"I'd like to see the trail stay along I-40 and Wade Ave and connect to the Rocky Branch Trail where it meets House Creek and Reedy Creek Trails...It would provide better service for active transportation users by creating a direct connection to destinations inside Raleigh's beltline."

- Jurisdictional Partner

APPENDIX E
DESIGN RESOURCES

DESIGN RESOURCES

Below are several design resources that can be can used to inform bicycle and pedestrian design decisions. Organizations such as Federal Highway Administration (FHWA), American Association of State Highway and Transportation Officials (AASHTO), National Association of City Transportation Officials (NACTO), and North Carolina Department of Transportation (NCDOT) offer general guidelines and project-specific tools to help professionals make design decisions. These guidelines promote flexibility to ensure context-sensitive applications.

AASHTO GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES

The AASHTO Guide for the Development of Bicycle Facilities is the authoritative national standard for bikeway design. The document provides guidance to designers and planners by referencing a recommended range of design values and describing alternative design approaches. The guide provides information on how to accommodate bicycle travel and operations in most environments. Sufficient flexibility is permitted to encourage designs that are sensitive to local context and incorporate the needs of bicyclists, pedestrians, and motorists.

https://nacto.org/wp-content/uploads/2015/04/AASHTO_Bicycle-Facilities-Guide_2012-toc.pdf

AASHTO GUIDE FOR THE PLANNING, DESIGN AND OPERATION OF PEDESTRIAN FACILITIES

The AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities provides guidance for pedestrian facilities along streets and highways. The primary audiences for this manual are planners, roadway designers, and transportation engineers, whom make decisions on a daily basis that affect pedestrians. The guide focuses on identifying effective measures for accommodating pedestrians on public rights-of-way, and it recognizes the effect that land use planning and site design have on pedestrian mobility and addresses these topics as well.

https://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07(263)_FR.pdf

MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (MUTCD)

The Manual on Uniform Traffic Control Devices for Streets and Highways, or MUTCD defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public travel. The MUTCD is published by the Federal Highway Administration (FHWA) and is a compilation of national standards for all traffic control devices, including road markings, roadway signs, and traffic signals.

https://mutcd.fhwa.dot.gov/

NCDOT ROADWAY DESIGN GUIDE

The North Carolina Department of Transportation (NCDOT) Roadway Design Guide defines standards for roadways owned and maintained by NCDOT, including typical sections for roadways. Typical sections establish design elements that emphasize safety, mobility, complete streets, and accessibility for multiple modes of travel. Typical sections also provide guidelines for comprehensive transportation planning, project planning, and project design activities.

https://connect.ncdot.gov/projects/Roadway/Pages/RDM.aspx

NCDOT COMPLETE STREETS IMPLEMENTATION GUIDANCE

The North Carolina Department of Transportation (NCDOT) Complete Streets Implementation Guide is designed to assist NCDOT staff engineers, project managers and designers in implementing the Complete Streets Policy adopted by the Board of Transportation in August 2019. This document provides comprehensive guidance for incorporating a complete streets approach into NCDOT's planning, programming, design, and maintenance processes.

https://connect.ncdot.gov/projects/BikePed/Documents/Complete%20Streets%20Implementation%20Guide.pdf

NACTO URBAN BIKEWAY DESIGN GUIDE

The NACTO Urban Bikeway Design Guide provides cities with state-of-the-practice solutions that can help create complete streets that are safe and enjoyable for bicyclists. Design treatments included in the guide offer required, recommended, and optional design elements to address the complexity of individual streetscape situations. In August 2013, the FHWA issued a memorandum officially supporting the use of this document. All of the NACTO Urban Bikeway Design Guide treatments are in use internationally and in many cities around the US.

https://nacto.org/publication/urban-bikeway-design-guide/

APPENDIX E - DESIGN RESOURCES

NACTO URBAN STREET DESIGN GUIDE

The Urban Street Design Guide charts the principles and practices of the nation's foremost engineers, planners, and designers working in cities today. A blueprint for designing 21st century streets, the guide unveils the toolbox and the tactics cities use to make streets safer, more livable, and more economically vibrant. The Guide outlines both a clear vision for complete streets and a basic road map for how to bring them to fruition.

