III - USER MANUAL:

Network Priority Tool

Prepared for the Silicon Valley Bicycle Coalition

Project 190821

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# Table of Contents

## Overview of this user manual

### Chapter 1: Criteria for Network Prioritization
- High Need Areas
- Proximity to Destinations
- Harm Reduction
- Bicycle Network Connectivity
- Network Priority Tool Criteria Weighting

### Chapter 2: Network Prioritization Process
- Network Priority Tool Process Flowchart
- Process for the pre-generated data in QGIS
  1. Counting point-based locations within the specified buffer areas
  2. Determining where street segments cross areas of need
- Using the Tool
  - A. Data layers that have been pre-generated
  - B. Local data layers that must be generated and appended
    - Mapping Community Destinations and Senior Centers in Google Earth
    - Importing destinations and senior center data into QGIS
  - C. Creating a query data layer from bicycle plan maps or lists in Google Earth or GIS
  - D. Joining project corridors with the master segment file
  - E. Importing from GIS to Google Sheets or Excel for Scoring and Evaluation
Chapter 3: Updating Priority Tool Master Data Layer 37
- Protected bike network changes (updating the combined VTA, SMC bike networks layer) 37
- Census data for both counties 40
- Crash data for both counties 45

Chapter 4: AAA Design Evaluation 49
- Source Data for Evaluation 49
- Evaluation in Google sheets/Excel 52

Chapter 5: Readiness Evaluation 54

Appendix: Data Files 55
Overview of this user manual

This manual is the third document in a package developed for the SVBC Network Priority Tool. The first document is the public-facing Lookbook designed to explain the Tool, its high-level function and methodology, and its development and testing to the public. The second document – the Data Collection Handbook – discusses all of the open-source data sets used in this tool, where to source them and how to clean and process them for use. It also describes a number of techniques and strategies for additional data collection and communication. Thirdly, this user manual takes a deep dive into the step-by-step functionality of the SVBC Network Priority Tool (NPT) and allows the user to run a bicycle project priority analysis themselves on any municipality in Santa Clara and San Mateo counties.

There are three phases of evaluation to this tool, each one building on the previous:

1. **Bicycle Network Prioritization:** In the first phase analysis, bicycle project corridors that meet a high threshold of importance for cyclists are identified through the 17 criteria developed in this tool. The top 20 or 30 corridors from this phase evaluation are compared and contrasted with the local City’s AT plan recommendations to see what improvements might be made.

2. **AAA Design Evaluation:** Each of these top ranking corridors are then evaluated for their recommended level of design to ensure a safe and comfortable facility that meets an all ages and abilities (AAA) design standard.

3. **Project Readiness:** Finally, the top ranking corridors that meet the threshold of “readiness” are identified, each being explained in the context of why they may be more ready than other corridors in the top 20 or 30 for funding, design and construction.
Chapter 1: Criteria for Network Prioritization

The SVBC Network Priority Tool is based on a comprehensive scoring of 17 criteria that evaluate the importance of corridors in a transportation network for bicycle demand and connectivity. The sixteen criteria of this analysis are grouped into four major categories: High Need Areas, Proximity to Destinations, Harm Reduction, and Bike Network Connectivity. These primary issues are drivers of bicycle use and demand. The resulting scores of all criteria, ranks corridors that are most in need of safe bicycle access and development. This section will give an overview of the 17 criteria and overarching categories in which they are grouped and scored.

High Need Areas

High Need Areas are defined as locations where demand for cycling is high, these include MTC's communities of concern, population dense areas and communities where issues of access and equity may limit mobility and transportation options. These areas are key to serving broad community needs with safe and affordable bicycle access.

While the MTC's community of concern (CoC) definition has been used as a baseline criteria for evaluation, the definition is highly specific, with minority race and communities living below the federally-defined poverty line as the primary screening for that definition. The MTC CoC also integrates other significant barriers to equity, households without vehicles, over 50% of household income dedicated to rent/housing costs, single caregiver households, people with limited English-proficiency as well as disabled individuals. Many of these definitions factored into the scoring criteria for high need areas. While any MTC-defined community of concern receives 5 points in this scoring, additional criteria were built upon MTC's definitions of equity and access in order to prioritize areas where:

- At least ¼ of the households are single caregivers.
- At least ¼ of households have low vehicle access, either no vehicle access or two adults present have only one vehicle available to use for travel.
- At least ¼ of households are lower income with incomes less than $50,000, which was defined in the Data Collection Handbook to account for high Bay Area housing and transportation costs.
- More than ½ of the population speaks another language than English at home.
Why has ⅓ of households been used as defining points for many of these metrics? A third of households is an appropriate breakpoint for factors of equity rather than majority. If one of three residents has a significant disadvantage to getting access to affordable and safe mobility by bicycling, the street design and bicycle network needs to shift to serve them. These changes also benefit the more advantaged ⅔ of the population with increased safety and more mobility options. The exception is the language spoken at home metric, given the significant language diversity in Silicon Valley a higher threshold of ⅔ of the population was selected.

All these equity measures were integrated into the high need areas screening for network prioritization along with a high population density evaluation.

MTC Community of Concern

Communities of concern are defined by the Metropolitan Transportation Commission (MTC) based on census tracts that demonstrate households that represent: minorities, low-income levels, low levels of English proficiency, elderly residents, zero-vehicle households, single parent households, disabled residents and rent-burdened households. If a tract exceeds both threshold values for low-income and minority shares or exceeds the threshold value for low-income and also exceeds the threshold values for three or more variables, it qualifies. In addition to evaluating these issues, MTC’s CoC definitions are often used in funding priorities and by municipalities for prioritization of bicycle infrastructure. If a corridor crosses an MTC CoC tract it is given 5 points in the priority scoring.

Single Caregiver Households

The presence of single caregiver households in a census block group denotes a need for equity prioritization of cycling facilities as many of these households may have greater transportation constraints. With this criteria, when a corridor crosses a census block with more than a third of households with single caregivers – for example either a single parent or related person over 18 years of age caring for children under 18 years of age – 5 points are given to the corridor in question.

Lower Income Households

Lower income areas are vitally important to prioritize for bicycle investment as the bicycle is a very inexpensive form of transportation versus the car. Lower income households, with incomes less than $50,000 were defined in the Data Collection Handbook to account for high Bay Area housing and transportation costs. When a corridor crosses census block groups with more than a third of households classified lower income – 5 points are given to the corridor.
Low Vehicle Access Households

Households with low vehicle access also require prioritization for bicycle facilities in order to be able to offer residents transportation options beyond the car that are safe and accessible for all. Here, when a corridor crosses a census tract with more than a third of households with low vehicle access – meaning a household without a car or a household with two adults and only one car – 5 points are assigned to the corridor.

Non-English Speaking Majority

As another important criteria for equity prioritization, non-english speaking households are taken into consideration for high need areas. When a corridor crosses a census tract with more than two-thirds of the local population not speaking English at home, it is awarded 5 points for priority.

High Population Density

Population estimates were collected from the US Census Bureau's American Community Survey for each census block group in both San Mateo and Santa Clara counties. Population density above a municipality's average population density are areas where a bicycle facility would service a greater number of users in that city. Corridors that cross census block groups above the average population density are given 5 points for this criteria.
Proximity to Destinations

In addition to identifying what areas have a high need for bicycling, the Network Priority Tool evaluates projects for proximity to destinations that people bike to and between, for example, work, shopping and errands, recreation and even transit connections. Data on destinations in the two-county area is sourced from several places – national, state, county and city levels as well as through stakeholder input since there is no consistent open dataset for destinations in Silicon Valley.

