Planning Report

16th Street Streetscape

Applied Innovation Corridor's North End

Charlotte, North Carolina

May 2018

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1 Executive Summary

1.1 Project Overview

The 16th Street Streetscape (Project) was identified as a prioritized project through advanced planning efforts for the Applied Innovation Corridor's (AIC) North End. The potential improvements identified for the Project in the advance planning were to utilize the existing two-lane roadway section and incorporate bicycle, pedestrian, and aesthetic improvements with project limits extending along 16th Street from N. Tryon Street to Parkwood Avenue. The Project, along with other City of Charlotte (City) project improvements in the area, will provide direct connections to the Blue Line Extension (BLE) stations, provide multi-modal transportation choices, and compliment other private and public investments in the area.

The existing road consists of two 15.5-foot lanes with curb and gutter. There are some small portions along the road where sidewalks exist. The posted speed is 35 mph. It crosses Norfolk Southern (NS) tracks and CATS' BLE. Details pertaining to the existing conditions, gaps, and deficiencies are provided in the USDG Abbreviated Six-Step Summary provided in Appendix D and maps provided in Appendix E.

There are a number of additional City projects and private development that are planned and progressing within the vicinity of the Project, to include CATS BLE, Cross Charlotte Trail (XCLT), Parkwood Avenue Streetscape, Charlotte Water Sewer Design-Build Project, City's Storm Water drainage improvement project, and a private mixed-use redevelopment, Thompkins Hall, formerly known as Highland Park Mill. As the design progresses for the Project, coordination with each of these projects will need to occur.

1.2 Investigations and Analyses

A number of investigations and analyses have been conducted pertaining to the Project pertaining to historic and cultural resources, natural resources, potentially contaminated sites, capacity analysis, and utility investigation.

Two historic properties were identified, Standard Trucking Company Terminals (DOE; MK3078) and Highland Park Manufacturing Company Mill No. 1 (MK1847). A map locating these historic properties is provided in Appendix A. Initial coordination with the NC State Historic Preservation Office (NCSHPO) has occurred and they have requested that detailed plans be provided to determine the effect of the project to the historic properties. The Project improvements should consider maintaining the historic nature of the area and construction should avoid impacts to historic features.

No jurisdictional features or Special Flood Hazard Areas (SFHA) were identified within the Project limits. A list of federally protected species for Mecklenburg County that could potentially occur within the Project area are provided in Table 1 within Section 3.2.4 on Page 8. It was determined that no suitable habitat exists for any of these species within the Project's study area and no additional surveys are recommended. Impacts to the federally protected species are not anticipated to occur from proposed Project related activities.

A Phase I Environmental Site Assessment (ESA) was completed for the Project. The ESA identified two Recognized Environmental Conditions (REC) and a Controlled REC (CREC) for the U-Haul Rental Center, located at 1224 N. Tryon Street, associated with Leaking Underground Storage Tank (LUST) and Leaking Above Ground Storage Tank (LAST) incidents. The ESA identified 3 Brownfield properties in the vicinity of the Project, but did not consider any of these brownfield properties to be RECs. It also identified that a former business located on the site where Consolidated Pipe & Supply Company is currently located at 201 16th Street previously operated as a Resource Conservative and Recovery Act (RCRA) generator of hazardous waste prior to 1984 and no RCRA violations were documented. The Phase I ESA does not consider this to be a REC. A map from the Phase I ESA showing the locations of each of these sites is provided in Appendix B.

The ESA does identify the long-term industrial use of the adjacent properties along 16th Street to be considered an REC. Although RECs are identified, the Phase I ESA indicates that the soil impacts from the Project do not appear to encroach onto the 16th Street right-of-way (ROW), the depth to groundwater ranges from 10 to 20 feet below ground surface, and it is not expected that roadway and utility improvements associated with the Project will encounter impacted soils or groundwater during construction activities.

A capacity analysis was performed for the intersection of 16th Street and N. Tryon Street. The analysis evaluated current traffic operations/Level of Services (LOS) for Year 2016 and future operational LOS for the proposed Build scenario for motor vehicular traffic for Years 2020 and 2040. Multimodal operations/LOS for bicyclists and pedestrians were also evaluated for the intersections. Figures indicating the AM and PM LOS for the existing and future years are provided in Appendix C. The LOS for all approaches and the intersection were determined to operate at an acceptable LOS for the future Build scenario with the maximum intersection volume to capacity (v/c) ratio to be 0.74 in Year 2040. The maximum queue length for the 16th Street was 159 feet for the PM westbound right-turn movement in Year 2040. The results of the multimodal LOS are provided in Table 2 in Section 3.4.2 on Page 11.

A geotechnical investigation for the Project has been conducted. The findings from the investigation, as well as recommendations for the roadway construction, pavement structure, and retaining walls will be provided in a detailed report. It is anticipated that a retaining wall will be needed along the U-Haul property and a wall could be possibly needed to limit cut in the most northwestern property and tie into the wing wall for the NS bridge.

A Utility Impact Assessment was completed and the utilities identified from this assessment are listed in Section 3.6 on Page 11.

1.3 Community Engagement

A public workshop was held on May 23, 2017 with an online meeting that was available to the public from May 23, 2017 to June 12, 2017. The Project team presented information on the Project, including the preferred cross-section, and asked for feedback. The feedback received was positive and in support of the preferred cross-section presented. The comments were categorized into themes provided in Figure 1 on Page 13.

1.4 USDG Six-Step Process

An Abbreviated Six-Step Process was followed to select a preferred cross-section for the Project improvements. The Six-Step Summary is provided in Appendix D, maps identifying the gaps and deficiencies are provided in Appendix E, the optional cross-sections that were evaluated are provided in Appendix F, and the final preferred cross-section is provided in Figure 2 on Page 17.

Three optional cross-sections were evaluated; Option 1A with a two-way cycle track located along the north side, Option 1B with a two-way cycle track located along the south side, and Option 2 with five feet bicycle lanes along both sides. All three options accounted for 11-foot travel lanes and six-foot sidewalks with varying widths for each option for the planting strips. Option 2 was determined to be the preferred cross-section with reducing the travel lanes to 10.5 feet in order that 5-foot bicycle lanes can be implemented utilizing the existing pavement width of 31 feet without widening. The preferred cross-section also includes six-foot sidewalks with eight-foot planting strips along both sides.

1.5 Design Considerations

Design criteria was generated and is provided in Appendix G. A conceptual design was developed and is provided in Figure 3 on page 19. Constraints along the U-Haul site and the area along the north side where the existing embankment and wing wall from the NS bridge will need to be considered in the design and retaining walls will likely be needed in these areas. Transitions from the bicycle lanes from 16th Street at the N. Tryon Street intersection and the MUP for the Parkwood Avenue Streetscape will need to be considered. In addition, the Project's design will need to be coordinated with Charlotte Water's sewer upgrade Design-Build project, the City's Storm Water project, and the redevelopment of Thompkins Hall.

The Project will be subject to Charlotte-Mecklenburg's Storm Water Post-Construction Storm Water Ordinance (PCSO) if the disturbed area is more than one acre and the built upon area (BUA) is more than 20,000 square feet within the proposed ROW/permanent easements. Based on the conceptual design of the Project, the disturbed area is less than one acre and the BUA is less than 20,000 square feet; therefore, the Project will likely be exempt from PCSO. If PCSO is required, the Project is located in a Transit Station Area and Distressed Business District and the PCSO parameters required are provided in Section 6.2 and in Appendix H.

An Erosion and Sediment Control Certificate of Approval from NC Division of Energy, Mineral and Land Resources will be required if the land disturbing activities exceed one acre. No other permits are anticipated.

A cost estimate has been generated for the Project and is provided in Appendix I. The cost estimate was prepared as a range from low, most likely, and high as follows:

- Low - $3.36 million
- Most Likely - $4.32 million
- High - $5.94 million

2 Project Overview

The AIC North End is an area identified within the City's FY2014 – FY2018 Community Investment Plan (CIP) to fulfill the emphasis on investing in corridors and promoting job growth through infrastructure investment. Advanced planning was conducted to identify and prioritize infrastructure projects within the AIC's North End to be funded through the CIP's allocated 2014, 2016, and 2018 bonds. This process entailed reviewing previous planning efforts, conducting a market analysis, and engaging with the community. The result of these efforts was a list of eight prioritized projects within the AIC's North End to fulfill the CIP goals. The Project was the fourth priority of the prioritized projects.

The potential Project improvements identified in the advanced planning were to utilize the existing two-lane roadway section and incorporate bicycle, pedestrian, and aesthetic improvements that could include street trees, landscaping, lighting, etc. The proposed Project limits are from N. Tryon Street to Parkwood Avenue. The benefits identified from these potential improvements were:

- Provides connection to the BLE stations.
- Provides transportation choices for cycling and walking, specifically with this being only one of two facilities crossing the NS rail yard and BLE. The other roadway within the North End that crosses the rail yard is Matheson Avenue.
- Complements other public investments in the area, such as:
    - BLE, XCLT, North Tryon Street Business Corridor Improvements, and Northeast Corridor Infrastructure Program (NECI).
- Provides potential leverage for public/private partnership - market analysis identified area in vicinity as strong potential for development.

The Project has progressed into planning to determine the final improvements to be implemented. This report summarizes the planning process and provides the recommendations of these final improvements to progress into design and construction.

2.1 Previous Planning Documents

A number of planning efforts, from both private and public entities, have been prepared that establish goals for the North End. The current vision of the AIC's North End is attributed most to two recent planning documents:

- *The North Tryon Area Plan* – Adopted by City Council May 2010
- *Center City 2020 Vision Plan* – Adopted by City Council September 2011

In addition, in April/May of 2014, an Advisory Services Panel within the Urban Land Institute (ULI) conducted a study focused on the feasibility of the AIC, specific to the North End.

The AIC was initially defined in the *Center City 2020 Vision Plan*. The plan was developed by the City, Mecklenburg County, and Charlotte Center City Partners. It is a strategic plan that provides a big picture framework and unifying vision for Center City growth and development.

The plan provides recommendations for Transformative Strategies and Focus Areas. The AIC was identified as a Transformative Strategy.

The *North Tryon Area Plan* identifies North Tryon Street north from Center City as a key area for growth within the City and Mecklenburg County. The plan area extends along North Tryon Street from I-277 to Sugar Creek Road. The purpose of the plan was to establish a vision for the area and provide recommendations to guide future growth and development. The *North Tryon Area Plan* identified improvements to the streetscape of 16th Street "by providing curb and gutter, a planting strip, street trees, sidewalks, and bike lanes" as an implementation strategy.

The ULI's Advisory Services Panel was requested to focus on the feasibility of the innovation aspect within the North End of the AIC that could be a catalyst for new land uses and neighborhood revitalization. The panel was also asked to identify supporting uses and development to accomplish the vision of the AIC established by the *Center City 2020 Vision Plan*. The Project was not specifically identified or discussed within the ULI's findings, but there was discussion that although implementation of complete streets and streetscapes may be positive, they may not be transformative.

Through the advanced planning for the AIC's North End, the community identified a need to provide sidewalks along 16th Street. The *Comprehensive Investment Strategy Report* for the AIC's North End, June 2016, provides more details on the planning documents discussed above and the advanced planning process in which the Project was identified and prioritized.

2.2 Route Function

16th Street extends between North Tryon Street and Parkwood Avenue. It is classified as an Avenue by the City of Charlotte's *Urban Street Design Guidelines* (USDG), and as an urban local road through NCDOT's functional classification. The existing NS rail yard is a significant barrier within the AIC's North End and 16th Street is only one of two roads that provide a connection between the two areas on either side of the rail yard. The other connection is Matheson Avenue. The posted speed limit for 16th Street, N. Tryon Street, and Parkwood Avenue is 35 mph.

2.3 Existing Conditions

16th Street is a two-lane roadway with curb and gutter. The existing travel lane widths are wider than typical lane widths at 15.5 feet. Some sidewalk along the south side of 16th Street that extends from the U-Haul property line east, across the Norfolk Southern (NS) and CATS' BLE to Parkwood Avenue. The sidewalk and four-foot concrete islands with bollards within the centerline of the roadway separating the two lanes of traffic have recently been constructed at the NS and BLE grade crossings. The panels implemented at the NS and BLE grade crossing were intended to be of adequate length to accommodate proposed improvements, such as sidewalks and possibly bicycle facilities, for 16th Street, envisioned at the time of the plan development for the BLE. The majority of the sidewalk is located at the back of curb. There are a couple of small sections near the Parkwood Avenue intersection with a planting strip, but it is not an adequate width to provide plantings or desirable separation between pedestrians and motor vehicles. There are no bicycle facilities present along 16th Street.

