CAMPO
NC Capital Area Metropolitan Planning Organization

HOT SPOT FEASIBILITY ANALYSIS BIKE/PEDESTRIAN NETWORK GAP STUDY

FEASIBILITY ANALYSIS TECHNICAL MEMO - FINAL

August 2022

STV 100 Years

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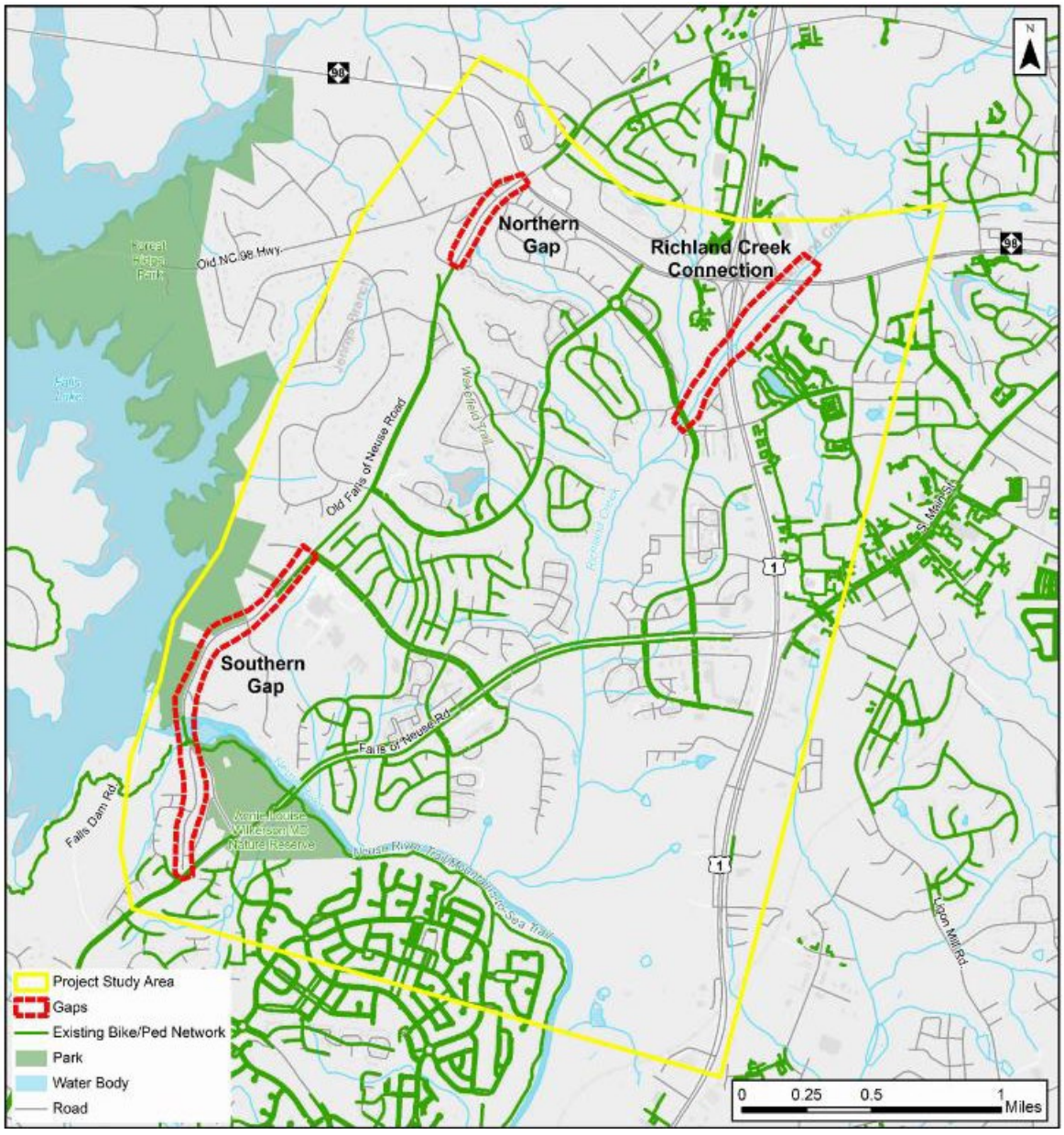
1 Introduction and Project Description

To address the rapidly growing area and increasing demand for multi-modal amenities, the Capital Area Metropolitan Planning Organization (CAMPO) is assessing and providing an implementation plan for bicycle and pedestrian improvements at three locations (see **Exhibit 1**) in a multi-jurisdictional area:

- Northern Gap (located south of the intersection of Old Falls of Neuse Road & NC 98);
- Southern Gap (located along Old Falls of Neuse Road between Wakefield Pines Drive and Falls of Neuse Road); and
- Richland Creek Connection intersecting with US 1 at the border of Raleigh City limits and the town of Wake Forest.

Exhibit 1: Bike and Pedestrian Accommodations- Existing Facilities and Identified Gaps



This Project Feasibility Analysis Technical Memorandum will examine the three (3) existing gaps within the Project Study Area (PSA), including a greenway connection to the Neuse River Trail in the Southern Gap, the feasibility of connecting the Neuse River Trail to the multi-use facility on NC 98 in Wake Forest in the Northern Gap, and proposed grade-separated facilities connecting the proposed Richland Creek Greenway across Capital Boulevard (US 1) and NC 98. The recommended facility types/concepts will be analyzed and screened based on the following factors:

- mobility and safety,
- right-of-way,
- environmental impacts,
- constructability, and
- construction costs.

1 Alternative Concept Development

Steering Committee meetings were held for this study comprised of representatives from CAMPO, the City of Raleigh, the Town of Wake Forest, and NCDOT. Discussions from those meetings led to the development of two concept alternatives each the Northern and Southern Gap sections and for the Richland Creek grade separated greenway connection across Capital Boulevard and NC 98. Meeting minutes are included in **Appendix A** .

Conceptual cost methodology was also presented and discussed. Conceptual costs were generated using the NCDOT bike/ped cost estimate tool used by NCDOT and its municipal partners for programming bicycle and pedestrian improvements into SPOT prioritization process. The cost estimation tool provides conceptual costs for FY2019, in which the study team will inflate to FY2022 costs. In addition, a contingency will be applied to account for the cost of curb and gutter, traffic control and infrastructure components. Refined planning level cost estimates will be summarized in the final report.

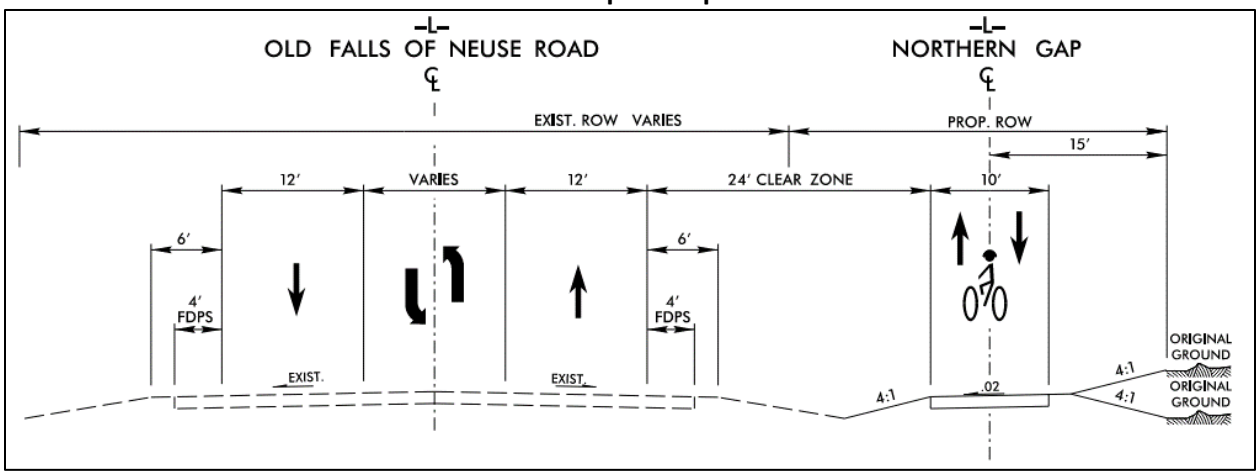
1.1 Northern Gap Alternative Concepts

The Northern Gap segment is a 0.4 mile stretch along the northern end of Old Falls of Neuse Road that lacks bike or pedestrian connectivity along the corridor within several multi-family residential developments and single-family residential at Wakefield Plantation. This concept would provide a bicycle/pedestrian connection from an existing multi-use path along the southern side of Old Falls of Neuse Road from the Garden Hill Drive / Keith Store Road intersection to the NC 98/Durham Road intersection, ultimately connecting to another section of existing multi-use path. There are no existing bicycle/pedestrian amenities along the northern/western side of Old Falls of Neuse, and the intersection of Old Falls of Neuse Road and NC 98 lacks crosswalks and pedestrian signals on all four legs.

1.1.1 Northern Gap Concept 1 (Shoulder Section)

Northern Gap Concept 1 proposes a 10’ wide multi-use paved path with bidirectional (five feet wide in each direction) lanes for pedestrians and cyclists. A proposed 24’ wide clear zone runs parallel to the existing roadway. (**Exhibit 2** and **Exhibit 4**). This concept provides more of a buffer from motorized vehicles for bicyclists and pedestrians, and the typical section matches the greenway connections at both ends of the northern gap.

Exhibit 2: Northern Gap Concept 1 Cross Section



1.1.2 Northern Gap Concept 2 (Curb & Gutter)

Concept 2 proposes a 10' wide multi-use paved path with a proposed 2'-6" curb and gutter along the northbound travel lane. To the right of the curb and gutter section is a 5' planting strip with the 10' multi-use path running parallel to the roadway (see **Exhibit 3** and **Exhibit 5**). This concept will reduce right of way impacts by approximately 16 feet along the corridor in comparison to Concept 1.

Exhibit 3: Northern Gap Concept 2 Cross Section

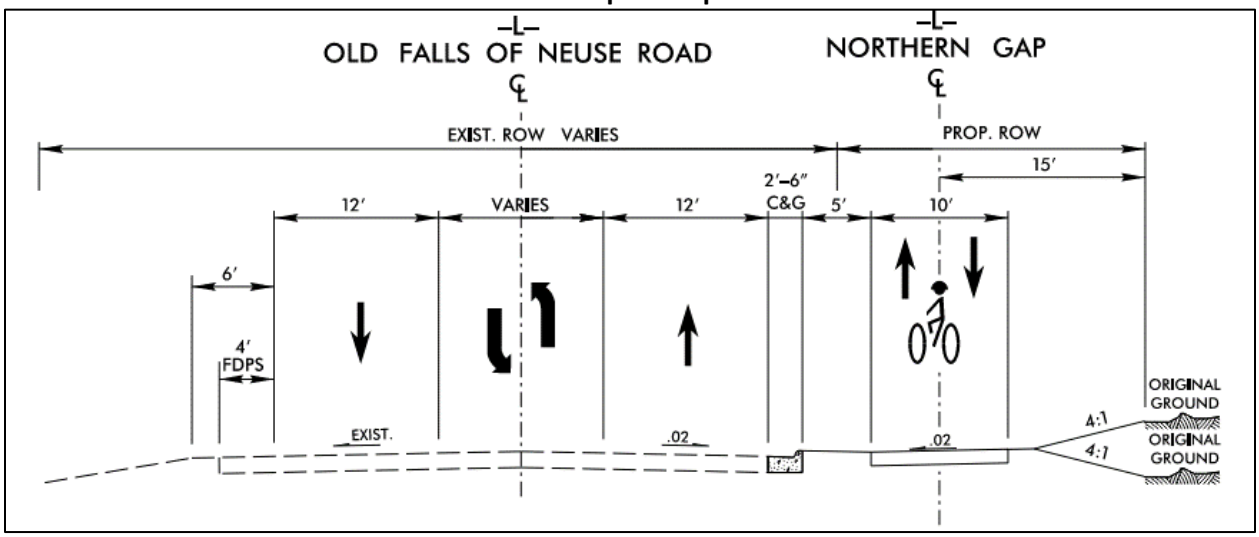


Exhibit 4: Northern Gap Concept 1 (Shoulder Section)

Exhibit 5: Northern Gap Concept 2 (Curb & Gutter)

1.1.3 Feasibility Screening of the Northern Gap

1.1.3.1 Mobility and Safety Screening

According to NCDOT, there were no pedestrian or bicyclist crashes within the Northern Gap dating back to 2007. Both Northern Gap concepts include a 10' wide shared use path to accommodate users traveling in both directions. A crosswalk at stop-controlled driveway at Garden Hill Drive may be needed to connect to the existing shared use path south of the gap. The proposed crosswalk across NC-98 will have impacts on the traffic signal timings and cycle lengths requiring pedestrian signals and a traffic signal modification at this intersection.

1.1.3.2 Right-of-Way Screening

1.1.3.2.1 Northern Gap Concept 1 (Shoulder Section)

The right-of-way footprint for the shoulder section concept is approximately 1.10 acres.

1.1.3.2.2 Northern Gap Concept 2 (Curb & Gutter)

The right-of-way footprint for the curb and gutter concept is approximately 0.12 acres.

