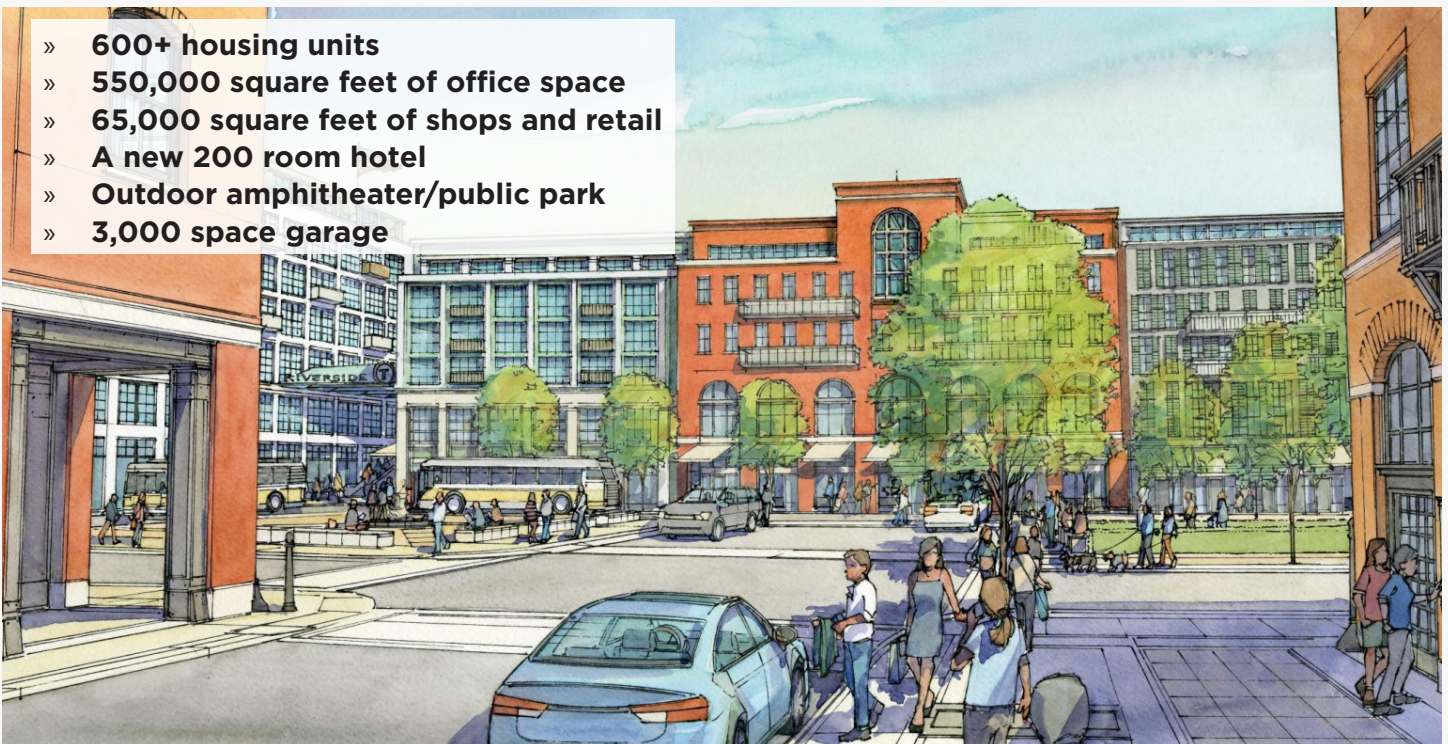
INTRO

Riverside, Newton is a transit oriented development outside of Boston, MA. The site is currently used as a massive surface parking lot servicing the terminus of the MTBA Green Line, in addition to other regional transit connections. The area will be re-imagined as a mixed use development following the tenets of new urbanism to create a walkable and engaging part of the greater community.

TAKEAWAYS THAT ARE KEY OPPORTUNITIES FOR HUB RTP

- » Key component of regional transit service integrated with a mixed use program
- » Buses enter the site to provide excellent first/last mile connection
- » A transportation demand management (TDM) plan was created prior to occupation
- » A primary selling point is the ability to link multiple modes (walkability, trails, transit, carpooling) for optimum flexibility

- » **600+ housing units**
- » **550,000 square feet of office space**
- » **65,000 square feet of shops and retail**
- » **A new 200 room hotel**
- » **Outdoor amphitheater/public park**
- » **3,000 space garage**



