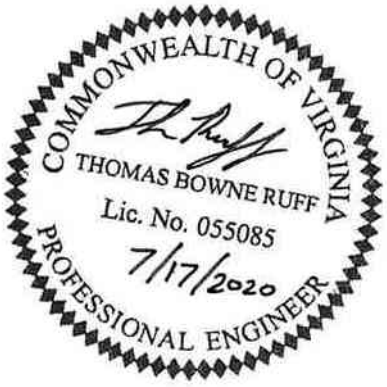
CHESTERFIELD COUNTY SIDEWALK INVENTORY AND IMPLEMENTATION PLAN

Demographic and Spatial Analysis

July 2020



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Chesterfield County, VA

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Chesterfield County Sidewalk Inventory and Implementation Plan

Chesterfield County, Virginia

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DEFINITIONS

- *Existing Sidewalk*
  - Any existing/constructed sidewalk or path within the public right-of-way, regardless of physical condition, material, or accessibility compliance. In addition, commercial and private sidewalks were collected in many locations but were not the focus of the sidewalk inventory.

- *Proposed Sidewalk*
  - Any sidewalk associated with a currently funded roadway project that includes sidewalk components (whether planned, in design, in ROW, or out for bid as of June 2020).
  - Any sidewalk associated with private development and/or requested by Planning Commission or Board of Supervisors along public right-of-way and property frontage.

- *Recommended Sidewalk*
  - Segments of sidewalk that connect existing/proposed sidewalk segments together.
  - Segments of sidewalk that extend existing/proposed sidewalks.
  - Segments of sidewalk that further the County's goal of creating a countywide sidewalk network and increase mobility for underserved communities.

- *Priority Sidewalk Segments*
  - Recommended sidewalk segments that Timmons Group has ranked as a top priority based on demographics, proximity to destinations, completion of the network, and engineering judgement.

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1 INTRODUCTION

1.1 PROJECT SCOPE

The project includes a spatial analysis of existing land uses, public services, pedestrian attractors, demographics, and socioeconomic characteristics to determine the preferred locations for sidewalk network completion and expansion throughout Chesterfield County. The project provides a countywide sidewalk masterplan and a prioritized implementation plan for all sidewalk facilities throughout Chesterfield County using the GIS spatial analysis.

1.2 PROJECT PURPOSE

"In Virginia, many roads were built without sidewalks. With steadily increasing efforts to develop a more balanced, multimodal transportation system, missing sidewalks pose a unique connectivity issue."

Virginia Transportation Research Council (VTRC)

The goal of the Countywide Sidewalk Inventory and Implementation Plan is to establish a long-term framework for improvements that will enhance the pedestrian environment and increase opportunities to choose walking as a mode of transportation. The sidewalk inventory itself creates a comprehensive database of the existing sidewalk network features within Chesterfield County. The implementation plan identifies future sidewalk additions for priority locations and between identified pedestrian destinations and generators.

According to the US Department of Transportation, Virginia residents are more likely to drive to work than the average US citizen and are less likely to utilize other modes of transportation to reach their work, including walking, biking, and public transit. Chesterfield County currently has more than 265 miles of sidewalks and shared use paths located, situated on both public and private land. Conversely, Chesterfield County has more than 4,000 lane miles that are VDOT-maintained, in addition to a large number of private roads and entrances maintained throughout the County. Clearly, the need to increase the availability of sidewalks is necessary for the future of Chesterfield County.

Why are sidewalks important? Roadways do not work independent of one another – together they form a network that moves both people and goods from one location to another. Sidewalks provide a dedicated space for pedestrian travel and eliminate the need for pedestrians to share the roadway with vehicles. Almost all trips have a walking component, whether to and from a transit stop or from a parking location to the final destination. Sidewalks improve safety for all citizens, but especially for children, the disabled, and the elderly. Sidewalks provide a safe method of transportation for shorter trips and reduce reliance on automobiles. VDOT has noted that serious pedestrian injury crashes can be reduced through improvement and expansion of pedestrian facilities in urban areas.

Investment in sidewalk infrastructure has many benefits for a community. Walking tends to be particularly important for lower-income populations who have fewer opportunities to participate in the traditional automobile-centric transportation network. The ability for pedestrians to move safely and conveniently through an area is important to its economic vitality. A number of studies have determined that investing in walking or biking pedestrian infrastructure has many benefits spread widely across the community. According to the Victoria Transport Policy Institute, an improved pedestrian environment provides many individual and community health benefits, such as opportunities for increased social interaction, reduced crime, increased sense of community, and increased volunteerism.

Many localities recognize that encouraging pedestrians to move throughout an area via sidewalks and other pedestrian amenities is important to economic development. A study completed jointly by the University of Arizona and Indiana University found that office, retail, and apartment properties had higher property values if they are located in areas rated as more "walkable". Investing in sidewalks is investing in the economic health of the County.

In the overall transportation infrastructure financial climate, resources for sidewalk maintenance and development are limited and competitive. Chesterfield County relies on good information to utilize those limited resources efficiently. This project includes an accurate inventory of where sidewalks are located and recommendations to where sidewalks should be located, so as to optimize the investments of the County. Installation of sidewalks is in keeping with Complete Streets policy, as well as furthers the goals of Vision Zero and other pedestrian safety programs.

1.3 PROJECT THEMES

Throughout discussions with County staff, the following themes were consistent factors in the development of the Countywide Sidewalk Inventory and Implementation Plan:

- Demographic Challenges – Neighborhoods that rely upon local trips to reach work, recreation, or commercial needs are limited to utilizing in-road or poorly maintained paths and shoulders along roadways instead of a dedicated pedestrian space.
- Mobility Challenges – Sidewalks provide multimodal choices for residents with mobility challenges. People who prefer not to drive or are unable to drive will have more travel options. Provision of ADA-compliant facilities will ensure that people with disabilities have more mobility options.
- Safety – Between 2013 and 2019, roadways within Chesterfield County experienced 277 crashes involving pedestrians, for an average of over 39 pedestrian-related crashes per year. Installing sidewalks in heavy pedestrian corridors can reduce conflicts, serve as a mitigation factor, and ultimately increase pedestrian safety.
- Connecting Important Destinations – Key activity centers, such as schools, civic buildings, libraries, and commercial destinations do not currently have the necessary sidewalk infrastructure to increase local pedestrian use and reduce vehicle trips.
- Connectivity – Continuity of sidewalks that currently exist or are planned in the County provides a network where each new segment enhances the value to each citizen.

2 EXISTING SIDEWALK INVENTORY

2.1 DATA COLLECTION METHODOLOGY

Data collection for the sidewalk inventory began in November 2019 and continued through January 2020. A GIS database compiled in 2017 of known sidewalk locations, provided by Chesterfield County, served as the basis for the inventory. The data collection effort consisted of three (3) components:

1. Verifying all sidewalk locations provided by the County's existing data;
2. Utilizing available VDOT statewide inventory for roadway components within the right-of-way to identify sidewalk locations for all major routes in the County; and
3. Adding all currently funded sidewalk/trail projects in the County.

The final deliverable was a database of all existing sidewalks in Chesterfield County as of January 2020. It should be noted that there is a considerable amount of residential construction ongoing in Chesterfield County and this inventory was focused primarily on collectors, arterials, and other major routes, not neighborhood streets.

Timmons Group's existing sidewalk analysis for Chesterfield county required Timmons Group technicians to digitize all currently constructed sidewalk throughout the county. To expedite this process, Timmons Group GIS Analysts combined a sidewalk layer provided by Chesterfield County and a sidewalk layer that Timmons Group had previously created for a statewide inventory for VDOT through an automated and repeatable process using Safe Software's FME Data Integration Platform. This platform allowed for inputs to account for nearly identical sidewalks which were subsequently deleted, as well as attribution merging where necessary.

While this process expedited and improved what would have been a lengthy manual digitization process, it did still require manual review and clean up by Timmons Group GIS Technicians. This manual review included additional attribution and sidewalk digitization along main roads using a combination of Esri's imagery and Google Streetview. These efforts were focused on major roads in Chesterfield County and not on private developments or local neighborhood streets.

After completion of the existing conditions review and addition of all proposed segments, the analysis determined that Chesterfield County currently contains more than 265 miles of sidewalk, shared-use paths, trails, and other pedestrian facilities. The vast majority (>97%) of these facilities are typical concrete sidewalks.

Figures 2-1 through 2-3 helps to illustrate the findings of the existing conditions analysis.

Deliverable

- GIS data set of existing, updated, confirmed sidewalks (pedestrian facilities) with metadata.