1.1.3.3 Environmental Screening

For both concepts, there are no impacts to streams and wetlands.

1.1.3.4 Constructability and Construction Costs Screening

1.1.3.4.1 Northern Gap Concept 1 (Shoulder Section)

The existing shoulder section along Old Falls of Neuse Road is retained, and the majority of the bike path construction will take place outside of the clear zone of the roadway. Disruptions to vehicle traffic during construction will likely be minimal. Construction costs are estimated to be

1.1.3.4.2 Northern Gap Concept 2 (Curb & Gutter)

The existing shoulder will be replaced by a 2'-6" curb and gutter, directly adjacent to the travel lane. Shoulder closures, lane shifts, and/or temporary lane closures may be needed at intervals during construction. This concept is assumed will have higher costs associated with construction of the curb and gutter and incorporating stormwater drainage along this section.

2 Southern Gap

The Southern gap is a 1.3-mile section along Old Falls of Neuse Road between Falls of Neuse Road at the southern terminus and Wakefield Pines Drive as the northern terminus. Land uses along the corridor include the Ann Louise Wilkerson Nature preserve to the south, Falls Lake Recreation Area, limited single family residential homes and Wakefield High School.

There is access to the Neuse River Greenway via the Upper Neuse Greenway along Old Falls of Neuse Road at Pleasant Union Church Road, which is part of the Mountains-to-Sea Trail. This Mountains-to-Sea Trail is a unique 1,175-mile trail, consisting of footpaths, roads, and state bike paths which extends from the Great Smoky Mountains National Park to the Outer Banks. There is also a parking lot facility off of Pleasant Union Church Road just west of the access to Upper Neuse Greenway.

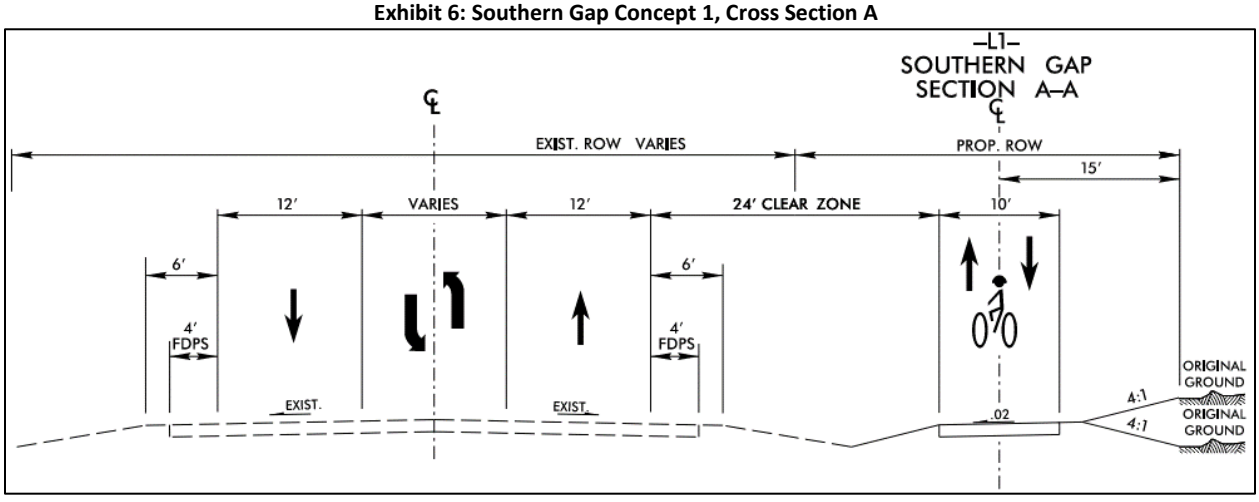
There are some limited pedestrian/bicycle facilities in the area, including sidewalks in the vicinity of Wakefield High School that connect to an existing multi-use path at the northeast corner of Wakefield Pines Drive at Old Falls of Neuse Road which ends approximately 500 feet south of the bus parking lot driveway of Wakefield High School. There is a protected path adjacent to the southbound travel lane on the bridge over Neuse River, with sidewalk continuing along the western side of the Old Falls of Neuse Road connecting to the Upper Neuse Greenway. The pedestrian path from Falls Lake Dam Road toward Fonville Road is an existing gravel path with moderate elevation changes and is not currently ADA compliant.

2.1 Southern Gap Alternative Concepts

2.1.1 Southern Gap Concept 1 (Shoulder Section)

At its southern end, the Southern Gap Concept 1 (see **Exhibit 6** and **Exhibit 10**) uses a 10’ wide bidirectional paved multi-use path which ties into the existing sidewalk at the northeast corner of the Old Falls of Neuse Road & Falls of Neuse Road intersection. The path extends north along the northbound travel lane. The proposed path crosses the River Boat Launch driveway and provides a connection to the Upper Neuse Greenway.

Exhibit 6: Southern Gap Concept 1, Cross Section A

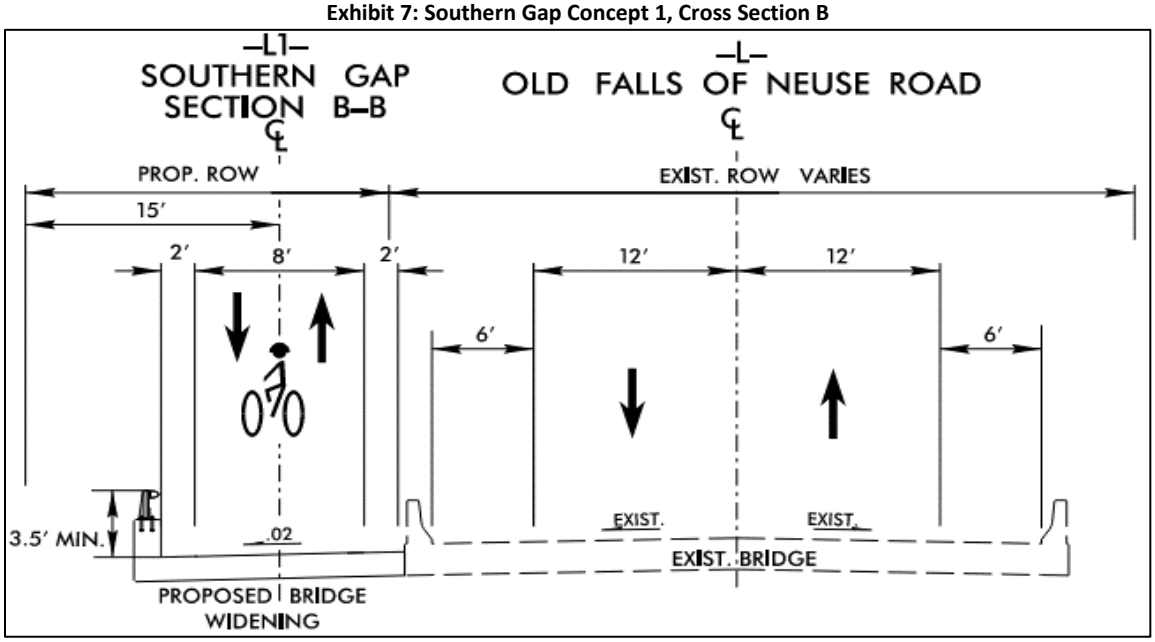


Between the River Boat Launch driveway and Fonville Road, a proposed at-grade crossing is used to cross over Old Falls of Neuse Road to the southbound travel lane side and provide an additional spur to

the Neuse River Trail. The path then crosses the entry/exit point of Fonville Road using a 10' wide crosswalk and turns west along the southbound travel lane of Pleasant Union Church Road and extends approximately 175 feet. A retaining wall is proposed between the path and the hill in front of The Bike Guy Shop to reduce private property impacts and retain existing parking.

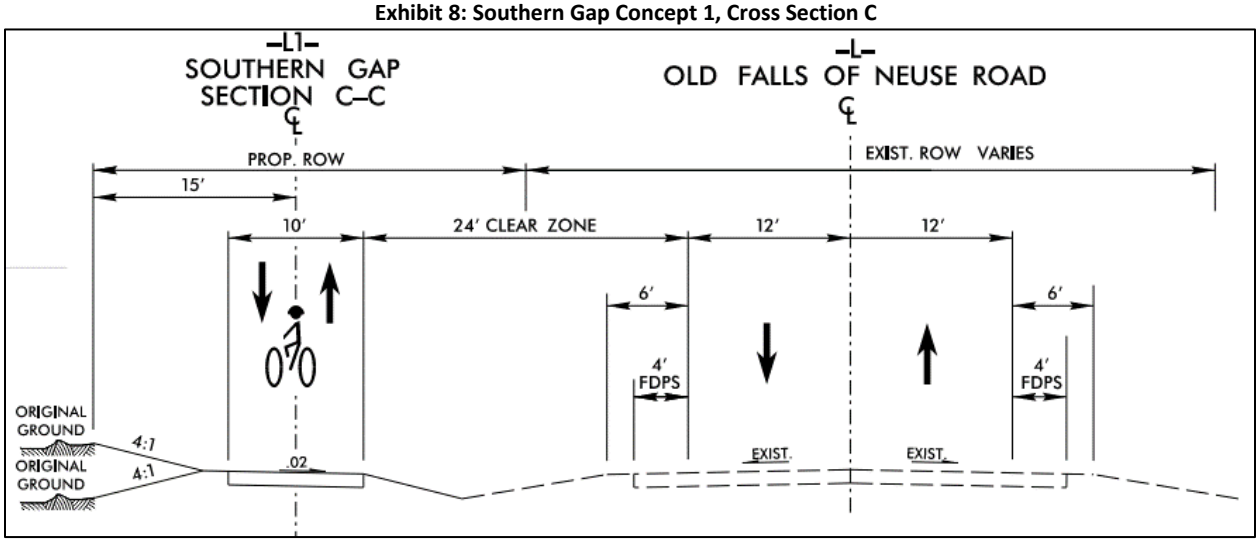
The proposed paved path narrows to eight feet as it dead ends just before an existing gate. The concept connects to the existing stairway and ramp at the terminus of Upper Neuse Greenway located adjacent to The Bike Guy Shop. The existing pedestrian and bike path along Old Falls of Neuse and over the Neuse River will be retained. The existing path to top of Falls Lake dam is paved in both concepts and lengthened to allow an appropriate grade to and from the top of the dam. The existing bridge over the Neuse River will need to be widened to accommodate a buffered bicycle and pedestrian amenity. The existing bridge railing will be retained, and the structure will be widened to accommodate a 12-foot bikeway as shown in typical **Exhibit 7**.

Exhibit 7: Southern Gap Concept 1, Cross Section B



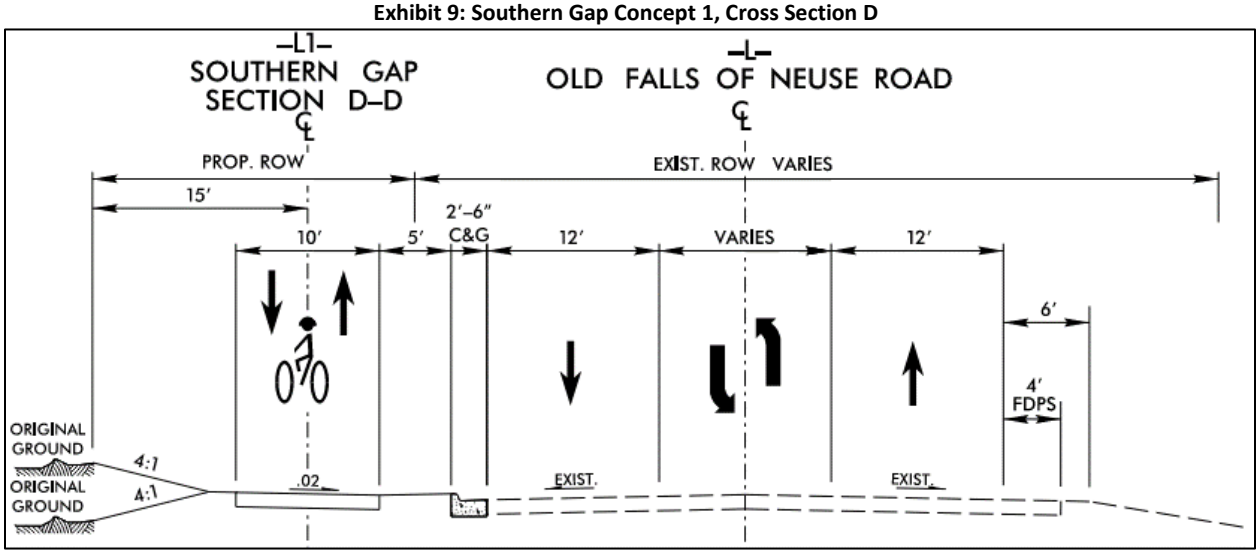
North of the proposed bridge widening, along the southbound travel lane of Old Falls of Neuse Road, the proposed paved multi-use path continues north towards Wakefield High School. The 24' clear zone pushes the path into the Falls Lake Dam Recreation Area property for approximately .25 miles, as shown in **Exhibit 8**.

