Berkeley SafeTREC

SAFE TRANSPORTATION RESEARCH AND EDUCATION CENTER

PS 21033

City of Montclair
Complete Streets Safety Assessment

Final Report:
Issues, Opportunities, and Suggested Strategies

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Executive Summary

The City of Montclair requested that the Safe Transportation Research and Education Center at University of California, Berkeley conduct a Complete Streets Safety Assessment (CSSA) study. A team of three complete streets safety experts conducted a site visit for the CSSA for Montclair on May 19, 2021 and prepared this report. The objectives of the CSSA are to improve pedestrian and bicycle safety and to enhance walkability and accessibility for all pedestrians and bicyclists in Montclair.

Collision Data

Based on the OTS 2018 statistics, City of Montclair ranked 3 out of 97 California cities in Group D, in total fatal and injury collisions (with a ranking of "1" being the worst and "97" the best). It ranked 16 for pedestrian collisions, and 47 for bicyclist collisions. This ranking is based on a number of weighted factors including population, daily vehicle miles traveled, collision records, collision trends, and others. For more information on OTS rankings, please refer to https://www.ots.ca.gov/media-and-research/crash-rankings-results/. Chapter 2 provides an overview of collision data for the City.

Benchmarking Analysis of Policies, Programs and Practices

A typical component used to assess pedestrian and bicyclist safety conditions in Concord, is the completion of a benchmarking analysis, to understand how the City's existing conditions compared to current best practices. Due to staffing changes at the City of Montclair, this process was not completed for this report. Information on the benchmarking process is provided for reference, should the City wish to undertake this process in the future. Through a pedestrian and bicycle safety assessment, the City's pedestrian policies, programs, and practices can be categorized these into three groups:

- Key strengths (areas where the City is exceeding national best practices)
- Enhancement areas (areas where the City is meeting best practices)
- Opportunity areas (areas where the City appears not to meet best practices)

A sample benchmarking questionnaire is provided in Chapter 3 for topics across these three categories. Cities have differing physical, demographic, and institutional characteristics that may make certain goals or policies more appropriate in some jurisdictions than others. Ultimately, City staff may determine where resources and efforts are best placed for meeting local development and infrastructure goals for bicyclists and pedestrians.

Walking Audit Suggestions for Potential Improvement

A field visit and walk audit was conducted at three locations, determined in coordination with City staff. Positive practices, as well as pedestrian safety and accessibility issues, were identified. The three focus areas were:

1. Arrow Highway from Mills Avenue to Benson Avenue
2. Moreno Street from Monte Vista Avenue to Benson Avenue
3. Central Avenue from Arrow Highway to Palo Verde Street

Observations made during the walking audit were used to suggest policies and physical improvements intended to enhance accessibility and connectivity for pedestrians and bicyclists. Key findings from the audit include:

- Many intersections and crossing locations in the walking audit lacked ideal accessibility for pedestrian travel. Installing high-visibility crosswalks, ADA compliant curb ramps with truncated domes, pedestrian push buttons, and enhanced safety features at these locations can benefit pedestrian accessibility.
- Many roadway segments in the walking audit feature a combination of vehicular capacity that exceeds demand and a lack of bicycle facilities. Implementing a road diet with dedicated bicycle facilities can encourage safer speeds and better multimodal accessibility.
- Multiple signalized intersections feature a permissive left turn phase, which can increase potential conflict between vehicles and other users. Adding protected left turns at these locations can minimize conflict and enhance safety for all modes.

A narrative description of audit observations and potential improvements, as well as a graphic summary of suggested improvements, are provided in Chapter 4.

Many of the strategies suggested in this report are appropriate for grant applications, including Office of Traffic Safety (OTS) or Safe-Routes-to-School funding. The strategies may also be incorporated into future updates to the City's Bicycle and Pedestrian Master Plan, as well as other documents that may set forth bicycle, pedestrian and streetscape policies for the City and identify and prioritize capital improvement projects.

The suggestions presented in this report are based on limited field observations and time spent in Montclair by the CSSA evaluators. These suggestions, which are based on general knowledge of best practices in bicyclist and pedestrian design and safety, are intended to guide City staff in making decisions for future safety improvement projects in the city, and they may not incorporate all factors which may be relevant to the pedestrian and bicyclist safety issues in the City.

As this report is conceptual in nature, conditions may exist in the focus areas that were not observed and may not be compatible with suggestions in this report. Before finalizing and implementing any physical changes, City staff may choose to conduct more detailed studies or further analysis to refine or discard the suggestions in this report, if they are found to be contextually inappropriate or appear not to improve pedestrian safety or accessibility due to conditions including, but not limited to, high vehicular traffic volume or speeds, physical limitations on space or sight distance, or other potential safety concerns.

1. Introduction

1.1 Objective

The City of Montclair requested that the Safe Transportation Research and Education Center at University of California, Berkeley conduct a Complete Streets Safety Assessment (CSSA) study. The objectives of the CSSA are to improve safety and accessibility for all people walking and biking in the City of Montclair.

1.2 Evaluation Approach

Prior to visiting the city, the CSSA Team conducted pre-visit telephone interviews with City staff in spring of 2021. The results from this interview aided in the selection of study sites. The Team visited the city on May 19, 2021 to observe and document field conditions. Following this, a list of suggestions for potential site-specific improvements was drafted based on the results of the complete streets audit and best practices in designing for pedestrians and bicyclists.

1.3 Organization of this Report

Chapter 2 presents background information on bicyclist and pedestrian safety in the city, including safety rankings, locations of the highest number of bicyclist and pedestrian-involved injuries, and locations where bicyclist and pedestrian fatalities occurred (from 2015 to 2019). Chapter 3 presents the findings and suggestions for potential improvement from the benchmarking analysis. Chapter 4 presents the findings and suggestions for potential improvements from the audit.

The report has four appendices: Appendix A and Appendix B presents a glossary of pedestrian and bicyclist improvement options, Appendix C is a resource list, and Appendix D is a citywide connectivity resource.