https://nacto.org/publication/urban-street-design-guide/

NACTO URBAN STREET STORMWATER GUIDE

The Urban Street Stormwater Guide advances the discussion about how to design and construct sustainable streets. The guide provides cities with national best practices for sustainable stormwater management in the public right-of-way, including core principles about the purpose of streets, strategies for building inter-departmental partnerships around sustainable infrastructure, technical design details for siting and building bioretention facilities, and a visual language for communicating the benefits of such projects. The guide sheds light on effective policy and programmatic approaches to starting and scaling up green infrastructure, provides insight on innovative street design strategies, and proposes a framework for measuring performance of streets comprehensively.

https://nacto.org/publication/urban-street-stormwater-guide/

FHWA SAFE TRANSPORTATION FOR EVERY PEDESTRIAN (STEP)

Through the Every Day Counts STEP initiative, FHWA promotes and provides design guidance on the following countermeasures to improve pedestrian crossing locations and reduce crashes: road diets, pedestrian hybrid beacons, pedestrian refuge islands, raised crosswalks, crosswalk visibility enhancements, rectangular rapid flashing beacons, and leading pedestrian intervals.

https://safety.fhwa.dot.gov/ped_bike/step/

FHWA PEDESTRIAN SAFETY GUIDE AND COUNTERMEASURE SELECTION SYSTEM

The Pedestrian Safety Guide and Countermeasure Selection System is intended to provide practitioners with the latest information available for improving the safety and mobility of those who walk. The online tools provide the user with a list of possible engineering, education, or enforcement treatments to improve pedestrian safety and/or mobility based on user input about a specific location.

http://www.pedbikesafe.org/PEDSAFE/

FHWA ACHIEVING MULTIMODAL NETWORKS: APPLYING DESIGN FLEXIBILITY AND REDUCING CONFLICTS

This publication is resource for practitioners seeking to build multimodal transportation networks. It highlights ways that planners and designers can apply the design flexibility found in current national design guidance to address common roadway design challenges and barriers. It focuses on reducing multimodal conflicts and achieving connected networks so that walking and bicycling are safe, comfortable, and attractive options for people of all ages and abilities.

https://www.fhwa.dot.gov/environment/recreational_trails/publications/rwt2021/

FHWA BIKEWAY SELECTION GUIDE

A resource to help transportation practitioners consider the trade-offs relating to the selection of bikeway types. The document builds upon other FHWA resources that promote design flexibility and support connected, safe, and comfortable bicycle networks. The Bikeway Selection Guide outlines a process for identifying the desired bikeway type and assessing and refining potential options based on real-world conditions and decision-making factors. This process is intended to accelerate the delivery of high-quality multimodal projects that improve safety for everyone and meet the transportation needs of people of all ages and abilities.

https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf

FHWA STRATEGIES FOR ACCELERATING MULTIMODAL PROJECT DELIVERY

Transportation agencies face growing demand for an integrated transportation network that safely and efficiently moves people. The project development process for multimodal projects - those intended to serve bicyclists and pedestrians - can experience delays and challenges as projects move from one phase to the next. This Workbook is intended to help transportation agencies and practitioners identify top strategies for accelerating multimodal infrastructure delivery.

https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/multimodal_delivery/

ADA STANDARDS FOR ACCESSIBLE DESIGN

This guide explains requirements in the current editions of the Americans with Disabilities Act (ADA) Standards issued by the Department of Justice (DOJ) and the Department of Transportation (DOT). It provides the scoping and technical requirements for new construction and alterations resulting from the adoption of revised 2010 Standards in the final rules for Title II and Title III.

https://www.ada.gov/2010ADAstandards_index.htm

MAINTENANCE RESOURCES

Below are templates for maintenance and encroachment agreements required by NCDOT between the agency and the municipality when construction is proposed within NCDOT right-of-way. The following encroachment agreements will be required by NCDOT prior to construction of the Triangle Bikeway: 16.1A – Two-Party, Non-Utility, Not Related to Road Construction and 16.7 Grading or Alteration of Drainage (C/A).