The intersection of North Tryon Street and 16th Street is signalized, while the intersection of Parkwood Avenue and 16th Street is stop controlled. The 2012 Average Annual Daily Traffic (AADT) was 1600 vehicles per day. This AADT was projected to 1800 vehicles per day for Year 2016 as the current AADT determined for the Project.

More details pertaining to the existing conditions, gaps, and deficiencies are shown in the maps provided in Appendix E and discussed within the USDG Abbreviated Six-Step Summary provided in Appendix D.

2.4 Anticipated Future Conditions

The CATS BLE, which crosses 16th Street, is expected to be open for service in 2018. The Parkwood Station for the BLE will be located at the intersection of Parkwood Avenue and N Brevard Street. As part of the Northeast Corridor Infrastructure Program, the Parkwood Avenue Streetscape will improve accessibility for pedestrian, bicycle, and motor vehicle connections to the Parkwood Station. The primary components of the Parkwood Project are to construct a 12-foot multi-use path (MUP) along the west side of Parkwood Avenue and implement a conversion of the existing four-lane facility to a three-lane facility to provide separated bicycle lanes.

A portion of the XCLT, which is an extension to the Little Sugar Creek Greenway, was recently constructed in the area. This portion of the greenway extends along Little Sugar Creek, under Parkwood Avenue, and continues to intersect 24th Street. The XCLT will extend from there and continue north.

The projected AADT for 16th Street for the design year of 2040 is 3,000 vehicles per day. With the opening of the BLE, significant development/redevelopment nearby, and specifically due to the Parkwood Station, the area in the vicinity of the Project is expected to see an increase in both pedestrian and bicycle traffic. With the continued implementation of the XCLT, the demand for multi-modal network will likely increase.

2.5 Planned Developments

Thompkins Hall, formerly known as Highland Park Mill, is a proposed mixed-use redevelopment utilizing the existing building located in the southwest corner of the 16th Street and Parkwood Avenue. As part of this redevelopment, 16th Street will be realigned from the BLE grade crossing to Parkwood Avenue to align with 16th Street east of Parkwood Avenue. This portion of 16th Street does not currently connect to Parkwood Avenue and no connection is proposed at this time. With this realignment, the developer will construct the roadway section to match the Project with respect to lane widths, sidewalks, pedestrian facilities, etc. The design and construction of the Project and the developer's realignment will need to be coordinated. The full length of 16th Street was originally intended to be the City's project so the City intends to reimburse the developer for constructing the realignment through a developer agreement.

3 Investigations and Analyses

3.1 Historic and Cultural Resources

Based upon a review of the NCSHPO online GIS service, the Charlotte-Mecklenburg Historic Landmarks Commission online database, and the Mecklenburg County Polaris 3G historical mapping program, there are historic properties listed within the Project limits. Standard Trucking Company Terminals (DOE; MK3078) is located along the northern portion of the Project limits. Additionally, Highland Park Manufacturing Company Mill No. 1 (MK1847), found on the NCSHPO study list, is partially located within the southeastern portion of the Project area. A map locating these historic properties is provided in Appendix A.

A letter was sent to NCSHPO describing the intended Project improvements and identifying the two historic properties identified. NCSHPO has responded that the Project may affect the National Register-listed Highland Park Mill No. 1 (MK1847) and requested that more detailed plans be provided to determine the effect.

The Charlotte Historic District Commission administers the Local Historic District Program and encourages the preservation of historically and architecturally significant areas of the City. Six of the City's most significant older neighborhoods have been designated as Local Historic Districts. A process to obtain a Certificate of Appropriateness has been established for projects located within the Local Historic Districts. The Project is not located within one of the Local Historic Districts and it does not seem a Certificate of Appropriateness is applicable pertaining to the historic properties identified, but this will be confirmed with the commission.

The Project improvements should consider maintaining the historic nature of the area and construction should avoid impacts to historic features.

Archaeological data is not included as part of the NCSHPO GIS services and therefore was not assessed as part of the Project's investigations.

3.2 Natural Resources

3.2.1 Wetlands and Jurisdictional Waters of the US

The Project area was field-reviewed for wetlands and jurisdictional waters of the US under Section 404 of the Clean Water Act (CWA). The on-site reconnaissance activities revealed that no jurisdictional features occur within the Project limits.

3.2.2 Federal Emergency Management Agency Floodplains and Riparian Buffers

The Federal Emergency Management Agency (FEMA) Map Service Center National Flood Hazard Layer indicates that there are no SFHA within or adjacent to the Project limits. The closest stream is located approximately 40 linear feet northwest from the Project area, but the 35-linear foot buffer does not extend into the Project limits.

3.2.3 US Army Corps of Engineers Section CWA 404 Permits

No jurisdictional features are within the Project's study area; therefore, Section 404/401 permitting is not anticipated to occur from proposed Project related activities.

3.2.4 Federally Protected Species

A list of federally protected species for Mecklenburg County, North Carolina was compiled using the US Fish and Wildlife Service (USFWS), a USFWS Information for Planning and Conservation (IPaC) report, and a NC Natural Heritage Program (NCNHP) Data Explorer data review report. Table 1 provides a summary of the federally protected species listed for Mecklenburg County.

Table 1 – Federally-protected species potentially occurring within Mecklenburg County

Major Group	Scientific Name	Common Name	Status	Habitat	Source
Plant	*Helianthus schweinitzii*	Schweinitz's sunflower	E	Along roadsides, old pastures, transmission line right-of-ways, open areas, maintained habitat, ecotones	USFWS 2017 IPaC
Plant	*Rhus michauxii*	Michaux's sumac	E	Sandy or rocky open woods, on highway right-of-ways, roadsides, or edges of artificially-maintained clearings.	USFWS 2017 IPaC
Plant	*Echinacea laevigata*	Smooth purple coneflower	E	Open woods/glades/xeric hardpan forests/diabase glades in abundant sunlight and little competition in the herbaceous layer	USFWS 2017 IPaC
Mollusk	*Lasmigona decorata*	Carolina heelsplitter	E	Cool, clean, well-oxygenated water with stable, silt-free stream bottoms	USFWS 2017 IPaC
Animal	*Bombus affinis*	Rusty patched bumble bee	E	Grasslands and tallgrass prairies, open areas with wildflowers	USFWS 2017
Animal	*Haliaeetus leucocephalus*	Bald eagle	BGPA	Estuaries, large lakes, reservoirs, rivers, and seacoast.	NCNHP 2017 IPaC
Animal	*Myotis septentrionalis*	Northern long-eared bat	T	Forested areas of any age, rocky areas with boulders, and culverts greater than four feet wide	USFWS 2017 IPaC

* E-Endangered, T-Threatened, BGPA - Bald and Golden Eagle Protection Act

The IPaC report lists five protected species as potentially occurring within the Project area; however, the NCNHP Data Explorer report does not list any known Element Occurrences within a one-mile radius of the Project area. Based on the on-site investigation, it was determined that no suitable habitat exists for the federally protected species listed in Table 1 within the Project's study area. Therefore, no additional surveys are recommended, and impacts to the species listed in Table 1 are not anticipated to occur from proposed Project related activities.

3.3 Potentially Contaminated Sites

A Phase I ESA was completed for the Project. Off-site RECs and CRECs were identified adjacent to the Project area.

The U-Haul Rental Center, located at 1224 North Tryon Street, is identified on the LUST, Underground Storage Tank (UST), LAST, Incident Management Database (IMD), and Superfund Enterprise Management System lists. Regulatory database information indicates that assessment and remediation activities were conducted at the facility from 1995 until 1999. The North Carolina Department of Environmental Quality (NCDEQ), Inactive Hazardous Sites Branch closed the release incident with a No Further Remedial Action Planned letter in August 1999.

The property also formerly operated several USTs of various sizes with known and unknown contents. These USTs were removed from the site in 1989 and 1993. Localized petroleum impacted soils and groundwater contamination were detected at the northern portion of the site during the removal of the USTs, characterized as LUST incident No. 8765. The NCDEQ issued a No Further Action (NFA) letter. The Phase I ESA considered this LUST incident to be a Historical REC.

In August 2001, oil and grease constituents were found in soil in the northern portion of the property, characterized as LAST incident No. 85843. Reportedly, this was attributed to an aboveground leak and not the former USTs. The LAST incident has not been closed by the NCDEQ and the Phase I ESA considers this open incident to be a REC associated with the site.

A release was discovered at the site in September of 1993 when a 10,000-gallon petroleum UST was removed; this was characterized as LUST incident No. 11498. Approximately 135 tons of petroleum impacted soils were reportedly removed from the site and in May of 2001 methyl tert-butyl ether (MTBE), isopropyl ether, and benzene were detected in the groundwater above their respective 2L Standards. The NCDEQ issued an NFA letter with a Notice of Residual Petroleum in January 2002. The facility is on the IMD listing as a result of this LUST incident, and the Phase I ESA considers LUST incident No. 11498 to be a CREC associated with the site.

The Parkwood Stormwater CIP, also located at 1224 North Tryon Street, is identified on the US Brownfields listing. According to the regulatory database report, the City Stormwater Division completed a study focused on improvements to public storm drainage discharge and flood prevention and included properties near 16th Street. Based on the regulatory stats, the Phase I ESA does not consider the Parkwood Stormwater CIP to be an REC associated with the site.

Standard Trucking Company (currently the location of Consolidated Pipe & Supply Company) at 201 16th Street is identified as a RCRA Non-Generator of hazardous waste since the facility is no longer in operation. The facility operated a RCRA generator prior to 1984 and no RCRA violations were documented for the facility. The Phase I ESA does not consider this former generator status to be an REC at this time.

The BLE project is identified on the US Brownfields listing. Prior to the construction of the BLE, assessment activities, such as sampling soils for arsenic and herbicides, were conducted along the NS railway with oversight from the US Brownfields Program. One area along the railroad tracks near 16th Street found arsenic concentrations in surficial soils that ranged from 2.9 to 42 milligrams per kilogram. This was consistent with typical background levels; therefore the Phase

I ESA does not consider the Brownfields listing or associated sampling activities along the BLE project to be an REC at this time.

The former Highland Park Mill, also known as Thompkins Hall is a NC Brownfields property. In 2016, soil, groundwater, and soil vapor samples on the property were collected as part of a Brownfields Assessment. Soil contamination was localized to the areas near a fuel oil AST and an area south of N Brevard Street. Groundwater samples collected near 16th Street did not identify constituents of concern. Based on the groundwater flow direction at the adjacent facility, the Phase I ESA does not consider the former mill to be an REC.

A map from the Phase I ESA showing the locations of each of these sites is provided in Appendix B.

The Phase I ESA does identify the long-term industrial use of the adjacent properties along 16th Street to be considered an REC.

The Phase I ESA indicates that soil impacts do not appear to encroach onto the 16th Street ROW, and the depth to groundwater ranged from about 10 to 20 feet below ground surface. The Phase I ESA does not expect roadway and utility improvements associated with the Project to encounter impacted soils or groundwater during construction activities and does not recommend additional assessments of the documented impacts on adjacent properties.

3.4 Capacity Analysis

A capacity analysis was performed for the Project. The analysis evaluated current traffic operations/ LOS and future operations/LOS of proposed Build scenarios for motor vehicular traffic at the 16th Street and N. Tryon Street intersection. Multimodal operations/LOS for bicyclists and pedestrians were also evaluated for the intersection.

3.4.1 Capacity Analysis for Motor Vehicle Traffic

The capacity analysis for 16th Street was incorporated into the analysis for the proposed N. Tryon Street Gateway Project. For the N. Tryon Street project, two Build scenarios were evaluated; a four-lane section and a three-lane section. It was determined that the three-lane Build scenario did not result in acceptable operations and it was recommended that a three-lane section not be implemented; therefore, for this report, only the recommended four-lane Build scenario will be presented. The Build scenario accounts for the lane configurations at the intersection to be the same as it exists currently.

The existing year was established as 2016 and the design year as 2040. An intermediate-year analysis for 2020 was also included. A figure providing the AM and PM peak hour volumes for Years 2016, 2020, and 2040 at the 16th Street/N. Tryon Street intersection is provided in Appendix C.

Additional figures indicating the AM and PM LOS based on the Synchro analysis for each approach and the overall intersection for the No Build and four-lane Build scenario are provided in Appendix C for Years 2020 and 2040. The Measures of Effectiveness (MOE) for all intersection approaches for years 2020 and 2040 for the No Build and four-lane Build scenario

are also provided in Appendix C, as well as the queuing results from Synchro and SimTraffic for the Build scenario.