1.4 Acknowledgements

Montclair staff members contributed to the wide range of topics addressed in this report, including providing local important context that informed the site selection and recommendations of this report.

1.5 Disclosures

The benchmarking analysis aims to provide the City with information on current best practices and how the city compares. Cities have differing physical, demographic, and institutional characteristics that may make certain goals or policies more appropriate in some jurisdictions than others. Ultimately, City staff will determine where resources and efforts are best placed for meeting local development and infrastructure goals for people walking and biking.

The suggestions presented in this report are based on limited field observations and limited time spent in the City of Montclair by the CSSA evaluators. All observations and visits were conducted during the COVID-19 Pandemic, and thus may not reflect typical conditions. These suggestions, which are based on general knowledge of best practices in pedestrian and bicycle design and safety, are intended to guide City staff in making decisions for future safety improvement projects in the city, and they may not incorporate all factors which may be relevant to the pedestrian and bicycle safety issues in the city.

As this report is conceptual in nature, conditions may exist in the focus areas that were not observed and may not be compatible with suggestions in this report. Before finalizing and implementing any physical changes, City staff may conduct more detailed studies or further analysis to refine or discard the suggestions in this report, if they are found to be contextually inappropriate or appear not to improve pedestrian and bicyclist safety or accessibility due to conditions including, but not limited to, high vehicular traffic volume or speeds, physical limitations on space or sight distance, or other potential safety concerns.

2. Background

2.1 Pedestrian and Bicyclists Safety Overview

The Office of Traffic Safety (OTS) collision rankings facilitate funding decisions and identify emerging traffic safety problem areas. The rankings allow cities to compare themselves to other cities with similar-sized populations and help them identify potential disproportionate traffic safety issues. OTS rankings are indicators of historical collisions; there are many factors that affect collisions in a city.

Victim and collision data for the rankings were acquired from the California Highway Patrol (CHP) Statewide Integrated Traffic Records System (SWITRS), California Department of Transportation (Caltrans), California Department of Justice (DOJ), and the Department of Finance (DOF).

The City of Montclair is located in San Bernardino County. Per Office of Traffic Safety, as of 2018, with a population of approximately 39,452, it is categorized as one of the 97 cities in Group D, population 25,001 - 50,000, as shown in Table 2-1.

TABLE 2-1 MONTCLAIR SUMMARY STATISTICS

Year	County	Population	Population Group	Daily Vehicle Miles Traveled (VMT)
2018	San Bernardino	39,452	D	349,207

Source: California Office of Traffic Safety, https://www.ots.ca.gov/media-and-research/crash-rankings-results/

The 2018 OTS safety rankings for Montclair are shown in Table 2-2. Based on the OTS 2018 statistics, Montclair ranked 3 out of 97 California cities in Group D, in total fatal and injury collisions (with a ranking of "1" being the worst and "97" the best). It ranked 16 for pedestrian collisions, and 47 for bicyclist collisions. Of particular note is the high ranking for number of alcohol involved collisions, 7 out of 97.

TABLE 2-2 MONTCLAIR TRAFFIC COLLISIONS AND RANKINGS, 2017

Type of Collision	Victims Killed and Injured	OTS Ranking (of 97 cities)
Total Fatal and Injury	346	3/97
Alcohol Involved	34	7/97
Motorcycles	7	33/97
Pedestrians	21	16/97
Pedestrians < 15	2	29/97
Pedestrians 65+	3	25/97
Bicyclists	7	47/97
Bicyclists < 15	1	42/97

Source: California Office of Traffic Safety, https://www.ots.ca.gov/media-and-research/crash-rankings-results/

2.2 Pedestrian and Bicycle Collision Data

The collision data for Montclair from January 2015 to the end of 2019 was taken from the SafeTREC Transportation Injury Mapping System (TIMS) database. During this five-year period, 1,452 collisions occurred in Montclair, 8 of which were fatal. There were 90 collisions involving pedestrians and 76 involving bicyclists.

Pedestrian Collisions

Within the 5-year period analyzed from TIM's data, 90 collisions involved pedestrians, four of which were fatal and 12 with severe injury. Of the 90 collisions, 37 involved pedestrian crossing in crosswalk at an intersection, 4 were crossing in crosswalk, not at intersection, and 24 crossing not in crosswalk. Crossings outside of a crosswalk can be an indicator of missing infrastructure in locations of high pedestrian demand and desire lines. 16 were in road, including shoulder. The following charts depict this data:

TABLE 2-3 NUMBER OF PEDESTRIAN COLLISIONS BY COLLISION SEVERITY

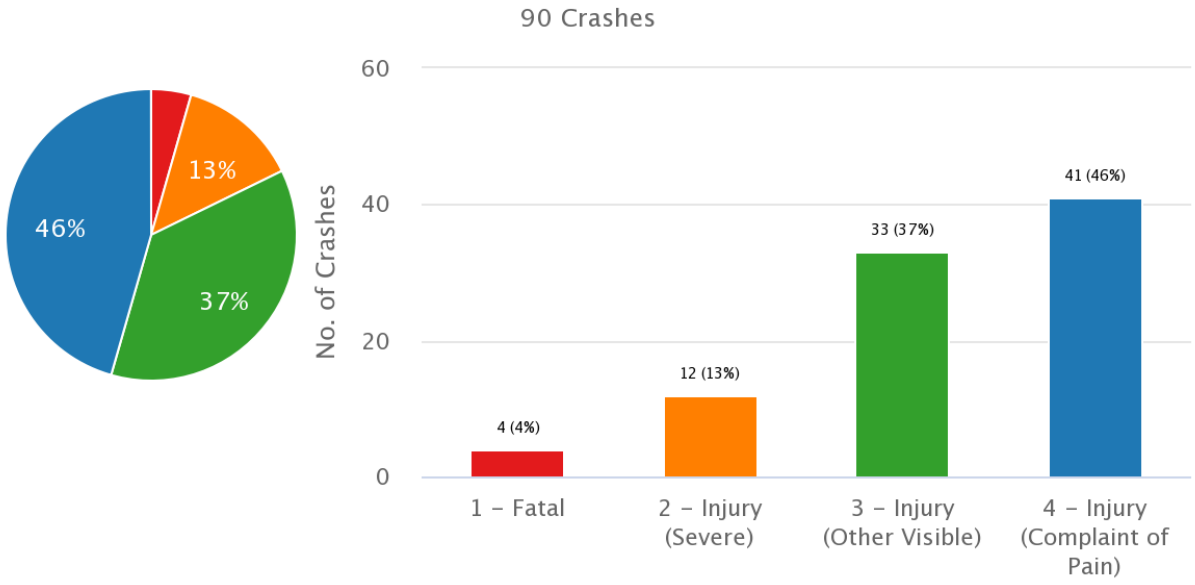


TABLE 2-4 NUMBER OF PEDESTRIAN COLLISIONS PER DAY OF WEEK PER TIME

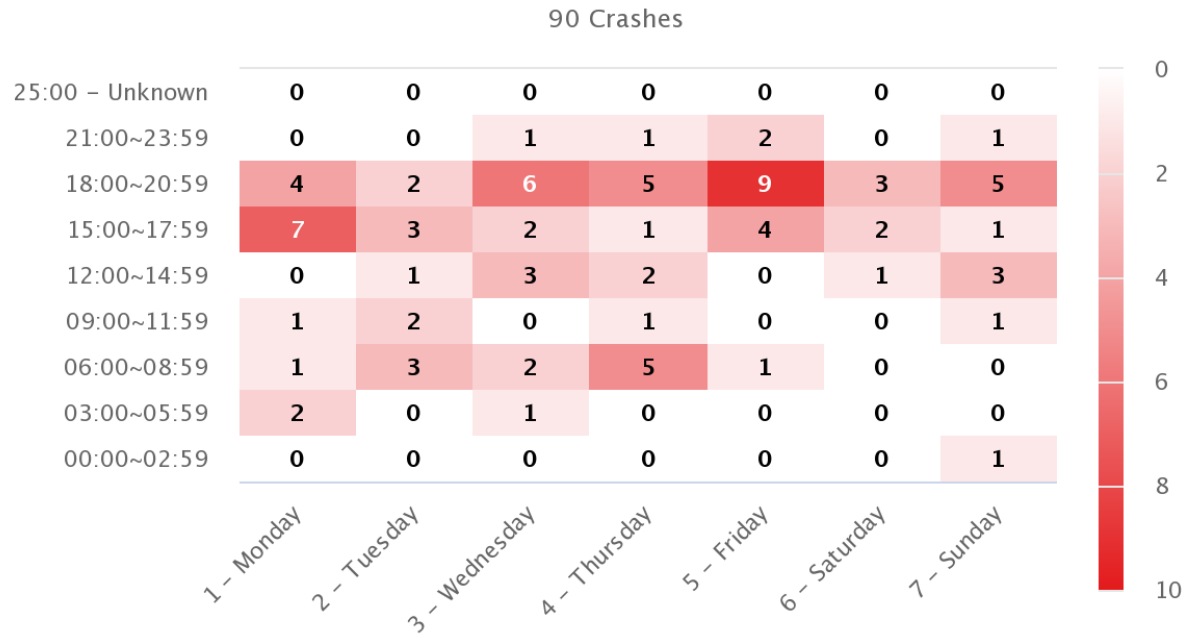
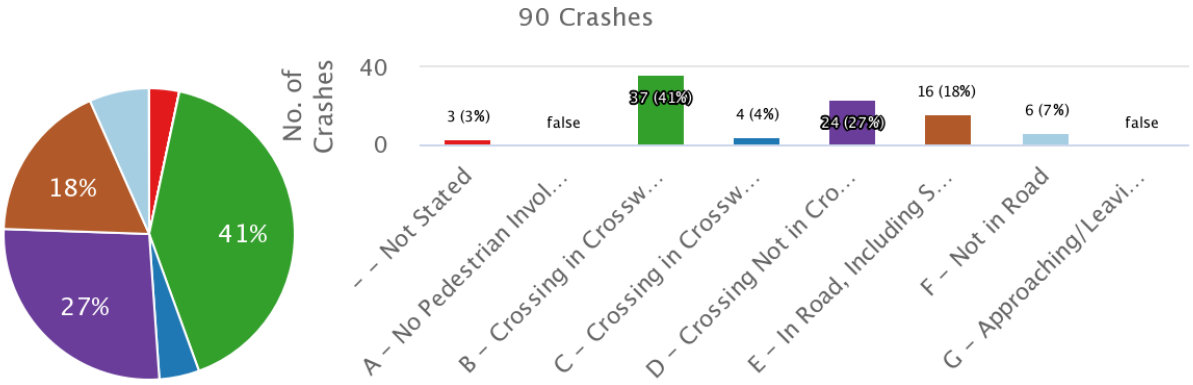


TABLE 2-5 NUMBER OF PEDESTRIAN COLLISIONS BY PEDESTRIAN ACTION



Pedestrian Action

- – – Not Stated
- A – No Pedestrian Involved
- B – Crossing in Crosswalk at Intersection
- C – Crossing in Crosswalk Not at Intersection
- D – Crossing Not in Crosswalk
- E – In Road, Including Shoulder
- F – Not in Road
- G – Approaching/Leaving School Bus

Pedestrian Action	Count	%
- -Not Stated	3	3.33%
B - Crossing in Crosswalk at Intersection	37	41.11%
C - Crossing in Crosswalk Not at Intersection	4	4.44%
D - Crossing Not in Crosswalk	24	26.67%
E - In Road, Including Shoulder	16	17.78%
F - Not in Road	6	6.67%

Bicycle Collisions:

Based on the TIMS data, within the 5-year (2015-2019) period, there were 76 collisions involving bicyclists, one of which was fatal and 6 were with severe injury. A total of 11 collisions happened due to the bicyclist riding on the wrong side of road. This can be an indicator of missing low stress bicycle infrastructure in locations of high bicycle demand and desire lines. The following charts depict this data.