16.1A – Two-Party, Non-Utility, Not Related to Road Construction: *This encroachment agreement is used for the installation of signs, fencing, sidewalks, shared-use paths, etc. within NCDOT right-of-way. NCDOT states that applicants submitting this agreement must install and maintain the facility installed.*

STATE OF NORTH CAROLINA

ROUTE _____ PROJECT _____ COUNTY OF _____

DEPARTMENT OF TRANSPORTATION
-AND-

RIGHT OF WAY ENCROACHMENT AGREEMENT FOR NON-UTILITY ENCROACHMENTS ON PRIMARY AND SECONDARY HIGHWAYS

THIS AGREEMENT, made and entered into this the _____ day of _____ , 20 _____ , by and between the Department of Transportation, party of the first part; and _____ party of the second part,

W I T N E S S E T H

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) _____ , located _____

with the construction and/or erection of: _____

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part in the exercise of authority conferred upon it by statute, is willing to permit the encroachment within the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on attached plan sheet(s), specifications and special provisions which are made a part hereof upon the following conditions, to wit:

That the said party of the second part binds and obligates himself to install and maintain the encroaching facility in such safe and proper condition that it will not interfere with or endanger travel upon said highway, nor obstruct nor interfere with the proper maintenance thereof, to reimburse the party of the first part for the cost incurred for any repairs or maintenance to its roadways and structures necessary due to the installation and existence of the facilities of the party of the second part, and if at any time the party of the first part shall require the removal of or changes in the location of the said facilities, that the said party of the second part binds himself, his successors and assigns, to promptly remove or alter the said facilities, in order to conform to the said requirement, without any cost to the party of the first part.

That the party of the second part agrees to provide during construction and any subsequent maintenance proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways and Amendments or Supplements thereto. Information as to the above rules and regulations may be obtained from the Division Engineer of the party of the first part.

That the party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the installation and maintenance of this encroachment.

It is clearly understood by the party of the second part that the party of the first part will assume no responsibility for any damage that may be caused to such facilities, within the highway rights of way limits, in carrying out its construction and maintenance operations.

That the party of the second part agrees to restore all areas disturbed during installation and maintenance to the satisfaction of the Division Engineer of the party of the first part. The party of the second part agrees to exercise every reasonable precaution during construction and maintenance to prevent eroding of soil; silting or pollution of rivers, streams, lakes, reservoirs, other water impoundments, ground surfaces or other property; or pollution of the air. There shall be compliance with applicable rules and regulations of the North Carolina Division of Environmental Management, North Carolina Sedimentation Control Commission, and with ordinances and regulations of various counties, municipalities and other official agencies relating to pollution prevention and control. When any installation or maintenance operation disturbs the ground surface and existing ground cover, the party of the second part agrees to remove and replace the sod or otherwise reestablish the grass cover to meet the satisfaction of the Division Engineer of the party of the first part.

That the party of the second part agrees to assume the actual cost of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part agrees to have available at the encroaching site, at all times during construction, a copy of this agreement showing evidence of approval by the party of the first part. The party of the first part reserves the right to stop all work unless evidence of approval can be shown.

Provided the work contained in this agreement is being performed on a completed highway open to traffic; the party of the second part agrees to give written notice to the Division Engineer of the party of the first part when all work contained herein has been completed. Unless specifically requested by the party of the first part, written notice of completion of work on highway projects under construction will not be required.

That in the case of noncompliance with the terms of this agreement by the party of the second part, the party of the first part reserves the right to stop all work until the facility has been brought into compliance or removed from the right of way at no cost to the party of the first part.

That it is agreed by both parties that this agreement shall become void if actual construction of the work contemplated herein is not begun within one (1) year from the date of authorization by the party of the first part unless written waiver is secured by the party of the second part from the party of the first part.