INTRO

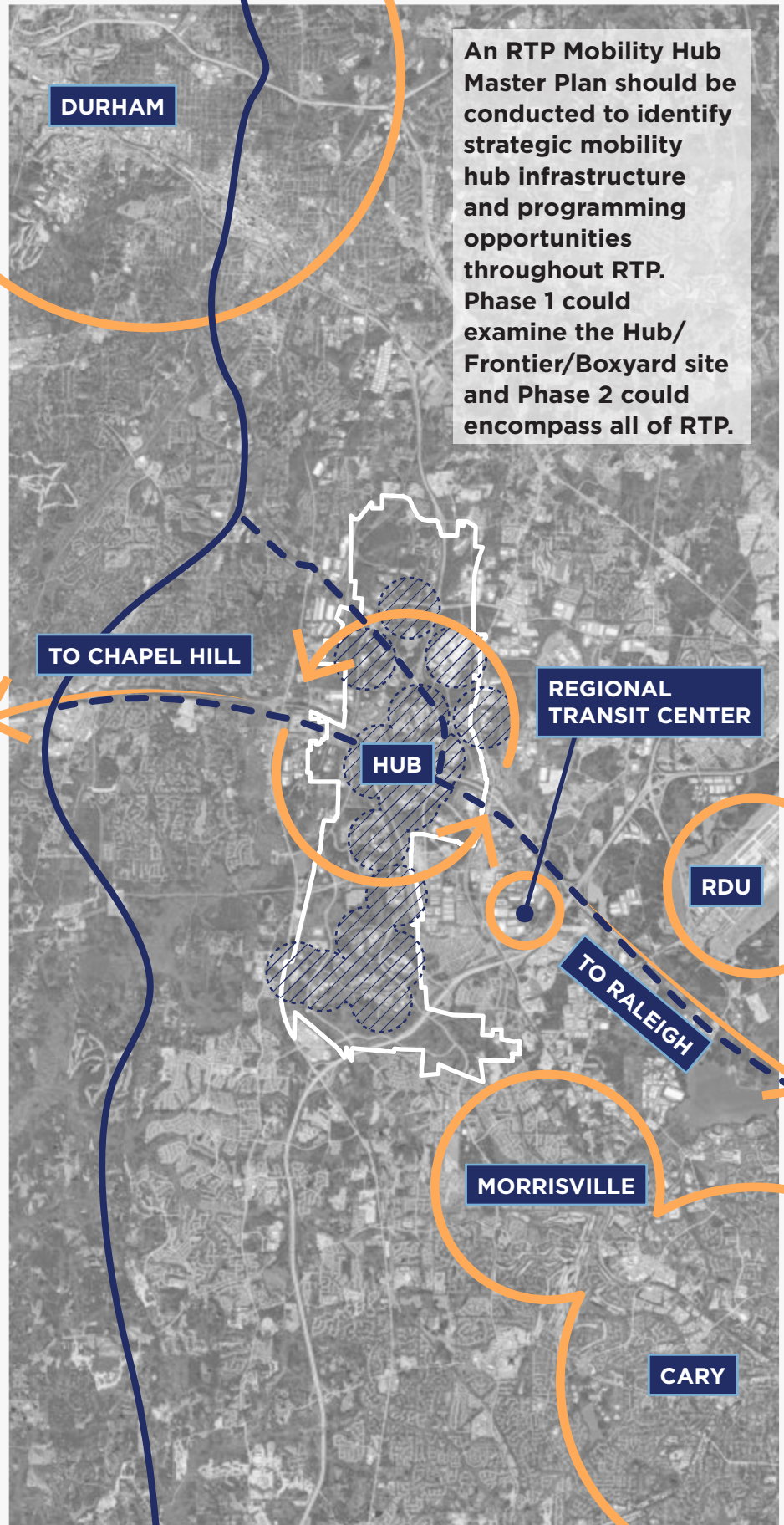
RTP holds a prominent position at the heart of the rapidly growing region. Working with surrounding communities to increase the ease, efficiency, and comfort of regional travel will bolster the overall livability and vitality of RTP.

TRIANGLE BIKEWAY

The Triangle Bikeway is a proposed shared use path connecting Durham, Raleigh, and Chapel Hill. RTP's Hub is well-positioned to be a central node/trailhead along the route. This amenity will benefit the livability, competitiveness, and activation of the Hub.

TRANSIT

RTP benefits from its proximity to the GoTriangle Regional Transit Center (RTC) but there could be opportunities for better integration in the future. As the region grows, so to will interest in services such as light rail, commuter rail, dedicated bus lanes, etc. This will likely require a re-imagining of the RTC. The Hub's mixed-uses and proximity to highways and regional trails would make it an ideal location for more transit oriented development.



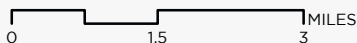
RTP Activity Area



American Tobacco Trail



Triangle Bikeway



Wayfinding

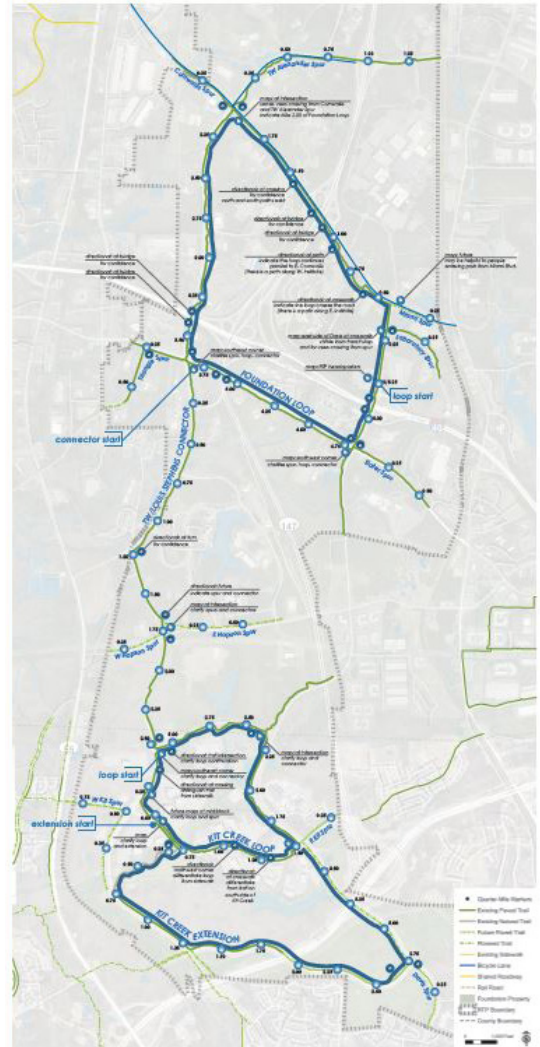
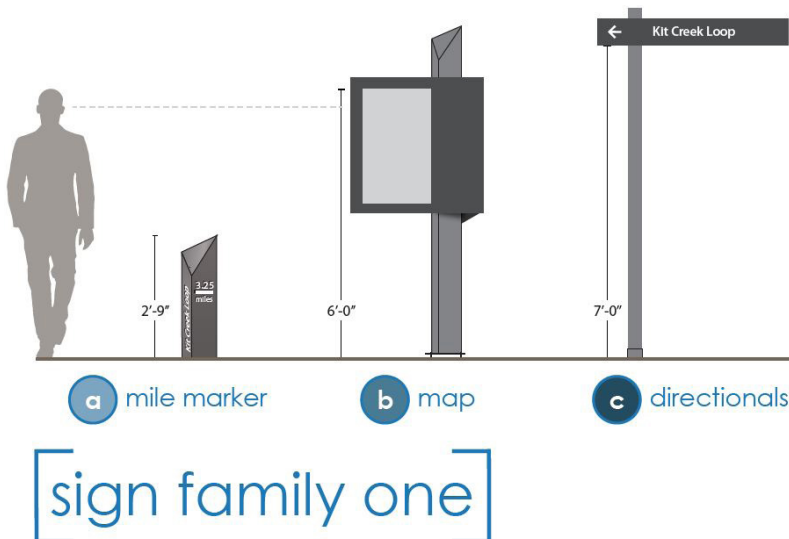
A wayfinding signage placement plan and signage family concepts were previously assembled and partially implemented. The signage placement plan and three sign family concepts are below and on the following page. While mile marker posts were not implemented, RTP implemented wayfinding pavement blazes that include mileage. Some directionals (see photo to the right), similar to 'c' from sign family one (see below) have been implemented as well.