TABLE 2-6 NUMBER OF BICYCLE COLLISIONS BY COLLISION SEVERITY

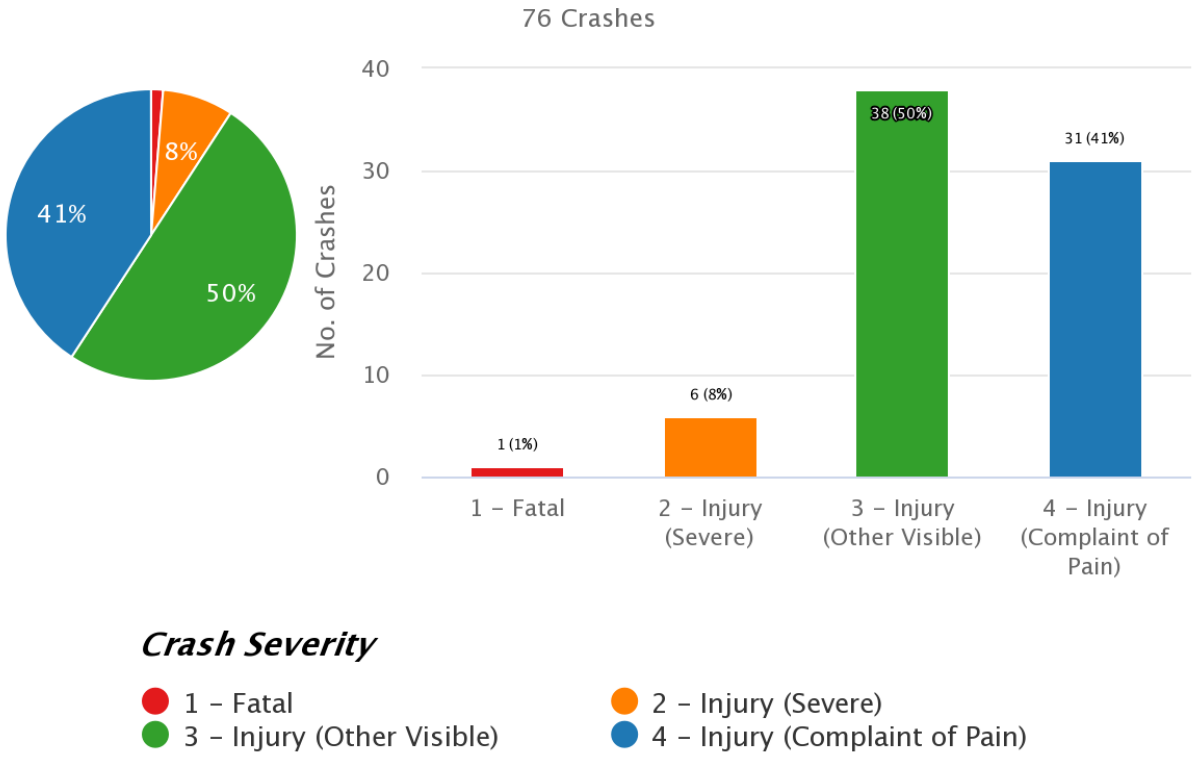


TABLE 2-7 NUMBER OF BICYCLE COLLISIONS PER DAY OF WEEK PER TIME

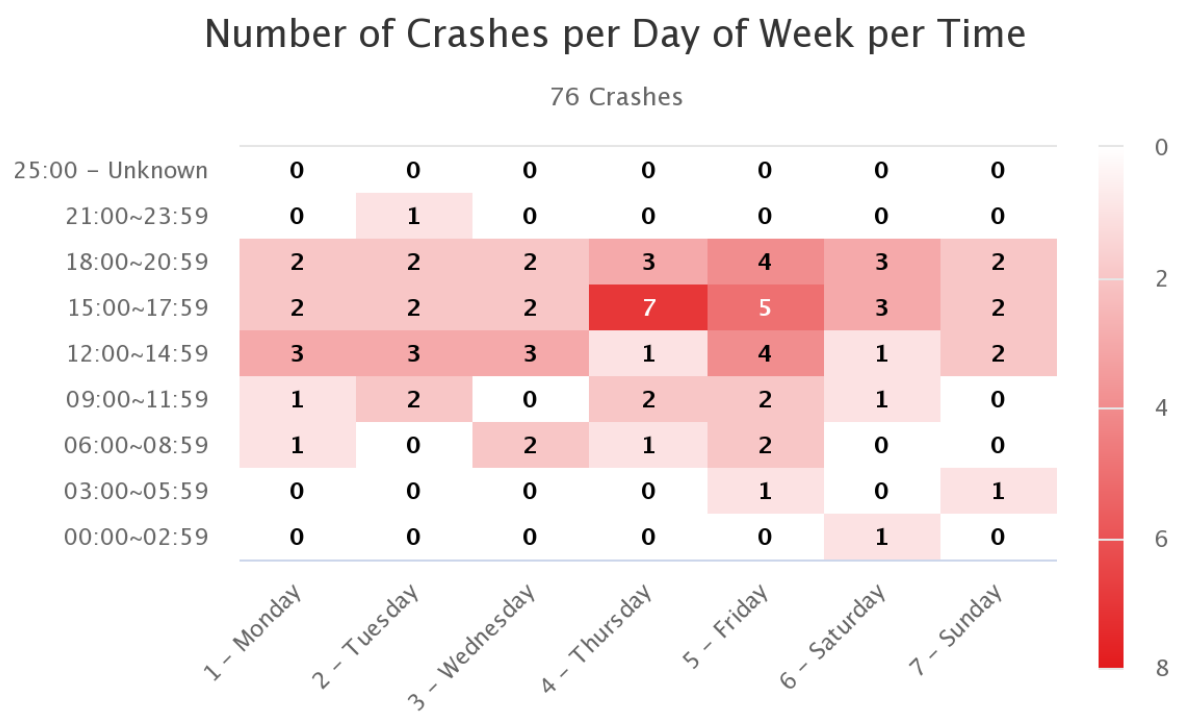
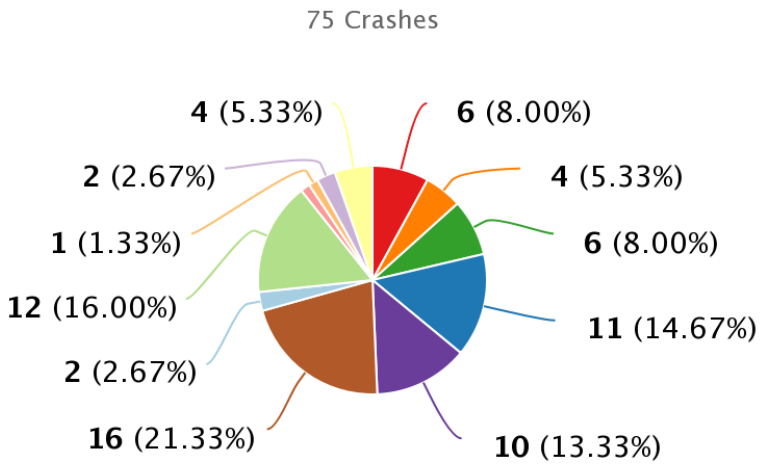