Job Sites

Estimates of the number of jobs at each job site is obtained from the US Census Bureau’s Longitudinal Employment and Housing Dynamics Survey. Employers with more than 100 employees that fall within a ¼ mile of corridors are attributed to that corridor. Each project corridor gains 5 points for having at least one large employer.

Community Destinations

Open data for local points of interest are available in Silicon Valley, including parks, recreation centers, civic centers, libraries, beaches, hospitals and government agency offices. In addition to these data, key community destinations are added with Google Maps in concert with stakeholder input. Community destinations may include shopping centers where grocery shopping and errands are frequently done, parks, religious centers, libraries, universities or other destinations for recreation or daily life. Corridors with at least one or more community destinations within ¼ of a mile are awarded 5 points in the network prioritization scoring.

Transit Hubs

In order to foster choice in transportation through multi-modal trip-chaining, transit connectivity is an important criteria to determine priority of bicycle project ranking. Caltrain, VTA and BART stations as well as regional bus transit centers are mapped as transit hubs. BART’s rail extension stations were also included in the analysis to ensure bicycle networks can grow in concert with the region’s transit investments. A street network based analysis was done to select street and trail segments within ½ mile along the street network, mapping the ½ mile bikeshed of transit hubs. Project corridors within this ½ mile bikeshed are awarded 5 points in the scoring.
Harm Reduction

Prioritizing bicycle-friendly corridors should strive to reduce harm that may be present along existing streets today. In order to identify those corridors where harm reduction should be a priority, past crash data serves a vital purpose. Three years of crash statistics were sourced for the two counties from the Traffic Injury Mapping System (TIMS), as per the Data Collection Handbook. The data includes crashes where bicycle-users and people walking were injured as well as those in which they died as a result of a fatal crash.

Equally, when following an all ages and abilities (or 8-to-80) approach for harm reduction, projects in the vicinity of schools and senior/community centers are prioritized in the scoring, earning between 5 - 10 additional points. This helps the Tool rank corridors that reduce the risk of danger for the most vulnerable users of city streets, the young and old. Prioritizing bicycle implementation projects that benefit both cyclists that use the facility and the more vulnerable pedestrians, children and the elderly, is a key element of creating an all ages and abilities bicycle network to simultaneously slow and buffer vehicular traffic for people walking.

Crash Rates

Crash sites are considered worthy of some points if an injury to a pedestrian or cyclist occurred at least once within ¼ mile of the corridor, adding 5 points to the corridor score. High crash sites are those where crashes occurred 3 or more times in the past three years, averaging at least one pedestrian or bicyclist crash each year, adding 10 points to the corridor score.

Fatalities of Vulnerable Users

Beyond investigating the absolute number of incidents of bicycle and pedestrian crashes along a corridor in order to measure the degree of priority necessary for harm reduction – it is essential to understand the severity of past incidents. Street design that permits high vehicular speed generally sees a strong correlation with a high severity of injuries for vulnerable users like bicyclists and pedestrians. Measuring fatalities on the corridor can give another strong indication that a certain corridor requires priority intervention. In this tool, when even a single bicycle or pedestrian fatality occurs, the corridor is awarded 5 points.
Proximity to Public Schools

For this criteria, if one or more public K - 12 schools are within a ¼ mile of a corridor, it is awarded 5 points for immediately being important for reducing harm for children and for providing a safe route to school by bicycle or walking. The data aggregation allows for private and public schools to be evaluated or public schools only to be evaluated for this criteria. Universities and colleges are included in the destinations dataset.

Proximity to Senior Centers

Much like with schools, a similar argument can be made for local senior centers when conducting the analysis of a municipality with the Network Priority Tool. These are community hubs for the elderly and their families. Senior long-term care facilities can be incorporated into this criteria when they are present in a municipality or study area as they house some of the most vulnerable people in our communities. It is important to prioritize these locations for harm reduction, so all corridors that fall within a ¼ mile of one or more senior centers and/or long-term care centers, are given 5 points. Bicycle infrastructure improves the experience of older people walking as well as people bicycling, acting as a safety buffer from vehicular traffic.
Bicycle Network Connectivity

Connectivity is one of the most important factors when planning and prioritizing a bicycle network, as the entire system is only as efficient and useful as the individual connections that make up the whole. Here, 30 points are awarded to connectivity-based criteria to ensure that local bicycle network plans in Silicon Valley connect bicycle users as effectively and logically as possible, especially to safe and protected facilities that offer an entry-point to all ages and all abilities of cyclists.

Space Syntax Analysis

Space Syntax is an analytical tool developed by the University College London that examines the most basic connectivity of a network. The analysis looks only at the links in a network and asks how many potential connections can be made from each individual segment in a street network to all other segments. Since connectivity is essential to a functional bicycle network, a corridor with a high score on Space Syntax – meaning more than 5.25 axes of connection for a given corridor – is awarded 10 points. This ensures that the priority projects in any municipality’s bicycle network are well-connected and offer cyclists real transportation options.

Bikeable Street Grade

Priority projects in a bicycle network should also take into account the ease-of-use of a certain corridor for bicyclists. It is generally defined that easy bicycle riding conditions for most people of all ages and abilities is on surfaces with less than a 3% incline. Between 3-5% the grade is felt more intensely but can still be taken on by the vast majority who ride a bicycle. Slopes above 5% become very cumbersome for the average cyclist and are not accessible to slower or less-able riders. Based on this, corridors in the two-county area that fall below a 5% grade are given 5 points in prioritization for bicycle network planning.
Connections to Existing Protected Bike Facilities

Bike network connectivity is the most effective when it prioritizes high-quality facilities that are appropriate for all ages and abilities. Facilities that are either off-street bicycle paths or protected on-street bicycle lanes, separated from vehicle traffic with a physical delineator are safer and easier to navigate for users of all ages and abilities. To build upon existing local protected networks, this criteria assigns 10 points to project corridors that intersect protected on-street bicycle lanes or off-street trail facilities.