Figure 2-1: Chesterfield County Existing Sidewalks Dashboard

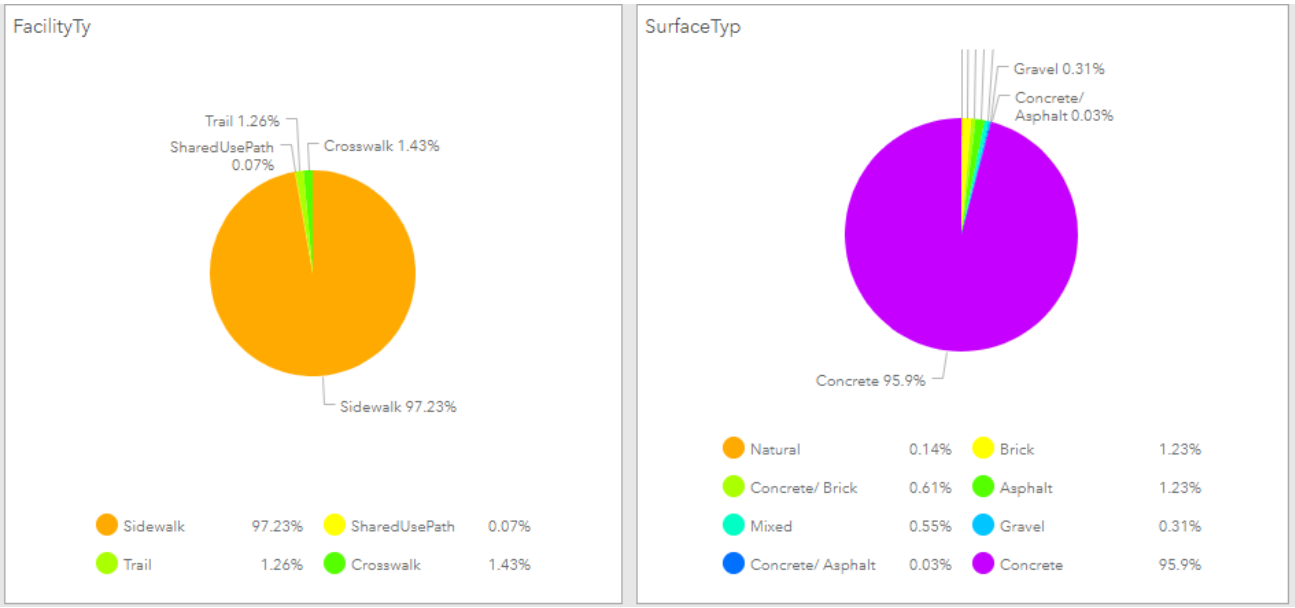


Figure 2-2: Chesterfield County Existing Sidewalks Dashboard

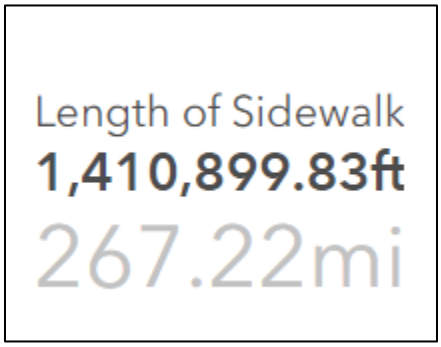
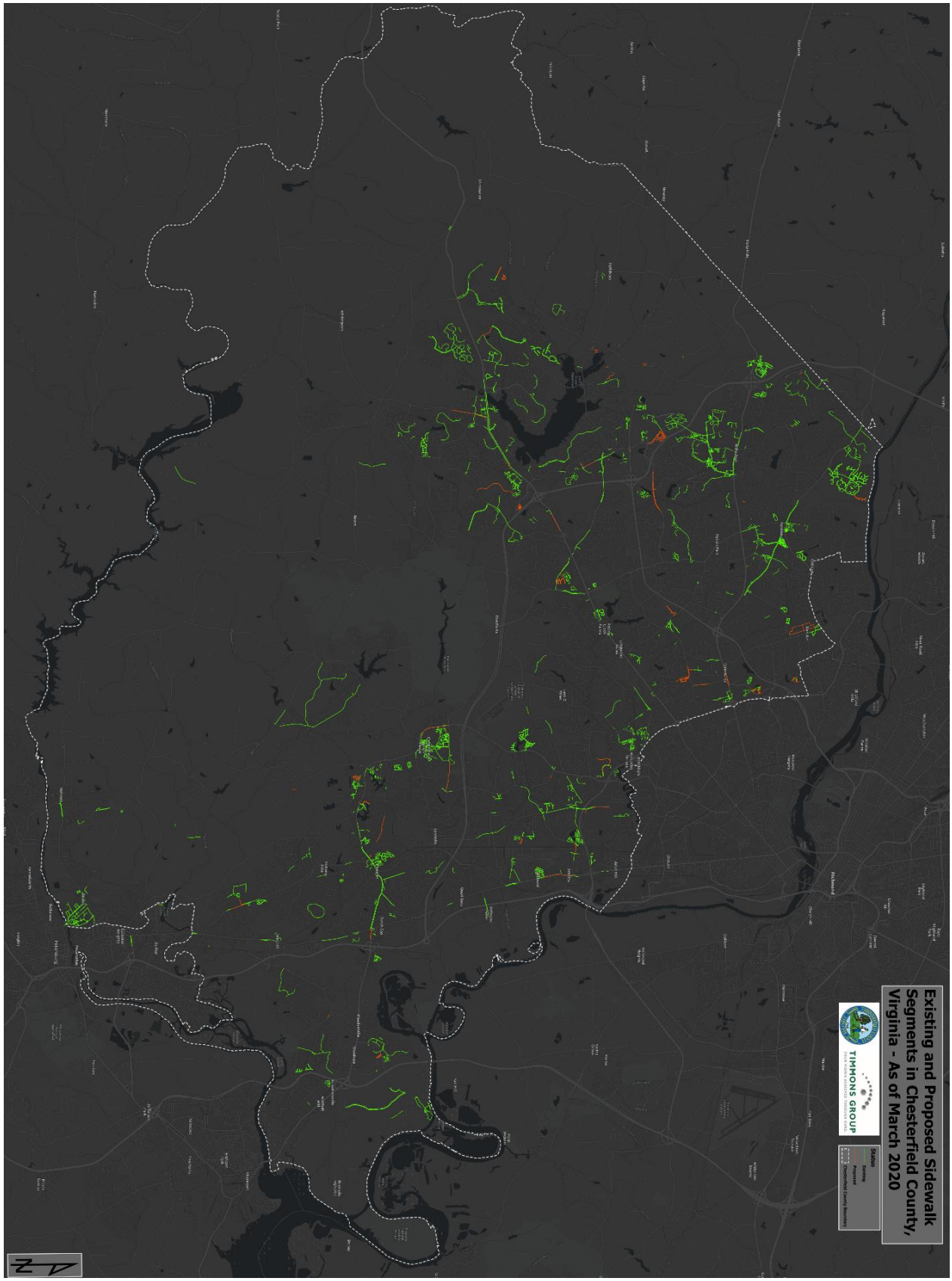


Figure 2-3: Chesterfield County Existing Sidewalks Dashboard



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3 ANALYSIS METHODOLOGY

3.1 OVERALL APPROACH

The first step in identifying and prioritizing future sidewalk projects was a demographics analysis. The demographics analysis was completed using input both from the CDC Vulnerability Index and from County staff recommendations and identified which census blocks are highest in "need" of sidewalks and mobility for their population. The demographic data analysis allowed the team to locate focus areas but did not provide specific locations for sidewalk improvements. Each census block was ranked and assigned a priority score based on the above.

The second step in identifying and prioritizing future sidewalk projects was a proximity analysis. The proximity analysis takes each potential recommended sidewalk segment and measures its proximity to attractors (schools, municipal, services, commercial areas, jobs, transit) and detractors (pedestrian crashes, roadway speed, ADT). The closer that a recommended segment is to a destination or multiple destinations, the higher the score. The proximity analysis allows us to identify the sidewalk projects within the County that will garner the most user benefit if installed.

The final step to prioritizing future sidewalk projects was combining the demographics analysis census block score with proximity analysis score to prioritize the projects in the Sidewalk Implementation Plan. If we visualize the analysis process as a traditional origin/destination study for pedestrians, the demographics are the "origin" and proximity to schools or commercial areas are the "destination".

The demographics analysis, proximity analysis, and other map overlays were provided as separate maps for use by County staff to review specific locations or other proposed/future sidewalk projects. The other standalone overlay maps can be used with the Sidewalk Implementation Plan to identify other areas that the County may pursue for specific grants/funding sources. Information from these maps can be used to change scoring or only as visual representation of areas of need.

3.2 DEMOGRAPHIC ANALYSIS

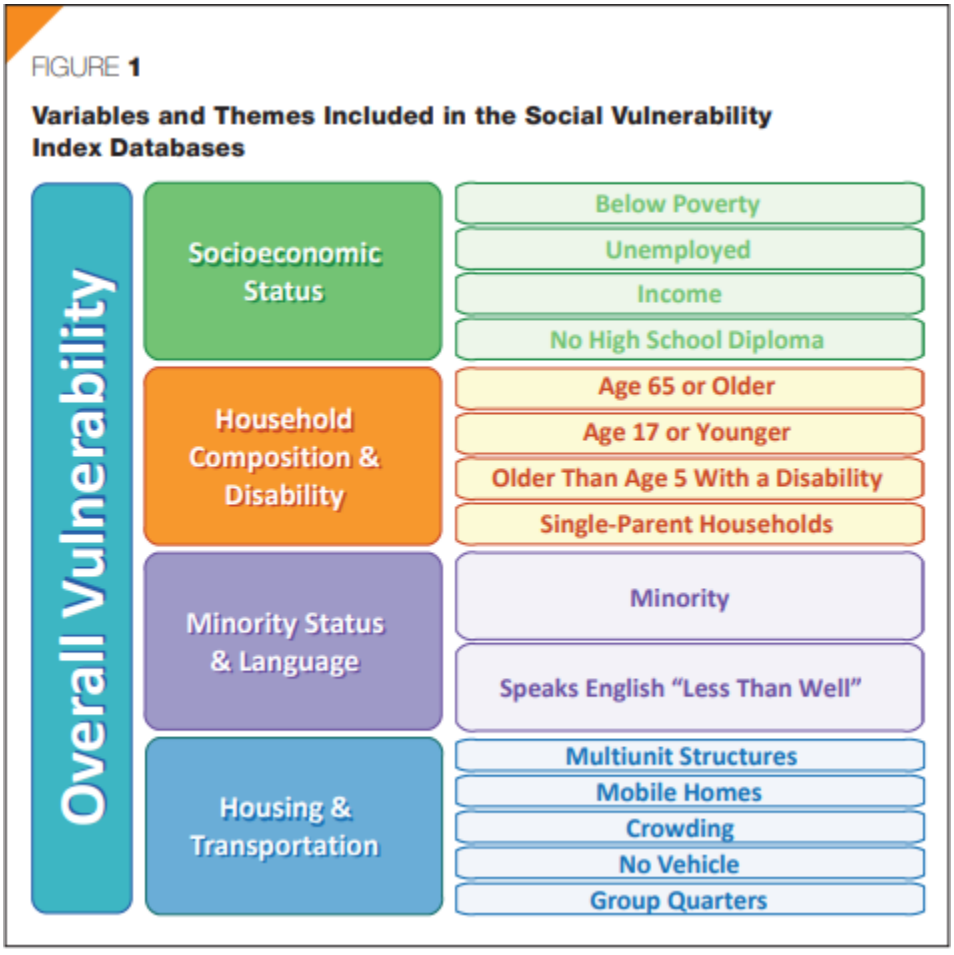
At the beginning of the project, it was determined that a key component of the data enrichment process would be the use of demographic analysis to identify communities that would benefit the most from the addition of pedestrian improvements. Demographic analysis was performed using the Business Analyst Online (BAO) application in Esri's ArcGIS Online platform at the Census Block Group level[1]. Chesterfield County is comprised of 168 Census Block Groups (CBGs) using 2010 Census data. The CBGs were ranked based on two (2) separate sets of criteria – CDC Social Vulnerability Index and Chesterfield County's Demographic Ranking Criteria.

[1] https://www.esri.com/en-us/arcgis/products/arcgis-business-analyst/overview

3.2.1 CDC Social Vulnerability Index (SVI)

The US Centers for Disease Control Social Vulnerability Index (SVI) was originally designed to help identify localities most at-risk from natural or human-caused disasters[2]. It utilizes four (4) demographic themes (Socioeconomic Status, Household Composition and Disability, Minority Status and Language, and Housing and Transportation) comprised of 17 total demographic data points to rank order communities on a continuum from most to least at-risk. This index was selected for its academic rigor, current usefulness to policymakers, and parallel purpose to project outcomes. The four (4) demographic themes and 17 demographic variables are illustrated in Figure 4-1 below.

Figure 3-1: CDC Social Vulnerability Index



To re-create the SVI methodology, each of the four (4) themes were run as separate suitability analyses in BAO with their attending data points as the variables. The resulting final rankings in each thematic category were then rerun in an aggregate suitability analysis to determine the overall ranking of the CBGs according to the SVI.

[2] https://svi.cdc.gov/

The data points for each theme were recreated as consistently as possible using the most recent analogous data available through Esri's Business Analysis Online (BAO) data search using the follow data:

- Socioeconomic Status: 2019 Household Incomes less than $26,000 (Esri), 2019 Unemployed Population 16+ (Esri), 2019 Average Household Income (Inverse, Esri), and No HS Diploma (Esri).