Exhibit 8: Southern Gap Concept 1, Cross Section C



At the northern section, adjacent to Wakefield High School, of Southern Gap Concept 1, the 2'-6'' curb and gutter is reintroduced along the southbound side of Old Falls of Neuse Road and terminates at the northwest corner of Old Falls of Neuse Road & Wakefield Pines Drive. The existing pedestrian crossing allows pedestrians to cross Old Falls of Neuse and ties in with the existing greenway to the north on the northbound side. The cross-section for this segment is shown in **Exhibit 9**.

Exhibit 9: Southern Gap Concept 1, Cross Section D



2.1.2 Southern Gap Concept 2 (Curb & Gutter)

Southern Gap Concept 2 uses the same route as Concept 1, but instead of the 24-footclear zone as the separator between the Old Falls of Neuse travel lanes, Concept 2 uses a 2'-6" curb and gutter to separate pedestrians and bicyclists from vehicular traffic. This concept will reduce right of way impacts by 24-30 feet along the corridor in comparison to Concept 1.

2.1.2.1 Historic Properties

Exhibit 10: Southern Gap Concept 1 (Shoulder Section)

Exhibit 11: Southern Gap Concept 2 (Curb & Gutter)

2.1.3 Feasibility Screening of the Southern Gap

2.1.3.1 Mobility and Safety

Similar to the Northern Gap concepts, both Southern Gap concepts include a 10' wide shared use path to accommodate users traveling in both directions. According to NCDOT, two bicyclist crashes were reported in 2017; one located at the signalized intersection of Old Falls of Neuse Road at Wakefield Plantation Drive and other located at the school bus driveway entrance for Wakefield High School.

Based on a site visit and field observations (6/1/2022-06/2/2022), bus circulation and pedestrian activities were observed related to drop-off and pick-up times to assess the need and placement of a mid-block crosswalk in the vicinity of Wakefield High School. Potential crossings were originally proposed just south of the bus drop-off/pick-up parking lot driveway and in between other driveways along the northbound travel lane of Old Falls of Neuse Road. However, low pedestrian activity and extensive queuing along Old Falls of Neuse Road, using the existing protected crossing at the signalized intersection (Wakefield Pines Drive) to access a proposed multi-use path on the north side of Old Falls of Neuse Road may provide a familiar degree of comfort since there was no observed crossings midblock.

Further analysis of the internal school circulation will be needed during project development for the possible implementation of a mid-block crosswalk south of the Wakefield Pines Drive intersection.

2.1.3.2 Right-of-Way Screening

2.1.3.2.1 Southern Gap Concept 1 (Shoulder Section)

The right-of-way footprint for the shoulder section concept is approximately 3.2 acres.

2.1.3.2.2 Southern Gap Concept 2 (Curb & Gutter)

The right-of-way footprint for the curb and gutter concept is approximately 1.5 acres.

2.1.3.3 Environmental Screening

For both concepts, there are no impacts to streams and wetlands.

2.1.3.4 Constructability and Construction Costs Screening

2.1.3.4.1 Southern Gap Concept 1 (Shoulder Section)

The existing shoulder section is retained, and the majority of the bike path construction will take place outside of the clear zone of the roadway. The widening of the existing bridge over the emergency spillway takes place outside of the existing barrier rail; therefore, traffic operations are not anticipated to be affected on the bridge. Disruptions to vehicle traffic will likely be minimal.

2.1.3.4.2 Southern Gap Concept 2 (Curb & Gutter)

The existing shoulder will be replaced by a 2'-6" curb and gutter, directly adjacent to the travel lane. The widening of the existing bridge takes place outside of the existing barrier rail; therefore, traffic operations are not anticipated to be affected on the bridge. Shoulder closures, lane shifts, and/or temporary lane closures may be needed at intervals during construction. Additionally, since this is a two-lane road, flaggers and detours may need to be utilized during construction.

3 Richland Creek Connection

3.1 Richland Creek Connection Concepts

The Richland Creek Connection is a proposed 1.1-mile-long greenway connection along Richland Creek that intersects with US 1 (Capital Boulevard), located within the Town of Wake Forest and City of Raleigh jurisdictions. The proposed greenway would follow along Richland Creek and eventually provide a connection to the south with Neuse River Trail approximately 2.3 miles from its crossing of US 1, and ultimately extends north to the Town of Youngsville in Franklin County.

Land use in the area is urbanized, with commercial and residential land uses adjacent to the US 1/NC 98 interchange. However, the proposed greenway is within a large floodplain. NCDOT proposes to widen US 1 as a controlled access facility as part of STIP U-5307, with ROW acquisition anticipated to begin October 2028.

3.1.1 Richland Creek Connection Concept 1

Concept 1 proposes a 6,120’ long, 10’ wide paved bidirectional multi-use path starting at the intersection of Forest Pines Drive at Pawleys Mill Circle and connecting to the future Town of Wake Forest greenway approximately 2,000’ past NC 98. Concept 1 proposes a 225’ long pedestrian tunnel to cross under US-1/Capital Boulevard (see **Exhibit 12** and **Exhibit 16**) and under the existing bridge of NC 98 (see **Exhibit 13**).

Upon request by the Town of Wake Forest, Concept 1 proposes a 10’ wide paved path to Blue Bird Lane in the Caveness Farms Apartment Homes neighborhood to the south as highlighted in **Exhibit 14**. This connection would ultimately provide access to the trail surrounding the neighborhood pond south of Blue Bird lane.

Exhibit 12: Proposed Tunnel under US-1; Concept 1

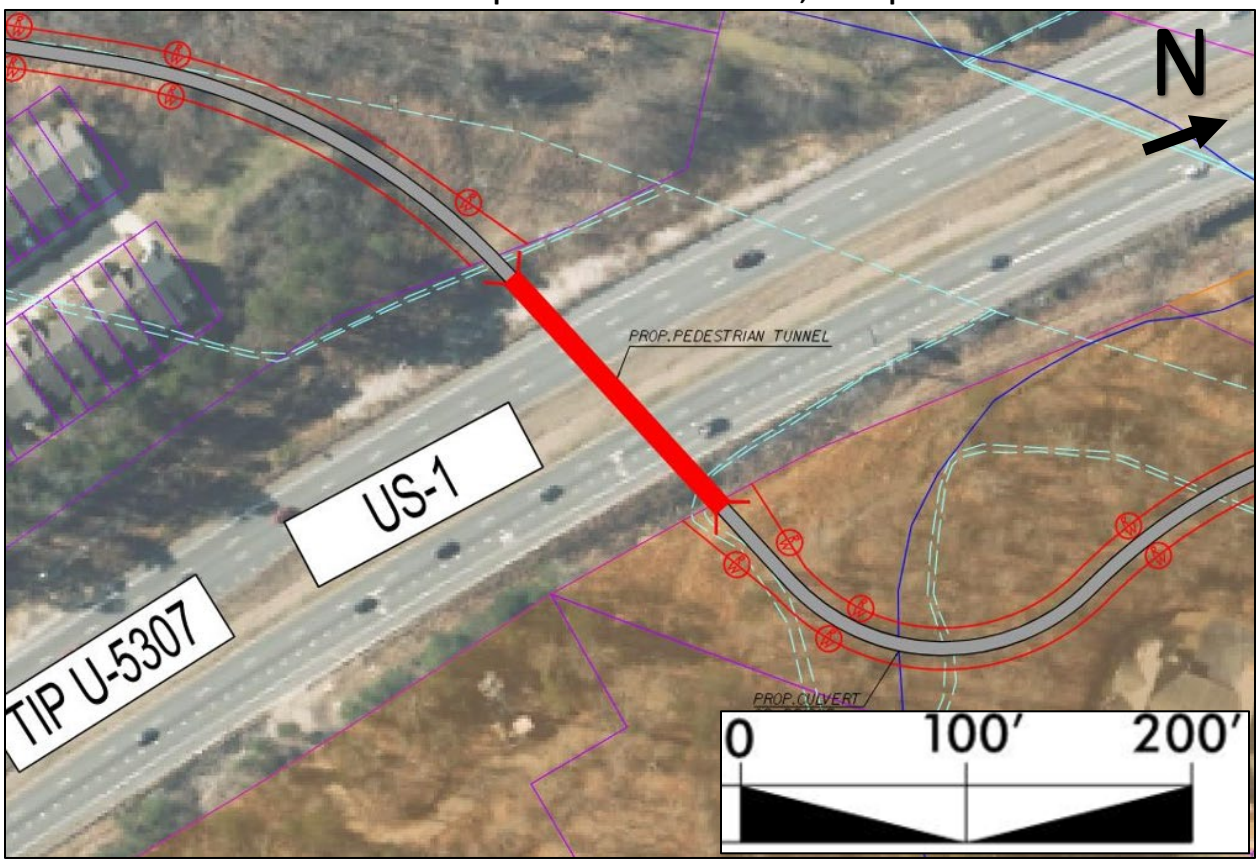


Exhibit 13: Crossing Under Existing Bridge of NC 98

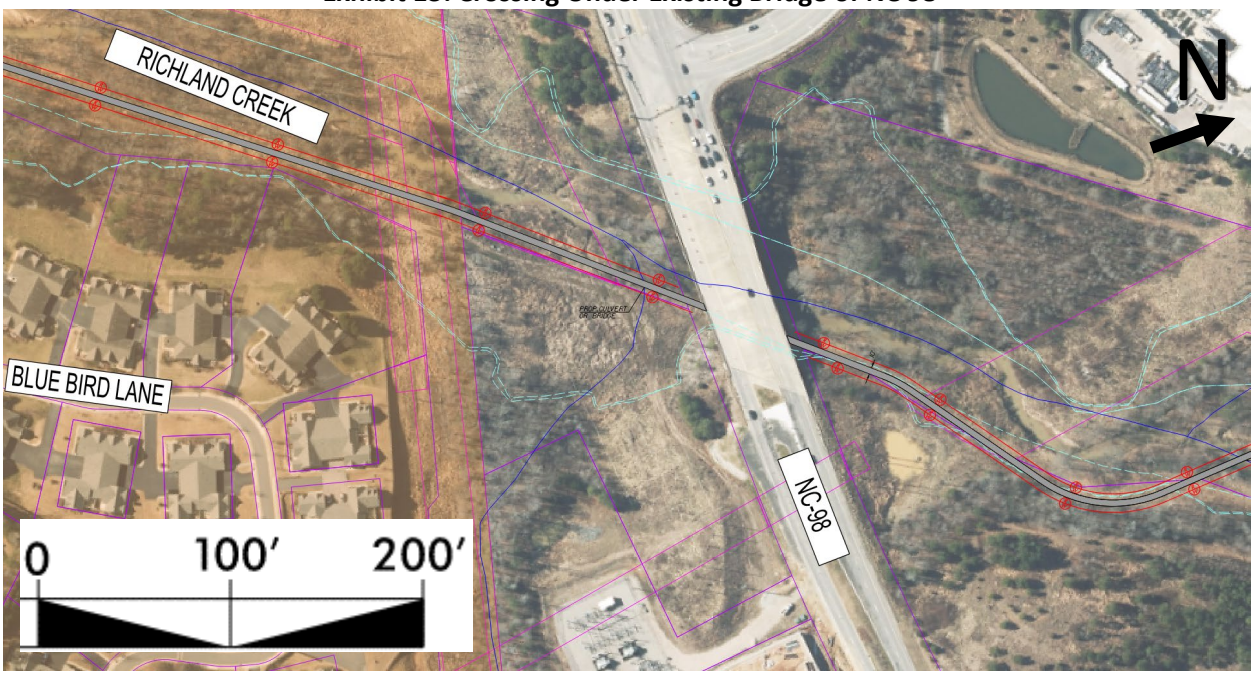
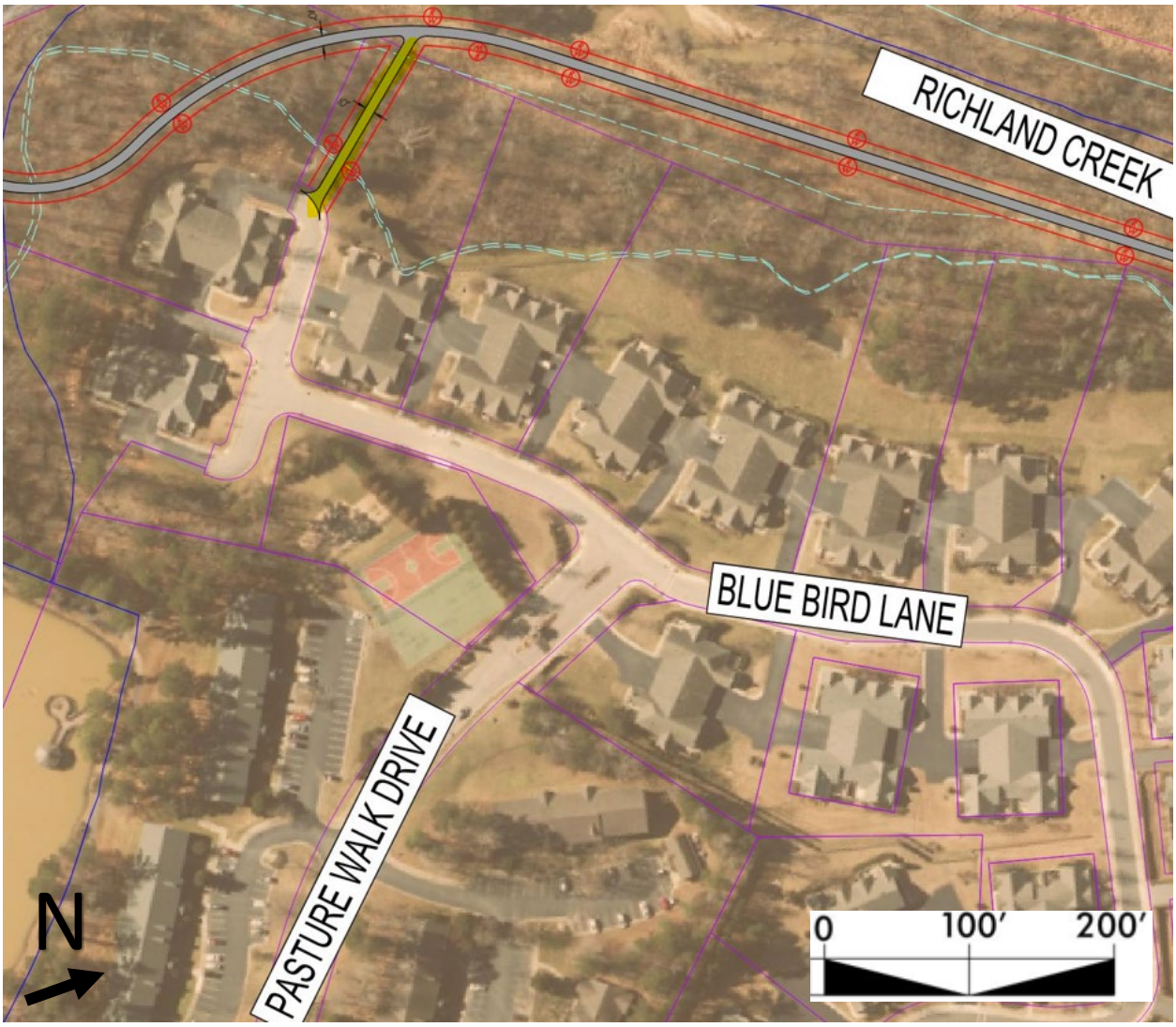