Corridors that Close a Gap in the Bike Network

The final criteria for connectivity awards points to corridors that close gaps between existing on-street and off-street facilities. Many of the on-street facilities today may not achieve a standard of design that promotes new or less confident riders to use them, but they are still used by local riders. It is important to build upon existing bicycle lanes and paths to ensure coherence with the existing network as it grows and develops more connected and protected corridors. Project corridors that close a gap created between two existing painted or protected facilities are each given 5 points for prioritization.
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<th>Category</th>
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<th>Points</th>
<th>Total</th>
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<td></td>
<td>Single Caregiver Households</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Lower Income Households</td>
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<td></td>
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<td>Low Vehicle Access Households</td>
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<td>Non-English Speaking Majority</td>
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<td>15</td>
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<td>Community Destinations</td>
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<td>Transit Hubs</td>
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<td></td>
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<td><strong>Harm Reduction</strong></td>
<td>Moderate Crash Rate <strong>OR</strong> High Crash Rate</td>
<td>5 or 10</td>
<td>25</td>
</tr>
<tr>
<td></td>
<td>Fatalities of Vulnerable Users</td>
<td>5</td>
<td></td>
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<td></td>
<td>Proximity to K - 12 Schools</td>
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<td></td>
</tr>
<tr>
<td></td>
<td>Proximity to Senior Centers or Long-term Care Homes</td>
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<td></td>
</tr>
<tr>
<td><strong>Bicycle Network Connectivity</strong></td>
<td>Space Syntax Analysis</td>
<td>10</td>
<td>30</td>
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<td></td>
<td>Bikeable Street Grade</td>
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<td>Connections to Existing Protected Bike Facilities</td>
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<tr>
<td></td>
<td>Corridors that Close a Gap in the Bike Network</td>
<td>5</td>
<td></td>
</tr>
</tbody>
</table>

Maximum Points Awarded for Project Priority 100
Chapter 2: Network Prioritization Process

The SVBC Network Priority Tool (NPT) uses open data and user generated data to build out the 17 criteria necessary to prioritize bicycle projects in the cities of San Mateo and Santa Clara counties. This chapter walks the user of the tool through the process to build out the priority list of bicycle projects used for planning and advocacy.

The process begins with a master segment file that can be opened and examined in QGIS open source software (or in ArcGIS if available). This master segment file contains the analyses of 14 criteria for all street and trail segments in the two counties. The explanation of how these criteria were pre-generated can be found on page 16. The remaining 3 criteria require a number of steps to generate data through Google Maps or Google Earth, which is explained on page 19. This data creation can be done in tandem with local authorities or independently by SVBC.

The next step in the process is the creation of a query data layer, found on page 25 – essentially the map of project corridors proposed in the local AT plan. This can be done in tandem with local authorities and their data layers. Finally, combining these project corridors with the master segment file and exporting the data to the final scoring sheet will allow SVBC staff or local authorities to look at total scores, breakdowns and priority lists generated by the Network Priority Tool. These processes are outlined on page 30 and 34.

Figure 1: Network Priority Tool Process Flowchart
Process for the pre-generated data in QGIS

There are two core elements to the analysis process that generate the spatial data for street and trail segments in the two counties and are then used to score each bicycle project. The first was counting locations within a distance of a $\frac{1}{4}$ mile of the street segments, essentially if a cyclist hopped off a bike and walked just a bit they’d reach these key destinations. The second was evaluating segments that cross or are within a zone or district of interest, for example, areas where communities live that need more access to bicycle infrastructure.

1. Counting point-based locations within the specified buffer areas

To count the number of specific point-based locations for a specific criteria, the first step is to create a simple buffer zone around the street segments in the municipality in question, this process is described in detail in Chapter 2B: Local data layers that must be generated and appended on page 19. To develop the count data for crashes, schools, jobs, senior centers and destinations the buffer represents a short ‘walking’ distance surrounding the street segments. A $\frac{1}{4}$ mile area was determined to be the longest reasonable distance from where a bicycle could be parked and riders could walk to their final destination. Buffering all street and trail segments results in a new file that includes the ID_BCModel (a segment identification number) – preserving this field is important to combine the outputs of multiple processes.

The Count Tool in QGIS counts the number of points within boundary areas. In the Network Priority Tool, these boundaries are the $\frac{1}{4}$-mile buffers surrounding street and trail segments (if done in ArcGIS software, this process is done via the spatial join tool).

This method applies to the following criteria:

- Locations of jobs, including total number of jobs in the surrounding area, medium and large employers (100 and 500 employees respectively).
- School locations
- Senior center locations
- Crashes that involve bicyclists and pedestrians
- Fatalities of bicyclists and pedestrians
2. Determining where street segments cross areas of need

For many of the metrics regarding high need areas, the US Census is the primary source of data for the prioritization screening. To evaluate where street and trail segments cross census tracts or block groups, the Select by Location Tool was used in QGIS after census tracts/block groups were filtered using a Definition Query for the thresholds determined for scoring (see Chapter 1).

This process was completed for the most recent data release of the Census Data, noted in the Data Collection Handbook, and the steps are detailed in how to update the data under Chapter 3.
Using the Tool

A. Data layers that have been pre-generated

Data layers for 14 of the 17 criteria have been pre-generated for street and trail segments throughout San Mateo and Santa Clara Counties, which have removed highways and interstates, since they do not permit bike travel (for more information, see page 21 in the Data Collection Handbook).

Using the two analysis processes described in the previous section, the following criteria have been coded for all street and trail segments:

- US Census-based data thresholds for high need areas
- Counts of jobs, employers with more than 100 employees and 500 employees
- Counts of public schools, all schools, and universities/colleges
- Intersections with the existing protected bicycle network
- Crash and fatality counts
- Street and trail segments slope grade
- Street and trail segments with connectivity over 5.25 network nodes in Space Syntax

Master File of Street and Trail Segments

The final output of all the criteria screening for project corridors is found in a master shapefile of all street and trail segments in the two-county area (filename: MASTER_NPT_StreetTrailSegments.shp). This file is used to query the length of specific project corridors, not only a block or two of one street segment. An example of this would be running a query of El Camino Real along the whole length of Sunnyvale's boundaries.

This file has a key ID for all segments, called ID_BCModel, this field must be preserved for all data updates and links to the segments pre-generated ¼ mile buffer shapefile, MASTER_NPT_SegmentsBuffer.shp. For each municipality or study site project corridor comparison it is recommended to create a copy of the master file, which is described in more detail below. The following section describes the column/field descriptions of the 14 pre-generated criteria found within the master file.
A full QGIS map project package (and ArcGIS for those with the available software) has been created so that users can see the processed data from the data library and master data files.

[Tutorial Video #1] walks through how to open the QGIS map project package, select the processed data shapefiles and master data files and open them up in QGIS. It then demonstrates how to toggle between layers to begin looking through these files.

1. **Location counts within ¼ mile buffer of segments**

Using the count tool as described previously, the following criteria data were counted for each street segment and totaled if more than one instance was present:

- All Jobs (**Column/Field name: NUM_Jobs**)
- Count of employers with more than 100 employees (**Column/Field name: NUM_100Emp**)
- Count of employers with more than 500 employees (**Column/Field name: NUM_500Emp**)
- Pedestrian and bicyclist crashes (**Column/Field name: NUM_Crash**)
- Pedestrian and bicyclist fatalities (**Column/Field name: NUM_Fatal**)
- Public schools K-12 (**Column/Field name: NUM_PSch**)
- All schools (**Column/Field name: NUM_ASch**)
- Universities and colleges (**Column/Field name: NUM_Uni**)
- Destinations from San Mateo County Landmarks (**Column/Field name: NUM_SMCDes**)

Each of these criteria screenings can be found for any street segment under the column/field name listed above in the master file **MASTER_NPT_StreetTrailSegments.shp** by opening the attribute table for that shapefile in QGIS and scrolling through the columns/fields present.
2. Segments with pass-fail binary evaluation (1=yes, 0=no)

Criteria that were not count-based were evaluated for each segment on a pass/fail basis. In each data table for the associated criteria, the column “Pass” identifies any segment intersecting a high need area or serving transit and bicycle connectivity with a coded “1”. All segments that intersect districts that don’t meet thresholds defined in Chapter 2 or fail to meet connectivity criteria are coded “0”. This analysis was done using the Select by Location Tool as described in the previous section. The criteria treated with a binary evaluation are as follows:

- Segments that intersect or fall within census tracts/blocks designated as a High Need Area:
  - Population Density by Municipality (Column/Field name: Pass_PopDe)
  - Lower Income (Column/Field name: Pass_LInc)
  - Vehicle Access (Column/Field name: Pass_Car)
  - Non-English Speaking Majority (Column/Field name: PassLang)
  - Singler Caregiver households (Column/Field name: Pass1Care)
  - MTC Communities of Concern (Column/Field name: Pass_COC)

- Segments within ½ mile of all existing/planned transit hubs as per a station area street network analysis (Column/Field name: Pass_Transit)

- Segments that scored above 5.25 on Space Syntax analysis of connectivity for bicycle riders covering a typical 20 minute, 5 km / 3 mile travel distance (Column/Field name: Pass_Connec)

- Segments with grades less than 5% (Column/Field Name: PassSlope)

- Segments that intersect protected bicycle facilities (Column/Field name: IntersectPB)

Each of these criteria screenings can be found for any street segment under the column/field name listed above in the master file MASTER_NPT StreetTrailSegments.shp by opening the attribute table for that shapefile in QGIS and scrolling through the columns/fields present.
B. Local data layers that must be generated and appended

Two key criteria – community destinations and senior centers – are not available from open data sources and these map layers must be created for each municipality or planning area. This process can be coordinated with a city or county agency, and it's preferable if they can provide the data as a GIS file, kml or shp. Additional community destinations can be mapped in Google Earth or Google Maps. San Mateo County maintains local destinations and recreation centers that include senior services as part of their landmarks file, but not specifically all senior centers, which can be maintained by local non-profits. Additional data on shopping and other important community-based destinations will need to be added to the SMC destination count, which is appended to the master segments file. Long-term care homes can be incorporated into the analysis as part of the senior centers mapping if the study area or municipality has them present and at the discretion of SVBC and their partners.

Mapping Community Destinations in Google Maps/Google Earth

To create a data map layer of community destinations, online tools like Google Maps or Google Earth can be used. These are helpful for having a clear basemap of data; street names, a few local landmarks, and the like allow people to know where to place markers for community destinations.

Start a new Google Map from Google Drive or create a subfolder in My Places in Google Earth. Drop pins on the map for specific locations, give them simple names. Export the file as a .kml.

[Tutorial Video #2]

Figure 2: Mapping Destinations in Google My Maps

1. Start a new Google My Maps file in Google drive
2. **Drop a Pin for a Destination, write a name and description, click save.**

3. **Click on the three dots by the map title, and export the map to KML**

4. **Select the layer with the newly pinned destinations**

5. **Check the box for the KML export setting and download the file**
Mapping Senior Center Locations in Google Earth

The same process applies as the community destinations to create a map layer of senior centers/long-term care homes, however, creating a separate file from the destinations is helpful for combining data later on in QGIS.

Importing destinations and senior center data into QGIS

Import the .kml files into QGIS by opening a new vector layer and directing the software to open that file location. Import the \textit{MASTER\_NPT\_StreetSegmentsBuffer.shp} file. Next complete a count of community destinations within the ¼ mile buffer of street segments, save this file to a location with a clear title, e.g. \textit{[CityName]Destinations\_inBuffer.shp}. Avoid spaces in file names.

[Tutorial Video #3]

\textbf{Figure 3: Process for Counting Destinations}

1. Using the layer menu, add a vector layer, select the new .kml file and add to map
2. Using the “count points in polygon” function in the processing toolbox, count the destinations that fall within ¼ mile of street/trail segments.

3. From the drop down menu, select the layer to be counted – here we are counting the points of landmarks within the polygons of the segment buffers. Save count as NUM_Dest and save the file. This example has “SMC” for San Mateo County but that’s not necessary.

Repeat this process for senior centers and/or long-term care homes with a separate file name and a clear field name for the count (NUM_SenCen). With the two new shapefiles generated and the MASTER_NPT_StreetTrailSegments.shp file open, append the two count columns. Open the properties of the master file and join the NUM_Dest and NUM_SenCen fields with ID_BCModel as the common join ID. Export this new shapefile with the city or study area name, for example MtnView_StreetTrailSegments.shp.

[Tutorial Video #4]
1. Right click the segments layer to open its properties.

2. In the properties panel, click on the blue triangle icon to access the joins panel, and then click the plus sign on the bottom of the screen to start a join operation.
3. Select the data layer resulting from the count of destinations or senior centers. The two fields should point to ID_BCModel, check the box for joined fields and only join the NUM_Dest or other named field. Check the box for a custom field name prefix and delete the default entry. Click Ok.
C. Creating a query data layer from bicycle plans

Each new AT plan to be run through the Tool will have a set of corridor recommendations to analyze or perhaps SVBC staff may want to select a corridor for evaluation that is not yet in a bicycle plan. Because the tool works with the segment-level data, a query data layer must be generated to aggregate the segment-level data and evaluate corridors longer than one block.

The query data layer must be in a readable format for QGIS, preferably a shapefile (.shp) or (.kml) and include a specific ID field (i.e. column) for each corridor, this can be a project name or number. Examples are in the table below. Note that field/column names do not have spaces, use capitalization to distinguish words because shorter names will make sure the column text isn't cut off by either QGIS, ArcGIS or even spreadsheet software when importing and exporting data.

<table>
<thead>
<tr>
<th>ProjName</th>
<th>ProjectID</th>
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<td>El Camino Real Phase 1</td>
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<tr>
<td>El Camino Real Phase 2</td>
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</tbody>
</table>

Sourced GIS file from City or County agency

If a city or county agency has already created a GIS layer of their bicycle plans (*file type examples: .shp, .kml, etc.*) this can be imported into QGIS and compared to the street segments file. This process can be done by the city or county agency if they choose.

Be sure to use the Reproject Tool when bringing the project corridors layer into QGIS, by reprojecting into the State Plane California reference system so the file lines up correctly with the existing master data layers.

[Tutorial Video #5]
Figure 5: Reproject a map layer

1. Open the “Reproject layer” tool from the processing toolbox

2. Set the coordinate system to EPSG 2227 and save the file. This allows the data to be buffered by feet or miles.

Once the query data layer has been created or imported and the project corridors layer is visible in QGIS, be sure to check the names of the columns/fields and ensure they are titled *ProjName* and *ProjectID*.

[Tutorial Video #6]
Creating a query data layer without GIS files

Similar to creating a layer for community destinations, Google Earth or Google Maps can be used to translate existing print maps or project lists. The following example is the process for two phases of Mountain View’s El Camino Real bicycle plan. Trace El Camino Real for the different project phases, for example from Del Medio to Escuela as Phase/Segment 1 and from Escuela to Shoreline as Phase/Segment 2. Complete this in either Google Earth or Google Maps for each corresponding segmentation of a project corridor. Export the file as a .kml.