- Household Composition and Disability: 2019 Population totals, Both, Ages 65+ (Esri), 2019 Population totals, Both, Ages less than 17 (Esri), 2013-2017 ACS HHs w/1+ Persons w/Disability (ACS), 2010 Population Living in Other Family Households with a Male or Female Householder with no Spouse (2010 Census).

- Minority Status and Language: 2019 Minority Population (Esri), and ACS Population 5+ speak Spanish/API/Other & English Not Well/None (2013-2017 ACS, 18 Components).

- Housing and Transportation: ACS Housing: 1 Detached Unit in Structure (Inverse, ACS 2013-2017), ACS Housing: Mobile Homes (ACS 2013-2017), 2019 Population Density (Esri), ACS Owner/Renter HHs by Vehicles Available 1 or 0 (ACS 2013-2017), and 2019 Population in Group Quarters (Esri).

The CDC SVI information has been provided to allow for a comparison with the chosen methodology and criteria provided by Chesterfield County. The similarity in data and variables between the two (2) methods lends credibility to the chosen method presented below.

3.2.2 Chesterfield County Demographic Ranking Criteria

The Chesterfield County Transportation Department (CDOT) requested a separate demographic analysis according to criteria that aligned more closely to their goals for the overall project. This analysis utilized eight (8) demographic data points comprised of similar criteria as the CDC SVI, while adding Low-Moderate Income (LMI) from the federal Department Housing and Urban Development (HUD), as well as non-traditional commute methods to broaden the scope of the results.

The County variables are split equally between those primarily related to socioeconomic factors and those primarily related to pedestrian mobility needs.

Socioeconomically, the LMI variable was calculated as a percentage of households below the LMI threshold in each CBG. This official HUD data was acquired from the US Open Data Portal and was created using responses to the 2011-2015 American Community Survey (ACS).[3] Additionally, 2019 Median household income data was included as an inverse variable, along with 2019 population density and the 2019 unemployed population over 16 (Esri).

[3] Data.gov

On the transportation side of the equation, four (4) variables ranked CBGs based on pedestrian mobility needs according to ACS data points (from 2013-2017):

1. Owner or Renter Households by Vehicles Available 1 or 0;
2. Workers who walked to work;
3. Workers who biked to work; and
4. Workers who rode public transportation to work.

These criteria resulted in a more even distribution of rankings than the CDC SVI but showed similar geographic patterns among the highest ranked localities. The middle distribution of the Chesterfield analysis captured a broader range of areas within the county. After review, the Chesterfield County Demographic Ranking Criteria was chosen over the CDC SVI given that the additional variables better reflected the County's goals.

3.3 Demographic Analysis Data Sources

Data for the two (2) demographic analysis methodologies was drawn from authoritative sources via research and the BAO data browser. The only data (LMI%) not pulled directly from the data repository on BAO came from the US Government open data portal.[4]

The data credited to Esri is created by the Esri Demographics division, which is recognized as being the most accurate private demographic data vendor in a 2010 comparison of vendor forecasts with official 2010 Census Data, especially at the more granular level of Census Block Groups used in this application.[5]

2010 Census data was collected by the US Census Bureau (USCB) in 2010. This data is the benchmark in demography, and acts as the baseline for all other data forecasts and models like the Esri data described above. The only shortcoming is its decennial cycle, which often renders the data less than useful during the closing years of the decade as is the case with this analysis. This data was used for only one variable in this analysis – "single-parent households" in the SVI.

American Community Survey (ACS) data is an ongoing survey conducted by the USCB on an annual basis. Data is most often binned as averages or aggregates of 5-year blocks. This data serves a bridge between the decennial national census, and private demography data vendors like Esri. While it is not as up to date as vendor data, it has the advantage of being official data from the US government.

3.4 Demographic Analysis Results & Mapping

The following section is reserved for maps that illustrate the demographic analysis for the Chesterfield County Demographic Ranking Criteria. The maps rank all 168 CBGs in the County based on the criteria and will allow for scoring and ranking sidewalk segments based on the demographics.

[4] Data.gov
[5] https://www.esri.com/~/media/Files/Pdfs/library/brochures/pdfs/vendor-accuracy-study.pdf

3.5 PROXIMITY ANALYSIS

The proximity analysis on the Timmons Group recommended sidewalk segments was conducted utilizing location data from Chesterfield County, VDOT, Greater Richmond Transit Company (GRTC), and the Esri BAO relative to a wide array of variables that influence where pedestrians are likely to travel. These variables include County Points of Interest (Schools, Colleges, Parks, Community Centers, Government Buildings, Libraries, Post Offices, and Hospitals), County Services, Public Transit Stops, Vehicle/Pedestrian Crash Locations, and 1,400 county businesses and employers.

In order to analyze the wide variety of data available, a pedestrian priority model was created to convert the data into an organized and scoreable form.

3.5.1 Pedestrian Priority Model (PPM)

The Chesterfield Pedestrian Priority Model (PPM) was developed by Timmons Group and identifies areas within the county that are most likely to have pedestrian traffic. The cities of San Diego, CA and Duluth, MN performed similar calculations and their methodology served as guides for the development of the Chesterfield PPM. The model was created to identify the most likely pedestrian use locations and prioritize projects to affect the largest number of pedestrians. In conjunction with the sidewalk inventory, the model will identify gaps where pedestrian facilities should exist.

The model has three (3) basic components:

- Pedestrian Generators
- Pedestrian Attractors
- Pedestrian Detractors

Pedestrian generators utilize data from the American Community Survey and the US Census through Esri Business Analyst Online (BAO). Demographic inputs into the generator component include all items discussed in the Chesterfield County Demographic Ranking Criteria discussion above.

The concept behind the pedestrian generator component is that pedestrian activity is higher in areas where more people live and work. It also accounts for concentrations of vulnerable low-income populations. The final inputs of land use make the connection between land uses and where people live and work. As a reminder, these are the items that make up the pedestrian generation score from the Chesterfield County Demographic Ranking Criteria:

- 2013-2017 ACS Owner/Renter HHs by Vehicles Available: 1 or 0
- 2013-2017 ACS Workers Walking to Work
- 2013-2017 ACS Workers Biking to Work
- 2013-2017 ACS Workers Transit to Work
- 2019 Population Density
- 2019 Employed Population (16+)
- 2019 Median Household Income
- 2019 Low-Moderate Income (LMI)

The Pedestrian Generator Score was derived by performing a spatial join of the Chesterfield County Demographic Ranking Criteria scores to the TG Recommended sidewalk segments based on the centroid location of each segment. The 0-1 demographic score for each segment was multiplied by a hypothetical "perfect generator score" of 30 to give each segment a Pedestrian Generator Score.

Pedestrian attractors focus on geographic features that are likely to attract pedestrian activity. These places that are the destinations for pedestrians and draw traffic into an area. Geographic features incorporated in this component of the model include schools, parks/rec facilities, services, and neighborhood retail.

Each attractor received a point value based on the buffered distance to that attractor. The attractor point value was multiplied by the buffered distance value to calculate a cell's value for that specific geographic feature. Recognizing certain features are more appealing for pedestrian activity than others, points were assigned in relation to their desirability as shown in Figure 3-2 below.

The Pedestrian Attractor Score analysis evaluated the proposed segments to identify the presence and account for all points of interest within ½ mile of each. Points were then assigned based on the simple presence of each point type within the buffer area, except for businesses, which were evaluated based on a threshold of 10.

For a complete breakdown of geographic feature values and scoring, see Figure 3-2 below.

Figure 3-2: Pedestrian Attractors

Pedestrian Attractors	Points
Transit Stops	5
Community Centers	3
Neighborhood/Community Retail < 10	2
Neighborhood/Community Retail > 10	4
Elementary Schools	3
Middle Schools	2
High Schools	2
County Services	2
Libraries	2
Post Offices	1
Colleges	1
Parks and Recreation	1

Pedestrian detractors are features that discourage or detract people from walking in an area or could potentially serve as a barrier for pedestrians to cross a roadway. Inputs for the detractor component include pedestrian crashes, average daily trips (ADT) of a roadway, and speed limits.

Pedestrian crashes for the years 2013 to 2019 were obtained from publicly available VDOT crash data. A buffer of 1/16 mile was placed around each individual sidewalk segment to find crash totals, divided by the number of crash data years available at this time (7 years). The most recent year available for average daily traffic (ADT) data from VDOT for a segment of roadway was used as the input. ADT and speed limit data were spatially joined to the sidewalk segments using buffers on road centerline data. Where sidewalks spanned beyond a single road section resulting in multiple values for each factor, the maximum value was joined.

While a detractor is negative for the walkability of an area, it increases the importance for pedestrian treatments if there is potential for higher pedestrian traffic according to the generator/attractor components. Areas where the generator and attractor components score highly, and barriers exist, are considered high priority for treatment.

Figure 3-3 includes how detractors were valued for this component.

Figure 3-3: Pedestrian Detractors

Pedestrian Detractors	Points	Weighting	Final Score
Pedestrian Crashes per Year (1/16 mile buffer applied to each crash)			
1+	3	3	9
0.5 - 0.9	2		6
0 - 0.5	1		3
0	0		0
Average Daily Trips (ADT)			
> 45,000	3	2	6
35,000 - 45,000	2.5		5
25,000 - 35,000	2		4
15,000 - 25,000	1.5		3
10,000 - 15,000	1		2
5,000 - 10,000	1		2
< 5,000	0.5		1
Speed Limit			
> = 45 MPH	3	1	3
35 - 40 MPH	2		2
30 MPH	1		1
< = 25 MPH	0		0

3.6 Proximity Analysis Data Sources

Official County data (POI and county services locations) was provided in Excel tables that included XY coordinates for each location, which were converted into point feature classes in ArcGIS Pro. Official VDOT Crash data was received in a similar format from the county and filtered to only include crashes involving pedestrians, then processed into ArcGIS Pro. GRTC transit routes and stop data was obtained using the data portal in ArcGIS Pro. Business locations and the number of employees were obtained by searching in BAO for all businesses within Chesterfield County. The results were then imported to ArcGIS Pro to perform the analysis above.

3.7 Proximity Analysis Results & Mapping

The composite model combines the generators, attractors, and detractors components to determine the areas with the highest combination of points. Values for each component were overlaid on one another and the sum of all three (3) components was assigned to the area. The larger composite value identifies areas with the highest overall pedestrian priority. It should serve as a guide to where pedestrian facilities are needed the most based on the highest concentration of factors.

After the potential recommended segments were scored in all three (3) categories, the scores were summed, and the segments ranked in order from high to low. The following section is reserved for maps that illustrate the proximity analysis results and mapping. All 2,000+ recommended sidewalk segments in Chesterfield County were included in the scoring/evaluation process and have been ranked accordingly.

For this draft, the Top 25 recommended segments throughout the County are provided. Prior to finalizing the scoring and ranking, Chesterfield County staff will provide input. Once the scoring and rankings are finalized, a prioritized list will be provided to the County.