TABLE 2-8 NUMBER OF BICYCLE COLLISIONS BY PRIMARY COLLISION FACTOR (PCF) VIOLATION



PCF Violation

- 00 – Unknown
- 01 – Driving or Bicycling Under the Influence of Alcohol or Drug
- 03 – Unsafe Speed
- 05 – Wrong Side of Road
- 08 – Improper Turning
- 09 – Automobile Right of Way
- 10 – Pedestrian Right of Way
- 12 – Traffic Signals and Signs
- 14 – Lights
- 17 – Other Hazardous Violation
- 21 – Unsafe Starting or Backing
- 22 – Other Improper Driving

PCF Violation	Count	%
00 - Unknown	6	8.00%
01 - Driving or Bicycling Under the Influence of Alcohol or Drug	4	5.33%
03 - Unsafe Speed	6	8.00%
05 - Wrong Side of Road	11	14.67%
08 - Improper Turning	10	13.33%
09 - Automobile Right of Way	16	21.33%
10 - Pedestrian Right of Way	2	2.67%
12 - Traffic Signals and Signs	12	16.00%
14 - Lights	1	1.33%
17 - Other Hazardous Violation	1	1.33%
21 - Unsafe Starting or Backing	2	2.67%
22 - Other Improper Driving	4	5.33%

The type of information provided above was obtained from SafeTREC's TIMS (https://tims.berkeley.edu/) can help the enforcement department in decision making in regards to their enforcement efforts, as well as inform engineering and education interventions.

2.3 Street Story

The Street Story program (https://streetstory.berkeley.edu/) is a relatively new tool developed by UC Berkeley's Safe Transportation Research and Education Center (SafeTREC) with OTS support. Street Story is a community engagement tool that allows residents, community groups and agencies to collect information about transportation collisions, near-misses, general hazards and safe locations to travel. To promote access to the tool, SafeTREC conducts technical assistance sessions with communities and organizations on using Street Story. Street Story is free to use and publicly accessible.

Street Story features a survey where people can record travel experiences. Once a record has been entered, the information is publicly accessible on the website with maps and tables that can be downloaded.

It is suggested that City staff use this free tool to collect information from their residents for local needs assessments, transportation safety planning efforts, safety programs and project proposals.

3. Benchmarking Analysis Results and Suggestions

To assess pedestrian and bicycle safety conditions in the City of Montclair, the CSSA team first conducted a benchmarking analysis to understand how the City's existing conditions compared to current nationwide best practices. Responses were analyzed with a benchmarking matrix, as shown in Table 3-1, which lists the benchmarking topics that fall under the following categories:

- Implementation of Americans with Disabilities Act (ADA) Improvements
- Policies and Programs
- Funding
- Data Collection
- Pedestrian and Bicycle Network Implementation
- Pedestrian and Bicycle Support Programs

The CSSA team also reviewed the City's website and relevant documents. Through a pedestrian and bicycle safety assessment interview conducted with City's staff, the CSSA team identified the City's pedestrian and bicycle policies, programs, and practices and categorized these into three groups:

- Key strengths (areas where the City is exceeding nation-wide best practices)
- Enhancement areas (areas where the City is meeting best practices)
- Opportunity areas (areas where the City appears not to meet best practices)

While suggestions are provided for each category, cities have differing physical, demographic, and institutional characteristics that may make certain goals or policies more appropriate in some jurisdictions than others. Ultimately, City staff may determine where resources and efforts are best placed for meeting local development and infrastructure goals for pedestrians.

Each topic receives one of those three ratings and is highlighted in green in the table below. This analysis shares information on current best practices and how the City compares.

The items in Table 3-1 are further elaborated in the following sections, which provide a description for each benchmarking topic. Suggestions for improvement or further enhancement are also provided, which the City could consider if they are not already implemented by the City. City staff may select strategies for implementation based on local priorities.