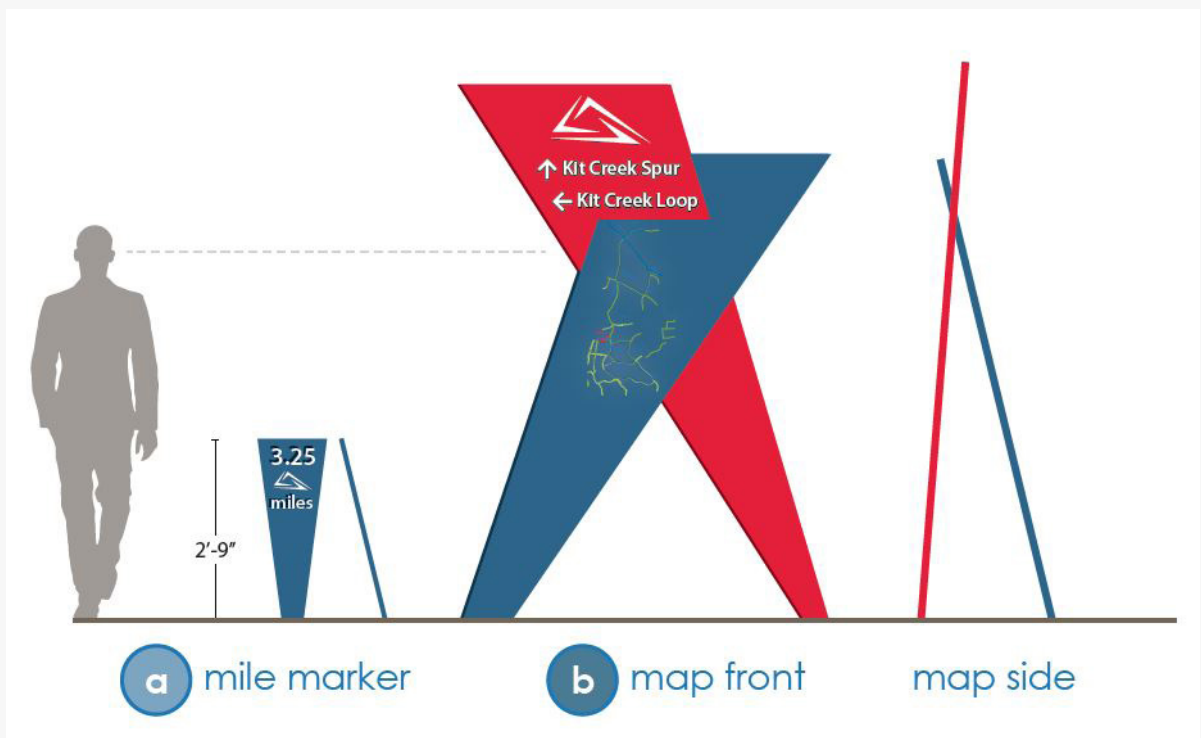
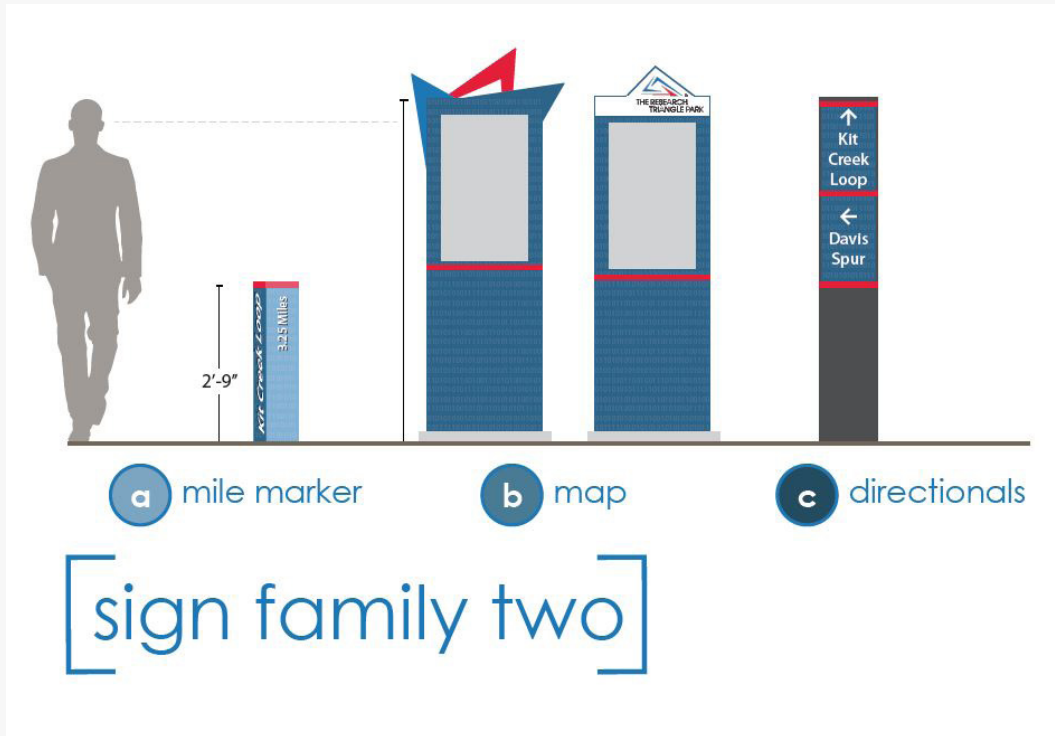
While the signage placement plan is still valid today, future trail segments, such as those within the Hub site development and the proposed Burdens Creek Greenway, should be incorporated into the wayfinding scheme once they are designed.

The previously proposed signage families should be examined again, and one of the three signage families (or a new/updated concept) should be selected for implementation. Because RTP has already implemented wayfinding pavement blazes, mile markers (sign type 'a') will not be needed. Signage types 'b' and 'c' only need to be considered.

Furthermore, because several directionals (sign 'c') have been installed along the RTP trail system, the selected signage scheme could consider a design that fits the existing directionals.