4 ENGINEERING APPROACH

During the completion of the GIS demographic and spatial analysis process, an engineering framework was adopted to assist in (1) identifying locations for recommended sidewalk segments and (2) determining cost estimates for integration into the final prioritization rankings.

The engineering process utilized both the collected/verified existing sidewalk and pedestrian facilities layer to identify the locations within the County that warrant the most focus. A "missing link" analysis was performed to ensure that all existing/proposed sidewalks were connected to another existing/proposed sidewalk segment. One (1) goal of the engineering approach was to ensure that projects were scalable from existing sidewalk segments so that compounding impact could increase the value of the recommended segment. Aerial imagery and familiarity with the area were leveraged to determine locations along existing roadways that were more suitable for sidewalk improvements.

After receiving preliminary information based on the demographic, socioeconomic, and proximity analyses, Timmons Group performed visual geometric assessments of existing roadway infrastructure to identify locations where sidewalk was most needed. In addition, the engineering review identified any potential constraints or opportunities related to respective pedestrian facilities. As an example, in more rural areas, sidewalk recommendations were generally confined to one side of the roadway for long stretches, making use of existing utility corridors that may limit right-of-way requirements.

Roadway widths, speeds, and volumes were assessed along each corridor to determine anticipated pedestrian traffic and necessary sidewalk improvements. In addition, the adjacent land uses and VDOT roadway functional classifications were consulted. Adjacent connections between residential, commercial, and office land uses can influence the current/future need of sidewalk. Major roadways with more than 2 lanes of traffic were generally recommended to have sidewalks on both sides of the roadway to increase access and reduce the potential for mid-block crossing (jaywalking) and other crossing safety concerns.

The overarching goal of creating an extensive recommended sidewalks segment list was to propose a larger sidewalk network that can serve as a long-range planning tool for Chesterfield County. The majority of sidewalk segments identified through the engineering approach do not score well in the ranking methodology but were included to provide a roadmap for funding future sidewalk improvements. In addition, the more sidewalk segments that were proposed for analysis allowed for refining of the model to ensure that the most necessary locations were ultimately included and ranked appropriately.

The currently funded and ongoing design projects under Chesterfield County or VDOT control as of June 1, 2020 were included in the mapping procedure as "proposed" sidewalk segments. In addition, any private development with proffered sidewalk improvements was also included in the "proposed" sidewalk segments map. These segments were used to understand the current development and plans of the County and aid in the missing link and gap analysis.

The estimated cost per linear foot associated with each typical section is based on general conditions anticipated to be encountered on a typical baseline project. Items difficult to quantify but could be necessary such as bridges, box culvert extensions, large pipe extensions, retaining walls, handrails, and signal upgrades are not included and should be accounted for separately on a project-by-project basis as appropriate.

4.1 PROPOSED SIDEWALK TYPICAL SECTIONS

Based on the anticipated recommended sidewalk locations, typical sections were developed to provide representative construction costs and placement within a corridor. The typical sections were conceptual/high level and are intended to assist in developing long-term costs and securing funding.

It should be noted that all costs were estimated using 2020 dollars and will need to be adjusted accordingly, based on anticipated construction dates. The costs are provided on a linear foot (LF) basis and in include all estimated construction costs, mobilization, material testing, construction contingencies, utility adjustments, construction administration, inspections, VDOT administration, right-of-way acquisition fees, environmental fees, wetlands mitigation costs, preliminary engineering and design, and other generic contingencies on a project of this nature. A typical section figure is provided for each of the proposed five (5) types.

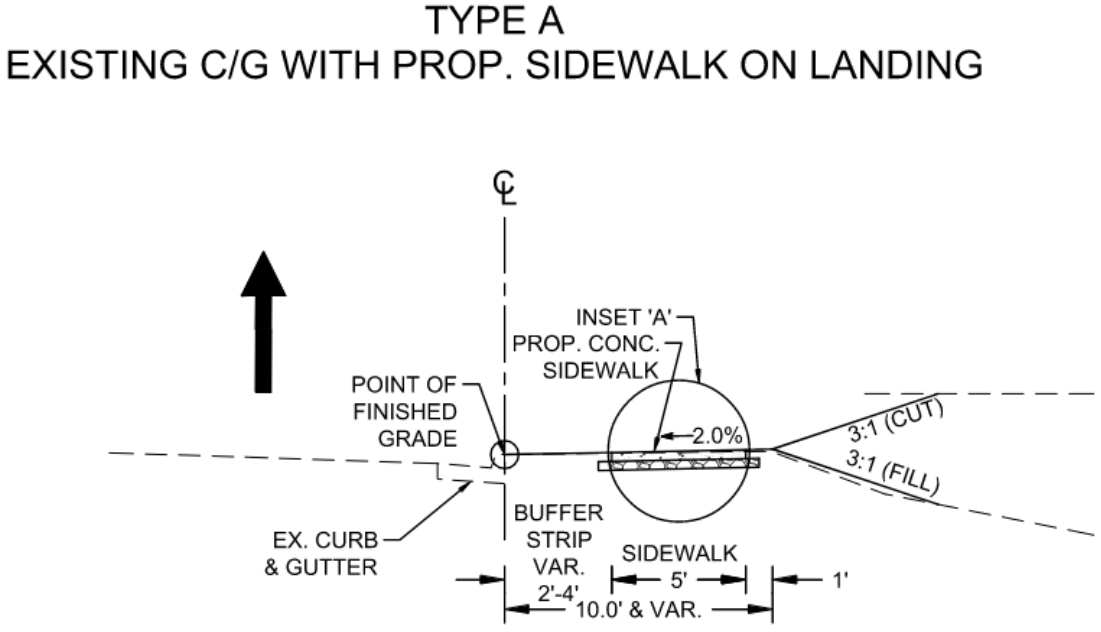
4.1.1 Typical A – Existing Curb and Gutter with Proposed Sidewalk on Landing

Typical A is a traditional sidewalk installation in a location that has existing curb and gutter and an existing graded landing behind. The sidewalk can be placed at the back of curb and gutter, or with a buffer, with minimal engineering and construction challenges. The typical estimate includes clearing and grubbing 10 feet behind the curb and gutter, erosion and sediment control/seeding, minor excavation for the sidewalk placement, and the typical stone and concrete necessary to complete a 5-foot wide, 4" depth sidewalk.

The rounded budget per linear foot for Typical A is $150.

Figure 4-1 below illustrates Typical A, showing the existing curb and gutter with the proposed sidewalk on the landing behind.

Figure 4-1: Typical A – Curb and Gutter with Proposed Sidewalk on Landing



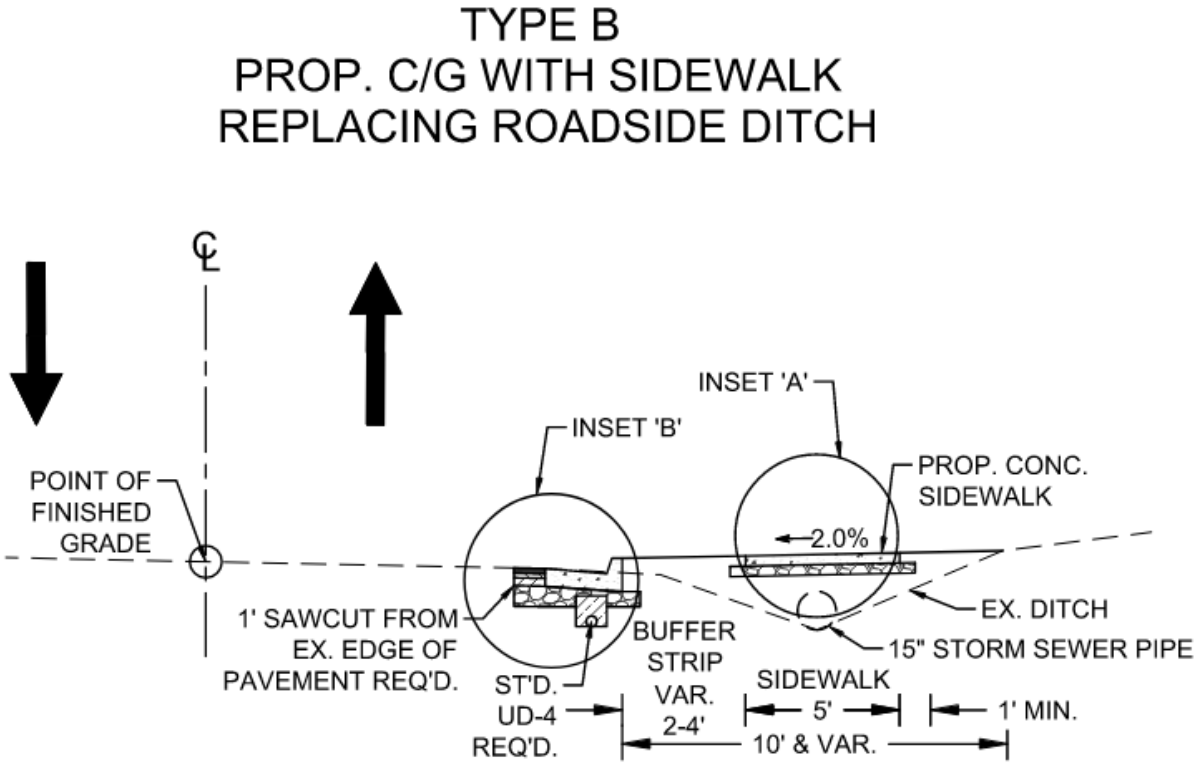
4.1.2 Typical B – Proposed Curb and Gutter with Sidewalk, Replacing Roadside Ditch

Typical B is a standard upgrade of a roadway section that currently has a shoulder and ditch to having a proposed curb and gutter with sidewalk on the new landing behind. This type of improvement is anticipated in areas where existing curb and gutter are available to connect/extend along the section or to provide improvement for future growth. The transition from a shoulder and ditch section to a curb and gutter was accounted for in the engineering and construction costs, in addition to the potential need for more right-of-way. The typical estimate includes clearing and grubbing 12 feet wide, demolition of existing pavement, borrow excavation for leveling the ditch section, storm sewer improvements, curb and gutter, pavement and stone to install the curb and gutter, erosion and sediment control/seeding, typical stone and concrete for sidewalk construction, and installation of driveway entrances along the path.

The rounded budget per linear foot for Typical B is $675.

Figure 4-2 below illustrates Typical B, showing the existing center line of the road out to the existing shoulder and ditch section, with all proposed curb, gutter, and proposed sidewalk on the landing behind.