The No Build scenario indicated acceptable LOS for all approaches and the intersection and 0.78 as the maximum intersection v/c ratio in Year 2040. The four-lane Build scenario is similar conditions to the No Build scenario and resulted in acceptable LOS for all approaches and the intersection and 0.74 as the maximum intersection v/c ratio in Year 2040. The maximum queue length for 16th Street in this Build scenario was 159 feet for the PM westbound right-turn movement in Year 2040.

3.4.2 Multimodal LOS

Pedestrian and bicycle LOS was determined for the intersections of 11th Street, 16th Street, and Dalton Avenue with N. Tryon Street using the worksheet provided by the Charlotte Department of Transportation. The results of the analysis are provided in Table 2 below.

Table 2 – Pedestrian and bicycle LOS

Scenario	16th St. Intersection with:	Pedestrian		Bicycle	
		Points	LOS	Points	LOS
2040 No Build	N. Tryon Street	73	C+	25	E
2040 Build	N. Tryon Street	78	B	27	E

3.5 Geotechnical Investigation

A geotechnical investigation for the Project has been conducted. The findings from the investigation, as well as recommendations for the roadway construction, pavement structure, and retaining walls will be provided in detailed report. It is anticipated that a retaining wall will be needed along the U-Haul property and a wall could be possibly needed to limit cut in the most northwestern property and tie into the wing wall for the NS Bridge.

3.6 Utilities

A Utility Impact Assessment was completed 16th Street in July of 2015 in association with the advanced planning for the AIC's North End. This report indicated a number of utilities located with the Project limits which are listed below:

- Duke Energy (distribution)
    - Double circuit distribution pole along the northern side of 16th Street (a portion of this distribution line is anticipated to be relocated by the developer of Tompkins Hall associated with the realignment of 16th Street.
- Duke Energy (lighting)
    - Various Duke Energy Fixtures leased by the City of Charlotte
- Piedmont Natural Gas (distribution)
- AT&T (legacy)
- Time Warner Cable
    - Aerial cables on existing Duke Energy poles on the northern side of 16th Street
- Verizon Business/MCI

    - Underground facilities along 16th Street
- Charlotte Water
    - Eight to 12-inch water lines within the Project limits
    - Eight-inch sewer lines within the Project limits
- Charlotte Storm Water
    - Storm water system along 16th Street

4 Community Engagement

Through the advanced planning, the Project team reached out to the community to help identify potential infrastructure improvement projects within the North End. Through this engagement, the community identified a need to provide sidewalks along 16th Street. Once the prioritization of the projects was finalized, the list of prioritized projects, which included the Project, was shared with the community at an Open House in October 2015.

As the Project progressed through the planning phase, a public workshop was held on May 23, 2017 at Extravaganza Depot, 1610 N. Tryon Street. The workshop also provided information on the N. Tryon Street Gateway Project. It was a drop-in format with a brief formal presentation. This workshop also included an online meeting that was available to the public from May 23, 2017, to June 12, 2017. Thirty-five people attended the meeting in person, and the online meeting received 181 visits.

At this workshop, the Project team presented a general overview of the Project, the Project Purpose, the preferred cross-section (discussed in more detail below), and a map that included an aerial photograph of the area with an overlay of the preferred cross-section. The attendees were asked for feedback on the Project.

Eight comment forms were received at the in-person meeting and one comment form, which was in reference to the N. Tryon Street Gateway Project, was received through the online meeting. The feedback received from the attendees at the in-person meeting and through the comment forms received was positive and in support of the preferred cross-section presented. The comments were categorized into the following themes:

- Support for biking and pedestrian features
- General support for the Project and its goals
- A desire for additional safety features like barriers between the sidewalk and streets
- Aesthetic recommendations including signage, wider sidewalks and planting strips
- A strong desire to see improved lighting
- Improving maintenance and the area environment
- Out of scope

Figure 1 provides the volume of comments received for each theme.

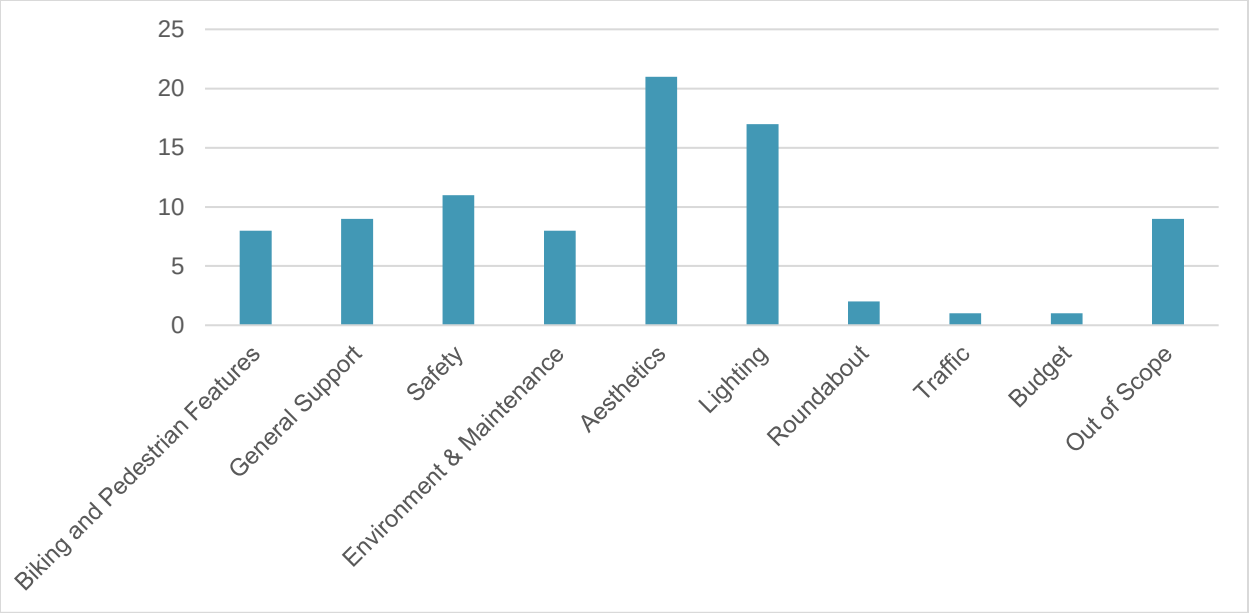


Figure 1 – Community workshop comment themes summary

5 USDG Six-Step Process

5.1 Steps 1 through 4 – Identifying Land Use and Transportation Context, Deficiencies, and Future Objectives

A site visit was conducted, existing policies and plans were referenced, future conditions were considered, and previous stakeholder input was evaluated, and Steps 1 through 4 were completed as documented in the Abbreviated Six-Step Process Summary provided in Appendix D. Maps identifying the gaps and deficiencies are provided in Appendix E.

5.2 Step 5 – Identifying and Evaluating Optional Cross-Sections

With the opening of the BLE, new development and redevelopment projects, and specifically due to the Parkwood Station in close proximity to the Project, this area is expected to see an increase in both pedestrian and bicycle traffic. With the continued implementation of the XCLT, the demand for multi-modal network, particularly perpendicular to XCLT, will likely increase. During the advanced planning, the community identified a need to provide sidewalks along 16th Street.

In order to provide a multi-modal facility, two initial optional cross-sections were identified; one with a two-way cycle track and one with bicycle lanes directly adjacent to the travel lanes. The cycle track could be implemented on either the north side or the south side of 16th Street. This accounts for two optional cross-sections with a cycle track, identified as Options 1A and 1B, and the option with bicycle lanes accounts for a third, identified as Option 2. For Option 1A, the cycle track is located on the north side and for Option 1B, the cycle track is located on the south side.

All three options accounted for two 11-foot travel lanes and six-foot sidewalks along both sides. In Options 1A and 1B, the two-way cycle track was 12 feet wide with a four-foot buffer separating the cycle track from the travel lanes, an eight-foot planting strip separating the cycle track from the sidewalk, and a six-foot planting strip on the opposite side. In Option 2, the bicycle lanes were five feet and the planting strips on both sides were eight feet. These optional cross-sections are provided in Appendix F.

The existing pavement width is 31 feet with 15.5-foot travel lanes. Options 1A and 1B would require approximately seven feet in widening to accommodate the proposed total pavement width of 38 feet. Option 2 would require one foot of widening in order to accommodate the proposed total pavement width of 32 feet. For all three cross-sections, the existing ROW is not sufficient for the proposed improvements and additional ROW would need to be acquired. The needed ROW for Option 2 is four feet less than Options 1A and 1B.

As the three optional cross-sections were evaluated, Options 1A and 1B were compared with respect to determining which side of 16th Street would be more desirable for the cycle track to be provided. Each side of the road has three driveway accesses that would be conflict points to bicyclists traveling the cycle track, but the access for the U-Haul property on the south side will likely have more vehicles ingressing and egressing in comparison to the others.

The most constrained area within the Project limits is the frontage along the U-Haul property. The area along the north side is also constrained due to an existing embankment and wing wall from the NS bridge that crosses N. Tryon Street directly adjacent to the intersection with 16th Street. Any widening to the existing roadway or berm behind the curb would result in impacts to the paved area on the U-Haul site and would likely require a retaining wall along the U-Haul property, as well as in the area of the NS bridge embankment along the north side.

Implementing the widening to the south with Option 1B would result in more impacts to the U-Haul site than with Option 1A. Option 2 requires less than widening than Options 1A and 1B resulting in fewer overall impacts to all adjacent properties. Retaining walls would still likely be needed along the U-Haul property and along the NS bridge embankment with Option 2.

The existing utility poles are located along the north side of 16th Street. Implementing the widening to the north with Option 1A would require the utility poles to be relocated; whereas under Options 1A and 2, poles located within the planting strip could possibly remain in place, if acceptable to the City.

5.3 Step 6 – Selection of Preferred Cross-Section

The preferred cross-section was determined to be Option 2 with the adjacent bicycle lanes. In order to eliminate the need for the one-foot narrow widening, it was determined to utilize the existing 31-foot pavement width to incorporate the bicycle lanes. Because of the low traffic volumes along 16th Street, the anticipated increase of bicycle traffic and the need for multi-modal transportation, it was determined that providing the standard five-foot bicycle lanes is more preferable than wider travel lanes. The travel lane width was reduced from 11 feet to 10.5 feet. The final preferred cross-section is provided in Figure 2. This reduction in travel lane is identified as a tradeoff.

Additionally, the medians and other rail-crossing equipment installed as part of the BLE at-grade crossing were installed with dimensions and future plans known circa 2012, and these dimensions are incompatible with the sections being discussed presently. The equipment would have to be removed/reconfigured to continue bike lanes east of the railroad tracks, which is infeasible. There will not be a bike lane on eastbound 16th Street east of the BLE.

On July 27, 2017, the City's Department Directors supported the staff recommendations described here.

Option 2 was preferred to Options 1A and 1B because it can be accommodated with the existing pavement, results in fewer impacts to the adjacent properties, and allows the option for the utility poles to remain in place. Implementing the bicycle lanes fulfills the planned land use context, future transportation conditions, and objectives, as well as addresses the majority of the deficiencies. It was determined that a more enhanced bicycle facility, such as a cycle track, is not needed along 16th Street, specifically because there will be no receiving designated bicycle facilities along N. Tryon Street. The transition for cyclists traveling to/from N. Tryon Street and 16th Street can be adequately accommodated with the bicycle lanes.

This preferred cross-section adds and enhances pedestrian facilities, provides designated bicycle facilities, enhances and increases dedicated pedestrian crossings, and increases multi-modal connectivity to adjacent neighborhoods. A map is provided in Appendix E that identifies the remaining gaps and deficiencies with the implementation of the preferred cross-section.

6 Design Considerations

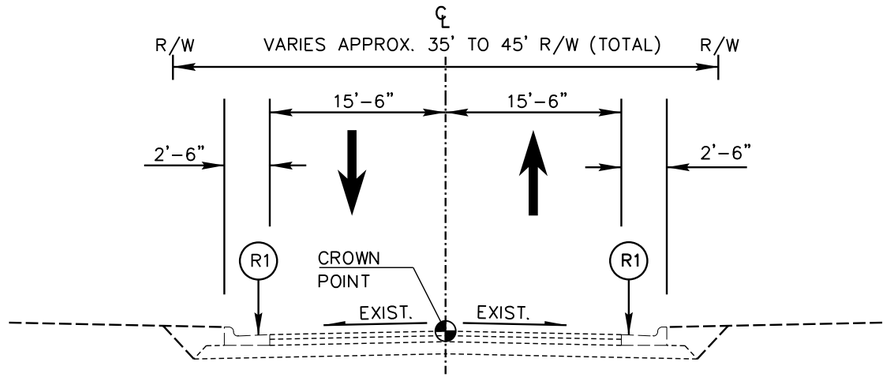
6.1 Design Criteria and Conceptual Design

Design criteria was generated based on the results of the Abbreviated USDG Six-Step Process and the other references as noted. The criteria is provided in Appendix G. A conceptual design was developed based on the design criteria and the preferred cross-section and a plan layout of this design is provided in Figure 3.