Right:
Existing
directional





Chapter 3:

Implementatio

n

TOPIC	PAGE
General Phasing	85
Funding Considerations	91
Cost Estimate Detail	95

General Phasing



Note - Projects may be spread to 10 year time frame or beyond

RTP Mobility Hub Master Plan	PHI PLANNING	DESIGN/CONSTRUCTION & PROGR
Spot Improvements (Misc Hazards, Trail bridge maintenance)	COMPLETE IMPROVEMENTS, MAINTENANCE CONTINUED	
Failing Trail Sections	RESURFACE <i>(sections not in Ph 1 widening/upgrades)</i>	
Remaining Highway Bridge Improvements	DESIGN/CONSTRUCTION <i>(TWA/I-40 & Davis Dr/I-40 completed</i>	
Intersections	DESIGN/CONSTRUCTION <i>(Potential to complete several as part</i>	
PH 1 Widening/ Upgrades - Davis Dr, NC 54/TWA , RTP Connector	DESIGN	CONSTRUCTION
New Trails: Burdens Creek Greenway, O’Kelly Chapel Rd link	DESIGN	
PH 2 & 3 Widening/ Upgrades & New Trails		

Y3

Y4

Y5

and pending financial commitments as well as evolving funding mechanisms due to COVID-19

PROGRAMMING/BEGIN PH 2 PLANNING

RESURFACE (AS NEEDED)

(with FY 2019-2020 dollars)

(of Ph 1 Widening/Upgrades)

CONSTRUCTION

DESIGN/CONSTRUCTION

Phasing Detail: 5

		Y1	Y2
RTP Mobility Hub Master Planning & Implementation		Conduct Ph 1 Concept/Design Plan for Hub/Frontier/Boyard site \$100,000	Begin implementing Concept/Design Plan for \$100,000 Begin Ph 2 planning for mobility hub connectivity RTP-wide \$50,000
Spot Improvements	<u>Misc Hazards</u>	Some of these can be folded into existing RTP maintenance tasks, total may be less than \$50k \$50,000	
	<u>Trail Bridges</u>	Power wash/grit paint application - may partially be folded into existing RTP and NCDOT maintenance tasks and construct railings at various locations \$50,000	
	<u>Failing Trail Sections</u> Cost will be affected by economies of scale - if packaged and contracted all together = cheaper	Begin sections not in Ph 1 segment upgrades/widenings \$120,000	Continue sections not in Ph 1 segment upgrades/widenings \$120,000
	<u>Highway Bridge Improvements</u>	Construction (Cost estimate for NC 54/147 bridge already completed by RTP - this would be the high end) \$100,000 Design Cornwallis/147 & TWA/147 bridges \$20,000 Design NC 54/147 bridge \$15,000	Construct Cornwallis/147 & TWA (Assuming cost would be similar to Davis Dr/I-40 & TWA/I-40 as design will be similar) \$120,000
	<u>Intersections</u>		Cost estimate already completed by RTP for Cornwallis Rd/Davis Dr (\$200k) and NC 54/TWA improvement (\$80k) \$280,000
New Trail Extension/Connection		Louis Stephens multiuse path under 540 (cost share) \$149,964	
Ph 1 Widening/upgrades		Design Davis Dr from I-40 to Cornwallis* \$90,000	Construct Davis Dr from I-40 to Cornwallis \$600,000 Design Burdens Creek Greenway* \$175,000 Design O'Kelly Chapel Rd link* \$219,300
<i>Inflation (3% per year)</i>			\$49,929
		Year Totals \$694,964	\$1,714,229

*(Design typically 10%-20% of construction costs)	Average per/mile cost from Ph 1 cost estimates	\$1,642,000
---	--	-------------

Project Costs	\$17,308,364
Inflation	\$1,498,760
Total	\$18,807,124

-Year Option

Y3	Y4	Y5
Continue implementing Concept/Design Plan for Hub/Frontier/Boxyard as well as Ph 2 mobility hub connectivity RTP-wide \$100,000	Continue Ph 2 implementation for mobility hub connectivity RTP-wide \$100,000	Continue implementing Concept/Design Plan for mobility hub connectivity RTP-wide \$100,000
	Re-application needed every few years - cost may be folded into existing RTP maintenance tasks \$50,000	
Continue sections not in Ph 1 segment upgrades/widenings \$120,000	Continue sections not in Ph 1 segment upgrades/widenings \$120,000	Continue sections not in Ph 1 segment upgrades/widenings \$120,000
Design undercrossing of NC 540 at Little Dr \$15,000	Construction of undercrossing of NC 540 at Little Dr - note - this is a generic number, would need further study \$100,000	
Construct Burdens Creek Greenway \$1,160,000	Construct RTP Connector Trail from Burdens Creek to Cisco/Netapp driveway \$3,506,000	Construct first 3.5 miles of Ph 2 segment upgrades/widening \$5,747,000
Construct O'Kelly Chapel Rd link \$1,462,000		
Design RTP Connector Trail from Burdens Creek to Cisco/Netapp driveway* \$525,000	Design first 3.5 miles of Ph 2 segment upgrades/widening* \$862,050	Design last 3.5 miles of Ph 2 segment upgrades/widening* \$862,050
\$202,920	\$426,425	\$819,486
\$3,584,920	\$5,164,475	\$7,648,536

*Note - Mobility Hub master planning and implementation costs can vary significantly, based on study results and potential funding available

*Note - Spot improvement implementation costs can vary, based on year to year maintenance needs and trail wear and tear (and potential funding available)

*Note - Costs can vary based on findings during the full design phase

\$18,807,124
5-Year Total

Potentially funding opportunities with outside sources such as SPOT, LAPP, future development, neighboring jurisdictions, etc. \$12,795,000