Figure 4-2: Typical B – Proposed Curb and Gutter with Sidewalk Replacing Roadside Ditch



4.1.3 Typical C – Proposed 4' Roadway Widening with Curb, Gutter, and Sidewalk

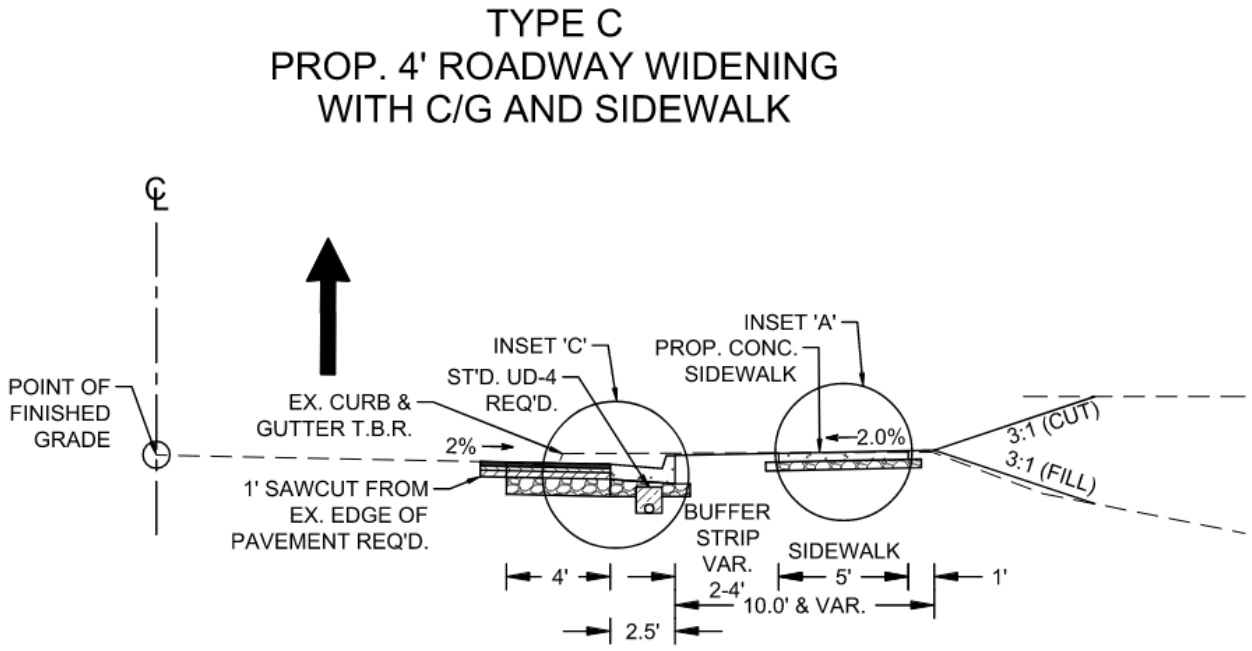
Typical C is a more involved roadway section upgrade than Typical B. Typical C is intended where the existing roadway is not wide enough to meet VDOT standards for lane widths or the roadway needs additional shoulder to accommodate the volume of vehicular and/or bicycle traffic. Typical C widens the roadway section by 4 feet in addition to installing curb, gutter, and sidewalk. The right-of-way costs for this typical are the highest given the expected need for widening. In addition, this option includes higher costs for engineering and construction given the complexity of situation that a widening would be required.

The typical estimate includes clearing and grubbing 12 feet wide, demolition of existing pavement, borrow excavation for leveling the ditch section, additional excavation for widening, storm sewer improvements, curb and gutter, pavement and stone to install the curb and gutter, erosion and sediment control/seeding, typical stone and concrete for sidewalk construction, and installation of driveway entrances along the sidewalk section.

The rounded budget per linear foot for Typical C is $825.

Figure 4-3 below illustrates Typical C, showing the existing center line of the road out to the proposed curb and gutter section, buffer area, sidewalk, and graded tie-in to existing.

Figure 4-3: Typical C – Proposed 4' Roadway Widening with Curb, Gutter, and Sidewalk



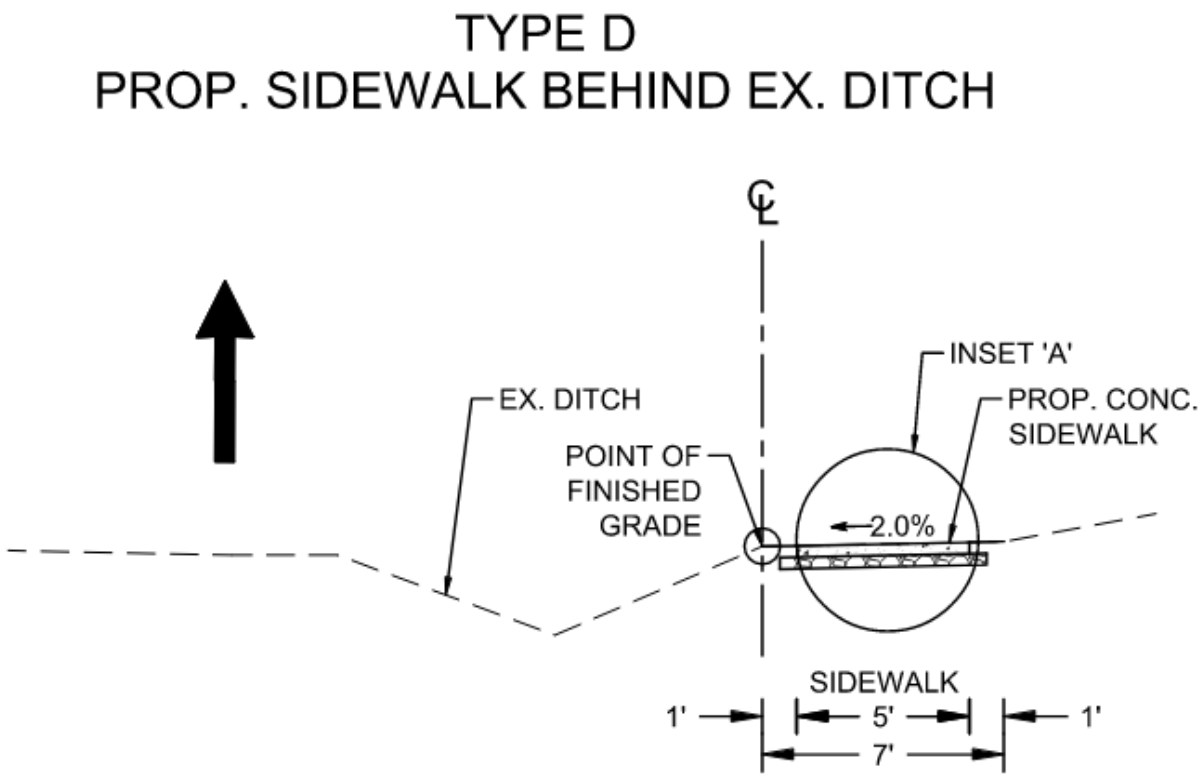
4.1.4 Typical D – Proposed Sidewalk Behind Existing Ditch

Typical D is a traditional sidewalk installation behind an existing ditch. There are no improvements to the existing roadway, shoulder, or ditch drainage. This option has similar construction costs to Typical A but includes higher right-of-way costs. Generally, this type of improvement will be recommended in the more rural areas to allow for flexibility of sidewalk placement and to avoid additional costs associated with drainage improvements; this contributes to the increased right-of-way costs due to potential prescriptive or narrow ownership along certain roadways. The sidewalk can be placed at the back of ditch with minimal engineering and construction challenges. The typical estimate includes clearing and grubbing 15 feet behind the existing ditch, erosion and sediment control/seeding, minor excavation for the sidewalk placement, and the typical stone and concrete necessary to complete a 5-foot wide, 4" depth sidewalk.

The rounded budget per linear foot for Typical D is $180.

Figure 4-4 below illustrates Typical D, showing the maintenance of the existing roadway, shoulder, and ditch section and placement of the sidewalk improvements at the back of the ditch.

Figure 4-4: Typical D – Proposed Sidewalk Behind Existing Ditch



4.1.5 Typical E – Proposed Shared Use Path Behind Existing Curb and Gutter

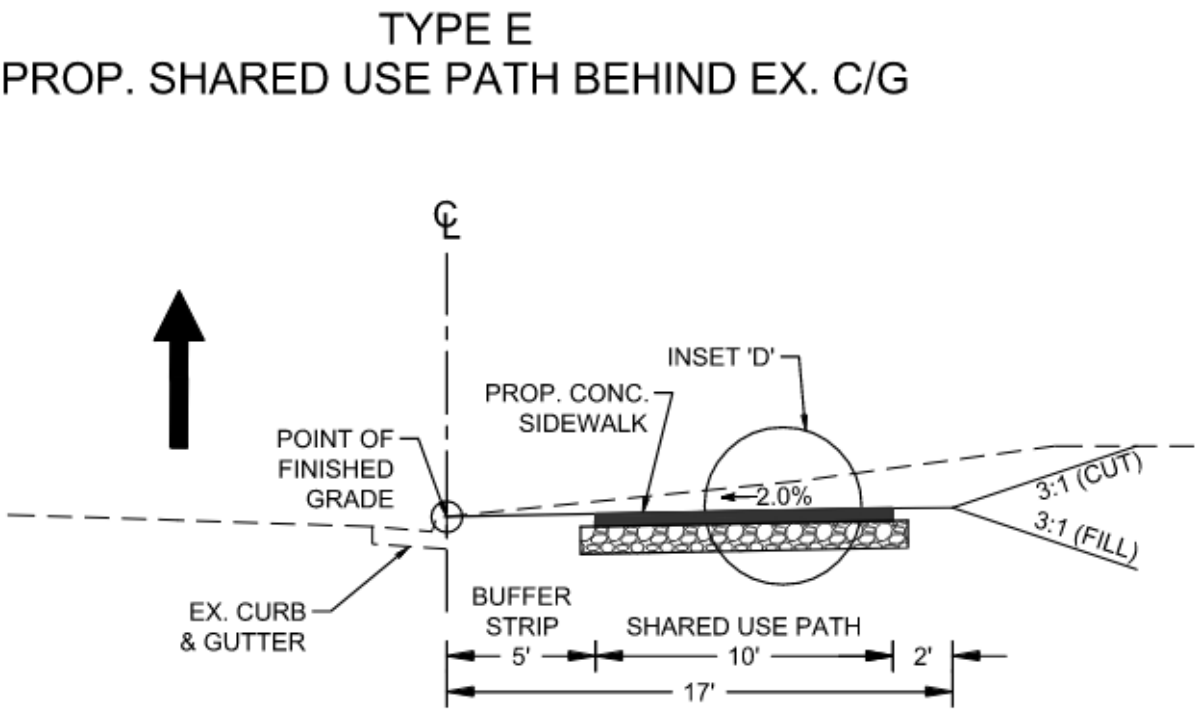
Typical E is a traditional shared use path installation in a location that has existing curb and gutter and an existing graded landing behind. Although there may be an existing landing, the shared use path is anticipated to necessitate additional right-of-way and grading. The shared use path can be placed at the back of curb and gutter, or with a buffer, with minimal engineering and construction challenges. Typical E was generally recommended in locations where it was understood that the County may want to pursue more pedestrian/bicycle mobility on a major route but does not have the ability to widen the roadway for a bicycle lane.