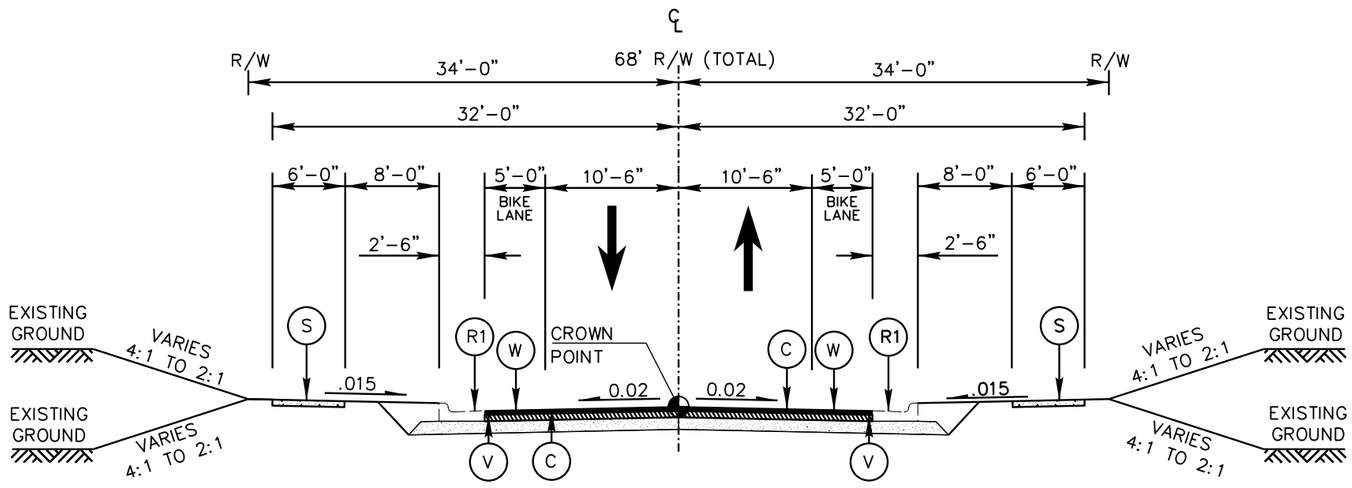
As the design progresses, the constraints near the N. Tryon Street intersection with respect to the U-Haul site and the area along the north side with the existing embankment and wing wall from the NS bridge will need to be considered. A retaining wall would likely be needed along the U-Haul property and could likely be needed on the north side as well. The intention with the preferred typical section is to retain the existing curb and gutter and pavement as much as possible, and the horizontal and vertical alignments developed for the Project should account for this. There are four-foot concrete islands with bollards within the centerline of the road at the NS rail and BLE at-grade crossings, which reduce the amount of existing pavement available to accommodate the bicycle lanes. The design will need to account for these existing islands. Some widening in this area could be needed.

Transition of the bicycle lanes at the N. Tryon Street intersection and the MUP to be implemented with the Parkwood Avenue Streetscape Project will need to be considered. Coordination of the two projects' designs will need to occur. The developer for Thompkins Hall

will implement the design and construction of the portion of 16th Street between the BLE grade crossing and Parkwood Avenue, including the realignment. The Project's design will need to be coordinated with the developer's design. The BLE provides a clean project phase line between the City's 16th Street project and the Thompkins Hall developer's project to realign the portion of 16th Street.



TYPICAL SECTION NO. 1
16TH STREET - EXISTING



TYPICAL SECTION NO. 2
16TH STREET - PROPOSED

LEGEND
(C) SURFACE COURSE
(R1) EXISTING 2'–6" CURB & GUTTER
(S) PROPOSED CONCRETE SIDEWALK
(V) MILLING
(W) WEDGING

CHARLOTTE.

Plans Prepared For:
600 East Fourth Street
Charlotte, North Carolina 28202
Phone: (704) 336-2241
Fax: (704) 336-5586
CITY OF CHARLOTTE
ENGINEERING & PROPERTY MANAGEMENT
PLANNING & DESIGN GROUP

NO.	DATE	BY	DESCRIPTION

Plans Prepared By:
HDR Engineering, Inc. of the Carolinas
440 S. Church Street, Suite 1000
Charlotte, NC 28202
N.C.B.E.L.S. License Number: F-0116

NTS	DBT	1–3–2018
SCALE	CHECKED BY	DATE
--	BEP	LMP
JOB NO.	PREPARED BY	APPROVED BY

APPLIED INNOVATION CORRIDOR
16TH STREET
SHEET
OF

Figure 2 - Preferred Cross-Section

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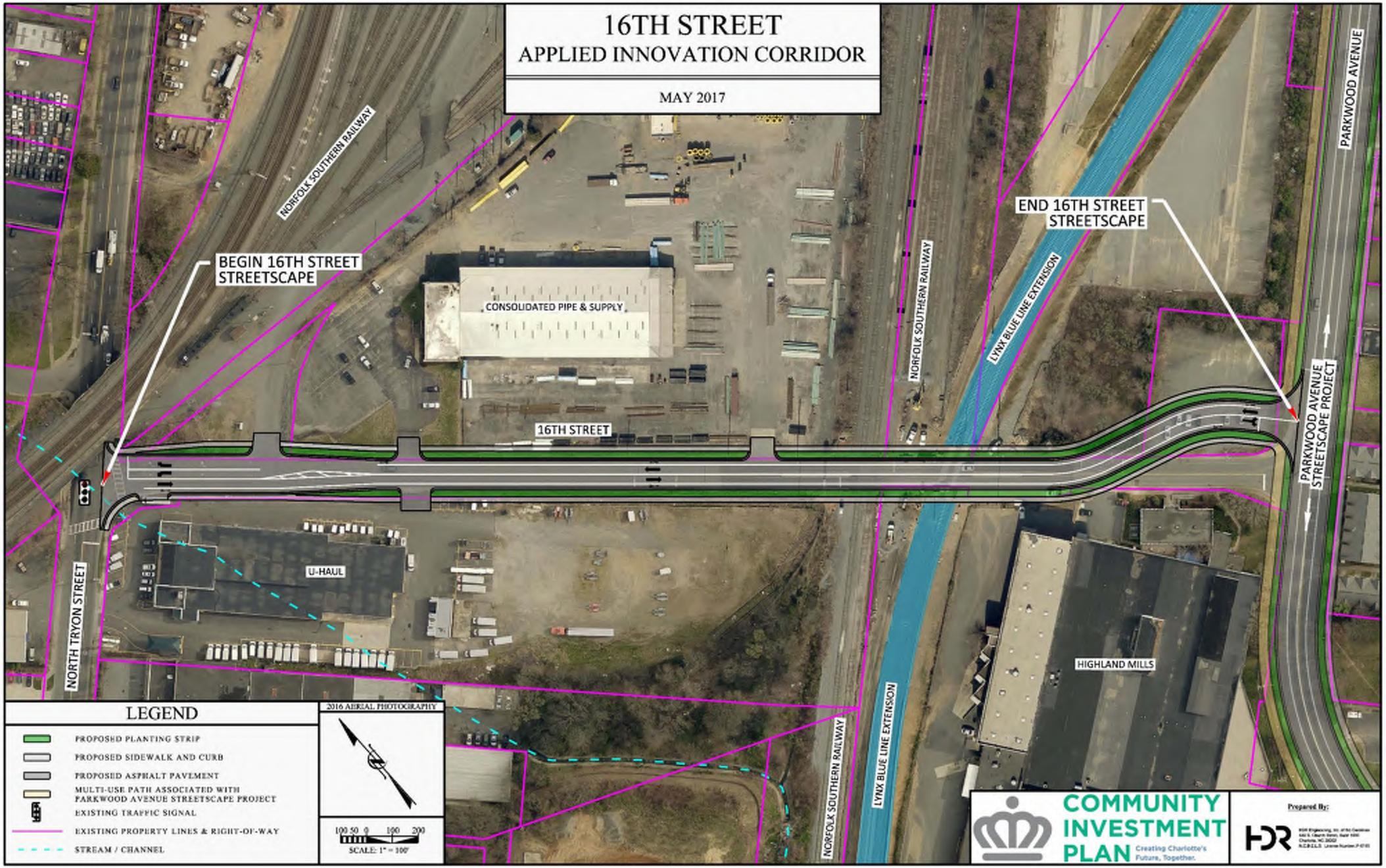

Figure 3 - Conceptual Design

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6.2 Post Construction Storm Water Ordinance

Roadway improvement projects are subject to Charlotte-Mecklenburg's Storm Water Services' PCSO if the project results in a cumulatively disturbed area of more than one acre and BUA of more than 20,000 square feet within the proposed ROW/permanent easements. Based on the conceptual design of the Project and its characterization as a "development", the disturbed area is less than one acre and the BUA is less than 20,000 square feet; therefore, the Project will likely be exempt from the PCSO.

In addition, the Project Team has coordinated with City's Storm Water Services concerning the PCSO requirements for the Project. Through this coordination, it is understood that there are also additional concessions to these calculations for roadway projects implementing new sidewalks when there are no existing sidewalks. If an existing roadway does not include adjacent sidewalks, it is assumed that there were intentions to provide sidewalks in the future and any implementation of standard six-foot sidewalks is not required to be included as new impervious area, thus BUA. Any portion of a sidewalk that exceeds the standard six-foot width should be included in the new impervious area. The Project area of 16th Street does not include existing sidewalks and the majority of the sidewalk proposed to be implemented will be a standard width of six feet. This results in even less BUA, further increasing the likelihood that the Project will be exempt from PCSO.

As the design progresses, additional coordination with the City's Storm Water Services should occur to confirm this understanding and exemption from PCSO.

If PCSO is determined to be required, the Project is located in the Central Catawba Watershed, but is also located in a Transit Station Area and within a Distressed Business District. The PCSO requirements that would need to be considered for the Project are identified below and are provided in Appendix H.

- Structural Water Quality SCMs - because the Project is located within the Central Catawba watershed, SCMs will be required if the BUA is greater than 24%.
- Buffers – because there are no streams within the project limits, no stream buffers apply.
- Quality Treatment, Volume Control, Peak Control, Mitigation – control the peak for the 10-year and 25-year 6-hour storms for new BUA and one of the following:
    - Provide 85% TSS removal from the first inch of rainfall
    - Provide 1-year 24-hour volume control and 10-year 6-hour peak control
    - Pay the City a mitigation fee for the untreated BUA in existence prior to July 2008, plus the new BUA up to five acres added after July 2008. New BUA in excess of five acres must comply with the ordinance.
- Natural Area – not required.

If needed, the Charlotte-Mecklenburg *BMP Design Manual,* the City's *Pilot BMP Monitoring Program,* NCDOT's *Stormwater Best Management Practice Toolbox*, as well as other resources, including product vendors, will be referenced as Best Management Practices (BMPs) for consideration to address the PCSO requirements for the Project.

6.3 Coordination with Other City Projects

As mentioned previously, the Project's design will need to be coordinated with MUP and other improvements associated with the Parkwood Avenue Streetscape Project.

Charlotte Water and the City's Storm Water Services both have improvement projects along 16th Street. Charlotte Water is utilizing Design-Build for their project delivery and have already secured a Design-Builder. Their project consists of implementing a new sewer system within the pavement of 16th Street. Storm Water's project is implementing a large box culvert within the pavement of 16th Street, specifically to help eliminate flooding that occurs along N. Tryon Street under the NS railroad bridge. The design and construction of these three projects will need to be coordinated.

6.4 Required Permits

No jurisdictional features are within the Project's study area; therefore, Section 404/401 permitting is not anticipated to be required. There are no SFHA within or adjacent to the Project limits; therefore, a Charlotte-Mecklenburg Individual Floodplain Development Permit is not anticipated to be required. An Erosion and Sediment Control Certificate of Approval from NC Division of Energy, Mineral and Land Resources is required for land disturbing activities exceeding one acre. It is likely that the disturbed area of the Project could be less than an acre and an Erosion and Sediment Control Certificate of Approval would not be required. As the design progresses, it will be determined whether this one-acre threshold for disturbed area is exceeded.