Phasing Detail: 10

		Y1	Y2	Y3	Y4		
RTP Mobility Hub Master Planning & Implementation		Conduct Ph 1 Concept/Design Plan for Hub/Frontier/Boxyard site \$50,000	\$50,000	Begin implementing Concept/Design Plan for \$50,000 Begin Ph 2 planning for mobility hub connectivity RTP-wide \$25,000	\$50,000 \$25,000	Continued Concept Hub/Frontier well a conn	
Spot Improvements	Misc Hazards	Some of these can be folded into existing RTP maintenance tasks, total may be less than \$50k \$25,000	\$25,000				
	Trail Bridges	Power wash/grit paint application - may partially be folded into existing RTP and NCDOT maintenance tasks and construct railings at various locations \$25,000	\$25,000				
	Failing Trail Sections	Cost will be affected by economies of scale - if packaged and contracted all together = cheaper Begin sections not in Ph 1 segment upgrades/widenings \$60,000	\$60,000	Continue sections not in Ph 1 segment upgrades/widenings \$60,000	\$60,000	Continued upg	
	Highway Bridge Improvements	Construction (Cost estimate for NC 54/147 bridge already completed by RTP - this would be the high end) \$50,000 Design Cornwallis/147 & TWA/147 bridges \$10,000 Design NC 54/147 bridge \$7,500	\$50,000 \$10,000 \$7,500	\$50,000 \$10,000 \$7,500	Construct Cornwallis/147 & TWA (Assuming cost would be similar to Davis Dr/I-40 & TWA/I-40 as design will be similar) \$60,000	\$60,000	Design NC
	Intersections			Cost estimate already completed by RTP for Cornwallis Rd/Davis Dr (\$200k) and NC 54/TWA improvement (\$80k) \$140,000	\$140,000		
New Trail Extension/Connection		Louis Stephens multiuse path under 540 (cost share) \$149,964					
Ph 1 Widening/upgrades		Design Davis Dr from I-40 to Cornwallis* \$45,000	\$45,000	Construct Davis Dr from I-40 to Cornwallis \$300,000 Design Burdens Creek Greenway* \$87,500 Design O'Kelly Chapel Rd link* \$109,650	\$300,000 \$87,500 \$109,650	Continued Const Design Trail fr to Cisco	
Inflation (3% per year)			\$8,175	\$49,929	\$74,894		
Year Totals		\$422,464	\$280,675	\$882,079	\$907,044		

*(Design typically 10%-20% of construction costs) Average per/mile cost from Ph 1 cost estimates \$1,642,000

Project Costs \$17,308,364
 Inflation \$3,254,895
 Total \$20,563,259

Potent such as

10-Year Option

Y5	Y6	Y7	Y8	Y9	Y10
Continue implementing Concept/Design Plan for Frontier/Boxyard as Ph 2 mobility hub connectivity RTP-wide \$50,000	\$50,000	Continue Ph 2 implementation for mobility hub connectivity RTP-wide \$50,000	\$50,000	Continue implementing Concept/Design Plan for mobility hub connectivity RTP-wide \$50,000	\$50,000
		Re-application needed every few years - cost may be folded into existing RTP maintenance tasks \$25,000	\$25,000		
Continue sections not in Ph 1 segment upgrades/widenings \$60,000	\$60,000	Continue sections not in Ph 1 segment upgrades/widenings \$60,000	\$60,000	Continue sections not in Ph 1 segment upgrades/widenings \$60,000	\$60,000
Construction of undercrossing of NC 540 at Little Dr \$7,500	\$7,500	Construction of undercrossing of NC 540 at Little Dr - note - this is a generic number, would need further study \$50,000	\$50,000		
Construct Burdens Creek Greenway \$580,000	\$580,000	Construct RTP Connector Trail from Burdens Creek to Cisco/Netapp driveway \$1,753,000	\$1,753,000	Construct first 3.5 miles of Ph 2 segment upgrades/widening \$2,873,500	\$2,873,500
Construct O'Kelly Chapel Rd link \$731,000	\$731,000				
Design RTP Connector from Burdens Creek to Cisco/Netapp driveway* \$262,500	\$262,500	Design first 3.5 miles of Ph 2 segment upgrades/widening* \$431,025	\$431,025	Design last 3.5 miles of Ph 2 segment upgrades/widening* \$431,025	\$431,025
\$202,920	\$253,650	\$426,425	\$497,495	\$819,486	\$921,922
\$1,893,920	\$1,944,650	\$2,795,450	\$2,866,520	\$4,234,011	\$4,336,447

*Note - Mobility Hub master planning and implementation costs can vary significantly, based on study results and potential funding available

*Note - Spot improvement implementation costs can vary, based on year to year maintenance needs and trail wear and tear (and potential funding available)

*Note - Costs can vary based on findings during the full design phase

\$20,563,259
10-Year Total

Identify additional funding opportunities with outside sources such as SPOT, LAPP, future development, neighboring jurisdictions, etc.	\$12,795,000
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FUNDING CONSIDERATIONS

When considering possible funding sources for RTP trail projects, it is important to remember that not all construction activities or programs will be accomplished with a single funding source. It will be necessary to consider several sources of funding that together will support the implementation process. Funding sources can be used for a variety of activities, including: programs, planning, design, and implementation.

The table below highlights several funding mechanisms that can be applied to projects recommended in this document.

Furthermore, scoring criteria for the NCDOT STI process (SPOT 6.0) as well as CAMPO's Locally Administered Projects Program (LAPP) are outlined and applied on the following pages.

Source	Project
Research Triangle Foundation	Planning & Design of most projects
NCDOT (STI)	Trail upgrades/new trail construction through SPOT 6.0
CAMPO (LAPP)	Trail upgrades/new trail construction in the Wake County section of RTP
DCHCMPO	Coordinate Triangle Bikeway connectivity, Isenhour St link, northern RTP greenway connectivity, and continue coordinating on projects in development such as E. Cornwallis Rd (STIP: P-5717) and NC 54 (STIP: EB-5708)
TJCOG	TDM Grant for Mobility Hub Master Plan
Town of Cary	Coordinate on O'Kelly Chapel Rd connectivity as well as Kit Creek Rd connectivity
Town of Morrisville	Continue coordinating on the Louis Stephens Ext project (STIP: U-5827)
Projects with development	Hub internal and external trails, northern RTP Greenway link

Davis Dr Widening/Upgrade: SPOT 6.0 example

Similar to most RTP projects, the Park Center Loop Trail section along Davis Dr will do well scoring points in SPOT 6.0 for connectivity to other bike/ped facilities, employment centers, and # of employees. Because no bike/ped crashes have been recorded along this section of Davis Dr in the past five years, this project will miss 80% of the points available under the Safety category.