Exhibit 14: Connection to Caveness Farms Apartment Homes



3.1.2 Richland Creek Connection Concept 2

Similar to Concept 1, Concept 2 proposes a 6,260' long, 10' wide paved bidirectional multi-use path starting at the intersection of Forest Pines Drive at Pawleys Mill Circle and connecting to the future Town of Wake Forest greenway approximately 2,000' past NC 98. However, Concept 2 proposes a 225' long pedestrian bridge over US-1 (see **Exhibit 15** and **Exhibit 17**) with a underpass under the existing bridge of NC 98 (see **Exhibit 13**). The proposed length of Concept 2 is longer than Concept 1, due to the necessary switchback feature to maintain a running grade of no more than 8.3 percent to clear US 1 by way of a pedestrian bridge. Similar to Concept 1, Concept 2 also proposes a 10' wide paved path to Blue Bird Lane in the Caveness Farms Apartment Homes neighborhood to the south as highlighted in **Exhibit 14**.

Exhibit 15: Proposed Pedestrian Bridge over US-1; Concept 2

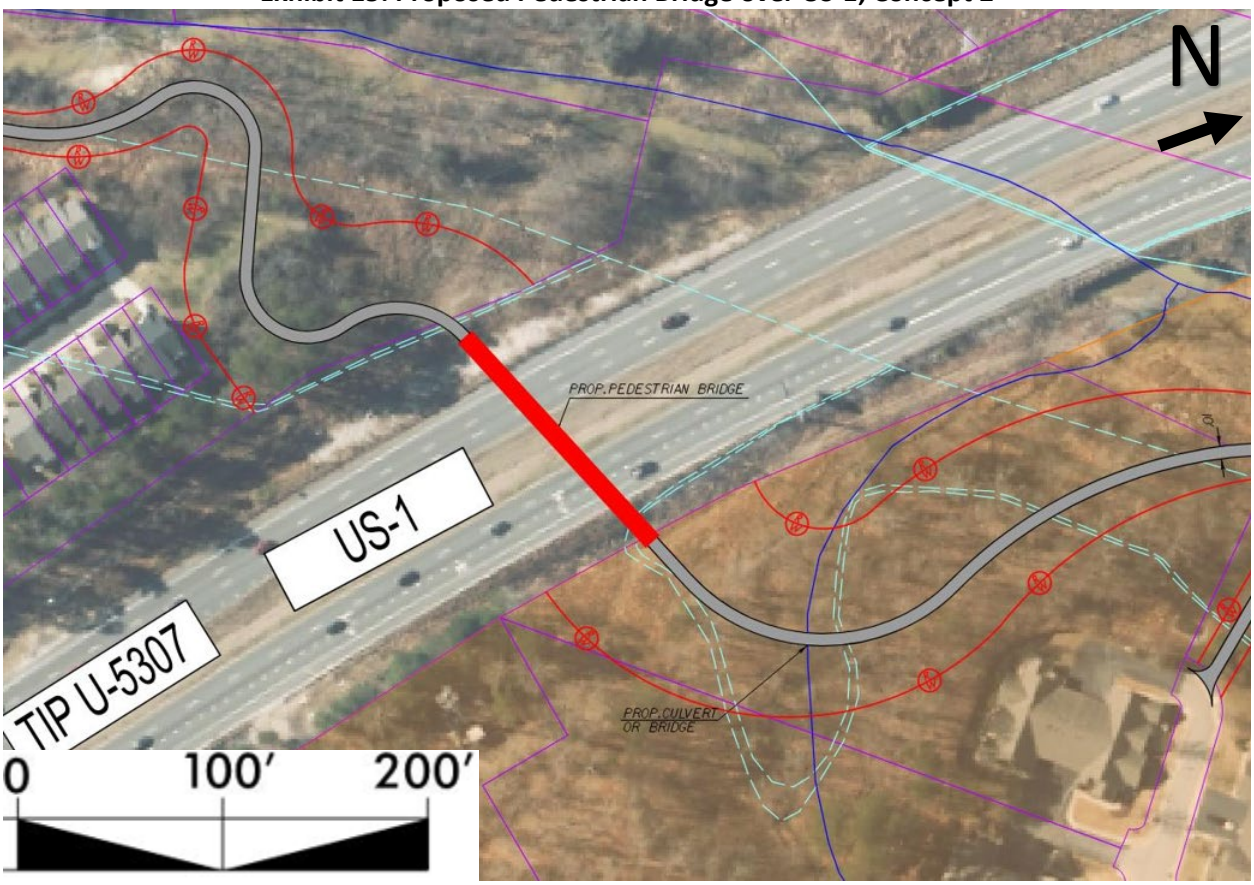


Exhibit 16: Richland Creek Connection Concept 1 (Tunnel)

Exhibit 17: Richland Creek Connection Concept 2 (Bridge)

3.1.3 Feasibility Screening of the Richland Creek Connection

3.1.3.1 Mobility and Safety

Both concepts provide a grade-separated crossing of US 1 and NC 98 and propose a direct connection to the buffered bicycle lanes along Forest Pines Drive where the Wake Forest Loop Bus travels. A proposed crosswalk at the Pawleys Mill Circle driveway may be needed and would require further study to gauge treatment types for the potential high volume of bicycle and pedestrian crossings. With direct access to the future Richland Creek Greenway, additional traffic control such as a High-Intensity Activated Crosswalk (HAWK) signal or a Rectangular Rapid Flashing Beacon (RRFB) may be recommended.

3.1.3.1.1 Richland Creek Connection Concept 1 (Tunnel)

Under Concept 1, the pedestrian tunnel would take advantage of the existing lower terrain elevation off road which ranges between 10' to 15' below the US 1 road elevation. Concerns were expressed during the last Steering Committee Meeting with the length of the tunnel, the need for lighting and aesthetics of a tunnel in this area. Although natural lighting is preferred, lighting would need to be artificially provided for a 225-foot tunnel to accommodate the needs of users with vision impairments and increase level of comfort. Most pedestrian tunnel designs are short in length and aim for users to "see the light" at the end of the tunnel. Although natural lighting is preferred, a lighting system would be required to increase comfort level, safety and security but would increase conceptual costs.

3.1.3.1.2 Richland Creek Connection Concept 2 (Bridge)

Under Concept 2, the trail would require a switchback path to traverse up to the proposed pedestrian bridge. This results in a higher impact to grade changes than Concept 1 for clearance over the US 1 roadway. According to NACTO, the grades up to the pedestrian bridge would max at 8.3 percent. Unlike Concept 2, the pedestrian bridge concept can provide a visually aesthetic gateway that connects communities, existing greenways, and historical features on either side of US 1.

3.1.3.2 Right-of-Way Screening

3.1.3.2.1 Richland Creek Connection Concept 1 (Tunnel)

The right-of-way footprint for this concept is approximately 3.9 acres. The tunnel would likely require less right of way acquisition.

3.1.3.2.2 Richland Creek Connection Concept 2 (Bridge)

The right-of-way footprint for this concept is approximately 6.0 acres. Substantial right of way acquisition will be needed to build the path up so the bridge can achieve a proper clearance over US-1.

3.1.3.3 Environmental Screening

The majority of the proposed greenway for both concepts is within the Richland Creek floodplain and crosses the surrounding streams at four locations.

3.1.3.3.1 Richland Creek Connection Concept 1 (Tunnel)

This pedestrian tunnel concept would have lower impacts to streams (140 linear feet) and wetlands (0.1 acres) compared to Concept 2

3.1.3.3.2 Richland Creek Connection Concept 2 (Bridge)

This pedestrian bridge concept would have high impacts to streams (265 linear feet) and wetlands (0.2 acres) compared to Concept 1.

3.1.3.4 Constructability and Construction Costs Screening

3.1.3.4.1 Richland Creek Connection Concept 1 (Tunnel)

The majority of the greenway will be constructed on new location and within the Richland Creek floodplain, with the exception of the crossing of US-1, where a pedestrian tunnel is proposed. Construction of the tunnel will ideally be performed in tandem with the NCDOT Capital Boulevard Upgrade widening project (STIP U-5307C). The STIP U-5307C proposes to replace the grass median on US-1 with an additional lane and a 12' paved shoulder in each direction separated by a median barrier. Because cost efficient phased construction of the tunnel will require extensive lane shifts, it would be more difficult to construct the tunnel option following the completion of U-5307C.

Constructing a pedestrian tunnel in a floodplain will require additional design measures. To mitigate flooding risks the tunnel will be constructed with drainage structures at the entrance and exit and maybe within the tunnel to convey water out. Additionally, the tunnel will be sloped to evacuate water from the interior.

3.1.3.4.2 Richland Creek Connection Concept 2 (Bridge)

The majority of the greenway will be constructed away from traffic and within the Richland Creek floodplain, with the exception of the crossing of US-1, where a pedestrian bridge is proposed. Substantial right of way acquisition will be needed to build the path up so the bridge can achieve a proper clearance over US-1. Coordination with the U-5307 project will be required, to ensure adequate horizontal clearance for placement of bridge bents. Construction on the bridge would be easiest in conjunction with U-5307 but is achievable before or after that project complete.

4 Conclusion and Next Steps

Based on the feasibility screening and feedback from the Steering Committee, the shoulder section concepts 1 for both the Northern and Southern gaps will be summarized as the preferred project concepts in the final report. The Richland Creek Connection Concept 2, the pedestrian bridge was also recommended for advancement into the final report with an implementation plan outlining local jurisdictional responsibility. As part of the final report, policy level work and recommendations for future studies will be provided as well as potential funding sources and grant opportunities for the gap study.