6.5 Cost Estimates

A cost estimate for the Project was generated to account for the design, construction engineering and inspection, utility relocations to be incurred by the City, ROW acquisition, and permitting. The break-down of the cost estimate is provided in Appendix I. An escalation of 3 percent was applied to the construction cost with an assumption of Year 2023 as the mid-point of construction. An escalation of 4 percent was applied to the ROW cost with the assumption of Year 2019 as the mid-point of acquisition. These escalations were based on a recent analysis conducted for York County's Pennies for Progress Program. The cost estimate was prepared as a range from low, most likely, and high as follows:

- Low - $3.36 million
- Most Likely - $4.32 million
- High - $5.94 million

The values provided above account for 16th Street from N. Tryon Street to Parkwood Avenue in its entirety, including the portion that will be constructed by the developer for Thompkins Hall.. The cost estimate was prepared for the two separate segments; the first extending between N. Tryon Street and the BLE grade crossing to be designed and constructed by the City and the second extending between the BLE grade crossing and Parkwood Avenue to be designed and constructed by the developer. The cost estimate break-down provides estimates for each segment separately.

7 References

Carolina Wetland Services, Inc. *Environmental Screening Technical Memorandum for 16th Street Streetscape*, October 2, 2017

Charlotte-Mecklenburg Planning Department. *Blue Line Extension Transit Station Area Plan*, May 13, 2013.

Charlotte-Mecklenburg Planning Department. *North Tryon Area Plan*, May 24, 2010.

Charlotte-Mecklenburg Stormwater Services. *Post-Construction Stormwater Ordinance Administrative Manual*, July 2016.

City of Charlotte, Mecklenburg County, Center City Partners. *Center City 2020 Vision Plan*, September 12, 2011.

HDR. *Comprehensive Investment Strategy Report for Applied Innovation Corridor's North End*, June 2016.

Terracon Consultants, Inc. *Phase I Environmental Site Assessment for 16th Street Streetscape*, June 1, 2017.

Urban Land Institute Advisory Services Panel. *Applied Innovation Corridor*, April 27-May 2, 2014.

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A

Appendix A – Map of Historic Properties

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MK---- Warehouse
W 15th St
E 16th St
MK3078 Standard Trucking Company Terminals
MK3078 Standard Trucking Company Terminals
N Tryon St
Wadsworth Pl
Elm St
E Liddell St
N College St
MK---- House
MK---- House
MK---- House
Parkwood Av
MK---- House
MK---- Stores
MK---- Merchants Bonded Cotton Warehouse
MK1847 Highland Park Manufacturing Company Mill No. 1
E 17th St
Duncan Gardens
MK---- Storage Building
N Brevard St
Alpha Mill Ln
MK1809 Orient Manufacturing Co./Chadwick Hoskins No. 3
E 18th St
N Caldwell St
Belmont Av
N Davidson St
Legend
Project Limits (8.6 ac.)
Roads
NCHPO Points
NR and Local Landmark
Study List individual entry
Determined Eligible - DOE
Surveyed Only
Surveyed, Gone
NCHPO Boundaries
National Register
Determination of Eligibility
300 150 0 300 Feet
REFERENCE: BACKGROUND AERIAL IMAGERY PROVIDED BY NC ONEMAP, DATED 2016. BACKGROUND GIS LAYER(S) PROVIDED BY MECKLENBURG COUNTY GIS DEPARTMENT, DATED 2016 AND NORTH CAROLINA STATE HISTORIC PRESERVATION OFFICE, DATED SEPTEMBER 1, 2017.
SCALE: 1 inch = 300 feet
DATE: 9/25/2017
CWS PROJECT NO: 2017-0471
DRAWN BY: AVH
APPLICANT NO:
CHECKED BY: GCA
CAROLINA WETLAND SERVICES
North Carolina State Historic Preservation Office Map
16th Street Streetscape
Charlotte, North Carolina
CWS Project No. 2017-0471
FIGURE NO. 4
C:\Users\AlisaHarjunen\Desktop\Current Projects\HDR Projects\16th Street Streetscape\ArcGIS\Figure4_SHPO.mxd

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B

Appendix B – Phase I ESA Detail Map

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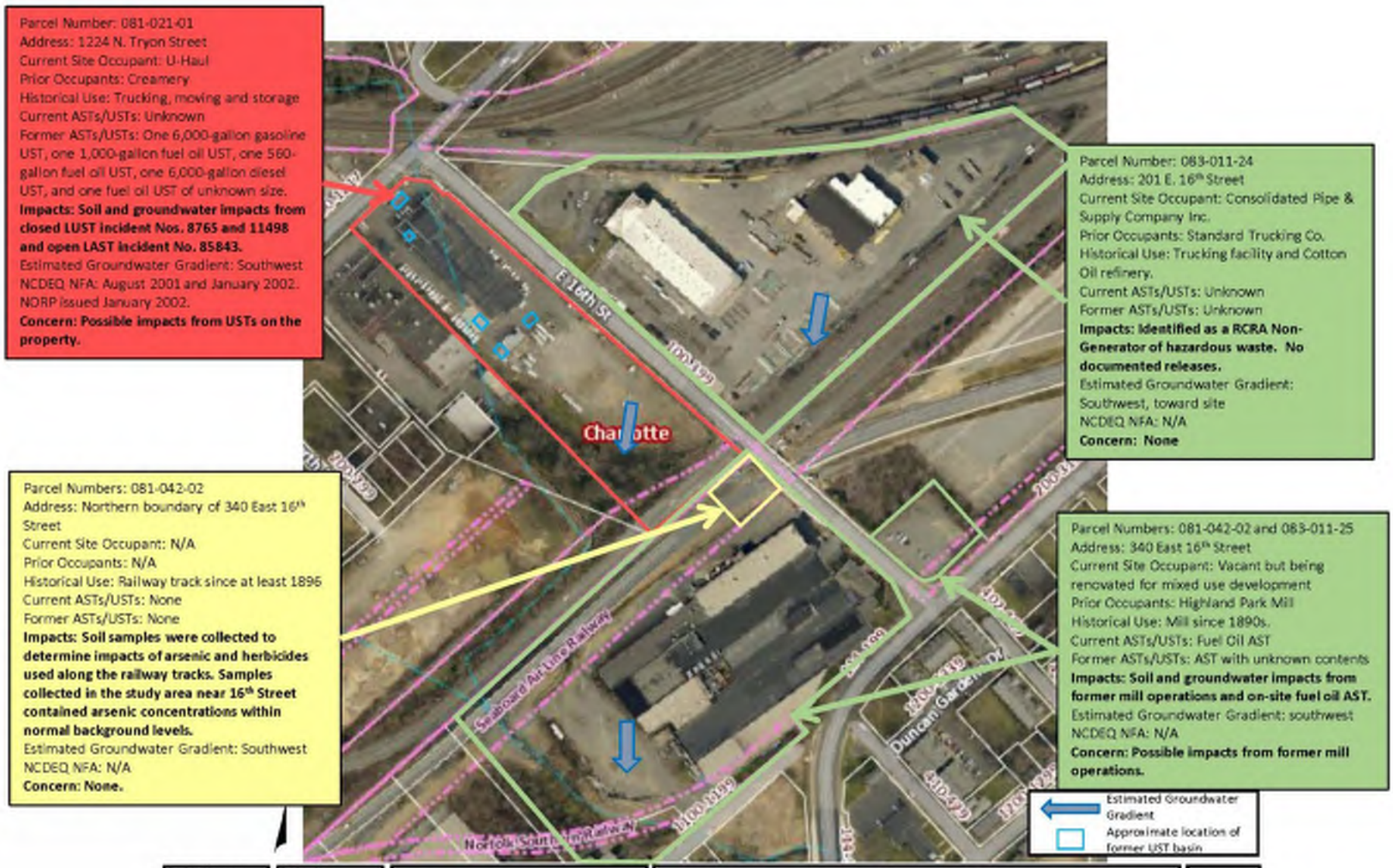
Parcel Number: 081-021-01
Address: 1224 N. Tryon Street
Current Site Occupant: U-Haul
Prior Occupants: Creamery
Historical Use: Trucking, moving and storage
Current ASTs/USTs: Unknown
Former ASTs/USTs: One 6,000-gallon gasoline UST, one 1,000-gallon fuel oil UST, one 560-gallon fuel oil UST, one 6,000-gallon diesel UST, and one fuel oil UST of unknown size.
Impacts: Soil and groundwater impacts from closed LUST incident Nos. 8765 and 11498 and open LAST incident No. 85843.
Estimated Groundwater Gradient: Southwest
NCDEQ NFA: August 2001 and January 2002.
NORP issued January 2002.
Concern: Possible impacts from USTs on the property.
Parcel Number: 083-011-24
Address: 201 E. 16th Street
Current Site Occupant: Consolidated Pipe & Supply Company Inc.
Prior Occupants: Standard Trucking Co.
Historical Use: Trucking facility and Cotton Oil refinery.
Current ASTs/USTs: Unknown
Former ASTs/USTs: Unknown
Impacts: Identified as a RCRA Non-Generator of hazardous waste. No documented releases.
Estimated Groundwater Gradient: Southwest, toward site
NCDEQ NFA: N/A
Concern: None
Parcel Numbers: 081-042-02
Address: Northern boundary of 340 East 16th Street
Current Site Occupant: N/A
Prior Occupants: N/A
Historical Use: Railway track since at least 1896
Current ASTs/USTs: None
Former ASTs/USTs: None
Impacts: Soil samples were collected to determine impacts of arsenic and herbicides used along the railway tracks. Samples collected in the study area near 16th Street contained arsenic concentrations within normal background levels.
Estimated Groundwater Gradient: Southwest
NCDEQ NFA: N/A
Concern: None.
Parcel Numbers: 081-042-02 and 083-011-25
Address: 340 East 16th Street
Current Site Occupant: Vacant but being renovated for mixed use development
Prior Occupants: Highland Park Mill
Historical Use: Mill since 1890s.
Current ASTs/USTs: Fuel Oil AST
Former ASTs/USTs: AST with unknown contents
Impacts: Soil and groundwater impacts from former mill operations and on-site fuel oil AST.
Estimated Groundwater Gradient: southwest
NCDEQ NFA: N/A
Concern: Possible impacts from former mill operations.
E 16th St
Seaboard Air Line Railway
Norfolk Southern Railway
Duncan Garden Dr
Estimated Groundwater Gradient
Approximate location of former UST basin
Project Manager: MAW
Drawn by: HEH
Checked by: CLC
Approved by: CLC
Project No.: 71177236
Scale: NOT TO SCALE
File Name: 71177236
Date: June 2017
Terracon
2020-E Starita Road
Charlotte, NC
DETAIL MAP
16th Street Streetscape
East 16th Street
Charlotte, North Carolina
Figure
3