FORM R/W 16.1A (Revised February 2021)

R/W (161A) : Party of the Second Part certifies that this agreement is true and accurate copy of the form R/W (161A) incorporating all revisions to date.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

DEPARTMENT OF TRANSPORTATION

BY: _____
DIVISION ENGINEER

ATTEST OR WITNESS:

_____ _____

_____ _____

_____ _____
Second Party

INSTRUCTIONS

When the applicant is a corporation or a municipality, this agreement must have the corporate seal and be attested by the corporation secretary or by the empowered city official, unless a waiver of corporate seal and attestation by the secretary or by the empowered City official is on file in the Raleigh office of the State Utilities Manager. In the space provided in this agreement for execution, the name of the corporation or municipality shall be typed above the name, and title of all persons signing the agreement should be typed directly below their signature.

When the applicant is not a corporation, then his signature must be witnessed by one person. The address should be included in this agreement and the names of all persons signing the agreement should be typed directly below their signature.

This agreement must be accompanied, in the form of an attachment, by plans or drawings showing the following applicable information:

1. All roadways and ramps.
2. Right of way lines and where applicable, the control of access lines.
3. Location of the proposed encroachment.
4. Length and type of encroachment.
5. Location by highway survey station number. If station number cannot be obtained, location should be shown by distance from some identifiable point, such as a bridge, road, intersection, etc. (To assist in preparation of the encroachment plan, the Department's roadway plans may be seen at the various Highway Division Offices, or at the Raleigh office.)
6. Drainage structures or bridges if affected by encroachment.
7. Typical section indicating the pavement design and width, and the slopes, widths and details for either a curb and gutter or a shoulder and ditch section, whichever is applicable.
8. Horizontal alignment indicating general curve data, where applicable.
9. Vertical alignment indicated by percent grade, P.I. station and vertical curve length, where applicable.
10. Amount of material to be removed and/or placed on NCDOT right of way, if applicable.
11. Cross-sections of all grading operations, indicating slope ratio and reference by station where applicable.
12. All pertinent drainage structures proposed. Include all hydraulic data, pipe sizes, structure details and other related information.
13. Erosion and sediment control.
14. Any special provisions or specifications as to the performance of the work or the method of construction that may be required by the Department must be shown on a separate sheet attached to encroachment agreement provided that such information cannot be shown on plans or drawings.
15. The Department's Division Engineer should be given notice by the applicant prior to actual starting of installation included in this agreement.
16. Method of handling traffic during construction where applicable.
17. Scale of plans, north arrow, etc.

16.7 Grading or Alteration of Drainage (C/A): *This encroachment agreement is used for grading and/or the alteration of drainage within controlled access rights-of-way during construction of a facility not related to road construction.*

STATE OF NORTH CAROLINA

ROUTE_____

COUNTY OF _____

DEPARTMENT OF TRANSPORTATION
AND

RIGHT OF WAY ENCROACHEMENT AGREEMENT FOR GRADING OR ALTERATION OF DRAINAGE ON INTERSTATE OR OTHER CONTROLLED ACCESS HIGHWAYS

THIS AGREEMENT, made and entered into this the _____ day of _____ , 20 _____ , by and between the Department of Transportation, party of the first part; and _____ party of the second part,

W I T N E S S E T H

THAT WHEREAS, the party of the second part desires to encroach on the right of way of the public road designated as Route(s) _____ , located _____

with the construction and/or erection of: _____

WHEREAS, it is to the material advantage of the party of the second part to effect this encroachment, and the party of the first part, in the exercise of authority conferred upon it by statute, is willing to permit the encroachment within the limits of the right of way as indicated, subject to the conditions of this agreement;

NOW, THEREFORE, IT IS AGREED that the party of the first part hereby grants to the party of the second part the right and privilege to make this encroachment as shown on the attached plan sheet(s), specifications and special provisions which are attached hereto and made a part hereof upon the following conditions, to wit:

That any work as set out herein performed under this agreement shall be accomplished without access from or to the through-traffic roadways and interchange ramps of the interstate or other controlled access highway facility.

That all grading shall be done as shown on the attached plan sheet(s), specifications and special provisions with slope intersections being well rounded and berm ditches, if any, adjusted to be entirely within the right of way. Staking for the grading and the finished grading shall be approved by the Division Engineer and the State Roadside Environmental Engineer.

That the traveled lanes, shoulders and interchange ramps of the interstate or other controlled access highway facility shall not be used for any construction operations.