5 References

NCDOT Bike/Ped Cost Estimate Tool
NEW BikePed Cost Estimation Tool - All Documents (ncdot.gov)

Existing Conditions Technical Memorandum
STV Inc (May 2022)

Mountains-To-Sea Trail Map and Information
Interactive Map | Mountains-to-Sea Trail (mountainstoseatrail.org)

Designing Sidewalks and Trails for Access Part II of II: Best Practices Design Guide, Federal Highway Administration, Washington, DC:2001

CAMPO
NC Capital Area Metropolitan Planning Organization

APPENDIX A

Bicycle Network Gap Hot Spot Study Steering Committee Meeting
Meeting Summary
April 6, 2022
10:00 AM
Attendees:

Alex Rickard	CAMPO Deputy Director	Alex.rickard@campo-nc.us
Daniel Spruill	CAMPO Engineering Technician	daniel.spruill@campo-nc.us
Brandon Watson	CAMPO Transportation Planner	brandon.watson@campo-nc.us
Shelby Powell	CAMPO Deputy Director	Shelby.powell@campo-nc.us
Hannah Reckhow	City of Raleigh Senior Planner	hannah.reckhow@raleighnc.gov
Fontaine Burruss	City of Raleigh Bike and Pedestrian Program Manager	fontaine.burruss@raleighnc.gov
Dylan Bruchhaus	Town of Wake Forest Long Range Transportation Planner	dbruchhaus@wakeforestnc.gov
Joshua Michael	Town of Wake Forest Long Range Transportation Planner	jmichael@wakeforestnc.gov
Robert Deaton	NCDOT Division 5 Corridor Engineer	rdeaton@ncdot.gov
Nicholas Morrison	NCDOT Division 5	nemorrison@ncdot.gov
Karlynn Kerney	STV Project Manager	karlynn.kerney@stvinc.com
Patrick Livingston	STV Roadway	patrick.livingston@stvinc.com
Elizabeth Oliver	STV Planning	Elizabeth.oliver@stvinc.com

Introductions

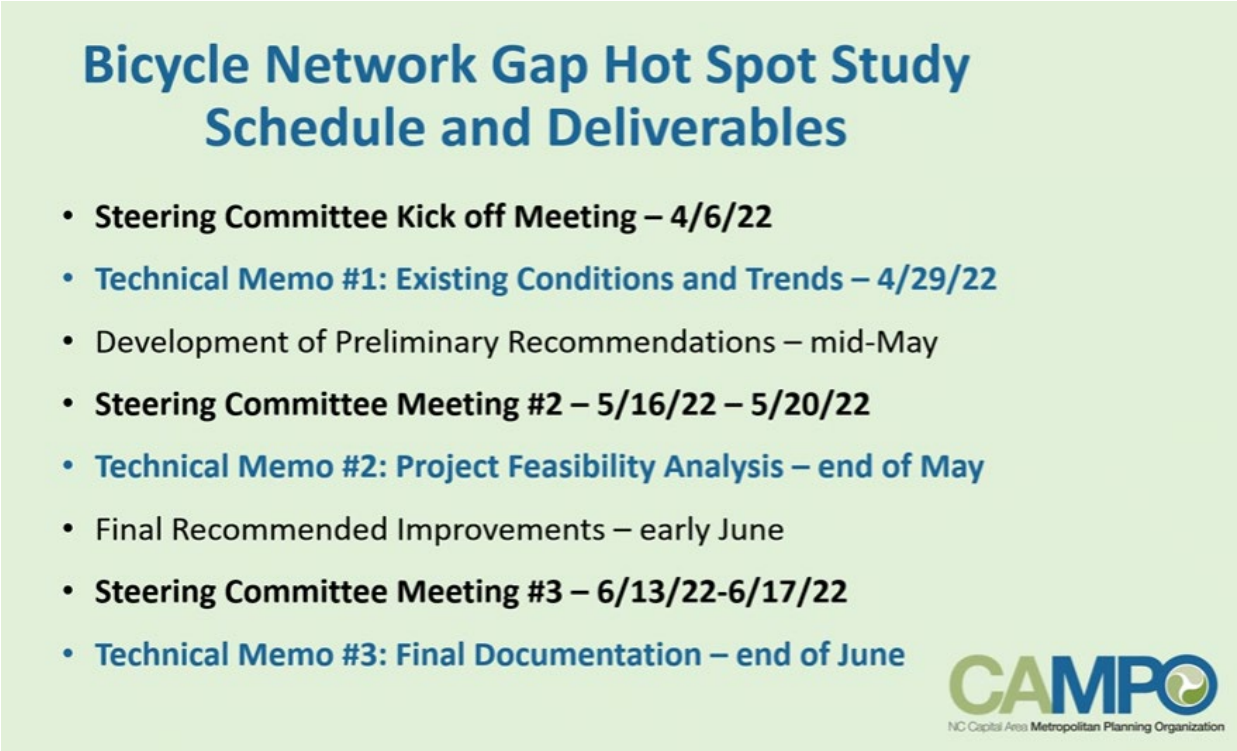
Alex Rickard (CAMPO) opened up the meeting.

- Hot spot studies are short term studies that are technical in nature and result in recommendations that can be implemented in the next couple of years.
- At the end of the study, CAMPO, the City of Raleigh and the Town of Wake Forest should have the foundation and information to start updates for bike/ped plans.
- Additionally, the technical memos will provide opportunities for funding opportunities or other strategies to implement the recommended projects.
- The project will be concluded at the end of June; a detailed schedule is included in these meeting minutes. There will be no public engagement as part of the Hot Spot Study. STV is the selected consultant.

A general project overview and study area map was presented. The general study area is from the Neuse River to US 98. Bike/Ped gaps have been identified. The key issues are how to connect the Richland Creek Greenway over NC 98 and Capital Boulevard.

Project Schedule/Deliverables

Karlynn Kerney (STV) presented the overall project schedule with associated deliverables. Although, tentative, these dates coincide with accelerated schedule and highlight the next two times the Steering Committee are set to meet. The technical memo will have concrete dates with a review period of one (1) week. A doodle pole will be provided for the next two Steering Committee Meetings.



Existing Conditions/Potential Improvement Recommendations Input

The floor was opened to the steering committee for opening remarks and initial recommendations. The City of Raleigh initially requested this study.

Hannah Reckow (City of Raleigh) shared that the City is in the process of concluding a study focusing on the nearby Wakefield area. The Wakefield Study is focused on bike/ped safety as user comfort seemed like the main area of concern by members of the community.

- Recommendations of this study include identification of greenway connections for recreational purposes. Specific recommendations include a multi-use path and sidepath along Falls of Neuse Road and the Richland Creek Greenway, and additionally a potential underpass under the Richland Creek Greenway under Falls of Neuse Road.
- The Wakefield plan also identifies some areas for bike lanes or bikeway designations. There are existing bike lanes on Forest Pines and portions of Common Oaks Drive. The study

recommended connecting Common Oaks and Forest Pines to complete loops in Wakefield Commons and Wakefield Crossing.

- Many of these recommendations are within residential areas; connections from residential areas across major thoroughfares to shopping centers (specifically Wakefield Commons and Wakefield Crossing shopping centers) were recommended. The hope is that these connections will increase connectivity and usability to the larger bicycle and pedestrian network in the area.
- The anticipated date of completion for the Wakefield report is the end of April. Hannah is going to potentially send along any existing conditions and recommendations GIS data from this project.

Dylan Brucchaus (Town of Wake Forest) indicated that there are two large property holdings north of NC 98 that will be developed within 5 years; the hope is that portions of the Richland Creek greenway will be constructed by the developer when the parcels are to be developed. Nonetheless, the connections of the greenway across NC 98 and US 1 (Capital Boulevard) are important as other portions will be developed in the short-term. No major projects are currently funded by the Town.

GIS data availability was discussed. CAMPO provides some data for download, but sidewalk data is not regularly updated. CAMPO requested that the municipalities provide any sidewalk or other data updates to CAMPO to be distributed to the project team. Any other specific data that stakeholders would like incorporated into the mapping for the purposes of this project should be sent and disseminated to STV. PBIN data should be reviewed. NCDOT confirmed the PBIN shows the same greenway network CAMPO depicted.

In terms of recommended facilities, citizens have expressed interest in a sidewalk connection along Old US 98 to connect neighborhoods to the park at the end of the peninsula. Funding is a constraint as the sidewalk would need to be approximately 1 mile long along hilly terrain. Additional constraints include utilities relocation and ROW acquisition. The area is outside the Town of Wake Forest and City of Raleigh limits. Bob Deaton (NCDOT) had run a preliminary cost estimate for this stretch of sidewalk and the result was upwards of $750,000.

There are some potential transit connections to consider in the area. The goal is to provide safe bicycle and pedestrian connections to transit stops, bolstering a flourishing multi-modal transportation network. There is a Wake Forest transit loop that has bus stops at Forest Pine and Wakefield Plantation. And there are currently bike lanes on Forest Pines Drive. Facilities should be investigated in this area.

In terms of STRAVA or StreetLight data, no stakeholders have access to the bicycle/pedestrian data provided by these platforms. The project team will be using publicly accessible STRAVA data for the purposes of this analysis.

The NCDOT can provide origin/destination vehicular data if that is needed. Field visit for existing conditions will take place shortly; there is an open invitation for any stakeholders to attend the field visit.

Action Items:

- CAMPO/Municipalities will coordinate on GIS data and disseminate
- STV will send out Doodle poll for next Steering Committee meeting
- STV will schedule upcoming field visit
- STV will provide a SharePoint site for this project

Bicycle Network Gap Hot Spot Study Steering Committee Meeting
Meeting Summary
May 25, 2022
1:00 PM
Attendees:

Alex Rickard	CAMPO Deputy Director	Alex.rickard@campo-nc.us
Daniel Spruill	CAMPO Engineering Technician	daniel.spruill@campo-nc.us
Brandon Watson	CAMPO Transportation Planner	brandon.watson@campo-nc.us
Hannah Reckhow	City of Raleigh Senior Planner	hannah.reckhow@raleighnc.gov
Fontaine Burruss	City of Raleigh Bike and Pedestrian Program Manager	fontaine.burruss@raleighnc.gov
Dylan Bruchhaus	Town of Wake Forest Long Range Transportation Planner	dbruchhaus@wakeforestnc.gov
Joshua Michael	Town of Wake Forest Long Range Transportation Planner	jmichael@wakeforestnc.gov
Robert Deaton	NCDOT Division 5 Corridor Engineer	rdeaton@ncdot.gov
Nicholas Morrison	NCDOT Division 5	nemorrison@ncdot.gov
Karlynn Kerney	STV Project Manager	karlynn.kerney@stvinc.com
Patrick Livingston	STV Roadway Lead	patrick.livingston@stvinc.com
Elizabeth Oliver	STV Planner	Elizabeth.oliver@stvinc.com
Katie Curry	STV Planner	Kathryn.curry@stvinc.com
Anne Lenart-Redmond	STV Planning Lead	Anne.Lenart-Redmond@stvinc.com
Doug Moore	STV Roadway	Doug.moore@stvinc.com

Existing Conditions Overview

The existing conditions memo has been completed. Comments are being accepted until the end of this week. The memo covered human and natural environment, local plans and policies, existing bike and pedestrian network and facilities, roadway conditions, existing network gaps, and STRAVA data.

The 3 key gaps are generally discussed:

- **Northern Gap:** 0.4 mile stretch between NC 98 and Garden Hill Drive. North and south of the gap is an existing multi-use path. There are no existing crosswalks at the intersection of NC 98 at Old Falls of Neuse Road/Durham Road. There are no crosswalks serving the ramps at Garden Hill Drive.
- **Southern Gap:** 1.3 mile stretch between Wakefield Pines Drive and Falls of Neuse Road. North and south of the gap is a multi-use path that continues as a sidewalk. The sidewalk dead-ends 500 feet south of the southern driveway of Wakefield High School. The bridge over the Neuse River includes a bike/ped section.
- **Richland Creek Connection:** Aims to connect the town of Youngsville in Franklin County. The Town of Wake Forest Comprehensive Plan proposes a greenway running north/parallel to the Neuse River.

Preliminary Concepts

An overview of the preliminary concepts were presented and discussed by the roadway team. For each location, there are 2 concepts for each. Each location presents a shoulder typical section and a curb and gutter typical section. In general for all locations, the shoulder section will have higher ROW costs but lower construction costs; the curb and gutter option will have lower ROW costs but higher construction costs. Aggregate cost estimates are not available at this time.

- Northern Gap: the curb and gutter option reduces ROW needs by 24-30 feet. Signals at the US 98 crossing will need to be timed longer to allow for bicycle/pedestrian crossing of this roadway.
- Southern Gap: the existing bridge over the Neuse River would need to be widened to accommodate bicycle/pedestrian amenities. Pedestrian path from Falls Lake Dam Road towards Fonville road: looking into ADA accessibility; the existing path is a gravel path and has some moderate elevation changes. It is currently not ADA compliant.
- Elevation in this area was discussed. The project team will look at whether a switchback in this area will be required due to the grade.
- Moving the crosswalk towards Wakefield High School was discussed. This would allow for more complete of a network along the corridor to carry the sidewalk on the east side further down the roadway. The grade/elevation change in this area would require more infill/reinforcement as the area surrounding the Wakefield Glen Apartments is very steep. The shoulder section in this location would allow for better transition to development. The pedestrian trail would be on its own alignment and be lower in elevation than the road.
- Richland Creek Connection:
- different alignments due to the Duke Transmission easement
- One option utilizes the transmission easement as the bike/ped facility could potentially be there but Duke would have to allow it; we do not know if that would be allowed. Starts at forest pines, crosses US 1 with a pedestrian bridge (limits impacts to traffic operations along US 1); includes a 10 ft multi use path under NC 98.
- The second option ties in at Forest Pines Drive; gets closer to the apartment complex; bridge crossing is not quite as wide; perpendicular to the Duke easement and moves under NC 98. The wider median would allow for bent span widths. It is possible that switchbacks will be needed to get up/down/over US 1.
- It may be beneficial to put a pat under US 1 as the culvert at Richland Creek is large. The Reedy Creek Trail is probably larger than this. The new connection would be smaller in size and have fewer spans. Comparison to the Hinshaw Greenway was discussed. The greenway goes over 8 lanes of US 1. Dylan from the Town of Wake Forest inquired as to whether the team can show an extension to Bluebird Lane to tie into Caviness Farms—the team is going to look into it.
- Crossing treatments at specific locations were discussed. Specifically, a preference between HAWK vs. RRFB were discussed. RFB would be preferred at Western Boulevard from a cost perspective and not wanting to completely stop traffic along this roadway. The road width

factors into the possibility of a HAWK; since the location is near a school, these are more effective at completely stopping traffic; HAWK would make sense in this location. ADA requirements for a crossing at a school need to be investigated. Coordination with the school will also need to occur as HAWK signalization may interfere with busses 2 times per day.