Safety (20%)	Accessibility/Connectivity (15%)	Demand/Density (10%)
<p><i># of bike/ped crashes along corridor in the last 5 years (40%) = 0 points due to lack of bike/ped crashes along corridor</i></p>	<p><i>Points of Interest points (1.5 mile buffer for bike projects; 0.5 mile buffer for ped projects) = This is calculated automatically by statewide data in ATLAS. The transit routes category will likely score the most points for this project, with some points scored for most categories (no cap on points)</i></p> <p>Several additional points of interest categories can be added manually. This includes employment centers, tourist destinations, and shelters. Adding RTP (and outside of RTP) employment centers will add points for this category.</p>	<p><i># of households per square mile near project = this will be automatically calculated in ATLAS (will capture some apartment complexes along Miami Blvd)</i></p>
<p><i>Crash Severity (20%) = 0 points due to lack of bike/ped crashes along corridor</i></p>	<p><i>Connection points (bike/ped infrastructure that is existing, committed, or in a plan) = to be entered manually by submitter. This will likely 4 points (connection to the south, connection to the Cornwallis Rd sidepath heading west, future connection to the E. Cornwallis Rd project (STIP P-5717), and connection to the Laboratory Dr trail spur.</i></p>	<p><i># of employees per square mile near project = this will be automatically calculated in ATLAS, and should score very well with the large number of employees located in the RTP.</i></p>
<p><i>Safety Risk (20%) = 0 points due to lack of bike/ped crashes along corridor</i></p>	<p><i>National/State/Regional Route points = This should receive 2 points because it is part of the proposed Triangle Bikeway route from Raleigh to Durham.</i></p>	
<p><i>Safety Benefits (20%) = 6 points (sidepath)</i></p>		

The RTP Connector Trail widening/upgrade will score similarly to this project. Due to its length, it will likely score more *Points of Interest* points and Demand/Density points by picking up more *households and employees per square mile*, which may be offset by the projects overall cost.

The point total from the inputs in the table above, divided by the project cost establishes the Cost Effectiveness points (5% of the overall scoring). The remaining 50% of the scoring is established through Local Input. Further information on the SPOT 6.0 scoring system can be found here - <https://connect.ncdot.gov/projects/planning/Pages/default.aspx>.

O’Kelly Chapel Rd: LAPP example

Because O’Kelly Chapel Rd is in the Wake County section of RTP, it could be considered for funding in CAMPO’s LAPP program. Below is an example of how the O’Kelly Chapel Rd link (1,000’ in length) may score in the LAPP program. Further detail on the LAPP scoring/prioritization for bike/ped projects can be found at the bottom of this page.

While this project may not be competitive for LAPP funding now, getting it shovel ready by completing the design will help the project’s score significantly. A planning level cost estimate was generated for the O’Kelly Chapel Rd link (\$1,460,000).

Bike/Ped Effectiveness (Up to 50 points)

<i>Missing Link</i> - 1 point (<0.5 miles) out of 10 points
<i>Major Obstacle</i> - 5 points most likely (project must overcome river)
<i>Safety Concern</i> - This project may score some points in this category, further study would be needed (and will change with the implementation of the Louis Stephens Dr Ext project).
<i>Improve Commuter Pattern</i> - This project may not score any points in this category.
<i>Connections</i> - 4 or 5 points possibly (shopping center, mountain bike trails, Kit Creek Ext Trail, existing O’Kelly Chapel Rd sidepath, and Louis Stephens Dr Ext Trail (future))
<i>Benefit/Cost</i> - Because a major bridge will likely be needed for the stream crossing, that element will negatively effect the benefit/cost ratio.

Bike/Ped Effectiveness		50	
Project Phase Multiplier CON = 100% of Score ROW = 50% of Score PE/NEPA = 10% of Score	10	Missing Link: Project must connect on both sides to an existing bike/ped facility to qualify for these points.	Length of Facility as completed via project: < .5 mi 1 point .5 mi to 2 mi 5 points >2 mi 10 points
	5	Major Obstacle: Project must overcome a railroad, river, or limited access roadway 4+ Lane Roadway Link must be CREATED, NOT IMPROVE AN EXISTING	5 points 3 points
	5	Safety Concern: Project is in an area with documented bicycle or pedestrian crash history related to facility design deficiency (TEAAS Report, Local Safety Data, Safety Audit)	
	5	Improve Commuter Pattern The project is within 1/4 mile of a transit service, or addresses an obvious pedestrian footpath on a residential collector or higher	
	15	Connections: Project must be within 1/4 mile of activity centers, high-density residential, or government facilities	
	10	Benefit/Cost Effectiveness Score / LAPP Cost	Scale to be created based on projects received

Above is a summary of the LAPP program scoring/prioritization criteria for bike/ped projects from CAMPO - <https://www.campo-nc.us/funding/locally-administered-projects-program>

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COST ESTIMATE DETAIL



Conceptual Cost Estimate

NC License #P-1301

DESCRIPTION AND LOCATION: 10 FT Wide Trail along NC 54/TW Alexander Dr
RTP, NC

ITEM NO.			ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
LINE NO.	DESC. NO.	SECT. NO.					
ROADWAY ITEMS							
0001	0000100000-N	800	MOBILIZATION	1	LS	\$78,700.00	\$78,700.00
	0000400000-N	801	CONSTRUCTION SURVEYING	1	LS	\$12,000.00	\$12,000.00
	0043000000-N	226	GRADING	1	LS	\$319,260.00	\$319,260.00
	0354000000-E	310	**** RC PIPE CULVERTS, CLASS ****	95	LF	\$100.00	\$9,500.00
	0995000000-E	340	PIPE REMOVAL	60	LF	\$30.00	\$1,800.00
	1121000000-E	520	AGGREGATE BASE COURSE	2680	TON	\$35.00	\$93,800.00
	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	730	TON	\$120.00	\$87,600.00
	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	45	TON	\$600.00	\$27,000.00
	2605000000-N	848	CONCRETE CURB RAMP	3	EA	\$2,500.00	\$7,500.00
	2830000000-N	858	ADJUSTMENT OF MANHOLES	1	EA	\$1,500.00	\$1,500.00
	3575000000-E	SP	GENERIC FENCING ITEM (HANDRAIL)	3040	LF	\$100.00	\$304,000.00
	4399000000-N	1105	TEMPORARY TRAFFIC CONTROL	1	LS	\$52,500.00	\$52,500.00
	5672000000-N	1515	RELOCATE FIRE HYDRANT	1	EA	\$4,000.00	\$4,000.00
	6000000000-E	1605	TEMPORARY SILT FENCE	7652	LF	\$4.00	\$30,608.00
STRUCTURE ITEMS							
	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION *****	1	LS	\$20,000.00	\$20,000.00
	8897000000-N	SP	BOARDWALK	310	LF	\$1,250.00	\$387,500.00
	8897000000-N	SP	CONCRETE APPROACH SLAB	4	EA	\$4,000.00	\$16,000.00