[Tutorial Video #7]

Figure 6: Creating Project Corridors in Google Earth

1. In Google Earth, trace the project corridor, name it and write a short description

2. Save to temporary places and right click to save places as.
3. **Save it as a .kml file**

![Save File dialog in Google My Maps](image)

**Figure 7: Creating Project Corridors in Google Maps**

1. **Start a new Google My Maps file in Google drive**

![Google My Maps interface](image)

2. **Trace the project corridor with the line tool and write a name and short description.**
3. **Click three dots by map title and export to .kml**

4. **Select the Layer corresponding to the bike project corridors**

5. **Export the .kml file**

Add this file into QGIS as a new layer (follow the same process as presented in Section B).
D. Joining project corridors with the master segment file

Because there may be some errors in the corridors that are traced or imported from different sources in the query data layer (the new list of project corridors) produced in the previous Section C, use the **Buffer Tool** on this layer. Creating a buffer of 100 feet along the project corridors will allow street segments from the master file to be appended with the project corridor names that lie within this small buffer distance.

[Tutorial Video #8](#)

**Figure 8: Using the Buffer Tool**

1. Reproject any KML or KMZ files by following the steps in Section C
2. Locate the Buffer tool by performing a search in the processing toolbox
3. Select the query data layer created in Section C as the input layer and set the buffer to a distance of 100 feet
Next, run a **Spatial Join** on the master street segments file created for the municipality or study area in question to join only the *Name and Description* fields from the query data layer (or list of project corridors), and then save this new file.

**[Tutorial Video #9]**

**Figure 9: Using the Spatial Join or “Join attributes by location” Tool**

1. Open the “Join attributes by location” tool in the processing toolbox

2. Select the input layer as the newly created master segments file (from page 23) and the join layer as the project corridor buffers layer. Ensure that the Geometric predicate is set to “within”

3. Select the “one-to-many” join type

   **Join type**

   Create separate feature for each located feature (one-to-many)

4. Run the “Join attributes by location” tool and save the output file with the city name
Finally, export the new layer with the segments of the project corridor appended as a .csv.

[Tutorial Video #10]

Figure 10: Exporting .csv table of project segments from the master file for final scoring

1. Open the attribute table of the newly joined layer by selecting the layer and then clicking “open attribute table”

2. Click on “Select features using an expression”

3. Select the project corridor segments with the following formula: “ProjName” IS NOT NULL
4. The project street segments will be highlighted in the table.

5. Close the attribute table and right click on the joined segments layer. Under export, choose “Save Selected Features As” – save the file as a .csv.
E. Importing into Google Sheets or Excel for scoring and evaluation

Spreadsheet software like Google sheets or excel are easier for many people to manipulate data. The following steps take the .csv file that has pulled 16 of the 17 criteria (all except for gaps in the bicycle network) from the geospatial files and allow the final scores to be generated and ranked. There is a standard template developed for calculating the scores based on the weighting, with two modification options available, depending on the reality more suitable for the municipality in question:

1. Either all schools are considered OR only public schools factor into the analysis of harm reduction
2. Employers with 100 OR 500 employees are considered “large” employers when weighting the proximity to destinations

The scoring template is saved as a google sheet and an excel spreadsheet, and any changes made to the weighting of criteria will prohibit SVBC and others from making cross-jurisdictional comparisons. Additionally, renaming or reordering the columns for the pivot table will break the formulas that calculate scores. When scoring a new group of projects it would be beneficial to make a copy of the spreadsheet, and rename it for the project in question to reduce the risk of edits to the template spreadsheet.

Open and copy the newly saved .csv file of project corridors into a new tab/worksheet of the scoring spreadsheet. Then create a pivot table from the data copied into another tab/worksheet, summing the segment values by corridor. So that it's easiest to move between pages, the first sheet in the spreadsheet How to Use this Workbook outlines the order of the pivot table creation.

[Tutorial Video #11]

**Figure 11: Pivot Table Creation**

1. Open the .csv values in a new worksheet
2. Select the copied project corridor table and create a pivot table in a new sheet

3. Define the project name and description fields as rows

4. Define each summed criteria as the values
Copy and paste the values from the pivot table as text into the Project Prioritization tab. The sheet will update with the corridor scoring.

**Final Criteria: Visual Assessment of Gaps in the Bicycle Network**

A project fills a gap in the bicycle network when that project connects at least two ends of an existing bicycle lane or trail. This can be determined by looking at current maps of the bicycle network within the city or county. The visual determination was found to be the quickest and most error-proof way to evaluate street and trail corridors that connect existing facilities, an earlier analysis test in QGIS led to more corridors being included than were actually connecting facilities.

In the spreadsheet, fill in the Gaps Analysis column with a 1 in the cells for projects that fill a gap in the network.

*Figure 12: Scoring the gaps analysis criteria for projects that fill a gap in the network*

<table>
<thead>
<tr>
<th>Y</th>
<th>Z</th>
<th>AA</th>
<th>AB</th>
<th>AC</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUM of NUM_Dest</td>
<td>SUM of NUM_SenCen</td>
<td>Fills a gap in the bike network? (1 = yes)</td>
<td>High Need Areas Score</td>
<td>Proximity to Destinations Score</td>
</tr>
<tr>
<td>10</td>
<td>0</td>
<td>1</td>
<td>25</td>
<td>20</td>
</tr>
</tbody>
</table>

As this last criteria score is input, the Scoring worksheet will automatically update and the lists can be ranked by highest scoring depending on the preference for all schools v. public schools only, and the large employer determination.

Inputting the final scores back into QGIS can be done to create a final map representation of the ranking for export and communication. The basic process can be seen in [Tutorial Video #12].
Chapter 3: Updating Priority Tool Master Data Layer

The following steps outline how to edit the master data layer when new public data is available. These steps will result in permanent changes to the `MASTER_NPT_StreetTrailSegments.shp` file.

Protected Bike Network changes
(updating the combined VTA, SMC bike networks layer)

In the event new protected bicycle facilities are added to the two-county area, the following steps will update the master segments layer and allow the tool to take into account the new facilities in the analysis. This process is ideally done in coordination with City or County staff who can provide a new GIS file of the updated bicycle network.

First, open the new bicycle network GIS file in QGIS or ArcGIS, using a **Definition Query** select the code or text select the protected bicycle facilities. Below is an example if the City or County provides the typical classification of bicycle facilities in either words or numbers (I = off street trail, IV = on-street curb/parking protected lane). Use the **Extract Vertices Tool** to pull the intersection points of the protected bike lane/trails. Using this file, count the projected bike intersections within the master buffer file, join this to the master segments file with the `ID_BCModel` field, using the same process as counting destinations described in **Chapter 2 Section B**. Create a new field name `NUM_Intersect`.

Figure 13: Update IntersectPB column in the master file

1. **Definition query to select for only protected bicycle facilities**

![Query Builder](image)
2. **Extract the vertices of the protected facilities by finding the tool in the processing toolbox**

![Image of Extract Vertices tool](image)

- Open the `Extract Vertices` tool in the processing toolbox.
- From the `Parameters` section, select the input layer, which is the file containing the protected facilities. For example, `\_Users\mack\Documents\EBC\ProtectedBikeNetwork_STATS\Network\Projection.shp`.
- Check the box for `Selected features only` to ensure only the current selected features are processed.
- Under `Vertices`, select `Open output file after running algorithm` to save the extracted vertices.

3. **Select by location the vertices that intersect with the master segments file**

![Image of Select by Location tool](image)

- Open the `Select by Location` tool in the processing toolbox.
- From the `Select features from` section, choose the layer containing the master segments, such as `\_Users\mack\Documents\EBC\ProtectedBikeNetwork_STATS\Network\Projection.shp`.
- Under `Where the features (geometric predicate)` select `Intersect` to filter vertices that intersect with the master segments.
- Modify the selection criteria as needed.