TABLE 3-1 SAMPLE BENCHMARKING SUMMARY OF PROGRAMS, POLICIES, AND PRACTICES

Benchmark Topic	Key Strength	Enhancement	Opportunity
Implementation of Americans with Disabilities Act (ADA) Improvements			
Implementation of Americans with Disabilities Act (ADA) Improvements	Uses state-of-the- practice (PROWAG) ADA improvements with consistent installation practices	Has clear design guidelines but no regular practices for ADA compliance	Has minimal design guidelines and practices related to ADA requirements
ADA Transition Plan for Streets and Sidewalks	Has ADA transition plan in place and an ADA coordinator	Partial or outdated ADA transition plan or an ADA coordinator	No transition plan or ADA coordinator
Policies and Programs			
Pedestrian/Bicycle Coordinator	Has a Coordinator on staff who manages the agency's pedestrian and bicycle programs	Occasionally uses a part-time contract coordinator	Does not have a pedestrian/bicycle coordinator
Formal Advisory Committee	Has a formal, active Transportation Advisory Committee that address bicycle/pedestrian issues	Has an ad-hoc Transportation Advisory Committee	Does not have a Transportation Advisory Committee
Traffic Calming Program	Has a significant traffic calming program with a dedicated funding source	Has a traffic calming program but no dedicated funding source	Does not have a traffic calming program, or the program only includes speed humps
Speed Limits and Speed Surveys	Employs comprehensive practice to proactively review speed limits such as USLIMITS2. Considers traffic calming before raising speed limits in pedestrian or bicycle zones	Reviews data only in response to reported concerns or frequent collisions	Does not have set practices for speed limit reviews
Safe Routes to Schools	Has an ongoing Safe Routes to Schools program and funding for recent projects.	Has obtained funding for recent projects, but has no community-wide Safe Routes to Schools program	Does not have a Safe Routes to Schools program and has not obtained recent funding
Crosswalk Installation, Removal, and Enhancement Policies	Has a crosswalk policy that reflects best practices for signalized and uncontrolled crosswalk treatments (FHWA Field Guide), including consideration of Pedestrian Hybrid Beacons	Has no policy, but has an established crosswalk installation, removal, and enhancement practice in place	Does not have a policy or set practices for addressing crosswalk installation, removal, or enhancement
Shared Mobility Services	Has curbside management, shared mobility, or micromobility policies (e.g. permitting, enforcement) in place that prioritize pedestrian and bicyclist safety	Has curbside management, shared mobility, or micromobility policies in place, but without a focus on safety	No curbside management, shared mobility, or micromobility policies in place
Funding			
Funding	Has a dedicated annual funding stream for pedestrian and bicycle projects and local grant matches	Depends on grant funding for projects, and is successful in obtaining grants	Only moderately successful in obtaining grant funding or has trouble spending funds when given grants
Data Collection			
Collection of Pedestrian and Bicyclist Volumes	Collects pedestrian and bicyclist volumes routinely with intersection counts and has a GIS database of counts	Collects some pedestrian and bicyclist volumes, but not routinely	Does not collect pedestrian and bicycle volumes

TABLE 3-1 SAMPLE BENCHMARKING SUMMARY OF PROGRAMS, POLICIES, AND PRACTICES

Benchmark Topic	Key Strength	Enhancement	Opportunity
Inventory of Bikeways, Parking, Informal Pathways, and Key Bicycle Opportunity Areas	Maintains an inventory of missing and existing bikeways in GIS and includes bikeway projects in the CIP	Maintains an inventory of missing facilities and opportunity areas	Does not have an inventory of missing/existing bikeways, parking, informal pathways, or key bicycle areas
Inventory of Sidewalks, Informal Pathways, and Key Pedestrian Opportunity Areas	Maintains an inventory of missing and existing sidewalks in GIS and includes sidewalk projects in the CIP	Maintains an inventory of missing sidewalks, informal pathways, or pedestrian opportunity areas	Does not have an inventory of missing sidewalks, informal pathways, or pedestrian opportunity areas
Pedestrian and Bicycle Traffic Control Audit (Signs, Markings, and Signals)	Maintains an inventory of pedestrian and bicycle signs, markings, and signals in GIS	Has a limited inventory of signs, markings, and signals	Does not have an inventory of signs, markings, and signals
Collision History and Collision Reporting Practices	Employs a data-driven systemic safety or Vision Zero approach to regularly analyze collision data citywide	Reviews data only following fatalities or other high-profile incidents	Does not have set practices for data review
Pedestrian and Bicycle Network Implementation			
Complete Streets Policy	Has a Complete Streets policy that includes all users and modes, affects new construction and maintenance, considers local context, and provides guidance for implementation	Has a Complete Streets policy that is narrow in scope or applies only to public works projects	Does not have a Complete Streets policy
Active Transportation Plans	Has a recently-updated Active Transportation Plan (or similar) with strategic prioritized list of projects that reflects current best practices (e.g. Level of Traffic Stress analysis, inclusion of Class IV protected bicycle facilities)	Has a Pedestrian or Bicycle Master Plan but it may be outdated and/or no recent projects from the Plan have been completed	Does not have a Pedestrian or Bicycle Master Plan
Existing bike network	Includes current best practice features such as cycle tracks, bicycle boulevards, intersection treatments, and/or buffered bike lanes	Includes Class I, II, and III only	Includes only bicycle routes or no designation
Existing pedestrian facilities	Includes current best practice ADA and safety features such as high visibility crosswalks and advance stop bars, PHBs or RRFBs, bulbouts, etc.	Narrow sidewalks or sidewalk gaps, crosswalks with few or no safety enhancements, with some pedestrian countdown signals	Missing key marked crosswalks and sidewalks, with few ADA improvements and no safety enhancements, and no pedestrian countdown signals
Bike Network Implementation Practices	Age 8 to 80 bicyclist considerations are applied and/or level of traffic stress is considered	Some traffic calming measures are implemented in conjunction with bikeway installation	Treatments are implemented where they fit within the right-of-way and vehicle LOS is not affected
Design guidelines and standards	Uses national best practices focused on bicycle and pedestrian safety for roadway and facility design guidelines and standards	Local standards reference national best practices, but are static or out of date, with minimal customized design policies for pedestrian and bicycle accommodations	Does not have a comprehensive design guidelines or standards for pedestrian or bicyclist treatments