Questions

- Alex: can we note the STRAVA line (thicker, brighter lines) are the most heavily utilized areas since there is no map symbology in the existing conditions memo?
- What are the decision points for the group today?
  - Preferences in typicals
  - Any additional areas the group wants the engineers to look at more closely?
  - What else we need to consider especially if we need to look at ped/bike facilities along NC 98?

Next Steps:

- **Stakeholders will provide feedback on existing conditions memo by the end of this week.**
- **Check US 1 crossing to allow for widening of US 1 (U-5309???) Adding one additional lane in each direction. Brandon will sent plans in meeting. -**
- **STV will further investigate issues regarding elevation/grade in aforementioned areas.**
- **STV will develop an additional Transit Map**
- **STV will note in the existing conditions memo that in regards to the STRAVA data, the thickest/brightest lines are the heaviest use areas as there is no legend for map symbology**

Bicycle Network Gap Hot Spot Study Steering Committee Meeting
Meeting Summary
June 15, 2022
10:00 AM
Attendees:

Alex Rickard	CAMPO	Alex.rickard@campo-nc.us
Daniel Spruill	CAMPO	daniel.spruill@campo-nc.us
Brandon Watson	CAMPO	brandon.watson@campo-nc.us
Shelby Powell	CAMPO	Shelby.powell@campo-nc.us
Hannah Reckhow	City of Raleigh	hannah.reckhow@raleighnc.gov
Dylan Bruchhaus	Town of Wake Forest	dbruchhaus@wakeforestnc.gov
Robert Deaton	NCDOT	rdeaton@ncdot.gov
Nicholas Morrison	NCDOT	nemorrison@ncdot.gov
Karlynn Kerney	STV	karlynn.kerney@stvinc.com
Griffin Frank	STV	Griffin.frank@stvinc.com
Elizabeth Oliver	STV	Elizabeth.oliver@stvinc.com
Katie Curry	STV	Kathryn.curry@stvinc.com
Anne Lenart-Redmond	STV	Anne.Lenart-Redmond@stvinc.com
Weston Murphy	STV	Weston.murphy@stvinc.com
Doug Moore	STV	Doug.moore@stvinc.com

Meeting Notes:
The meeting begins with an overview of the criteria that were used during the Feasibility Screening of the concepts evaluated during this phase of the project. The feasibility screening included evaluating concepts based on:

- Mobility and Safety (i.e. grade differences)
- Right-of-Way Footprint
- Environmental Impacts
- Constructability
- Construction Costs

The NCDOT Bike/Ped Cost Estimation tool was used to determine some of these criteria. A brief overview of the NCDOT Bike/Ped Cost Estimation tool was provided for those who were unfamiliar. The tool is used by NCDOT and NCDOT partners for SPOT programming of projects. It captures a wide scope of factors that go into project cost including ROW, structures, utilities, and work zone traffic control. It is noted by NCDOT that updates to the tool are coming as there have been some underestimations in terms of ROW costs factored into the tool. The tool uses 2019 dollars.

Feasibility of the northern gap concepts, southern gap concepts, and Richland Creek Connector were provided.

Northern Gap:

- There are two concepts presented for the northern gap: Concept 1 includes a shoulder section and Concept 2 includes a curb & gutter section. In terms of mobility and safety, both concepts provide separation from vehicular traffic, provide a 10-foot wide shared-use path for two-way users, and provide a crosswalk at NC 98 as a protected pedestrian crossing. Neither concept impact streams or wetlands. Cost estimates for Concept 1 are $1.7 million, while costs for Concept 2 are $1.8 million.
- The biggest difference between Concept 1 and Concept 2 is the ROW acquisition needed for each. Concept 1 requires 1.10 acres of ROW, while Concept 2 requires 0.12 acres of ROW acquisition.
- In terms of constructability, Northern Gap Concept 1 will not disrupt existing traffic. Concept 2 will have more disruption to traffic and some lane closures due to the curb & gutter construction.

Southern Gap:

- A few tweaks to the Concepts were presented. The shared-use path was extended to Wakefield Pines Drive. Additional field work was done to observe the bus area during drop-off and pickup times. People were using the existing crossing at Old Falls of Neuse Road; the existing crossing at Old Falls of Neuse Road will be used. Queueing was observed at the bus area; if a crossing were to be implemented in this location, it would likely create more conflicts in this location.
- There are two concepts presented for the northern gap: Concept 1 includes a shoulder section and Concept 2 includes a curb & gutter section. In terms of mobility and safety, both concepts provide separation from vehicular traffic, provide a 10-foot wide shared-use path for two-way users. There are spurs to the Nuese River Trail and to the top of Falls Lake Dam. This design uses existing crossings on Old Falls of Neuse Road and Wakefield Pines Drive. No impacts to wetlands or streams are anticipated. Concept 1 is estimated to cost $5.4 million whereas Concept 2 is estimated to cost $5.8 million.
- Concept 1 will require 3.2 acres of ROW; Concept 2 will require 1.5 acres. In terms of constructability, Concept 1 retains the existing paved shoulder and construction takes place mostly outside clear zone of the roadway. There will be minimal disruptions to traffic with the implementation of Concept 1. For Concept 2, construction will be required along the existing edge of travel. There will be various shoulder and lane closures and temporary lane shifts throughout construction. Specifically for the Southern Gap Concepts 1 & 2 bridge widening, construction takes place outside of the existing barrier. There will be minimal disruption to vehicular traffic. A Dam permit may be required for this construction.

Richland Creek Connection:

- For the Richland Creek Connection, two concepts are proposed to provide a connection to the future Wake Forest Greenway: Concept 1 involves a tunnel under US 1 and Concept 2 involves a bridge over US 1.

- Both are designed as 10-foot wide shared-use paths for two-way users. There is a connection to Forest Pines Drives existing buffered bike lanes. Concept 1 has lower impact grade changes, whereas Concept 2 has higher grade changes. Streams and wetland impacts are present for both Concepts 1 & 2, but the bridge concept has more impacts to both. Concept 1 requires 3.9 acres of ROW; Concept 2 requires 6 acres of ROW. Costs for both Concepts are around $5.2 million.
- The tunnel concept would need to tie into U-5307C (Capital Blvd (US 1) upgrades).

Implementation of Richland Creek Connection:

- It would be difficult to implement a tunnel option following the completion of U-5307C. The construction of the bridge concept would have greater flexibility. If the project were going to be independent of U-5307C, grant funding is an option. However, while the project is mentioned in both the Wake Forest CTP and the BikeRaleigh plan, it is not a high-priority project. In order to be competitive for grant funding, the project would need to move up in terms of prioritization. Coordination with the Town of Wake Forest and the City of Raleigh would be required.
- In terms of grant funding, opportunities exist through Federal Highways Flex Funding for projects that enhance access to transit. Since US 1 is a future BRT corridor, there is potential to explore this funding source. Local matches would still be required.
- There was a question as to whether the tunnel option would flood. Hydraulics has not been considered at this stage. Further consideration and study need to occur regarding utilities, refined cost estimates, hydraulics, et cetera. ROW may end up being a bigger constraint in the future due to cost because of continued development of the area. Concerns were expressed with the length of the tunnel and the need for lighting and aesthetics of a tunnel in this area. It was determined that the bridge would be preferred from a safety and aesthetic perspective.
- Coordination with NCDOT would need to take place to see if the tunnel concept could be rolled into U-5307C, if it is the preferred concept. While ROW is set to take place in October 2024 and LET occurs in October 2026, both representatives from CAMPO and NCDOT believe this timeline will be delayed. NCDOT stated that projects may be done differently in the future and be done in pieces as opposed to entire corridors at a time.

The Town of Wake Forest nor The City of Raleigh expressed preference in one concept over the other for any of the segments. It was determined that the shoulder section (Concept 1) is preferred for both the Northern and Southern Gaps; the bridge concept is preferred for the Richland Creek Connection.

Next Steps:

- Final Deliverables Review
  - Tech Memo #2 – Feasibility Analysis
  - Tech Memo #3 – Impact Analysis
  - Richland Creek Connection Implementation Plan
- Project Completion – July 2022

CAMPO
NC Capital Area Metropolitan Planning Organization

APPENDIX B

NCDOT Bike/Pedestrian Conceptual Cost Estimate Tool

NCDOT developed this tool for use on conceptual level cost estimates on bike and pedestrian projects. More detailed information would come from an engineered study. Structural and traffic control work can be exceedingly complicated, and the cost estimate tool provides only a rough estimate for these significant costs. We provided a few adjustments to the tool output to account for some costs that aren't captured by the tool.

On concepts that are principally curb and gutter options we multiplied the cost output by 1.10 to account for the curb and gutter and increased traffic control for its construction. On both southern concepts $125,000 has been added for potentially needed retaining walls in front of The Bike Guy's shop. On Richland concept 1, $100,000 has been added for lighting the pedestrian tunnel.

The cost estimate provides 2019 level prices and after the aforementioned adjustments the resultant cost was multiplied by a inflation factor of 1.13 for 2022 estimates.

Here is the link to the tool.

Here is a link to a terminology table explaining the different facility types the tool provides estimates for.

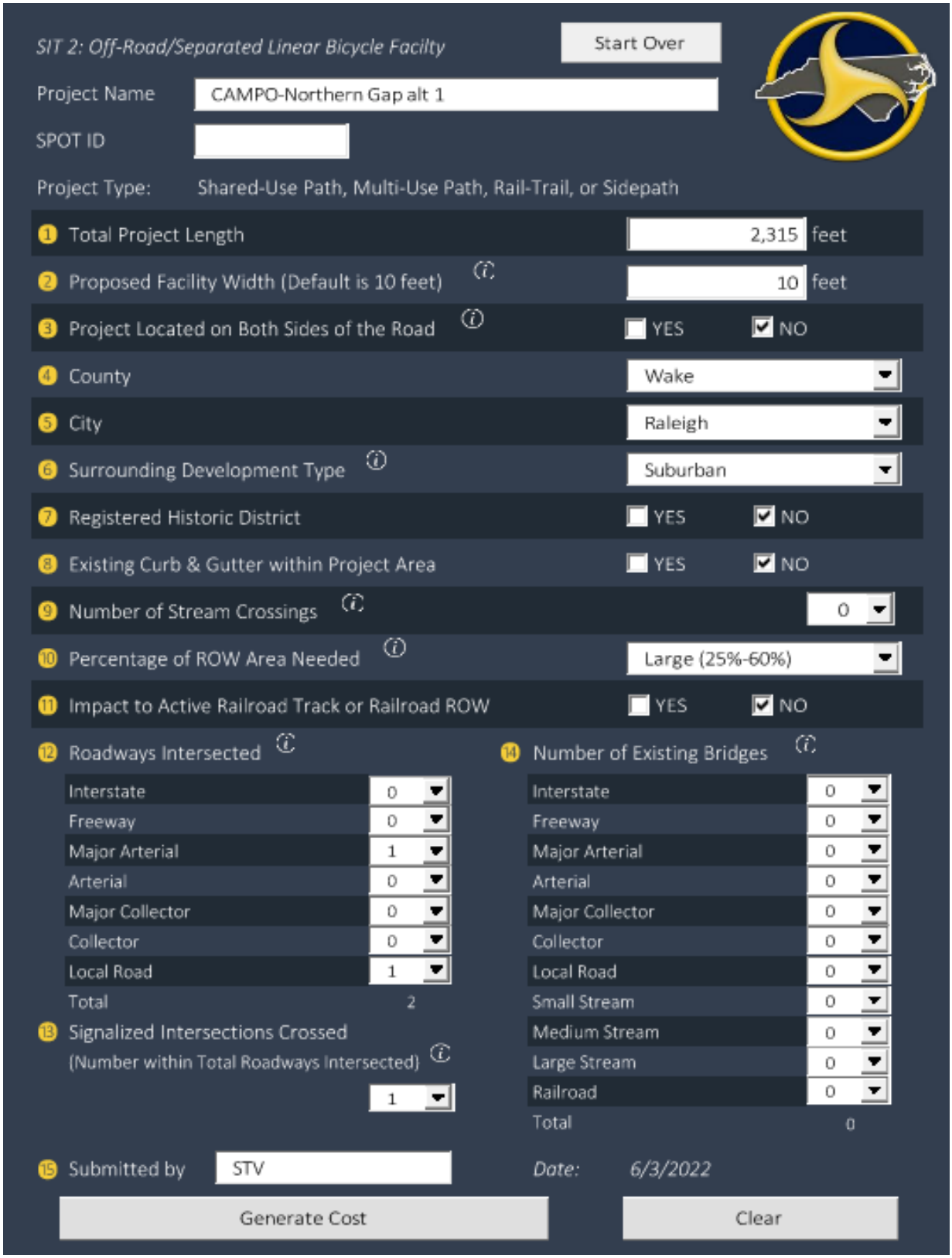
Note: The Southern Gap Concepts Cost Estimates were divided into two and combined in total costs.