Next, replace the `IntersectPB` field with a new calculated field. Click the master segments file and open the attribute table.

4. **Using the field calculator, create a new field `InterPB2`, as an integer with a length of 10.**

5. **Enter the following formula:**

   \[
   \text{if}(\text{attribute}($currentfeature, \text{"IntersectPB"}) > 1, 1, 0) \text{ OR } \text{if}(\text{attribute}($currentfeature, \text{"NUM_Intersect"}) > 1, 1, 0)
   \]

- Open the field calculator.
- Create a new field named `InterPB2`.
- Set the type to `Whole number (integer)` with `Length: 10` and `Precision: 0`.
- Enter the formula in the expression field:

  \[
  \text{if}(\text{attribute}($currentfeature, \text{"IntersectPB"}) > 1, 1, 0) \text{ OR } \text{if}(\text{attribute}($currentfeature, \text{"NUM_Intersect"}) > 1, 1, 0)
  \]

- Click `Create a new field` to add the calculated field `InterPB2` to the attribute table.
6. Click Ok and it will toggle into edit mode

7. In the field names section of properties, select the old `IntersctPB`, toggle editing, delete the old `IntersctPB` field, rename the `InterPB2` as `IntersctPB`
8. Right click the layer to save the edits and end editing mode.

Census data for both counties

All data tables must be downloaded from the US Census Bureau, American Community Survey 5-year estimates. Each table code is listed in Appendix B. For readability and ease, download the files that include column/field headings.

**Fig. 14: Data Download from Census.gov**

1. Use the search bar to find the table by table number as per the instructions in the Data Collection Handbook and Data Library list

2. Using the filter option, select **Surveys** and then the **American Community Survey** dataset for the most recent 5-year survey
3. In the advanced filter, select **Geography, California** and the **County**, check the box for all County census tracts or block groups.

4. Save data download as an excel or .csv spreadsheet.

Process the data for census tracts (vehicle access, language spoken at home) separately from census block level data (population, income levels, caregivers). Using the original Census data spreadsheet in either Google Drive or Excel complete a VLOOKUP query for each Census block or tract using the GEOID column/field to populate the new data for the estimates of population/households for each criterion described in the Data Collection Handbook. Calculate the percentage of households or population for the criteria, the example shown is for the single caregiver households for unmarried male/female relatives taking care of children.

**Fig. 15: Census data Clean-up in Google Sheets**

1. Create a tab for each new Census table to be imported, ideally append with the year of the data sourced, copy and paste the data tables by subject.
2. Update the vlookup formulas in the block group and census tract summary demographic tab to reference the new sheet, example here is for a 2018 data release

Copy and paste special values in a new datasheet, one each for the census block groups and census tracts. Because file names can be shortened when moving between software, name the data columns/fields as the following:

- **CENSUS TRACTS**
  - Percent No Car Households as PNoCar
  - Percent Low Car Access Households (ones with less than 1 car per 2 adults) as PLowCar
  - Percent of population speaking another language than English at home as P_NonEng

- **CENSUS block groups**
  - Population Density as Pop_Dens
  - Percent of households are Single Caregiver households as P_1Ckids
  - Percent of Households with less than $50,000 in income, see Data Collection Guidebook for a breakdown of incomes as P_LowInc

Join the new data to the original census block and tract shapefiles, using a **Join** as described above for importing destinations, with **GEOID** as the join field, or as described in the Data Collection Handbook.
To evaluate where street and trail segments cross census tracts or block groups, the Select by Location Tool is used in QGIS after census tracts/block groups were filtered using a Definition Query for the thresholds determined for scoring (see Chapter 2).

**Fig. 16: Creating a Definition Query to Screen Census Tracts for xx% of xx**

1. Open the properties of Census Tract shapefile layer in QGIS and open settings tab

   ![Layer Properties - Low Car Ownership HH, 33%+ Households](image)

   - Layer name: Low Car Ownership HH, 33%+ Households
   - Data source encoding: UTF-8

2. Click on the Query Builder button at the bottom of the box and create a definition query based on the criteria – the example here is 33.3% or more of households that have low vehicle access, thus summing the two criteria of no-car HHs and low-car HHs

   ![Query Builder](image)

   - Fields: STATEFP, COUNTYFP, TRACTCE, GEOID, NAME, NAMELSAD, MTFCC, FUNCSTAT, ALAND, AWATER, INPTTLAT, INPTTLON, GeoID_2, Geography, TOT_POP, TOT_HH_est, Percent_HH
   - Values: 
   - Operators: =, <, >, LIKE, %, IN, NOT IN, <=, >=, !=, ILIKE, AND, OR, NOT
   - Provider specific filter expression: 

   

   ```
   "P_NoCar"+"P_LowCar" = 33.3
   ```

3. The census tracts that meet this threshold will be the only ones in view and the only ones used in the select by location process
Then, the **Select by Location Tool** is used on the street segments file to select those segments that intersect the screened census tracts/block groups. The level of data resolution relies on reporting from the U.S. Census Bureau for any given subject of interest, census tracts are larger than block groups.

**Fig. 17: Using the Select by Location Tool to create segments within census areas that meet thresholds**

1. **Open the Select by Location Tool and use it to select only the streets that intersect the census tracts of the specific criteria**

2. **Using the field calculator, update the “pass/fail” score for segments that meet the threshold with a 1 – the example here is for the non-English speaking at home population threshold**
3. Invert selection to “zero” segments for failure to meet threshold and then use the field calculator to set them to 0

4. Save all edits.
Crash Data

Berkeley's TIMS traffic crash data was used to calculate crash statistics for corridors over a three year period from 2016 to 2018. Data is downloaded for each County to include all pedestrian and bicycle collisions, both fatalities and injuries. This data is then summarized by crash location in a spreadsheet software and mapped in QGIS.

Figure 18: Using the TIMS Data Download Portal

1. Access the data query page

   **SWITRS Query & Map**

   The SWITRS Query & Map application is a tool for accessing and mapping collision data from the California Statewide Integrated Traffic Records System (SWITRS).

   1. Please specify date and location

<table>
<thead>
<tr>
<th>Date</th>
<th>From 01/01/2017 to 12/31/2017</th>
</tr>
</thead>
<tbody>
<tr>
<td>County</td>
<td>Alameda</td>
</tr>
<tr>
<td>City</td>
<td>Unincorporated</td>
</tr>
<tr>
<td>State Route</td>
<td></td>
</tr>
</tbody>
</table>

2. Select bicycle and pedestrian collisions filters

   The current data table can serve as an example of how the downloaded data is imported and summarized. Import the .csv files into Google Sheets or Excel and combine the two-county data into one tab. Create a pivot table of each crash site by using the Latitude and Longitude as rows, totaling the pedestrian and bicycle injuries and fatalities separately, then calculate the sum of fatalities and crashes.
1. Create a pivot table of crashes, repeat the row labels for longitude to minimize duplication

2. Create a sum field by location

3. Copy and paste special to a new sheet in order to upload to QGIS – this is to avoid formulas in cells from resulting in Null values in QGIS. Download it as a .csv file and import into QGIS.