		SUBTOTAL	\$1,453,268.00
INFLATION FACTOR	2 Years	5%	\$148,959.97
CONSTRUCTION COST 2022			\$1,602,227.97
CONTINGENCIES		20%	\$320,445.59
MINOR ITEMS		10%	\$160,222.80
UTILITIES		1%	\$16,022.28
ESTIMATED CONTRACT COST (2022)			\$2,098,918.64
E. & C.		10%	\$209,891.86
CONSTRUCTION COST			\$2,308,810.50

NOTE: E&C is an NCDOT item and will be required only if the project is funded by NCDOT

COMPUTED BY JM
DATE 3/26/2020



Conceptual Cost Estimate

NC License #P-1301

DESCRIPTION AND LOCATION: 10 FT Wide Trail along Burdens Creek (from NC 54 to TW Alexander Dr)
RTP, NC

ITEM NO.			ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
LINE NO.	DESC. NO.	SECT. NO.					
ROADWAY ITEMS							
0001	0000100000-N	800	MOBILIZATION	1	LS	\$53,900.00	\$53,900.00
	0000400000-N	801	CONSTRUCTION SURVEYING	1	LS	\$6,800.00	\$6,800.00
	0043000000-N	226	GRADING	1	LS	\$120,875.00	\$120,875.00
	0354000000-E	310	**** RC PIPE CULVERTS, CLASS ****	86	LF	\$100.00	\$8,600.00
	1121000000-E	520	AGGREGATE BASE COURSE	1860	TON	\$45.00	\$83,700.00
	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	510	TON	\$170.00	\$86,700.00
	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	35	TON	\$700.00	\$24,500.00
	3575000000-E	SP	GENERIC FENCING ITEM (HANDRAIL)	515	LF	\$100.00	\$51,500.00
	6000000000-E	1605	TEMPORARY SILT FENCE	4715	LF	\$4.00	\$18,860.00
STRUCTURE ITEMS							
	8897000000-N	SP	BOARDWALK	210	LF	\$1,250.00	\$262,500.00
	8897000000-N	SP	CONCRETE APPROACH SLAB	4	EA	\$4,000.00	\$16,000.00

	SUBTOTAL	\$733,935.00
INFLATION FACTOR	2 Years	5%
CONSTRUCTION COST 2022		\$75,228.34
CONTINGENCIES	20%	\$161,832.67
MINOR ITEMS	10%	\$80,916.33
UTILITIES	0%	\$0.00
ESTIMATED CONTRACT COST (2022)		\$1,051,912.34
E. & C.	10%	\$105,191.23
CONSTRUCTION COST		\$1,157,103.57

NOTE: E&C is an NCDOT item and will be required only if the project is funded by NCDOT

COMPUTED BY JM
 DATE 3/26/2020



Conceptual Cost Estimate

NC License #P-1301

DESCRIPTION AND LOCATION: 10 FT Wide Trail along TW Alexander Dr/Louis Stephens D (Burdens Creek to Kit Creek Rd/Cisco Driveway)
RTP, NC

ITEM NO.			ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
LINE NO.	DESC. NO.	SECT. NO.					
ROADWAY ITEMS							
0001	0000100000-N	800	MOBILIZATION	1	LS	\$120,600.00	\$120,600.00
	0000400000-N	801	CONSTRUCTION SURVEYING	1	LS	\$12,000.00	\$12,000.00
	0043000000-N	226	GRADING	1	LS	\$839,995.00	\$839,995.00
	0354000000-E	310	**** RC PIPE CULVERTS, CLASS ****	160	LF	\$100.00	\$16,000.00
	0995000000-E	340	PIPE REMOVAL	40	LF	\$30.00	\$1,200.00
	1121000000-E	520	AGGREGATE BASE COURSE	5500	TON	\$35.00	\$192,500.00
	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	1570	TON	\$120.00	\$188,400.00
	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	95	TON	\$600.00	\$57,000.00
	2286000000-N	840	MASONRY DRAINAGE STRUCTURES	3	EA	\$5,000.00	\$15,000.00
	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	240	LF	\$70.00	\$16,800.00
	2591000000-E	848	4" CONCRETE SIDEWALK	40	SY	\$80.00	\$3,200.00
	2830000000-N	858	ADJUSTMENT OF MANHOLES	3	EA	\$1,500.00	\$4,500.00
	3575000000-E	SP	GENERIC FENCING ITEM (HANDRAIL)	4215	LF	\$100.00	\$421,500.00
	4399000000-N	1105	TEMPORARY TRAFFIC CONTROL	1	LS	\$65,300.00	\$65,300.00
	5672000000-N	1515	RELOCATE FIRE HYDRANT	7	EA	\$4,000.00	\$28,000.00
	6000000000-E	1605	TEMPORARY SILT FENCE	18380	LF	\$4.00	\$73,520.00
STRUCTURE ITEMS							
	8035000000-N	402	REMOVAL OF EXISTING STRUCTURE AT STATION *****	1	LS	\$10,000.00	\$10,000.00
	8897000000-N	SP	BOARDWALK	100	LF	\$1,250.00	\$125,000.00
	8897000000-N	SP	CONCRETE APPROACH SLAB	4	EA	\$4,000.00	\$16,000.00

	SUBTOTAL	\$2,206,515.00
INFLATION FACTOR	2 Years	5%
CONSTRUCTION COST 2022		\$226,167.79
CONTINGENCIES		20%
MINOR ITEMS		10%
UTILITIES		1%
ESTIMATED CONTRACT COST (2022)		\$3,186,814.45
E. & C.		10%
CONSTRUCTION COST		\$3,505,495.90

NOTE: E&C is an NCDOT item and will be required only if the project is funded by NCDOT