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C

Appendix C – Capacity Analysis Results

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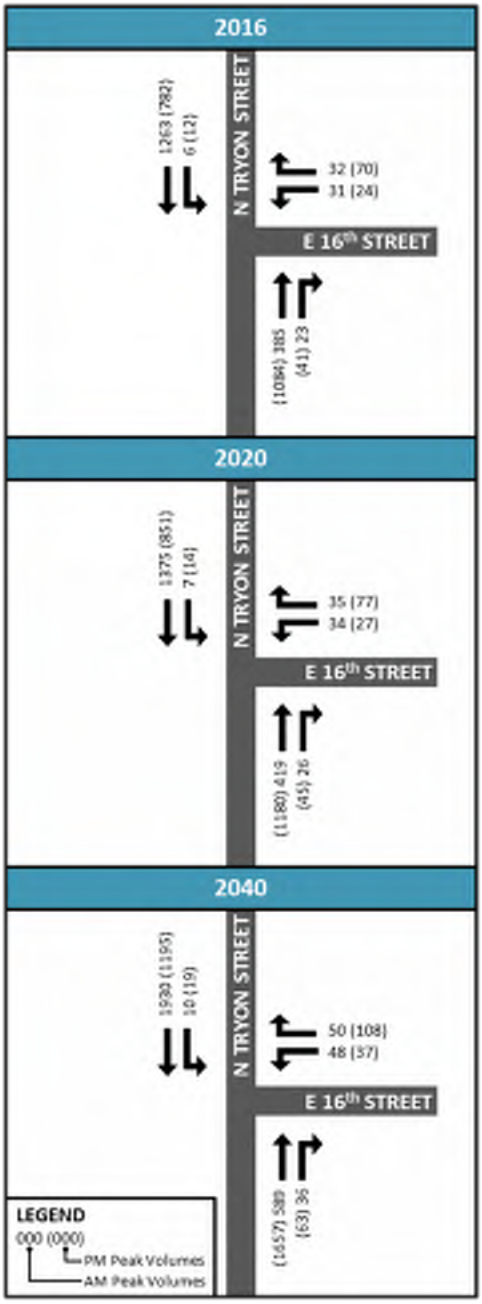
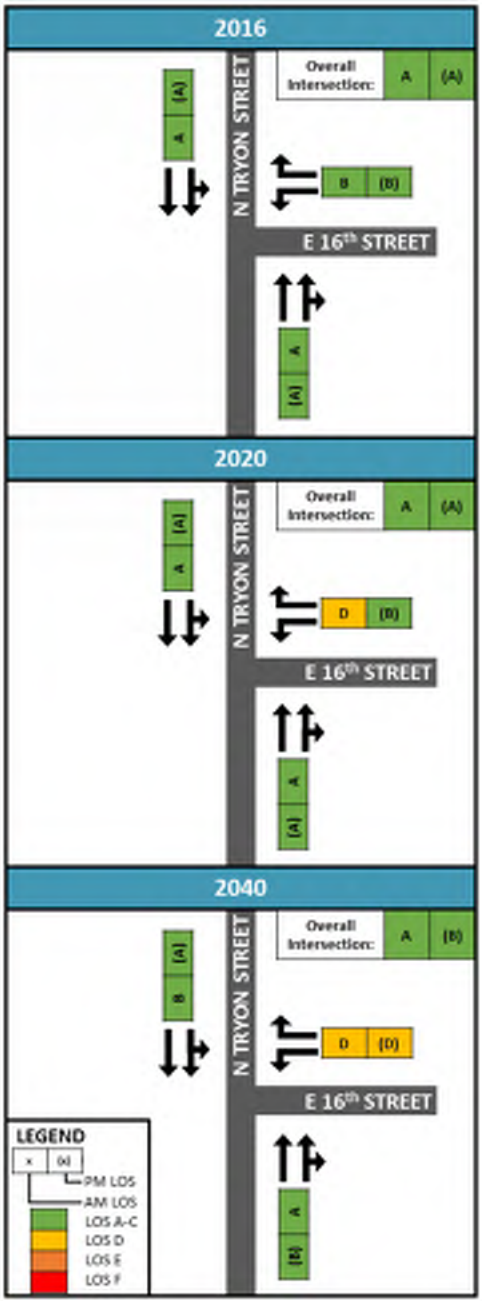
Peak Hour Volumes



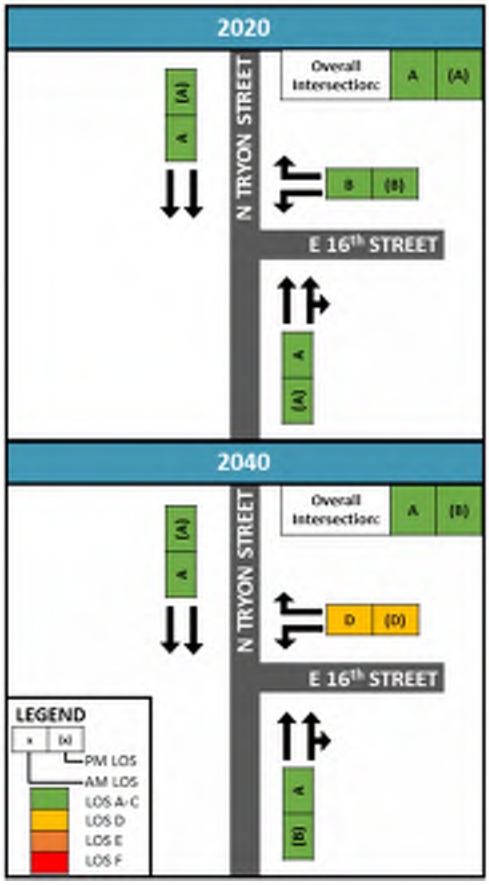
No Build LOS Results



No Build Synchro Results (MOEs)

Year	Appr.	AM Peak Hour					PM Peak Hour				
		HCM LOS	Delay (s/veh)	v/c	ICU LOS	ICU (%)	HCM LOS	Delay (s/veh)	v/c	ICU LOS	ICU (%)
2016	WB	B	16.8	0.09	-	-	B	14.1	0.17	-	-
	NB	A	3.3	0.17	-	-	A	5.7	0.49	-	-
	SB	A	5.7	0.54	-	-	A	5.0	0.37	-	-
	Int.	A	5.5	0.52	A	54.1%	A	5.8	0.50	A	46.3%
2020	WB	D	37.8	0.22	-	-	B	16.7	0.22	-	-
	NB	A	2.6	0.18	-	-	A	6.7	0.53	-	-
	SB	A	4.8	0.57	-	-	A	5.6	0.41	-	-
	Int.	A	5.5	0.55	B	57.1%	A	6.8	0.57	A	48.2%
2040	WB	D	35.9	0.28	-	-	D	35.4	0.43	-	-
	NB	A	3.2	0.25	-	-	B	11.5	0.80	-	-
	SB	B	10.7	0.81	-	-	A	8.1	0.63	-	-
	Int.	A	9.9	0.78	D	74.5%	B	11.3	0.72	B	62.8%

Four-Lane Build LOS Results



Four-Lane Build Scenario Synchro Results (MOEs)

Year	Appr.	AM Peak Hour					PM Peak Hour				
		HCM LOS	Delay (s/veh)	v/c	ICU LOS	ICU (%)	HCM LOS	Delay (s/veh)	v/c	ICU LOS	ICU (%)
2020	WB	B	19.1	0.13	-	-	B	16.5	0.22	-	-
	NB	A	3.5	0.18	-	-	A	6.8	0.53	-	-
	SB	A	5.9	0.57	-	-	A	5.3	0.37	-	-
	Int.	D	5.9	0.57	A	52.4%	A	6.7	0.57	A	48.2%
2040	WB	D	35.9	0.28	-	-	D	35.4	0.43	-	-
	NB	A	3.2	0.25	-	-	B	11.5	0.80	-	-
	SB	A	9.1	0.77	-	-	A	7.1	0.56	-	-
	Int.	A	8.7	0.74	C	67.8%	B	10.9	0.72	B	62.8%

Four-Lane Build Scenario Queuing Results

Year	Lane	AM Peak Hour		PM Peak Hour		Rec. Storage Length (ft.)
		Synchro 95th %ile Queue Length (ft.)	SimTraffic Longest Queue Length (ft.)	Synchro 95th %ile Queue Length (ft.)	SimTraffic Longest Queue Length (ft.)	
2020	WBL	28	49	24	50	50
	WBR	29	74	51	95	100
	NBT	48	77	203	199	-
	NBT/R	48	73	203	189	-
	SBT1	213	234	120	190	-
	SBT2	213	204	120	168	-
2040	WBL	57	69	53	73	100
	WBR	59	70	125	159	175
	NBT	75	97	463	404	-
	NBT/R	75	180	463	367	-
	SBT1	487	225	236	182	-
	SBT2	487	278	236	193	-

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D

Appendix D – USDG Abbreviated Six-Step Process

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E. 16th Street – USDG Abbreviated Six-Step Summary 10.18.17

1: Land Use Context		
	Existing	16th St. provides an East/West connection between Parkwood Ave and North Tryon. This connection is primarily auto-oriented with two vehicular travel lanes and a speed limit of 35 mph. Several desirable/destination establishments are located within 1+ miles of 16th St. A Sidewalk is only present along the South side on 16th St. from Parkwood Ave to the U haul business property line located across the Blue Line Extension Crossing. Current sidewalk is located primarily along back of curb and width varies from 4'-8'. A small planting strip is located between sidewalk and back of curb in one location. However, it is not of adequate width for planting and separation. No existing bicycle routes are present on 16th St. between Parkwood Ave. and N. Tryon St. 16th St. is primarily commercial/ Industrial. No residential homes are located directly on 16th St.
	Planned	The project is located in a corridor based on the Centers, Corridors and Wedges Plan. The most recent proposed land uses for the study corridor are described in the North Tryon Area Plan. In general, the land use recommendations for the area primarily consist of neighborhood, office, flex, light industrial and industrial. Industrial uses are primarily focused on the East side of N. Tryon. With the opening of the Blue Line Extension, this area is expected to see an increase in both pedestrian and bicycle traffic. Construction of the Cross Charlotte Trail will likely increase the demand for a multi-modal network and perhaps influence the redevelopment of auto-oriented parcels into transit-supportive, walkable destinations.
2: Transportation Context		
	Existing conditions	16th St. is an existing Street that is City of Charlotte maintained road. • 2012 Count Volumes: 1,600 (Parkwood Ave.) • TAP USDG classification (if applicable): N/A • Speed limit: 35 mph • Number of lanes and turn lanes: 1 through lane in each direction with left and right turn lanes at N. Tryon Intersection. • Median: Only one condition located at BLE Crossing.

		• Width: Variable (~35' curb face to curb face) (17.5' ThL, 17.5' ThL) • ROW width: ~45' (Variable) • Curb and gutter: Yes • Sidewalks: 4'-8' wide located on South side of 16th Street from Parkwood to BLE crossing. • Planting strip: Yes, small and inadequate located near Parkwood Ave. Intersection. • Bike facilities (nearest): NO signed bike route on 16th St. Multi-use path located on Parkwood. XCLT Trail located on Sugar Creek. • Transit: None on 16th St. Closest is on N. Tryon St. • Signals or other control: N. Tryon St. intersection. • Distance to nearest signal(s): Only one located at N. Tryon intersection
	Future conditions	• Bike Plan: Proposed bicycle facilities and connection to Cross Charlotte Trail • Transit: Blue Line Ext with connection to station at Parkwood.
3: Deficiencies		
	Gaps/deficiencies/ inconsistencies in transportation elements and network	• No vehicular connectivity to 16th St Extension across Parkwood • No dedicated bicycle facilities or wayfinding signage within corridor or beyond • No sidewalk facilities in some locations • No dedicated medians or pedestrian refuges • Sidewalk width, location, length inadequate • Inadequate pedestrian and vehicular lighting • Planting strip locations and widths are inadequate • Pedestrian crossings missing crosswalk designation.
4: Future Objectives		
		Existing policies that might/should influence: • Centers, Corridors, and Wedges Growth Framework • City Center 2020 Vision Plan • Urban Street Design Guidelines • North Tryon Area Plan • Comprehensive Transportation Plan • Cross Charlotte Trail • Charlotte BIKES Initiative **The community would like to see change:** • More and better quality recreational areas. • Better and safer sidewalks / more crosswalks. • More transportation choices. • Adaptive re-use of older buildings with character. • More employment opportunities and specialty retail.

		• Unsightly properties, vacant buildings, and industrial buildings need to be cleaned up. • Improved lighting. • Mixed-income housing opportunities. • Upgraded utilities and technology. • Better connectivity between communities **The proposed design supports stakeholders' expectations:** • It is assumed the proposed improvements will include more designated crosswalks with improved vehicular and pedestrian lighting to address community stakeholder concerns about safety. Enhancement of the bicycle and pedestrian connectivity within the corridor and to other neighborhoods supports stakeholders' comments and improvement expectations.
5: Classification		
		N. Tryon St.-Parkwood Ave Avenue– 2 lanes • Option 1A: Expand ROW 30'-40' – (2) 11' Through Lanes, 12' Cycle track with 4' wide raised curb on one side, 6' Sidewalk both sides, with 6'-8' Planting Strip on both sides. • Option 1B: Expand ROW 30'-40' – (2) 11' Through Lanes, 12' Cycle track with 4' wide raised curb on one side (opposite side of Option 1A), 6' Sidewalk both sides, with 6'-8' Planting Strip on both sides. • Option 2: Expand ROW 26'-36' – (2) 11' Through Lanes, 5' Bike Lanes both sides, and 6' Sidewalk with 8' Planting Strip both sides. Option 1A Constraints • Lack of sufficient ROW – requires capital project or redevelopment to acquire sufficient ROW and improve the street. • Widens road section to left side to allow for cycle track. Option 1B Constraints • Lack of sufficient ROW – requires capital project or redevelopment to acquire sufficient ROW and improve the street. • Widens road section to right side to allow for cycle track. Option 2 Constraints • Lack of sufficient ROW – requires capital project or redevelopment to acquire sufficient ROW and improve the street.