The typical estimate includes clearing and grubbing 25 feet behind the curb and gutter, erosion and sediment control/seeding, minor excavation for the shared use path placement, and the typical stone and concrete necessary to complete a 10-foot wide shared use path. Driveway/entrance improvements are necessary to accommodate the shared use path to the existing corridor.

The rounded budget per linear foot for Typical E is $300.

Figure 4-5 below illustrates Typical E, showing the maintenance of the existing roadway, curb, and gutter section and placement of the shared use path improvements after a buffer on the landing behind the curb and gutter.

Figure 4-5: Typical E – Proposed Shared Use Path Behind Existing Curb and Gutter



4.1.6 Typical X – Undefined

Typical X is a comprehensive typical that covers all sidewalk improvements that include known challenges to construction, design, or right-of-way that will require additional fee beyond the "typical costs". During the sidewalk recommendation process, there were several locations determined to be unique and outside the parameters established in typical sections A through E. Situations like this include crossing of major wetlands, bridge replacement requirements, crossing of interchanges, and other major construction or cost factors.

There is no estimate cost per linear foot for Typical X. Any recommended sidewalk that is ranked highly in the prioritization process and falls under Typical X will be reviewed by Timmons Group and Chesterfield County staff to determine if it should remain prioritized. If so, a cost estimate unique to that location can be calculated and provided for inclusion in the final report.

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5 PRIORITZED LIST OF RECOMMENDED SIDEWALK IMPROVEMENTS

Similar to other transportation improvements, including roadway projects, the resources available to construct pedestrian infrastructure are limited. Funding decisions must be made carefully to ensure that the investment of public resources provides the greats possible benefit in the most efficient way.

After completion of the demographic analysis, proximity analysis, and engineering review, the final list of more than 2,000 recommended sidewalk segments in Chesterfield County were ranked and prioritized against the goals of the project. The top recommended sidewalk segments are presented in eleven (11) different lists based on the overall Top 50, the Top 25 for different types of sidewalk installations, and the Top 10 for each Magisterial District. The entire ranked list and mapping has been provided for County staff to utilize in the most appropriate manner through ArcGIS software.

Based on the methodologies and data presented, Timmons Group has provided a prioritized list of recommended sidewalk improvements. Over the course of this project detailed data collection and analysis has occurred that allow the list of recommendations to be data driven. This methodology and approach will help implement sidewalks that provide the most value to the County.

The detailed cut sheets of the recommended segments have been provided to illustrate (1) the location of the segments, (2) each segments score and ranking, and (3) the approximate cost estimate for each segment.

In general, the detailed cut sheets include the following information:

- Sidewalk Location
  - Aerial imagery showing the location and length of the overall improvement.
- Logical Termini
  - Roadway to roadway, connections between existing sidewalk, shared-use path, crosswalk, or other pedestrian infrastructure.
- Type of Improvement
  - Using typical sections A through E to help understand the necessary improvement need.
- Demographic Data Census Block Score
  - Provides details on the overall mobility needs and context of the area for each project.
- Proximity Analysis Score
  - Provides specific number and approximate distances from a project to expected pedestrian destinations, such as schools, county services, commercial land uses, crashes, transit components.
- Roadway Information
  - Incorporate roadway speed and volume information to aid the ranking process for each roadway with an adjacent recommended sidewalk.

5.1 TOP RECOMMENDED SIDEWALK SEGMENTS

The recommended sidewalk segments have been ranked and prioritized into the following eleven (11) different lists to aid the County in selecting projects for implementation; see Figures 5-1 through 5-11. Detailed cut sheets for all the listed recommended sidewalk segments can be found in Appendix A.

Figure 5-1: Overall Top 50 Recommended Sidewalk Segments

Overall Rank	Description	Type
1	US Route 60 – Providence Road to Ruthers Road (EB)	SharedUsePath
2	US Route 60 – Buford Road to Providence Road (WB)	SharedUsePath
3	US Route 60 – Boulders Parkway to Donald May Jr. Drive (EB)	SharedUsePath
4	US Route 60 – Stonebridge Plaza Avenue to Boulders Parkway (WB)	SharedUsePath
5	Boulders Parkway – Boulder Springs Drive to US Route 60 (SB)	Sidewalk
6	US Route 60 – Providence Road to Gateway Centre Parkway (WB)	SharedUsePath
7	US Route 60 – Gateway Centre Parkway to Providence Road (EB)	SharedUsePath
8	US Route 360 – Brad McNeer Parkway to Commonwealth Center Parkway (EB)	Sidewalk
9	Turner Road – Cloverleaf Drive to US Route 60 (NB)	Sidewalk
10	US Route 10 – Ware Bottom Spring Road to Old Stage Road (WB)	Sidewalk
11	Turner Road – Walmsley Boulevard to US Route 360 (NB)	Sidewalk
12	US Route 1 – Falling Creek to Parkdale Rd (SB)	Sidewalk
13	US Route 1 – Marina Drive to Station Road (in median)	SharedUsePath
14	Ruthers Road – US Route 60 to end of 60 West Shopping Center (SB)	Sidewalk
15	Ruthers Road – End of 60 West Shopping Center to Marthaven Dr (SB)	Sidewalk
16	Clovertree Ct - Newsted Dr to Providence Road (WB)	Sidewalk
17	Provincetown Drive – Providence Road to Newstead Drive (EB)	Sidewalk
18	Provincetown Drive – Newstead Drive to Ruthers Road (EB)	Sidewalk
19	US Route 1 - Willis Road to Kingsland Creek (NB)	SharedUsePath
20	US Route 360 – Commonwealth Center Parkway to Lonas Parkway (EB)	Sidewalk
21	US Route 360 – Price Club Boulevard to Rockwood Square Shopping Center	Sidewalk
22	US Route 360 – Speeks Drive to Price Club Boulevard (EB)	Sidewalk
23	US Route 1 - Route 830 to Station Road (In Median)	Sidewalk
24	Buford Road - US Route 60 to Mayflower Drive (NB)	Sidewalk
25	US Route 1 - Sloan Court to Falling Creek (NB)	Sidewalk
26	US Route 10 - WaWa to Jessup Road (NB)	Sidewalk
27	US Route 360 - Turner Road to Access Road Intersection (WB)	Sidewalk
28	US Route 1 – Swineford Road to Merriewood Road (SB)	Sidewalk
29	US Route 60 - Tuxford Road to Stein Mart Festival Center (WB)	Sidewalk
30	US Route 10 - Old Stage Road to Redwater Creek Road (WB)	SharedUsePath
31	Turner Road - Chalkley Elementary to Walmsley Boulevard(NB)	Sidewalk
32	Walmsley Boulevard - Turner Road to Newington Drive (EB)	Sidewalk
33	US Route 60 - Robious Road to Sturbridge Drive (WB)	Sidewalk
34	US Route 60 - Sturbridge Drive to Pocono Crossing Center (WB)	Sidewalk
35	Huguenot Road - Promenade Parkway to Robious Road (WB)	SharedUsePath
36	Huguenot Road - Robious Road to Polo Parkway (EB)	Sidewalk
37	Huguenot Road - Big Oak Lane to Promenade Parkway (WB)	SharedUsePath
38	US Route 1 – Dundas Road to Swineford Road (SB)	Sidewalk
39	Providence Road - US Route 60 to Buford Road (NB)	Sidewalk
40	River Road – Hickory Road to Bass Street (WB)	Sidewalk
41	River Road - Bass Street to Winfree Avenue (WB)	Sidewalk
42	US Route 360 - Genito Road to Post Office Road (WB)	Sidewalk
43	Chester Road - US Route 10 to Wood Dale Road (NB)	Sidewalk
44	US Route 360 - Courthouse Road to Rockwood Square Shopping Center (WB)	Sidewalk
45	US Route 360 - Bailey Bridge Rad to Genito Road (EB)	Sidewalk
46	US Route 1 - Chester Road to Kingsland Creek (SB)	Sidewalk
47	US Route 60 - Pocono Shopping Center to Sturbridge Drive (EB)	Sidewalk
48	Huguenot Road - Brookwood Road to Jimmy Winters Road (EB)	Sidewalk
49	Huguenot Road - Jimmy Winters Road to Forest Hill Avenue (EB)	Sidewalk
50	US Route 60 - Steinmart Festival Shopping Center to Robious Road (WB)	Sidewalk

Figure 5-2: Top 25 Recommended Simple Sidewalk Segments

Segment Rank	Overall Rank	Description	Type
1	5	Boulders Parkway – Boulder Springs Drive to US Route 60 (SB)	Sidewalk
2	9	Turner Road – Cloverleaf Drive to US Route 60 (NB)	Sidewalk
3	10	US Route 10 – Ware Bottom Spring Road to Old Stage Road (WB)	Sidewalk
4	16	Clovertree Ct - Newsted Dr to Providence Road (WB)	Sidewalk
5	17	Provincetown Drive – Providence Road to Newstead Drive (EB)	Sidewalk
6	18	Provincetown Drive – Newstead Drive to Ruthers Road (EB)	Sidewalk
7	21	US Route 360 – Price Club Boulevard to Rockwood Square Shopping Center	Sidewalk
8	22	US Route 360 – Speeks Drive to Price Club Boulevard (EB)	Sidewalk
9	23	US Route 1 - Route 830 to Station Road (In Median)	Sidewalk
10	26	US Route 10 - WaWa to Jessup Road (NB)	Sidewalk
11	27	US Route 360 - Turner Road to Access Road Intersection (WB)	Sidewalk
12	28	US Route 1 – Swineford Road to Merriewood Road (SB)	Sidewalk
13	29	US Route 60 - Tuxford Road to Stein Mart Festival Center (WB)	Sidewalk
14	33	US Route 60 - Robious Road to Sturbridge Drive (WB)	Sidewalk
15	34	US Route 60 - Sturbridge Drive to Pocono Crossing Center (WB)	Sidewalk
16	36	Huguenot Road - Robious Road to Polo Parkway (EB)	Sidewalk
17	39	Providence Road - US Route 60 to Buford Road (NB)	Sidewalk
18	42	US Route 360 - Genito Road to Post Office Road (WB)	Sidewalk
19	43	Chester Road - US Route 10 to Wood Dale Road (NB)	Sidewalk
20	44	US Route 360 - Courthouse Road to Rockwood Square Shopping Center (WB)	Sidewalk
21	45	US Route 360 - Bailey Bridge Rad to Genito Road (EB)	Sidewalk
22	47	US Route 60 - Pocono Shopping Center to Sturbridge Drive (EB)	Sidewalk
23	48	Huguenot Road - Brookwood Road to Jimmy Winters Road (EB)	Sidewalk
24	49	Huguenot Road - Jimmy Winters Road to Forest Hill Avenue (EB)	Sidewalk
25	50	US Route 60 - Steinmart Festival Shopping Center to Robious Road (WB)	Sidewalk