1 For the separated bike path connecting the trail to the top of the dam and to the Neuse River trail
2 For the multi-use path along Old Falls of Neuse Road.

Summary of Estimated Costs

Concepts	Estimated Costs 2022
Northern Gap Concept 1 (shoulder section)	$1.7 million
Northern Gap Concept 2 (curb and gutter)	$1.8 million
Southern Gap Concept 1 (shoulder section)	$5.65 million
Southern Gap Concept 2 (curb and gutter)	$6.0 million
Richland Creek Connection Concept 1 (Tunnel)	$5.3 million
Richland Creek Connection Concept 2 (Bridge)	$5.25 million

Northern Gap Concept 1 (Shoulder Section) – Cost Estimate Inputs

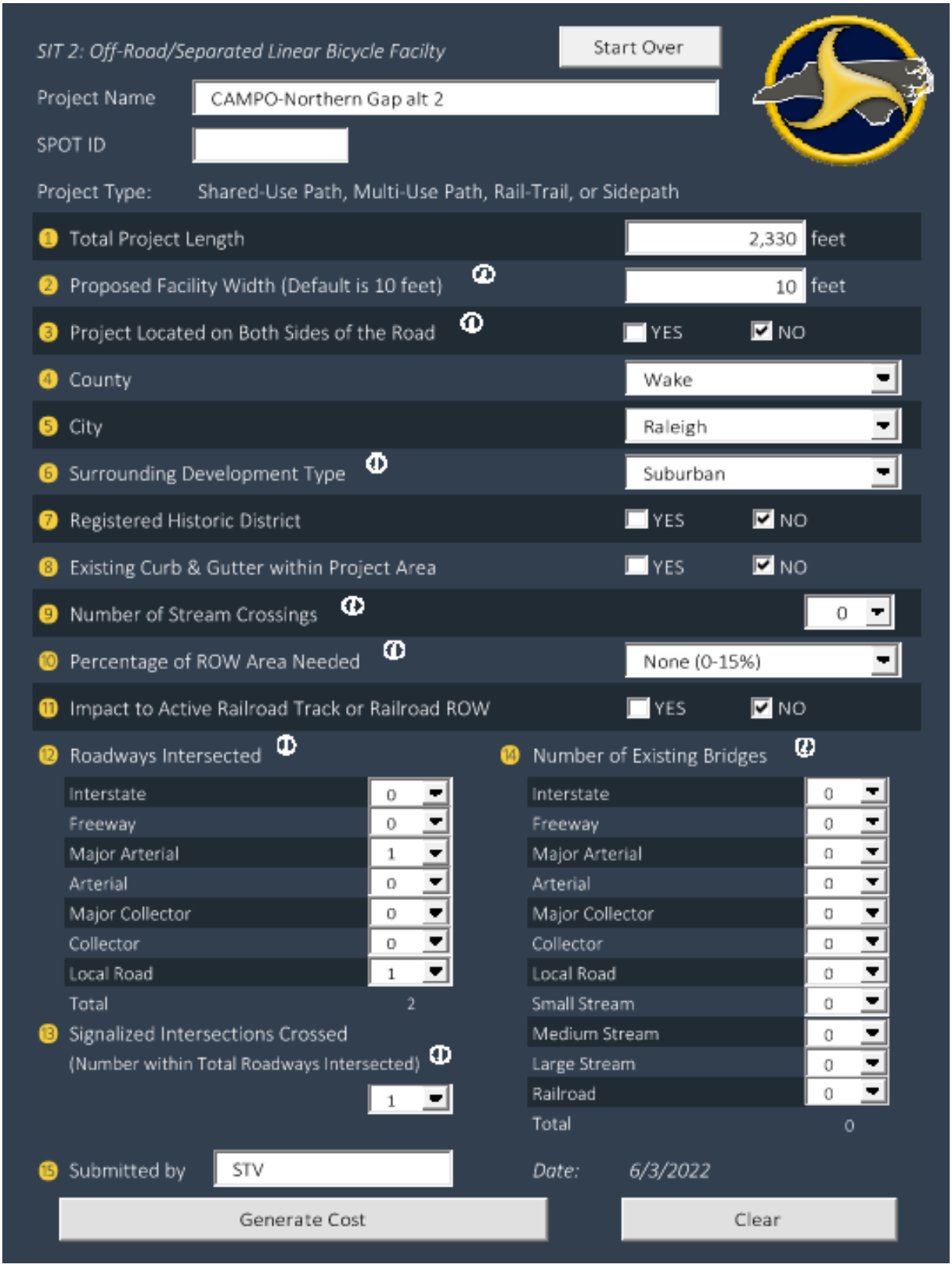


Northern Gap Concept 1 Cost Estimate Summary Output

Cost Estimate Summary		
Total	**$**	**1,465,000**
Design	$	230,000
ROW	$	85,000
Utilities	$	40,000
Construction	$	1,110,000

Northern Gap Concept 1: $1,4650,000*1.13 ~= **$1.7 million**

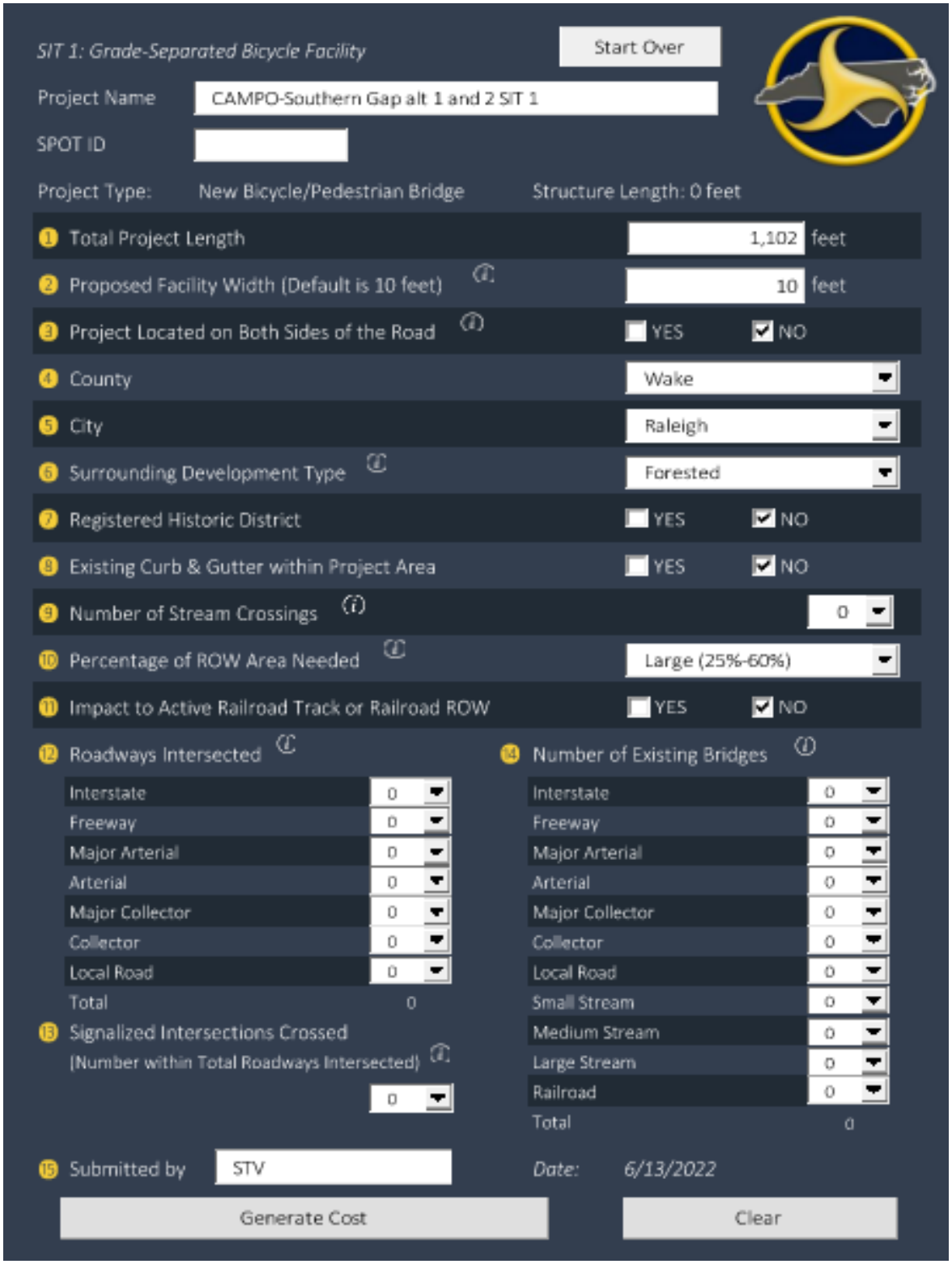
Northern Gap Concept 2 (Curb & Gutter Section) – Cost Estimate Inputs



Cost Estimate Summary		
Total	**$**	**1,405,000**
Design	$	230,000
ROW	$	20,000
Utilities	$	40,000
Construction	$	1,115,000

Northern Gap Concept 2: ($1,405,000 x 1.10) x 1.13 ~= **$1.8 million**

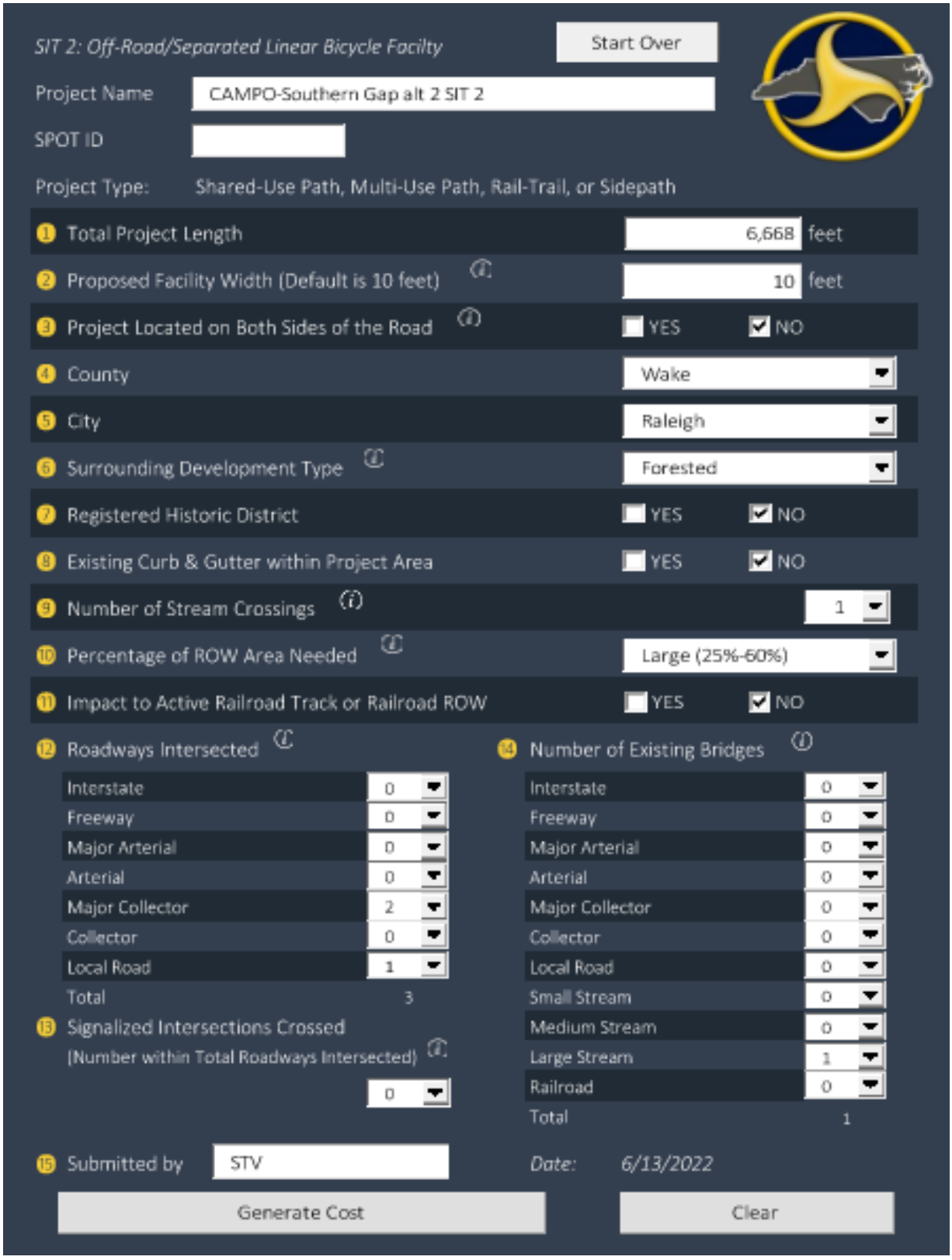
Southern Gap Concepts 1&2 (Dam Connection and Neuse River Greenway Connection) – Cost Estimate Inputs