6: Cross-Section Selection		
		N. Tryon St.-Parkwood Ave. Avenue– 2 lanes (68' ROW) • Expand ROW 23'-33' – (2) 10.5' Through Lanes, 5' Bike Lanes both sides, and 6' Sidewalk with 8' Planting Strip both sides. <u>Improvements</u> (4 Gaps and Deficiencies Removed) • Adds and Enhances pedestrian facilities away from vehicular traffic. • Provides designated bicycle facilities • Enhances and increases dedicated pedestrian crossing opportunities • Updates vehicular and pedestrian lighting to provide safer environment. • Increased multi-modal connectivity to adjacent neighborhoods. <u>Trade-offs</u> (3 Gaps and Deficiencies Remain) • Decrease in vehicular travel lane width to minimize impact of road widening.

E

Appendix E – Gaps and Deficiency Maps

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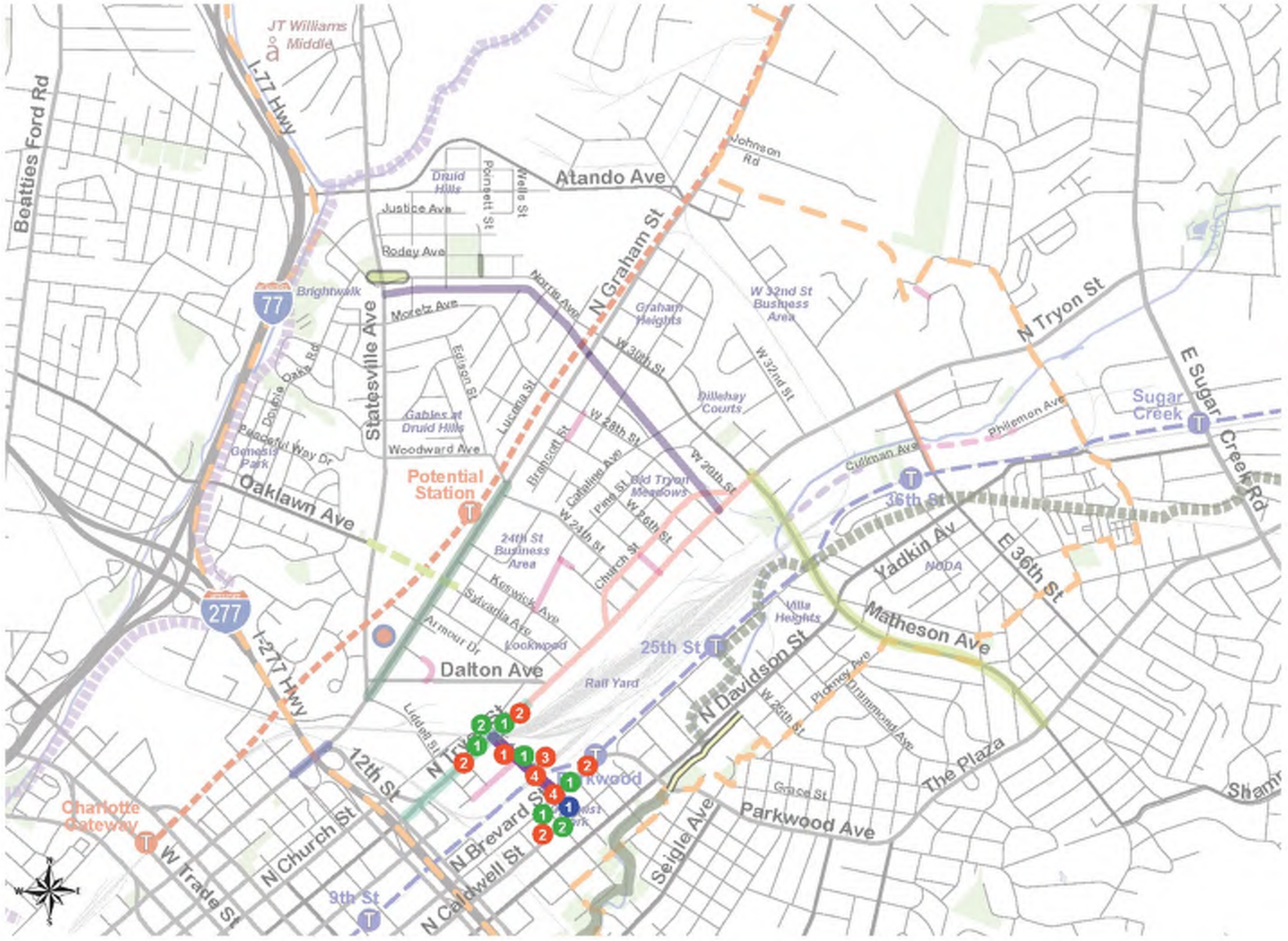


SYM.	PROPOSED PROJECT SCOPE
	Matheson Avenue Bridge and Streetscape
	N. Tryon Streetscape and Gateway
	16th Streetscape
	Multi-Use Paths
	Newland Road and Norris Avenue Intersection
	N. Graham Streetscape

SYM.	PLAN LEGEND
	Little Sugar Creek Extension
	Mooresville Trail
	Blue Line Extension
	Potential Red Line

SYM.	GAPS AND DEFICIENCIES
1	No Vehicular Connectivity to 16th Street
1	No Dedicated Bicycle Facilities
2	No Bicycle Wayfinding
1	No Sidewalk Facilities
2	Inadequate Sidewalk; Needs Improvement
3	Inadequate Pedestrian Lighting
4	No Dedicated Pedestrian Crossing

CHARLOTTE.

APPLIED INNOVATION CORRIDOR- NORTH END
CHARLOTTE, NC

E. 16TH STREET - Existing Condition Gaps & Deficiencies Map
DATE: 10.18.17 PROJECT NO.: 00254.00

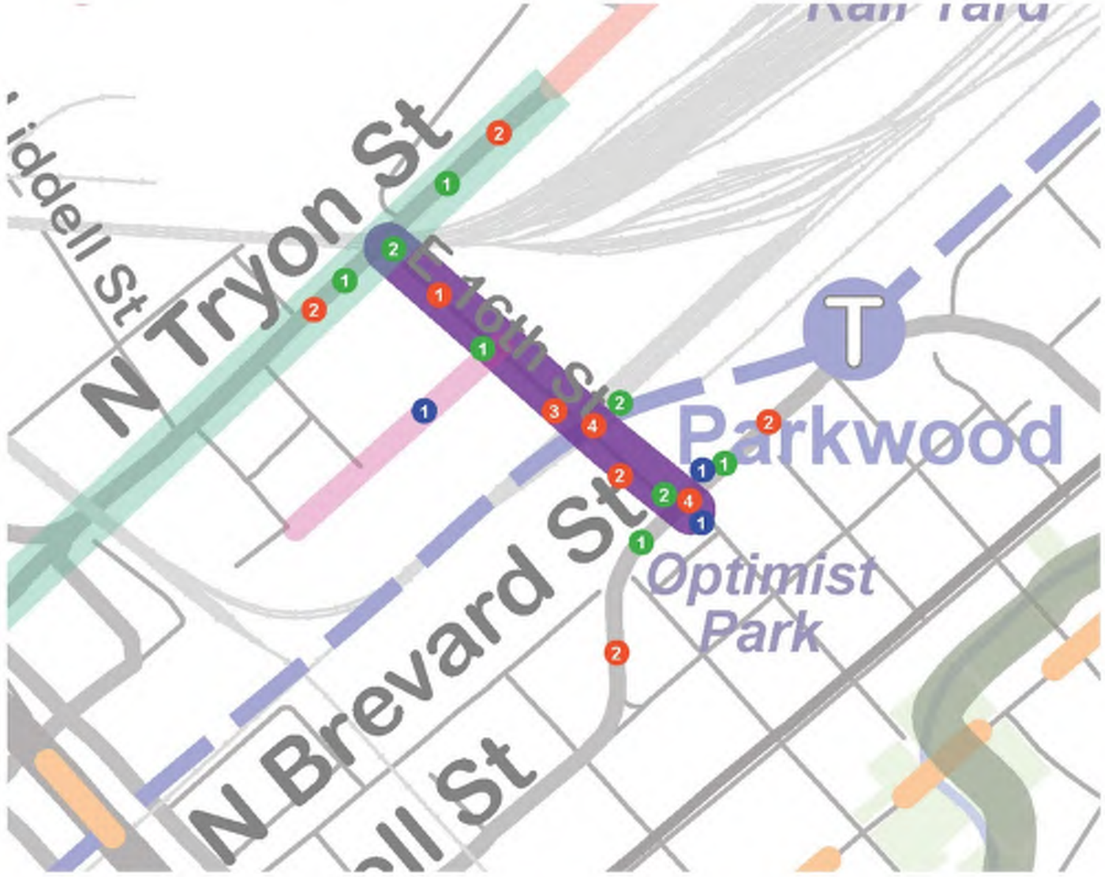
Bloc Design

SYM.	GAPS AND DEFICIENCIES
1	No Vehicular Connectivity to 16th Street
1	No Dedicated Bicycle Facilities
2	No Bicycle Wayfinding
1	No Sidewalk Facilities
2	Inadequate Sidewalk; Needs Improvement
3	Inadequate Pedestrian Lighting
4	No Dedicated Pedestrian Crossing


1 No Vehicular Connectivity to 16th Street


1 No Dedicated Bicycle Facilities


1 No Sidewalk Facilities




2 Inadequate Sidewalk; Needs Improvement


3 Inadequate Pedestrian Lighting


4 No Dedicated Pedestrian Crossing

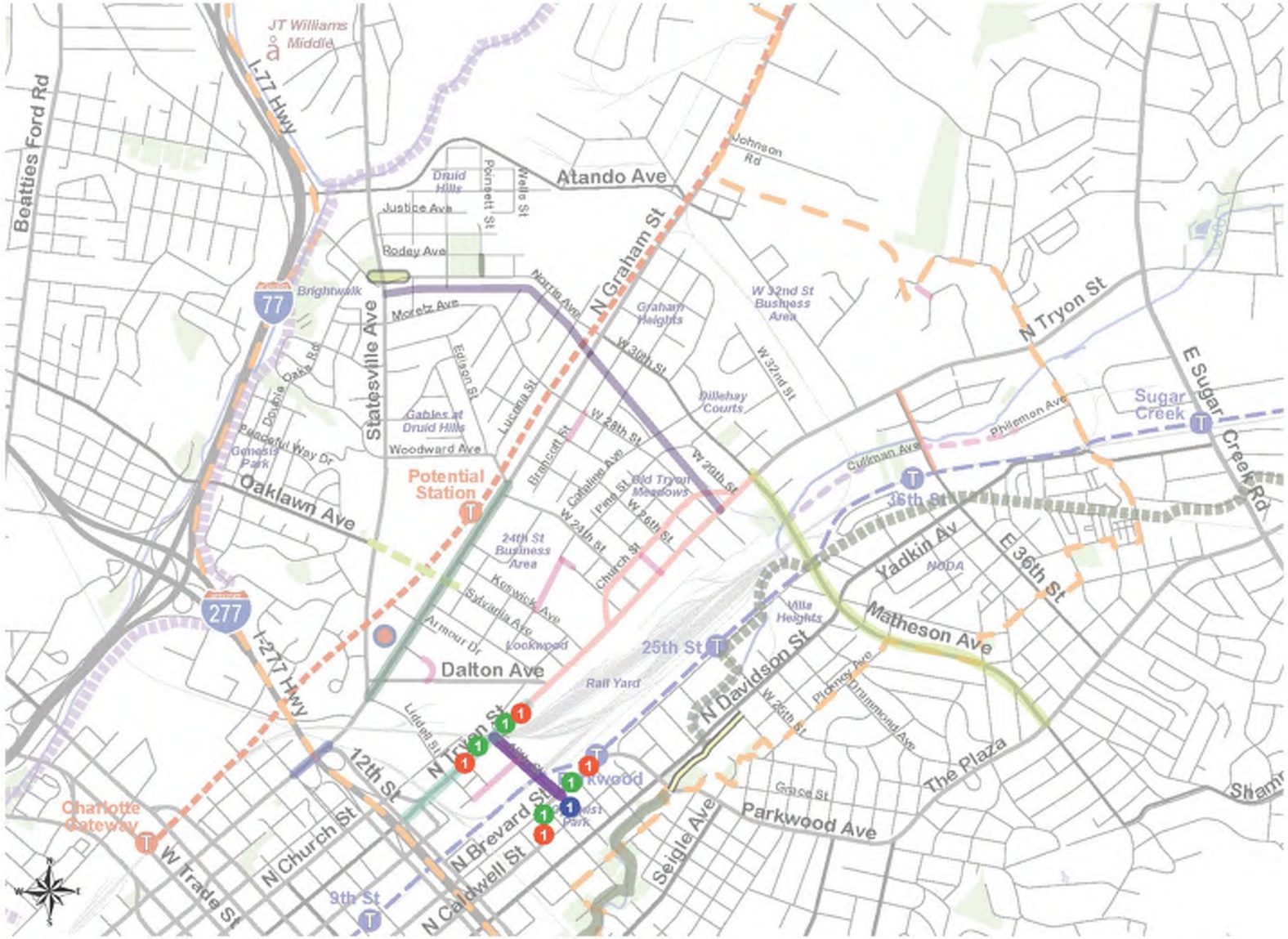
CHARLOTTE.