COMPUTED BY JM
 DATE 3/27/2020



Conceptual Cost Estimate

NC License #P-1301

DESCRIPTION AND LOCATION: 10 FT Wide Trail along Davis Drive (RTP Headquarters to E. Cornwallis Rd)
RTP, NC

ITEM NO.			ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
LINE NO.	DESC. NO.	SECT. NO.					
ROADWAY ITEMS							
0001	0000100000-N	800	MOBILIZATION	1	LS	\$24,100.00	\$24,100.00
	0000400000-N	801	CONSTRUCTION SURVEYING	1	LS	\$5,000.00	\$5,000.00
	0043000000-N	226	GRADING	1	LS	\$106,990.00	\$106,990.00
	1121000000-E	520	AGGREGATE BASE COURSE	1320	TON	\$45.00	\$59,400.00
	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	370	TON	\$170.00	\$62,900.00
	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	25	TON	\$700.00	\$17,500.00
	2549000000-E	846	2'-6" CONCRETE CURB & GUTTER	90	LF	\$80.00	\$7,200.00
	2830000000-N	858	ADJUSTMENT OF MANHOLES	3	EA	\$1,500.00	\$4,500.00
	4399000000-N	1105	TEMPORARY TRAFFIC CONTROL	1	LS	\$30,000.00	\$30,000.00
	6000000000-E	1605	TEMPORARY SILT FENCE	2965	LF	\$4.00	\$11,860.00
	7985000000-N	SP	GENERIC SIGNAL ITEM (MODIFY EXISTING SIGNAL)	1	LS	\$30,000.00	\$30,000.00

	SUBTOTAL	\$359,450.00
INFLATION FACTOR	2 Years	5%
CONSTRUCTION COST 2022		\$36,843.63
CONTINGENCIES		20%
MINOR ITEMS		15%
UTILITIES		1.50%
ESTIMATED CONTRACT COST (2022)		\$540,940.80
E. & C.		10%
CONSTRUCTION COST		\$595,034.88

NOTE: E&C is an NCDOT item and will be required only if the project is funded by NCDOT

COMPUTED BY JM
 DATE 3/23/2020



Conceptual Cost Estimate

NC License #P-1301

DESCRIPTION AND LOCATION: 10 FT Wide Trail along O'Kelly Chapel Rd (from RR to Louis Stephens Dr)
RTP, NC

ITEM NO.			ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
LINE NO.	DESC. NO.	SECT. NO.					
ROADWAY ITEMS							
0001	0000100000-N	800	MOBILIZATION	1	LS	\$53,000.00	\$53,000.00
	0000400000-N	801	CONSTRUCTION SURVEYING	1	LS	\$8,900.00	\$8,900.00
	0043000000-N	226	GRADING	1	LS	\$287,145.00	\$287,145.00
	1121000000-E	520	AGGREGATE BASE COURSE	520	TON	\$50.00	\$26,000.00
	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	140	TON	\$190.00	\$26,600.00
	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	10	TON	\$750.00	\$7,500.00
	3422000000-N	SP	GENERIC GUARDRAIL ITEM (GUARDRAIL ADJUSTMENT)	1	LS	\$5,000.00	\$5,000.00
	3575000000-E	SP	GENERIC FENCING ITEM (HANDRAIL)	1210	LF	\$100.00	\$121,000.00
	4399000000-N	1105	TEMPORARY TRAFFIC CONTROL	1	LS	\$20,000.00	\$20,000.00
	6000000000-E	1605	TEMPORARY SILT FENCE	1510	LF	\$4.00	\$6,040.00
	7985000000-N	SP	GENERIC SIGNAL ITEM (MODIFY EXISTING SIGNAL)	1	LS	\$20,000.00	\$20,000.00
STRUCTURE ITEMS							
	8897000000-N	SP	BOARDWALK	300	LF	\$1,250.00	\$375,000.00
	8897000000-N	SP	CONCRETE APPROACH SLAB	2	EA	\$4,000.00	\$8,000.00

	SUBTOTAL	\$964,185.00
INFLATION FACTOR 2 Years	5%	\$98,828.96
CONSTRUCTION COST 2022		\$1,063,013.96
CONTINGENCIES	20%	\$212,602.79
MINOR ITEMS	5%	\$53,150.70
ESTIMATED CONTRACT COST (2022)		\$1,328,767.45
E. & C.	10%	\$132,876.75
TOTAL CONSTRUCTION COST		\$1,461,644.20

NOTE: E&C is an NCDOT item and will be required only if the project is funded by NCDOT

COMPUTED BY JM
DATE 3/25/2020



Conceptual Cost Estimate

NC License #P-1301

DESCRIPTION AND LOCATION: Multiple locations as shown on Map 2.4 - page 39
RTP, NC

ITEM NO.			ITEM DESCRIPTION	QUANTITY	UNIT	UNIT PRICE	AMOUNT
LINE NO.	DESC. NO.	SECT. NO.					
ROADWAY ITEMS							
0001	0000100000-N	800	MOBILIZATION	1	LS	\$30,400.00	\$30,400.00
	0043000000-N	226	GRADING	1	LS	\$142,365.00	\$142,365.00
	1121000000-E	520	AGGREGATE BASE COURSE	2470	TON	\$35.00	\$86,450.00
	1519000000-E	610	ASPHALT CONC SURFACE COURSE, TYPE S9.5B	650	TON	\$140.00	\$91,000.00
	1575000000-E	620	ASPHALT BINDER FOR PLANT MIX	40	TON	\$665.00	\$26,600.00
	4399000000-N	1105	TEMPORARY TRAFFIC CONTROL	1	LS	\$15,200.00	\$15,200.00
	6000000000-E	1605	TEMPORARY SILT FENCE	6005	LF	\$3.00	\$18,015.00
	3575000000-E	SP	GENERIC FENCING ITEM (HANDRAIL)	150	LF	\$100.00	\$15,000.00

	SUBTOTAL		\$425,030.00
INFLATION FACTOR	2 Years	5%	\$43,565.58
CONSTRUCTION COST 2022			\$468,595.58
CONTINGENCIES		20%	\$93,719.12
MINOR ITEMS		5%	\$23,429.78
TOTAL CONSTRUCTION COST			\$585,744.47

NOTE: Replament of existing trail along multiple segments within the RTP trail system

COMPUTED BY JM
 DATE 3/16/2020



RTP TRAILS STUDY
2020