Figure 5-3: Top 25 Recommended Curb & Gutter Added Segments

Segment Rank	Overall Rank	Description	Type
1	12	US Route 1 – Falling Creek to Parkdale Rd (SB)	Sidewalk
2	13	US Route 1 – Marina Drive to Station Road (in median)	SharedUsePath
3	25	US Route 1 - Sloan Court to Falling Creek (NB)	Sidewalk
4	30	US Route 10 - Old Stage Road to Redwater Creek Road (WB)	SharedUsePath
5	31	Turner Road - Chalkley Elementary to Walmsley Boulevard(NB)	Sidewalk
6	40	River Road – Hickory Road to Bass Street (WB)	Sidewalk
7	41	River Road - Bass Street to Winfree Avenue (WB)	Sidewalk
8	55	US Route 1 - Route 830 to Cogbill Road (NB)	Sidewalk
9	64	US Route 360 – Fordham Road to Lockshire Drive (EB)	Sidewalk
10	84	River Road - Riverterrace Road to Hickory Road (EB)	Sidewalk
11	85	River Road - Attucks Drive to Riverterrace Road (EB)	Sidewalk
12	90	US Route 360 - at Pocoshock Boulevard	Sidewalk
13	92	US Route 1 - at Drewrys Bluff Road (SB)	Sidewalk
14	93	US Route 1 - Drewrys Bluff Road to Bensley Commons (SB)	Sidewalk
15	100	US Route 360 - Pocoshock Boulevard to Cross Pointe Marketplace (WB)	Sidewalk
16	120	Salisbury Drive - US Route 60 to Westfield Road (NB)	Sidewalk
17	137	Old Hundred Road - US Route 360 to Millridge Parkway (NB)	Sidewalk
18	141	East River Road - at Granger Street (EB)	Sidewalk
19	150	US Route 1 - Moores Lake Road to Perdue Springs Drive (NB)	Sidewalk
20	154	Lucks Lane - Courthouse Road to Spirea Road (WB)	Sidewalk
21	157	Lucks Lane - Smoketree South Parkway to Courthouse Road (EB)	Sidewalk
22	170	Centralia Road - at Old Wrexham Road (WB)	Sidewalk
23	177	River Road - Truth Drive to Attucks Drive (EB)	Sidewalk
24	184	US Route 1 - Perdue Springs Drive to Osborne Road (NB)	Sidewalk
25	191	Turner Road - Belcourse Road to Stevens Hollow Drive (NB)	Sidewalk

Figure 5-4: Top 25 Recommended Curb & Gutter Widening Segments

Segment Rank	Overall Rank	Description	Type
1	11	Turner Road – Walmsley Boulevard to US Route 360 (NB)	Sidewalk
2	14	Ruthers Road – US Route 60 to end of 60 West Shopping Center (SB)	Sidewalk
3	32	Walmsley Boulevard - Turner Road to Newington Drive (EB)	Sidewalk
4	46	US Route 1 - Chester Road to Kingsland Creek (SB)	Sidewalk
5	59	Willis Road - Pams Avenue to US Route 1 (WB)	Sidewalk
6	62	US Route 1 - at Bellwood Road (NB)	SharedUsePath
7	63	US Route 360 - Lockshire Drive to Gregory Pond Road (WB)	SharedUsePath
8	109	Frith Lane / Lori Road - From US Route 10 to Mimms Drive (EB)	Sidewalk
9	118	Dundas Road - US Route 1 to Wentworth Street (WB)	Sidewalk
10	151	Forest Hill Avenue - Choctaw Road to Burroughs Street (EB)	Sidewalk
11	159	Cogbill Road - US Route 1 to Shady Lane (WB)	Sidewalk
12	175	Buford Road - Train Tracks to Rattlesnake Road (NB)	Sidewalk
13	176	Cloverleaf Drive - Starview Lane to Michael Gray Way (WB)	Sidewalk
14	188	Robious Road - Belvedere Vista Lane to Huguenot Road (WB)	SharedUsePath
15	247	US Route 60 - at Pocono Crossing (WB)	Sidewalk
16	257	Lori Road - at Stable Gate Road (WB)	Sidewalk
17	286	Courthouse Road - at US Route 360	Sidewalk
18	291	US Route 60 - at Pocono Crossing (EB)	Sidewalk
19	296	Forest Hill Avenue - Burroughs Street to Bon Air Station Lane (EB)	Sidewalk
20	310	Courthouse Road - South to Genito (SB)	Sidewalk
21	318	US Route 1 - at Ashton Creek Vineyard (NB)	SharedUsePath
22	320	US Route 1 - at Ashton Creek Vineyard (NB)	SharedUsePath
23	347	Starview Lane - Cloverleaf Drive to Starview Court (SB)	Sidewalk
24	360	US Route 1 - Currins Road to Chesterfield Meadows Drive (NB)	Sidewalk
25	395	River Road - Matoaca Road to Jefferson Street (WB)	Sidewalk

Figure 5-5: Top 25 Recommended Behind Ditch Segments

Segment Rank	Overall Rank	Description	Type
1	15	Ruthers Road – End of 60 West Shopping Center to Marthaven Dr (SB)	Sidewalk
2	24	Buford Road - US Route 60 to Mayflower Drive (NB)	Sidewalk
3	37	Huguenot Road - Big Oak Lane to Promenade Parkway (WB)	SharedUsePath
4	69	Rattlesnake Road - Mcrae Road to Pulliam Street (WB)	Sidewalk
5	70	Rattlesnake Road - Buford Road to Mcrae Road (WB)	Sidewalk
6	71	US Route 10 - Harbour East Drive to Ware Bottom Spring Road (WB)	Sidewalk
7	74	Sherbourne Road - US Route 1 to Wentworth Street (WB)	Sidewalk
8	80	Salem Church Road - Old Warson Drive to Centralia Road (SB)	Sidewalk
9	96	Dalebrook Drive - Beulah Road to Meadowdale Boulevard (NB)	Sidewalk
10	107	Harrowgate Road - US Route 1 to Beechwood Avenue (NB)	Sidewalk
11	128	Charter Colony Parkway - at Midlothian High School (NB)	Sidewalk
12	129	US Route 360 - Gregory Pond Road to Amberleigh Boulevard (WB)	SharedUsePath
13	131	Fordham Road - Paulhill Road to US Route 360 (NB)	Sidewalk
14	152	Brookwood Road - Rattlesnake Road to Cedar Crest Road (WB)	Sidewalk
15	155	Wentworth Street - Dundas Road to Sherbourne Road (SB)	Sidewalk
16	167	Little Creek Lane / Howell Drive - to Cogbill Road	Sidewalk
17	172	US Route 1 - Myron Avenue to Gayland Avenue (NB)	SharedUsePath
18	181	Swineford Road - Drewrys Bluff Road to US Route 1 (EB)	Sidewalk
19	182	Richmond Street - at Old Hundred Road (EB)	Sidewalk
20	183	Richmond Street - Dodomeade Street to Gill Street (EB)	Sidewalk
21	185	Rattlesnake Road - Pulliam Street to Brookwood Road (WB)	Sidewalk
22	193	Huguenot Road - at Featherstone Drive (NB)	Sidewalk
23	198	North Street - Meridian Avenue to Harrowgate Road (WB)	Sidewalk
24	200	Falling Creek Avenue - US Route 1 to Caldwell Avenue (WB)	Sidewalk
25	208	Willis Road - US Route 1 to Pams Avenue (EB)	Sidewalk

Figure 5-6: Top 25 Recommended Shared-Use Path Segments

Segment Rank	Overall Rank	Description	Type
1	1	US Route 60 – Providence Road to Ruthers Road (EB)	SharedUsePath
2	2	US Route 60 – Buford Road to Providence Road (WB)	SharedUsePath
3	3	US Route 60 – Boulders Parkway to Donald May Jr. Drive (EB)	SharedUsePath
4	4	US Route 60 – Stonebridge Plaza Avenue to Boulders Parkway (WB)	SharedUsePath
5	6	US Route 60 – Providence Road to Gateway Centre Parkway (WB)	SharedUsePath
6	7	US Route 60 – Gateway Centre Parkway to Providence Road (EB)	SharedUsePath
7	8	US Route 360 – Brad McNeer Parkway to Commonwealth Center Parkway (EB)	Sidewalk
8	19	US Route 1 - Willis Road to Kingsland Creek (NB)	SharedUsePath
9	20	US Route 360 – Commonwealth Center Parkway to Lonas Parkway (EB)	Sidewalk
10	35	Huguenot Road - Promenade Parkway to Robious Road (WB)	SharedUsePath
11	60	US Route 1 - at Chester Road (NB)	SharedUsePath
12	81	US Route 1 - Bellwood Road to Railroad Tracks (NB)	SharedUsePath
13	101	Vaughan Williams Street (NB)	SharedUsePath
14	108	US Route 10 - Courthouse Road to Whitepine Road (In Median)	Sidewalk
15	110	US Route 10 to Lori Road - Through New Development	SharedUsePath
16	111	Lori Road - Mimms Drive to Police Station (SB)	SharedUsePath
17	119	US Route 60 - at Gateway Centre Parkway (WB)	SharedUsePath
18	127	US Route 1 - at Bellwood Road (NB)	SharedUsePath
19	130	US Route 360 - Randolph Road to Fordham Road (EB)	Sidewalk
20	133	US Route 1 - Dundas Road to Marina Drive (NB)	Sidewalk
21	158	US Route 1 / Chippenham Parkway Interchange (Bypass - Requires Bridge)	SharedUsePath
22	161	US Route 10 - Suburban Extended Stay Hotel to Old Stage Road (EB)	SharedUsePath
23	164	Chester Pedestrian Bypass - US Route 10 to Railroad Tracks (NB)	SharedUsePath
24	171	US Route 1 - Willis Road to Kingsdale Road (NB)	SharedUsePath
25	173	US Route 1 - Alcott Road to Gayland Avenue (NB)	SharedUsePath

Figure 5-7: Top 10 Segments – Bermuda District

Segment Rank	Overall Rank	Description	Type
1	10	US Route 10 – Ware Bottom Spring Road to Old Stage Road (WB)	Sidewalk
2	12	US Route 1 – Falling Creek to Parkdale Rd (SB)	Sidewalk
3	13	US Route 1 – Marina Drive to Station Road (in median)	SharedUsePath
4	19	US Route 1 - Willis Road to Kingsland Creek (NB)	SharedUsePath
5	23	US Route 1 - Route 830 to Station Road (In Median)	Sidewalk
6	25	US Route 1 - Sloan Court to Falling Creek (NB)	Sidewalk
7	28	US Route 1 – Swineford Road to Merriewood Road (SB)	Sidewalk
8	30	US Route 10 - Old Stage Road to Redwater Creek Road (WB)	SharedUsePath
9	38	US Route 1 – Dundas Road to Swineford Road (SB)	Sidewalk
10	43	Chester Road - US Route 10 to Wood Dale Road (NB)	Sidewalk