TABLE 3-1 SAMPLE BENCHMARKING SUMMARY OF PROGRAMS, POLICIES, AND PRACTICES

Benchmark Topic	Key Strength	Enhancement	Opportunity
Roadway Surfaces	Roadway resurfacing projects and debris removal are prioritized for bicycle routes.	Roadway surface is acceptable on bicycle routes and routine maintenance, including debris removal, occurs.	Roadway surface conditions are poor on some bicycle facilities and maintenance is not prioritized for bicycle facilities
Attention to Bicycle Crossing Barriers	Colored bike lanes and other innovative treatments, including geometric enhancements, are provided at intersections and interchanges	Bike treatments are installed at some intersections and interchanges	Bike treatments are not installed at intersections or through interchanges
Attention to Pedestrian Crossing Barriers	Has a recently updated policy and comprehensive inventory of barriers. Has design guidelines for addressing barriers	Has no policy, but has identified some barriers and taken steps to improve pedestrian access	Does not have a policy or practices for pedestrian crossings at railroads, freeways, and so on
Traffic Signal and Stop Sign Warrants	Uses relaxed warrants for traffic signals and/or all-way stops	Uses relaxed warrants for traffic signals or all-way stops	Uses MUTCD Warrants
Pedestrian and Bicycle Support Program			
Bicycling Supportive Amenities and Wayfinding	Bicycle supportive amenities (parking, routing/wayfinding, water fountains, repair stations) are found community-wide	Some bicycle supportive amenities are found in key areas	Bicyclist supportive amenities are not provided in the community
Pedestrian and Bicycle Safety Education Program	Pedestrian and bicycle education programs are data-driven and focused on local safety context; education programs are customized for different groups	Has some traffic safety education programs that include pedestrians and bicyclists	Does not have pedestrian and bicycle safety education programs
Others			
Enforcement	Police Department conducts sustained and data-driven enforcement efforts focused on behavior and locations related to most severe bicycle and pedestrian crashes; enforcement activities are designed to consider equity implications	Police Department conducts some enforcement activities related to bicyclist and pedestrian safety	Police Department does not have Traffic Safety Officer(s)

Implementation of Americans with Disabilities Act (ADA) Improvements

Implementation of ADA improvements is key to making walking accessible and safe for everyone, regardless of ability or age.

The City has design guidelines specific to the City of Montclair for ADA.

Suggestions for Potential Improvement

- Continue adding ADA ramps at intersections that currently lack them and upgrade ramps that are not compliant.
- Develop an ADA improvement program for items such as dual curb ramps, truncated domes, and audible pedestrian signals that applies consistent treatments. The program may provide an inventory, prioritization plan, and funding source for such improvements.

ADA Transition Plan for Streets and Sidewalks

ADA Transition Plans identify gaps and issues in the City's current ADA infrastructure, prioritize projects for implementation, and set forth the process for bringing public facilities into compliance with ADA regulations. Transition Plans typically a range of locations, such as public buildings, sidewalks, ramps, and other pedestrian facilities. Some local agencies also have ADA Coordinators, who are responsible for administering the Plan and reviewing projects for accessibility considerations.

City of Montclair has ADA Self-Evaluation and Transition Plan, dated 5/30/2019, and a specifically designated ADA coordinator on staff.

Suggestions for Potential Improvement

- Consider prioritizing sub-areas within the City that exhibit greatest pedestrian activity.
- Expand the ADA Transition Plan to include the public right-of-way, particularly the downtown areas, other priority development areas, bus stops, and schools.
- Provide ADA standards and best practice training for engineering staff at all levels.

Pedestrian/Bicycle Coordinator

A pedestrian/bicycle coordinator provides guidance for pedestrian/bicycle planning efforts and oversees implementation of plans. In a sampling of pedestrian-oriented California cities, a common denominator among local agencies (with a population over 100,000) is a full-time pedestrian/bicycle coordinator.

Suggestion for Potential Improvement

- Consider including a part-time Pedestrian/Bicycle Coordinator to write grants for ongoing funding for walking and biking related programs as well as to liaison with local non-profit, advocacy groups, and schools.

Formal Advisory Committee

Advisory committees serve as important sounding boards for new policies, programs, and practices. Responding to public concerns through public feedback mechanisms represents a more proactive and inclusive approach to bicycle and pedestrian safety compared to a conventional approach of reacting to collisions.

City of Montclair does not have any advisory committee, such as bicycle, pedestrian, complete streets, and active transportation committees.

Public Involvement and Feedback Process

Having multiple touch points with the community creates transparency and open lines of communication between the City staff, residents, and businesses. Different kinds of formats and venues for public involvement and feedback allows for broader participation from the community. Consideration of local demographics (e.g. languages spoken) and the easiest formats for people to participate (e.g. online, in person but in the course of their daily activities, or at City-organized meetings) are important for meaningful and productive community dialogue.

Suggestion for Potential Improvement

- Add "safety" or bicycle and pedestrian specific issues as the "work type" when people place a pin in 311 for easy coding and understanding of issues.
- Provide quarterly or annual updates to the community on the "state of walking and biking", including recently completed projects, anticipated timeline for upcoming projects, and what the City plans to fund.
- Provide notices and interpretation in the most commonly spoken languages.
- Consider utilizing UC-Berkeley SafeTREC "Street Story" Tool, which is a community engagement tool that allows residents, community groups, and agencies to report and collect information about transportation collisions, near-misses, general hazards and safe locations to travel (https://safetrec.berkeley.edu/tools/street-story-platform-community-engagement).

Traffic Calming Program

Traffic calming programs and policies set forth a consensus threshold on neighborhood requests and approvals, as well as standard treatments and criteria.

City of Montclair does have a Traffic Calming Program.