Cost Estimate Summary

Total		**570,000**
Design	$	105,000
ROW	$	40,000
Utilities	$	20,000
Construction	$	405,000

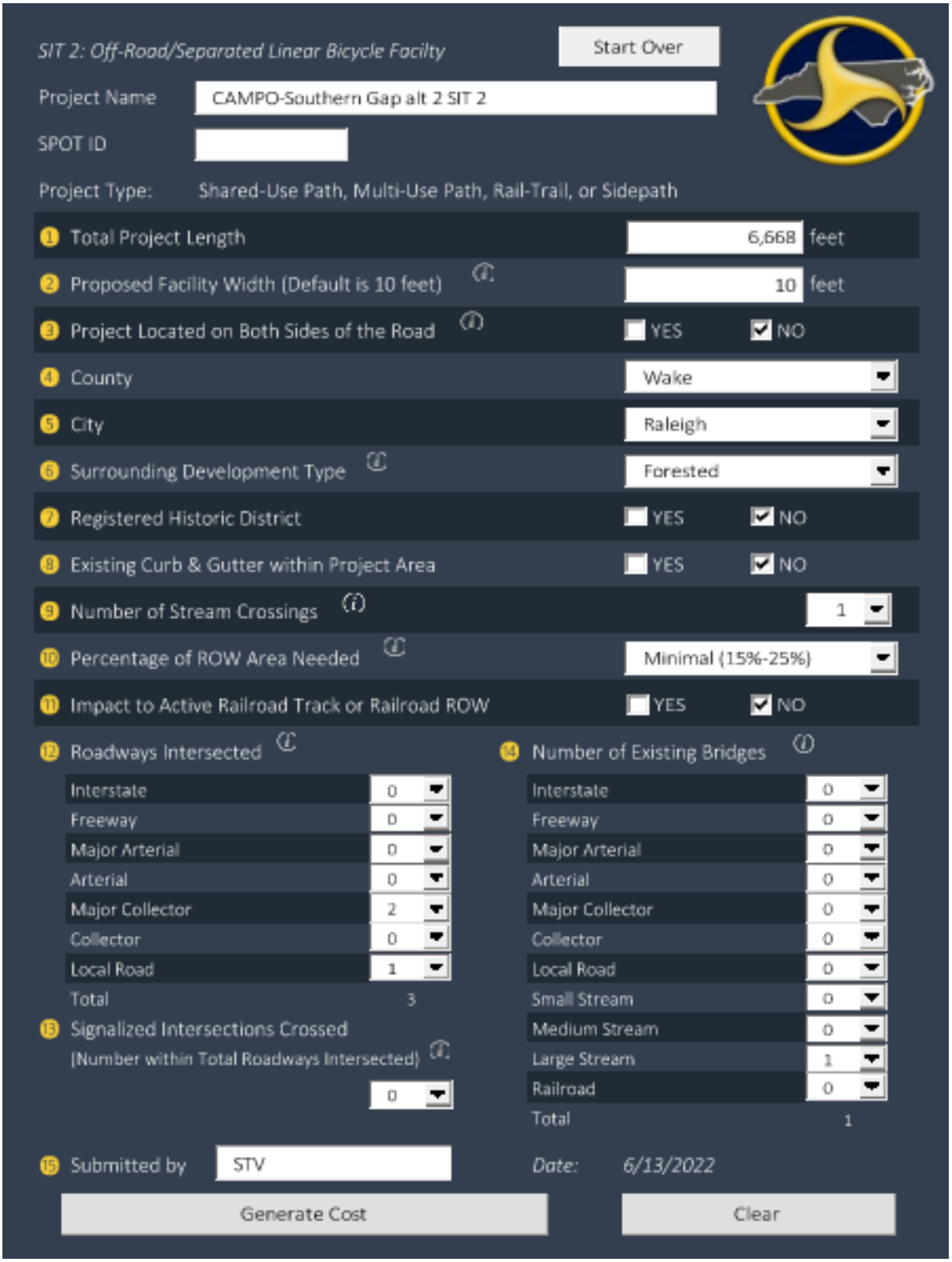
Southern Gap Concept 1 (Shoulder Section) – Cost Estimate Inputs



Cost Estimate Summary		
Total	**$**	**4,270,000**
Design	$	535,000
ROW	$	240,000
Utilities	$	115,000
Construction	$	3,380,000

Southern Gap Concept 1: ($570,000 + $4,270,000+125,000) x 1.13 ~= **$5.65 million**

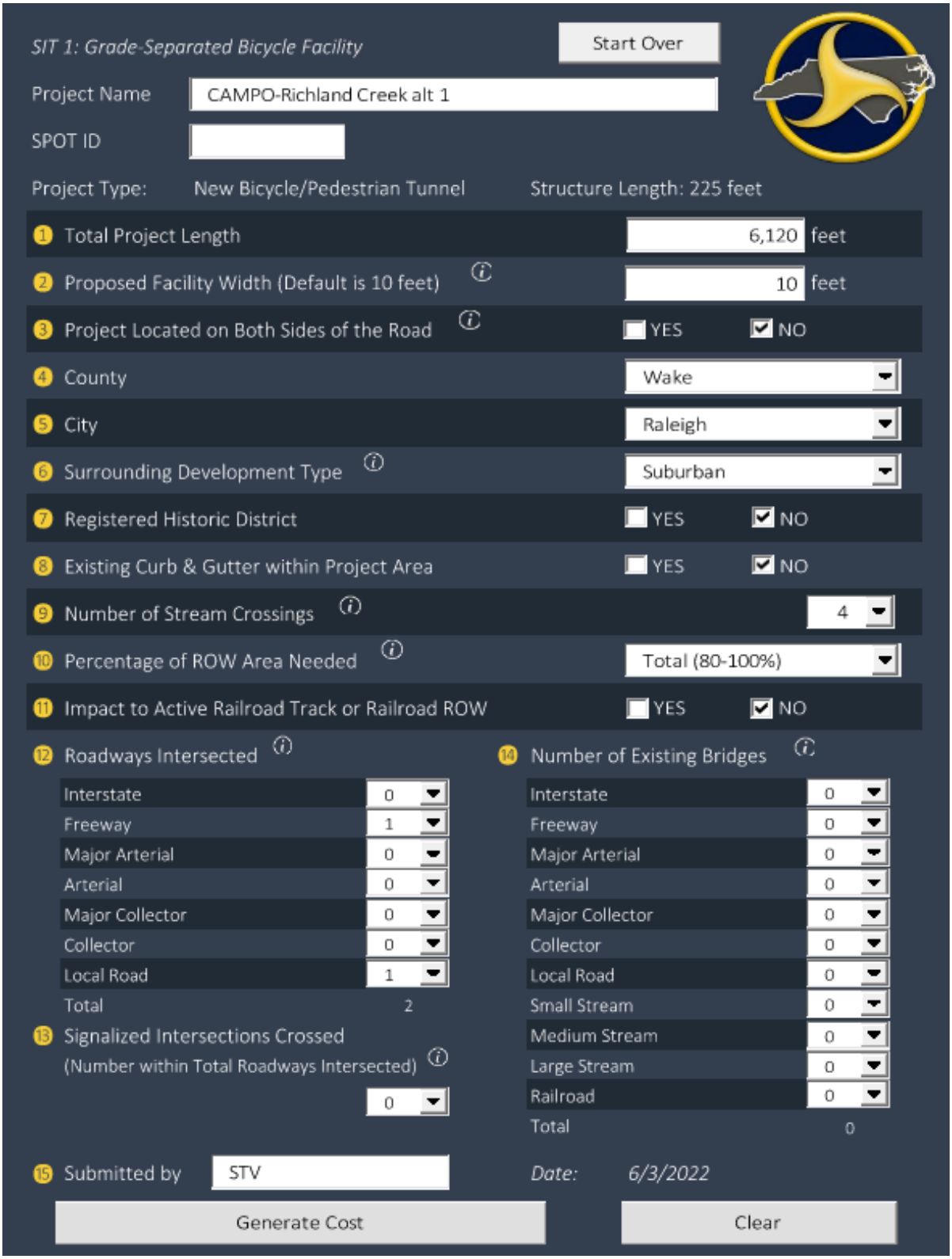
Southern Gap Concept 2 (Curb & Gutter Section) – Cost Estimate Inputs



Cost Estimate Summary		
Total	**$**	**4,130,000**
Design	$	535,000
ROW	$	100,000
Utilities	$	115,000
Construction	$	3,380,000

Southern Gap Concept 2: ($570,000 + ($4,130,000 x 1.10)+125,000) x 1.13 ~= **$6.0 million**

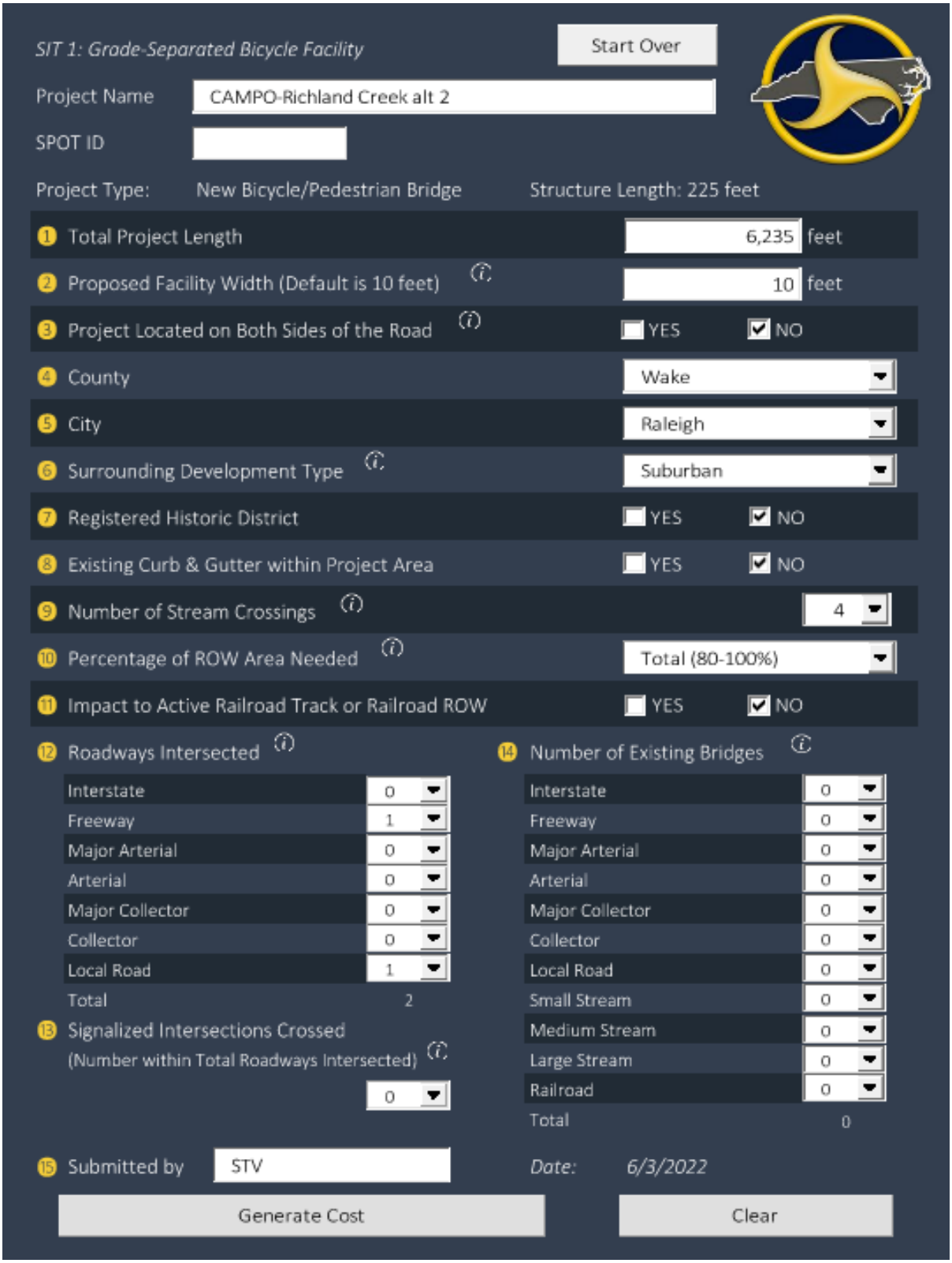
Richland Creek Connection Concept 1 (Tunnel) – Cost Estimate Inputs



Cost Estimate Summary		
Total	**$**	**4,565,000**
Design	$	675,000
ROW	$	370,000
Utilities	$	105,000
Construction	$	3,415,000

Richland Creek Connection Concept 1: ($4,565,000+$100,000) x 1.13 ~= **$5.3 million**

Richland Creek Connection Concept 2 (Bridge)



Cost Estimate Summary

Total	**$**	**4,600,000**
Design	$	680,000
ROW	$	375,000
Utilities	$	110,000
Construction	$	3,435,000

Richland Creek Connection Concept 2: $4,6000,000 x 1.13 ~= **$5.25 million**