Figure 20: Importing Crash Data into QGIS

1. Import .csv using the Add Delimited Layer Tool
2. Geocode the crash locations with the longitude and latitude values

3. Create a buffer the NPT street segments of 500 feet (this is smaller than the segments buffer but large enough to capture crashes adjacent to the roadway or in intersections)

4. Complete a count for crashes, weighting the fields by the crash field

5. Repeat the same process for the fatalities field

6. With the newly created count layers, use the Join based on attributes Tool to the MASTER_NPT_StreetTrailSegments.shp file and delete the old crash data columns, this is similar to the steps outlined above for updating census and bicycle network information.
Chapter 4: AAA Design Evaluation

Once the list of priority bicycle projects is produced and ranked, these corridors need to be assessed for their recommended infrastructure design – one that is appropriate for all ages and abilities (AAA).

The AAA Design Evaluation requires thresholds determined using both Annual Average Daily Traffic (AADT) and average speed on streets. The two factors determine what streets are safe for cycling based on Danish roadway safety and design standards. The following are the minimum data points needed for a street design evaluation, and appropriate estimates or substitutes if data is unavailable for all corridors:

- Measured Average Vehicle Travel Speed on Corridor OR Data substitution: Roadway width and number of lanes to calculate lane width and its correlation with travel speeds.
- Measured Average Annual Daily Traffic (AADT) OR Data estimation: Average Daily Traffic converted to AADT using seasonal adjustment factors.

Determining Corridor Design Treatments

The corridor design screening is used to determine the preferred treatment for each street based on an all ages and abilities safety framework to match the highest international standards. The design treatments are as follows for the evaluation:

**Figure 21: AADT and Speed Thresholds for AAA Bicycle Infrastructure**

<table>
<thead>
<tr>
<th>AADT (number of vehicles)</th>
<th>Average Travel Speeds (mph)</th>
<th>Design Treatment</th>
<th>Design Code (US Bicycle Facility Classification)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 2500</td>
<td>Less than 18</td>
<td>Traffic-calmed streets with chicanes, bike cut-throughs or physical traffic calming elements</td>
<td>1 (Bicycle boulevards with chicanes, speed humps, cut-throughs)</td>
</tr>
<tr>
<td>2500 - 5500</td>
<td>18 - 30</td>
<td>Painted bicycle lanes</td>
<td>2 (Class II)</td>
</tr>
<tr>
<td>Greater than 5500</td>
<td>More than 30</td>
<td>Physically protected bicycle lanes or off-street protected trails if the corridor is a Limited Access Highway</td>
<td>3 (Class IV or I)</td>
</tr>
</tbody>
</table>

When screening the corridor for AADT and speed data, if the corridor fails to meet a threshold, then the highest standard is applied. For example if the AADT exceeds 5500, but travel speeds are less than 20 mph then a higher standard for a protected lane/off-street trail should be proposed.
Source Data for Design Evaluation

Both traffic volume and travel speed data should be sourced from the local city or municipality in question, ideally they can provide the AADT and average travel speed specifically for the project corridors. It is typical of roadway surveys for local streets that the data is from the past 2 to 5 years. Highway or state roadway AADT data can be sourced from CalTrans.

**AADT (annual average daily traffic) for Project Streets**

It is easier for a city agency to work with their traffic engineering department to provide traffic data volumes as an annual average daily traffic figure for the project corridors than it may be for SVBC to make the following adjustments to Average Daily Traffic (ADT) counts. The following equations outline a process to convert ADT to AADT only if necessary:

\[
ADT \text{ (weekday)} = \frac{\text{Total Vehicles Counted}}{\text{Hours of Traffic Counting}} \times 24
\]

\[
\text{AADT} = \text{Daily Average Traffic} \times \text{Seasonal Adjustment Factor}
\]

Seasonal adjustment factors are calculated by most local or regional DOTs. In the U.S. some state DOTs may list seasonal adjustment factors for certain cities.

Before applying a seasonal adjustment factor, the month needs to be determined for each count using the following formula:  

\[\text{Month} = \text{Month}(\text{reference cell of last date of count})\]

Using a lookup table like the following a seasonal adjustment factor for each street segment can be calculated, the numbers here are an example:

<table>
<thead>
<tr>
<th>Month</th>
<th>Seasonal Adjustment Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1.63</td>
</tr>
<tr>
<td>3</td>
<td>1.63</td>
</tr>
<tr>
<td>4</td>
<td>1.68</td>
</tr>
<tr>
<td>7</td>
<td>1.35</td>
</tr>
<tr>
<td>8</td>
<td>1.37</td>
</tr>
<tr>
<td>9</td>
<td>1.39</td>
</tr>
<tr>
<td>10</td>
<td>1.56</td>
</tr>
<tr>
<td>12</td>
<td>1.46</td>
</tr>
</tbody>
</table>

*Figure 22: Examples of Seasonal Adjustment Factors*
To calculate the adjustment factor for each segment use the following formula:

\[ \text{vlookup}([\text{Reference cell of month}], [\text{Seasonal Adjustment Factor cells of Month} \# \text{ and Factor}], 2, \text{false}) \]

Then calculate: \( \text{AADT} = \text{Daily Average Traffic} \times \text{Seasonal Adjustment Factor} \)

**Travel Speeds on Project Corridors**

As with traffic volumes, average travel speed data needs to be gathered from the local municipality or county agency for the project corridors. If at any point a project corridor spans multiple streets or data points, it’s best practice to go with the most recent and highest reported average travel speeds.

**Lane Width to Estimate Travel Speeds**

In the event traffic volumes and travel speeds are unavailable, an allowance for a data substitution using Google Street View and Google Earth has been created for SVBC. This is the least accurate method but provides an alternative if there is no speed or traffic data available. Lane width can be a proxy for travel speeds. Speed studies done across the United States have shown that wider lanes lead to higher traffic speeds, resulting in more fatal and severe traffic collisions for bicycle users. The following research provided a framework for a design standard similar to Danish best practices for speed thresholds. With lanes wider than 11 feet, the travel speeds of cars often exceed 30 - 40 mph. This lane width was thus chosen as a threshold between design treatments.

*As the width of the lane increased, the speed on the roadway increased. When lane widths are 1 m (3.3 ft) greater, speeds are predicted to be 15 km/h (9.6 mph) faster.*

*Figure 23: NACTO Urban Street Design Guide*
The following breakpoints were determined and used for the AAA design evaluation using lane widths and number of lanes:

**Figure 24: Safe Lane Thresholds for AAA Bicycle Infrastructure**

<table>
<thead>
<tr>
<th>Number of Lanes</th>
<th>Lane width (feet)</th>
<th>Design Treatment</th>
<th>Design Code (US Bicycle Facility Classification)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>&lt; 10</td>
<td>Traffic-calmed streets with chicanes, bike cut-throughs or physical traffic calming elements</td>
<td>1 (Bicycle boulevards with chicanes, speed humps, cut-throughs)</td>
</tr>
<tr>
<td>2 or more</td>
<td>&lt; or = 11</td>
<td>Painted bicycle lanes</td>
<td>2 (Class II)</td>
</tr>
<tr>
<td>2 or more</td>
<td>&gt; 11</td>
<td>Physically protected bicycle lanes or off-street protected trails if the corridor is a Limited Access Highway</td>
<td>3 (Class IV or I)</td>
</tr>
</tbody>
</table>