Figure 5-8: Top 10 Segments – Clover Hill District

Segment Rank	Overall Rank	Description	Type
1	7	US Route 60 – Gateway Centre Parkway to Providence Road (EB)	SharedUsePath
2	20	US Route 360 – Commonwealth Center Parkway to Lonas Parkway (EB)	Sidewalk
3	42	US Route 360 - Genito Road to Post Office Road (WB)	Sidewalk
4	44	US Route 360 - Courthouse Road to Rockwood Square Shopping Center (WB)	Sidewalk
5	45	US Route 360 - Bailey Bridge Rad to Genito Road (EB)	Sidewalk
6	47	US Route 60 - Pocono Shopping Center to Sturbridge Drive (EB)	Sidewalk
7	63	US Route 360 - Lockshire Drive to Gregory Pond Road (WB)	SharedUsePath
8	82	US Route 60 - Southlake Boulevard to Johnston Willis Drive (EB)	Sidewalk
9	83	Courthouse Road - Reams Road to Southlake Boulevard (NB)	Sidewalk
10	86	US Route 360 - Rockwood Square to Suncrest Drive (WB)	Sidewalk

Figure 5-9: Top 10 Segments – Dale District

Segment Rank	Overall Rank	Description	Type
1	21	US Route 360 – Price Club Boulevard to Rockwood Square Shopping Center	Sidewalk
2	22	US Route 360 – Speeks Drive to Price Club Boulevard (EB)	Sidewalk
3	26	US Route 10 - WaWa to Jessup Road (NB)	Sidewalk
4	51	US Route 360 – Victorian Square to Speeks Drive (EB)	Sidewalk
5	57	US Route 10 - Jessup Road to Cogbill Road (SB)	Sidewalk
6	58	US Route 10 - at Krause Road (NB)	Sidewalk
7	64	US Route 360 – Fordham Road to Lockshire Drive (EB)	Sidewalk
8	73	US Route 10 - Ridgedale Parkway to Burnt Oak Drive (In Median)	Sidewalk
9	75	US Route 360 – Rockwood Square to Courthouse Road (EB)	Sidewalk
10	76	US Route 10 - at Commons Square (SB)	Sidewalk

Figure 5-10: Top 10 Segments – Matoaca District

Segment Rank	Overall Rank	Description	Type
1	8	US Route 360 – Brad McNeer Parkway to Commonwealth Center Parkway (EB)	Sidewalk
2	40	River Road – Hickory Road to Bass Street (WB)	Sidewalk
3	41	River Road - Bass Street to Winfree Avenue (WB)	Sidewalk
4	72	Lee Street - Chesterfield Avenue to Hayden Street (NB)	Sidewalk
5	84	River Road - Riverterrace Road to Hickory Road (EB)	Sidewalk
6	85	River Road - Attucks Drive to Riverterrace Road (EB)	Sidewalk
7	97	Chital Drive - Raised Antler Circle to US Route 360 (NB)	Sidewalk
8	99	Commonwealth Center Parkway (WB)	Sidewalk
9	101	Vaughan Williams Street (NB)	SharedUsePath
10	138	River Road - Loyal Avenue to Williams Street (WB)	Sidewalk

Figure 5-11: Top 10 Segments – Midlothian District

Segment Rank	Overall Rank	Description	Type
1	1	US Route 60 – Providence Road to Ruthers Road (EB)	SharedUsePath
2	2	US Route 60 – Buford Road to Providence Road (WB)	SharedUsePath
3	3	US Route 60 – Boulders Parkway to Donald May Jr. Drive (EB)	SharedUsePath
4	4	US Route 60 – Stonebridge Plaza Avenue to Boulders Parkway (WB)	SharedUsePath
5	5	Boulders Parkway – Boulder Springs Drive to US Route 60 (SB)	Sidewalk
6	6	US Route 60 – Providence Road to Gateway Centre Parkway (WB)	SharedUsePath
7	9	Turner Road – Cloverleaf Drive to US Route 60 (NB)	Sidewalk
8	11	Turner Road – Walmsley Boulevard to US Route 360 (NB)	Sidewalk
9	14	Ruthers Road – US Route 60 to end of 60 West Shopping Center (SB)	Sidewalk
10	15	Ruthers Road – End of 60 West Shopping Center to Marthaven Dr (SB)	Sidewalk

5.2 FUNDING SOURCES

Once prioritized, recommended sidewalk projects can be used to pursue specific funding from federal, state, or local sources. Projects that can be completed using municipal dollars can be packaged with the information provided to further the goals of the Sidewalk Implementation Plan. In addition, the overall mapping of recommended sidewalk segments throughout the County along major development routes my allow Chesterfield County to further pursue expansion of the sidewalk network through the private land development process.

Although there are multiple funding sources for roadway construction and transportation improvement projects where a pedestrian option can be added, only a limited number of options exist that focus directly on pedestrian/bicycle improvements. These include Congestion Mitigation and Air Quality (CMAQ) Improvement Program funds, Safe Routes to School (SRTS), Transportation Alternatives Program (TAP) (replacement for Transportation Enhancement Program), Highway Safety Improvements Program (HSIP), and Bicycle Pedestrian Safety Program (BPSP).

It should be noted that the Pedestrian Safety Action Plan (PSAP) program, created by VDOT in 2018, included recommendations for high priority pedestrian corridors that should be given scoring boosts in SMARTSCALE applications. Given that many of the recommended sidewalk segments match up with these PSAP locations, funding applications should concentrate on the connection to previously recommended improvement areas.

The major routes located in Chesterfield County that were included in the PSAP approved map include:

- US Route 1 from the City of Richmond border to the City of Colonial Heights border;
- US Route 10 from Chippenham Parkway to Chalkley Road; and
- Hopkins Road (Route 637) from City of Richmond line to US Route 288.

In addition, US Route 360, US Route 60, Jahnke Road (Route 686), and Forest Hill Avenue (Route 683) are all included within the City of Richmond limits, stopping at the Chesterfield County border. Connections to these sidewalk networks will further enhance any recommended sidewalk segments along the PSAP recommended routes.

6 OTHER RECOMMENDATIONS

In order to provide Chesterfield County with a comprehensive sidewalk implementation plan, the following additional recommendations are provided to aid the improvement of pedestrian conditions.

6.1 GENERAL RECOMMENDATIONS

The ultimate goal of Chesterfield County is to enhance mobility for its citizens through sidewalk implementation. The prioritized implementation strategy and plan presented in this report provides the framework to meeting these goals. The following is a summary of information from FHWA and ITE guidance documents on how to best improve sidewalks. The additional recommendations can help the County meet their goal of increasing mobility and safety throughout the County.

Sidewalks form the backbone of the pedestrian network. When sidewalks are not available, pedestrians are forced to share the street with vehicles, increasing the possibility for pedestrian collisions. The FHWA states that the decision to install sidewalks should not be optional. Sidewalks should be built and maintained in all urban areas, along non-Interstate public highway rights-of-way, in commercial areas where the public is invited, and between all commercial transportation stops and public areas.

According to a study by the University of North Carolina Highway Safety Research Center, conducted for the Federal Highway Administration, the likelihood of a site with a paved sidewalk being a crash site is 88.2% lower than a site without a sidewalk after accounting for traffic volume and speed limits.

It is recommended that, with the exception of interstate highways and freeways, all roadways should have some type of facility that separates non-motorized transportation from motorized transportation and that sidewalks should be constructed along any street or highway not provided with shoulders, even though pedestrian traffic may be light. Although this general policy cannot be applied to all situations, it can provide a logical goal for new roadway construction and redevelopment.

Roadways with higher levels of traffic require sidewalks to separate pedestrian from vehicles. In addition, there is a strong correlation between vehicle speeds and the severity of pedestrian crashes. Sidewalks should be a priority on roadways with higher vehicle speeds, with a buffer space provided between the sidewalk and the roadway.

Sidewalks provide access throughout the County for pedestrians, reducing traffic congestion, facilitating access to the transit system, and reducing emissions from automobiles. Unless otherwise exempted, all new development should provide sidewalk/share-use path/trail improvements that are consistent with the recommendations within this report.

It is recommended that sidewalks be installed along local streets and within new subdivisions, with no deferral allowed. All streets that are functionally classified as arterials or collectors should have sidewalks installed.

The Institute of Transportation Engineers (ITE) recommends all roadways should have some type of walking facility out of the vehicular traveled way included in the construction. ITE provides a high-level guideline for installing sidewalk on existing and new streets based on a combination of land uses for the surrounding area and functional classification of the roadway. The table can be found in Figure 6-1 below.

Figure 6-1: ITE Guidelines for Sidewalk Installation

Land Use Functional Classification	New Streets	Existing Streets
Commercial and Industrial (All Street Classifications)	Both Sides	Both Sides Complete all Missing Links
Residential - Major Arterials	Both Sides	Both Sides
Residential - Collectors	Both Sides	Multifamily - Both Sides Single Family - Require at least one side
Residential - Local Streets (> 4 units per acre)	Both Sides	Require at least one side
Residential - Local Streets (1 - 4 units per acre)	Prefer both sides, require at least one side	One side preferred; Min. 4-foot shoulder on both sides required
Residential - Local Streets (< 1 units per acre)	One side preferred; Min. 4-foot shoulder on both sides required	Min. 4-foot shoulder on both sides required

Notes:

Any local street within two (2) blocks of a school site that would be on a walking route to a school - sidewalk with curb/gutter required.

Sidewalks may be omitted on one side of a new street where that side clearly cannot be developed and where there are no existing or anticipated uses that would generate pedestrians trips on that side.
Where there are service roads, the sidewalk adjacent to the main road may be eliminated and replaced by a sidewalk adjacent to the service road on the side away from the main road.
For rural roads not likely to serve development, a shoulder at least 4 feet in width, preferebly 8 feet on primary routes, should be provided. Surface material should provide a stable walking surface.

6.2 TRANSIT ORIENTED

The presence of sidewalks is important for roadways designated as transit routes. Routes not served by sidewalk represent an impedance (if not a barrier) to those who want to access transit service. Riders of limited physical mobility (e.g. elderly and handicapped passengers), have difficulty traversing un-level terrains in order to get to a transit stop. Sidewalks provide the important connections from transit stops to rider's destinations. Sidewalk installation and linking pedestrian routes to transportation stops and major corridors should always be a priority. To better provide safe access to transit, roadways with transit routes should have sidewalks on both sides of the street. Arterials that have service with transit routes are prime candidates for sidewalk retrofitting.

6.3 SCHOOL ZONES

Chesterfield County does not have a policy that requires students to walk to school within a certain radius of the school campus. Most existing school sites in the County provide connections from the building to the adjacent roadways; future school sites tend to include sidewalks on-site with connections to adjacent roadways and neighborhoods. Sidewalks should be a priority in school zones to encourage students walking to school and providing them the safe space to do so. Recommended segments generally encompassed approximately 2 blocks in radius around the school or ¼ mile.

6.4 LAND USE

The presence and degree of pedestrian activity in an area depends on the land uses that are present. Typically, the greater the number and variety of land uses in an area, the more pedestrian traffic that will be generated. Density also plays a role, especially with respect to commercial and residential development, and also increases levels of pedestrian activity. In general, wherever roadside and land development conditions generate regular pedestrian movement along a highway, a sidewalk or path area should be furnished.

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