APPLIED INNOVATION CORRIDOR- NORTH END
CHARLOTTE, NC

E. 16TH STREET - Existing Condition Gaps & Deficiencies Map Enlargement

DATE: 08.23.16 PROJECT NO.: 00254.00

Bloc Design



SYM. PROPOSED PROJECT SCOPE

- Matheson Avenue Bridge and Streetscape
- N. Tryon Streetscape and Gateway
- 16th Streetscape
- Multi-Use Paths
- Newland Road and Norris Avenue Intersection
- N. Graham Streetscape

SYM. PLAN LEGEND

- Little Sugar Creek Extension
- Mooresville Trail
- Blue Line Extension
- Potential Red Line

SYM. GAPS AND DEFICIENCIES

- 1 No Vehicular Connectivity to 16th Street
- 1 No Dedicated Bicycle Facilities
- 1 Inadequate Sidewalk; Needs Improvement

PROPOSED IMPROVEMENT ASSUMPTIONS:

- Adequate Vehicular and Pedestrian Scaled Lighting will be Installed.
- Connection to the Rail Trail and Parkwood Multi-use Path will be Made.
- Bicycle Wayfinding Signage will be Installed Where Needed.
- Pedestrian Crosswalks, Signage, and ADA Compliant Ramps will be Installed Where Needed.

CHARLOTTE.

APPLIED INNOVATION CORRIDOR- NORTH END
CHARLOTTE, NC

E. 16TH STREET - Proposed Improvement Gaps & Deficiencies Map
DATE: 10.18.17 PROJECT NO.: 00254.00

Bloc Design

SYM.	PROPOSED PROJECT SCOPE
	Matheson Avenue Bridge and Streetscape
	N. Tryon Streetscape and Gateway
	16th Streetscape
	Multi-Use Paths
	Newland Road and Norris Avenue Intersection
	N. Graham Streetscape

SYM.	PLAN LEGEND
	Little Sugar Creek Extension
	Mooresville Trail
	Blue Line Extension
	Potential Red Line

SYM.	GAPS AND DEFICIENCIES
1	No Vehicular Connectivity to 16th Street
1	No Dedicated Bicycle Facilities
1	Inadequate Sidewalk; Needs Improvement

PROPOSED IMPROVEMENT ASSUMPTIONS:

- Adequate Vehicular and Pedestrian Scaled Lighting will be Installed.
- Connection to the Rail Trail and Parkwood Multi-use Path will be Made.
- Bicycle Wayfinding Signage will be Installed Where Needed.
- Pedestrian Crosswalks, Signage, and ADA Compliant Ramps will be Installed Where Needed.

CHARLOTTE. APPLIED INNOVATION CORRIDOR- NORTH END
CHARLOTTE, NC

E. 16TH STREET - Proposed Improvement Gaps & Deficiencies Map Enlargement
DATE: 4.30.18 PROJECT NO.: 00254.00

Bloc Design

F

Appendix F – Optional Cross-Sections

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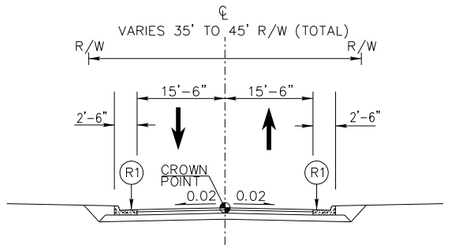
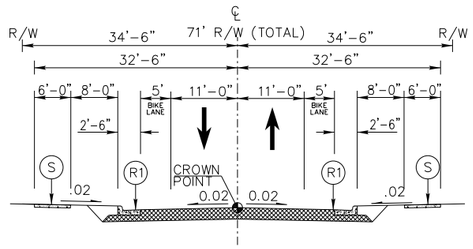
UPDATED TYPICAL SECTIONS FOR COST COMPARISON

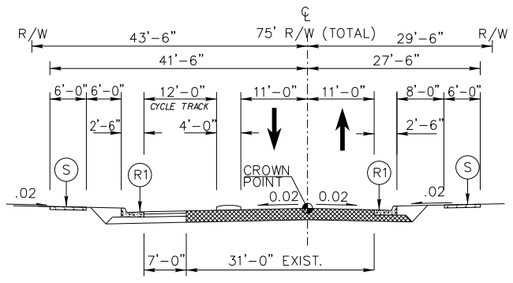
11/08/2016



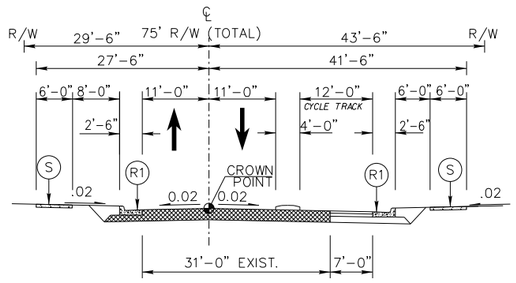
EXISTING
16th Street Streetscape



OPTION 2
16th Street Streetscape
(BIKE LANES W/ 8' PS, 6' SW)



OPTION 1A
16th Street Streetscape
(CYCLE TRACK W/ 6' PS LT, 8' PS RT, 6' SW;
MAINTAIN RT EOP, WIDEN TO LT)



OPTION 1B
16th Street Streetscape
(CYCLE TRACK W/ 6' PS RT, 8' PS LT, 6' SW;
MAINTAIN LT EOP, WIDEN TO RT)

KEY

- (R1) 2'-6" CONCRETE CURB AND GUTTER.
- (R2) 1'-6" CONCRETE CURB AND GUTTER.
- (S) 4" CONCRETE SIDEWALK.
- EXISTING PAVEMENT

CHARLOTTE.

Plans Prepared For:
BUILDING Partnership
600 East Fourth Street
Charlotte, North Carolina 28202
Phone: (704) 336-2237
Fax: (704) 336-4586
CITY OF CHARLOTTE
ENGINEERING & PROPERTY MANAGEMENT
PLANNING & DESIGN GROUP

NO.	DATE	BY	DESCRIPTION

Plans Prepared By:
HDR
HDR Engineering, Inc. of the Carolinas
440 S. Church Street, Suite 1000
Charlotte, NC 28202
N.C.B.E.L.S. License Number: F-0116

SCALE | CHECKED BY | DATE
JOB NO. | PREPARED BY | APPROVED BY

APPLIED INNOVATION CORRIDOR
16TH STREET
SHEET | OF

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G

Appendix G – Design Criteria

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16TH STREET STREETSCAPE DESIGN
PROPOSED DESIGN CRITERIA

PREPARED BY: HDR Engineering, Inc. of the Carolinas
DATE: 2/28/2018

ROUTE	16th Street			REFERENCE
TO/FROM	**N. TRYON ST TO BLUE LINE EXT.**			**OR REMARKS**
TRAFFIC DATA				
ADT CURRENT YR = 2016	1,800			
ADT DESIGN YR = 2040	3,000			
DESIGN VEHICLE	WB-67			
CLASSIFICATION				
USDG CLASSIFICATION	Avenue			USDG 6-Step Summary
AASHTO CLASSIFICATION	Urban Local			AASHTO pg. 1-12
TERRAIN TYPE	Rolling			
EXISTING POSTED SPEED (mph)	35			
DESIGN SPEED (mph)	30			
PROPOSED POSTED SPEED (mph)	30			
PROP. R/W WIDTH (ft)	68			
CONTROL OF ACCESS	N/A			
TYPICAL SECTION TYPE	2 Lane			USDG 6-Step Summary
LANE WIDTH (ft)	10.5			USDG 6-Step Summary
SHOULDER WIDTH (ft)	N/A			
CURB AND GUTTER	2'-6"			USDG 6-Step Summary
SIDEWALKS (ft)	6			USDG 6-Step Summary
BICYCLE LANES (ft)	5			USDG 6-Step Summary
MEDIAN WIDTH (ft)	N/A			
GRADE				
MAX.	10%			RM(I) 1-14
MIN.	0.5%			AASHTO pg. 3-119, CMSWDM pg. 4-3
K VALUE				
SAG	37			AASHTO pg. 3-161
CREST	19			AASHTO pg. 3-155
DESIGN SIGHT DISTANCES				
STOPPING SIGHT DISTANCE	200' (level roadway)			AASHTO pg. 3-4
INTERSECTION SIGHT DISTANCE	290' (Right Turn)			AASHTO pg. 9-41
HORIZ. ALIGN.				
MAX. SUPER	NC			
MIN. RADIUS (ft)	333			AASHTO pg. 3-55, Table 3-13b
SPIRAL (Y/N)	N			
CROSS SLOPES				
PAVEMENT	2%			
SIDEWALK	1.5%			
CLEAR ZONE (ft)	12-14			AASHTO Roadside Design Guide, Table 3-1

NOTES: USDG 6-Step Summary based on City of Charlotte Urban Streets Design Guide
AASHTO = AASHTO A Policy on Geometric Design of Highways and Streets, 2011
CMSWDM = Charlotte Mecklenburg Storm Water Design Manual

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H

Appendix H – PCSO Parameters

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Special District	Structural Water Quality SCMs	Buffers	Quality Treatment, Volume Control, Peak Control, Mitigation	Natural Area Requirements
Transit Station Areas and Distressed Business Districts	>24% BUA within the Central Catawba, >12% BUA within the Western Catawba, >10% BUA within the Yadkin-Southeast Catawba requires storm water quality treatment, storm water volume control, storm water peak control, and/or mitigation payment (see Quality Treatment, Volume Control, Peak Control, Mitigation column to the right) <24% (or 12%, 10%) BUA requires vegetated conveyances to the maximum extent practicable and buffers. Detention ordinance may apply.	See PCSO Buffer requirements per applicable watershed and S.W.I.M. Buffer requirements (Chapter 12 of the Zoning Ordinance).	**Meet Peak requirements:** Peak for Single Family Residential: Perform a downstream flood analysis to determine whether peak control is needed and if so, for what level of storm frequency (i.e., 10, 25, 50 or 100-yr, 6-hr) **OR** if a downstream analysis is not performed control the peak for the 10-yr and 25-yr, 6-hr storms for new built upon area created since July 1, 2008. Peak for non-Single Family Residential: Control the peak for the 10-yr, 6-hr storm **AND** perform a downstream flood analysis to determine whether additional peak control is needed and if so, for what level of storm frequency (i.e., 25, 50 or 100-yr, 6-hr) **OR** if a downstream analysis is not performed, control the peak for the 10-yr and 25-yr, 6-hr storms for new built upon area created since July 1, 2008. **AND one of the following options:** 1) Provide 85% TSS removal from the first inch of rainfall for the entire site, **OR** 2) Provide 1-year 24-hour volume control and 10-year 6-hour peak control (using predeveloped conditions as 50% woods and 50% pasture per Section 2.5.1 of the BMP Manual), **OR** 3) Pay the City a mitigation fee according to rates set forth in the Administrative Manual for the untreated total of developed and redeveloped built upon area. The maximum untreated built upon area eligible for the mitigation payment is the sum of all built upon area in existence prior to July 1, 2008 plus five (5) acres of new built upon area added after July 1, 2008. New built upon area in excess of 5 acres must comply with the ordinance. **Special note**: More than 20,000 square feet of impervious since 1978 for non-single family residential requires adherence to the requirements of the detention provisions of the Zoning Ordinance (12.601) - control the peak for the 2-yr and 10-yr storms for impervious coverage created after 1978.	Natural Area is not required in Transit Station Areas and Distressed Business Districts (Also see latest Tree Ordinance for any applicable tree save requirements).

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440 S Church Street, Suites 800, 900 & 1000
Charlotte, NC 28202-2075
704.338.6700

hdrinc.com