That grass cover shall be established by the party of the second part over the entire disturbed area of the right of way be seeding, mulching, and jute mesh, if necessary, in accordance with the standard erosion control procedures of the party of the first part.

During the performance of this concept, the second party, for itself, its assignees and successors in interest (hereinafter referred to as the "contractor"), agrees as follows:

a. Compliance with Regulations: The contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the U. S. Department of Transportation, Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

b. Nondiscrimination: The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements of materials and leases of equipment. The contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.

c. Solicitations for Subcontracts, including Procurements of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurements of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the grounds of race, color, or national origin.

d. Information and Reports: The contractor shall provide all information and reports required by the Regulations, or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Department of Transportation or the Federal Highway Administration to be pertinent to ascertain compliance with such Regulations or directives. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

e. Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to,

(1) withholding of payments to the contractor under the contract until the contractor complies, and/or

(2) cancellation, termination, or suspension of the contract, in whole or in part.

f. Incorporation of Provisions: The contractor shall include the provisions of paragraphs "a" through "f" in every subcontract, including procurements of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The contractor shall take such action with respect to any subcontract or procurement as the Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the Department of Transportation to enter into such litigation to protect the interests of the State, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

The party of the second part agrees to provide during construction and any subsequent maintenance proper signs, signal lights, flagmen and other warning devices for the protection of traffic in conformance with the latest Manual on Uniform Traffic Control Devices for Streets and Highways. Information as to the above may be obtained from the District Engineer of the party of the first part. The party of the first part reserves the right to stop any work for noncompliance.

The party of the first part does not guarantee that the highway right of way will be kept free from tree growth. Eventually trees may be planted or developed from volunteer growth and the party of the first part reserves the right to establish a complete screen on the right of way if the adjacent property is allowed to become unsightly as viewed from the highway.

That the party of the second part shall make no alteration of drainage which shall affect the lands of adjoining property owners other than the party of the second part, except upon written authorization from such adjoining property owners and such written authorization shall be attached to this agreement prior to the execution thereof by the party of the first part.

The party of the second part hereby agrees to indemnify and save harmless the party of the first part from all damages and claims for damage that may arise by reason of the construction and maintenance of this encroachment.

A final inspection of the work will be made by the Division Engineer and other employees of the party of the first part and designated representative of the Federal Highway Administration and the party of the second part agrees to promptly correct any deficiencies in the work as may be required by the Division Engineer. The party of the second part further agrees to assume the actual costs of any inspection of the work considered to be necessary by the Division Engineer of the party of the first part.

That the party of the second part shall furnish to the party of the first part a performance bond in the sum of $_____ Dollars to be attached hereto, the conditions of said bond to be that if the party of the second part, its heirs, successors and assigns shall, properly comply with, carry out, and perform all of the conditions, terms and obligations of this agreement, the said bond to be null and void, otherwise to remain in full force and effect, for a period of not less than one year from the date of completion of the work as set out herein.

That the said party of the second part binds and obligates himself to accomplish the encroachment herein described in such safe and proper condition that it will not interfere with or endanger travel upon said highway, nor obstruct nor interfere with the proper maintenance thereof, and if at any time the party of the first part shall require the changes in said encroachment; that the said party of the second part binds himself, his heirs, successors, and assigns, to promptly alter the said encroachment in order to conform to the said requirement, without any cost to the party of the first part.

IN WITNESS WHEREOF, each of the parties to this agreement has caused the same to be executed the day and year first above written.

DEPARTMENT OF TRANSPORTATION

BY:_____
STATE UTILITIES MANAGER

ATTEST OR WITNESS

_____ _____
(COMPANY)

_____

_____
(TYPE NAME AND TITLE)

R/W (167): Party of the Second Part certifies that this agreement is true and accurate copy of the form R/W (167) incorporating all revisions to date.

FORM R/W 16.7
Rev. February 2021

Additional information on NCDOT maintenance and encroachment agreement requirements can be found at the following site: *https://connect.ncdot.gov/municipalities/Utilities/Lists/EncroachmentAgreements/AllItems.aspx.*