**Evaluation in Google sheets/Excel**

There is a design evaluation sheet template in the **MASTER_NPT Scoring & Evaluation Sheets** file under the **NPT data tables** folder. This template accommodates the following types of design evaluations:

1. Evaluation with travel speeds and annual average daily traffic
2. In the event travel speed and AADT data cannot be acquired, the formulas to evaluate corridors based on the lane widths

The following formulas are phases of the screening criteria in the data table:

1. Calculate **Screen_AADT**, to determine recommended level of protection based on AADT thresholds

   \[
   \text{Screen_AADT} = \text{IF}([\text{AADT Cell Reference}] < 2500, 1, \text{IF}([\text{AADT Cell Reference}] < 5500, 2, \text{IF}([\text{AADT Cell Reference}] > 5500, 3, 0)))
   \]
2. Calculate *Screen Speed*, to determine the recommended level of protection based on travel speed thresholds

\[
=IF([Travel Speed Cell Reference]<=18,1,(IF((AND([Travel Speed Cell Reference]>18,[Travel Speed Cell Reference]<30)),2,(IF([Travel Speed Cell Reference]>30,3)))))
\]

3. Calculate the *Screen_LaneWidth* to determine the recommended level of protection for bicycle facilities in the event speed and AADT data is unavailable

\[
=IF([Number of Lanes Cell Reference]>2,3,(if([Lane Width Cell Reference]>=11,3,(if([Lane Width Cell Reference]<=10,1,2)))))
\]

4. There is additionally an evaluation option to determine if the recommended infrastructure type, as per Danish best practice standards, matches the existing design treatment of the corridor.

**Figure 25: Design Evaluation in Google Sheets**

1. Enter the data for the AADT, Travel Speed and/or Lane Widths and number of lanes for a project corridor, the example below is for El Camino, AADT from Caltrans and lane number/width evaluated in Google Street View/Earth, average travel speed is hypothetical

<table>
<thead>
<tr>
<th>ProjID</th>
<th>Corridor</th>
<th>From Street</th>
<th>To Street</th>
<th>Existing Bicycle Facility Classification (0 = no facility, Class I =3, Class II=2, Class III =1)</th>
<th>AADT (vehicles)</th>
<th>Average Travel Speed (mph)</th>
<th>Number of Lanes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>El Camino</td>
<td>Del Medio</td>
<td>Escuela*</td>
<td>0</td>
<td>43000</td>
<td>55</td>
<td>7</td>
</tr>
</tbody>
</table>

2. Cells in blue are locked and automatically update based on the thresholds defined above

When the design evaluation is completed, it's possible to copy and paste special values into a new tab and export a .csv spreadsheet. This will allow users to bring the data back into QGIS and join the table to the corridor segments data from Chapter 2 Section C based on the *ID_BCModel* field.
Chapter 5: Readiness Evaluation

Beyond the list of priority corridors for bicycle network planning and corresponding design recommendations produced, the SVBC Network Priority Tool puts the top ranked corridors through a third and final assessment by conducting a readiness evaluation. This seeks to identify a number of key projects within the top 20 or 30 list of corridors and demonstrate those that are deemed highest-priority and can be conceived of as ready for advanced design, implementation and ultimately construction.

The criteria below set out the parameters for choosing “ready corridors” in any local municipality:

1. **The project is identified in at least two statewide/countywide/regional/local planning efforts.**

2. **The project has undergone at least 10% of design and environmental review.**

3. **The project has a credible funding plan.**
   Meaning that it has one of the following:
   - It has potential for private sector contribution
   - It has a grant potential
   - It has already met local match requirement
   - It is already funded
   - It is already in the Capital Improvement Plan (CIP)
Appendix: Data Files

The following data files are in Map_Files

- NPT_map.qgz including the following layers and packaged in a .zip file
  
  - MASTER_NPT_StreetTrailSegments
  - MASTER_NPT_SegmentBuffers
  - Harm Reduction
    - Fatalities_Pedestrians and Bicyclists
    - CrashesPedBike_2016-2018
    - Schools_K-12
    - PublicSchoolsK-12
  - Destinations
    - LandmarksPnts_SanMateoCounty
    - Jobs_2017
    - CollegesUniversities_SCC_SMC
  - Bike Network Connectivity
    - TransitHubs_Points
    - TransitShed_halfmile
    - Intersections_ProtectedBikeNetwork
  - High Need Areas
    - Criteria Threshold Areas
      - MTC_Communities_of_Concern_2018Class
      - Low Income HH, 33.3%+ Households
      - Single Caregiver Households, 33.3%+ Households
      - Low Car Ownership HH, 33%+ Households
      - Non-English Speaking at Home, 66.6%+ of Population
    - Raw Data Files
      - MTC_Communities_of_Concern_2018Class
      - DemographicData_blockgroups
      - DemographicData_censustracts
**MASTER_NPT_StreetTrailSegments.shp** includes the following data fields

<table>
<thead>
<tr>
<th>Column Name</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NAME_BCMOD</td>
<td>Street or trail name</td>
</tr>
<tr>
<td>ID_BCModel</td>
<td>Identification number for NPT segments</td>
</tr>
<tr>
<td>NUM_PubSch</td>
<td>Public schools K-12</td>
</tr>
<tr>
<td>NUM_School</td>
<td>All schools K-12</td>
</tr>
<tr>
<td>NUM_Fatali</td>
<td>Pedestrian and bicyclist fatalities</td>
</tr>
<tr>
<td>NUM_Crashe</td>
<td>Pedestrian and bicyclist crashes</td>
</tr>
<tr>
<td>NUM_Uni</td>
<td>Universities and colleges</td>
</tr>
<tr>
<td>NUM_Employ</td>
<td>All Jobs</td>
</tr>
<tr>
<td>Emps100plu</td>
<td>Count of employers with more than 100 employees</td>
</tr>
<tr>
<td>Emps500plu</td>
<td>Count of employers with more than 500 employees</td>
</tr>
<tr>
<td>NUM_SMCDest</td>
<td>Destinations from San Mateo County Landmarks data</td>
</tr>
<tr>
<td>Pass_PopDe</td>
<td>Passed the criteria for average or more than average Population Density by Municipality</td>
</tr>
<tr>
<td>Pass_LInc</td>
<td>Passed the criteria for Lower Income</td>
</tr>
<tr>
<td>Pass_VecAcces</td>
<td>Passed the criteria for Vehicle Access</td>
</tr>
<tr>
<td>Pass_1Care</td>
<td>Passed the criteria for Singler Caregiver households</td>
</tr>
<tr>
<td>Pass_Lang</td>
<td>Passed the criteria for Non-English Speaking Majority</td>
</tr>
<tr>
<td>Pass_COC</td>
<td>Is an MTC Community of Concern</td>
</tr>
<tr>
<td>Pass_Transit</td>
<td>Segments within ¼ mile of all existing/planned transit hubs as per a station area street network analysis</td>
</tr>
<tr>
<td>IntersctPB</td>
<td>Segments that intersect protected bicycle facilities</td>
</tr>
<tr>
<td>PassSlope</td>
<td>Segments with grades less than 5%</td>
</tr>
<tr>
<td>PassConnec</td>
<td>Segments that scored above 5.25 on Space Syntax analysis of connectivity for bicycle riders covering a typical 20 minute, 5 km / 3 mile travel distance</td>
</tr>
</tbody>
</table>