Suggestion for Potential Improvement

- Increase the amount of dedicated funding available for traffic calming each year.
- Expand the City's traffic calming toolbox to include other tools, such as raised crosswalks, raised intersections, chicanes, and traffic diverters. The City could secure additional dedicated funding streams as part of the Bicycle and Pedestrian Plan buildout to accommodate these sometimes costlier (but highly effective) improvements.
- Expand the City's practices to include proactive traffic calming measures instead of only responding to community requests. The City could consider allocating a portion of funding to proactive traffic calming, such as on bicycle boulevard streets or safe routes to schools, and then allocate the remaining funding to react to specific community requests.
- Refer to the following resources for traffic calming best practices:

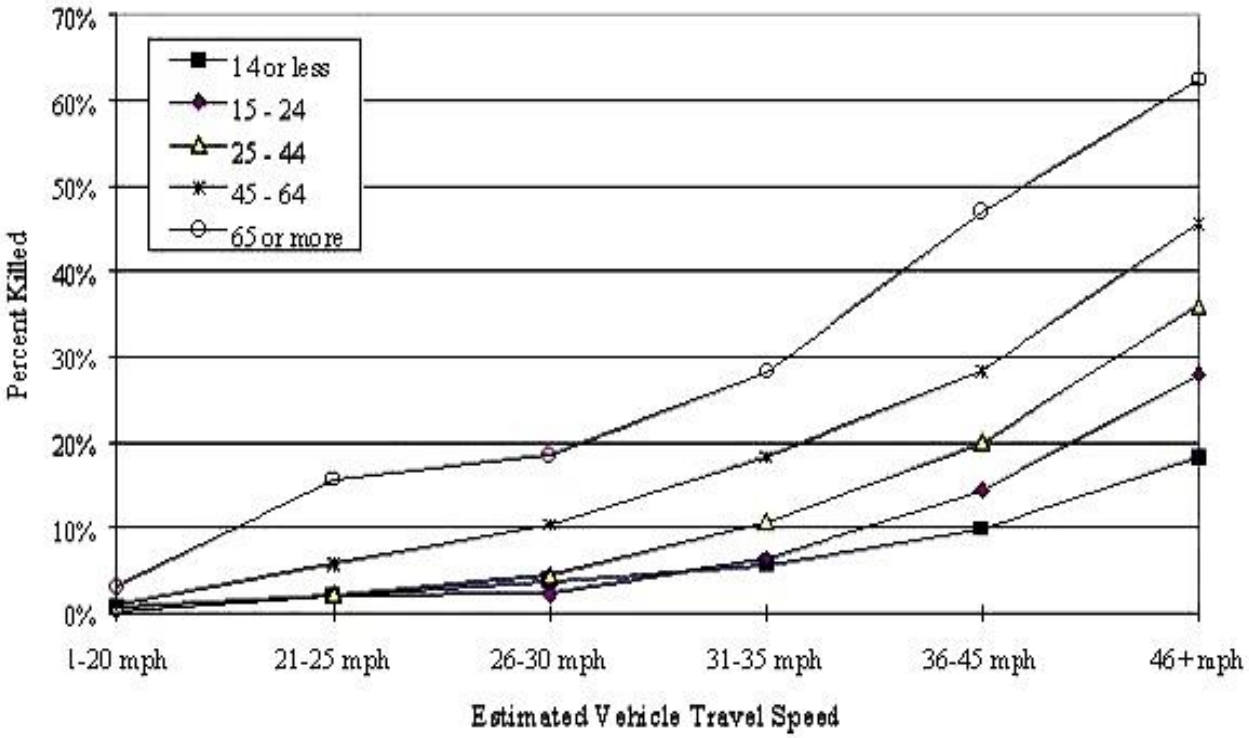
– *www.trafficcalming.org*

- Traffic Calming Guidelines from the City of Danville (*https://www.danville.ca.gov/DocumentCenter/View/139/NTMP-Guidelines-Booklet-PDF*)
- Neighborhood Traffic Management Program from the City of Anaheim (*https://www.anaheim.net/2841/NTMP3*)
- ITE Technical Resources – Traffic Calming Measures: (*https://www.ite.org/technical-resources/traffic-calming/traffic-calming-measures/*)

Speed Limits and Speed Surveys

Local municipalities have the authority to set the posted speed limit based on current speed data. The speed limit is rounded to the nearest five mile per hour (MPH) increment based on the 85th percentile speed of free-flowing traffic. School zone speed limits in California are a de facto 25 miles per hour or less, where specified. Speed is also critical for complete streets safety. Pedestrian fatality rates increase exponentially with vehicle speed. Thus, controlling vehicle speeds is one of the most important strategies for enhancing pedestrian and bicyclist safety.

Figure 3-1. Relationship between Vehicle Speed, Victim Age, and Fatalities



Suggestions for Potential Improvement

- Install traffic calming measures, signal coordination, and similar tools to maintain slower speeds appropriate for an urban community, particularly on streets that will be reviewed in the next speed survey.

- After complete streets improvement and other safety improvements are installed, conduct off-cycle speed surveys to review the speed limit and see if it needs to be reduced based on the improvements.
- Consider pedestrian volumes and known complete streets safety issues when setting speed limits and employ traffic calming strategies in locations where speed surveys suggest traffic speeds are too high for pedestrian and bicyclist safety.
- Ensure complete streets design standards have appropriate target design speeds for urban areas and do not contribute to a routine need for traffic calming.
- Consider the use of 15 MPH school zones.

Safe Routes to Schools

Safe Routes to School (SRTS) programs encourage children to safely walk or bicycle to school. The Marin City Bicycle Coalition was an early champion of the concept, which has spread nationally (refer to best practices at *www.saferoutestoschools.org*). SRTS programs are important both for increasing physical activity (and reducing childhood obesity) and for reducing morning traffic associated with school drop-off (as much as 30% of morning peak hour traffic). City has a SRTS Plan.

Suggestion for Potential Improvement

- Form an ongoing steering committee for the program (or each school) comprised of City staff, school district staff, PTA leaders, and other stakeholders that meets regularly to monitor efforts and identify new opportunities.

Crosswalk Installation, Removal, and Enhancement Policies

A formal policy for crosswalk installation, removal, and enhancement provides transparency in decision-making and adopts best practices in pedestrian safety and accommodation. It includes consideration of all kinds of crosswalks, including uncontrolled and controlled locations.

Suggestion for Potential Improvement

- Develop a Citywide crosswalk policy for the installation, removal, and enhancement of crosswalks at controlled and uncontrolled location. Ensure that it is consistent with best practices and recent research. This includes removing crosswalks only as a last resort and providing midblock crossings where they serve pedestrian desire lines.
- Consider developing a treatment selection "tool" to assist staff with the identification of applicable treatments in a given context.
- When crosswalk enhancements are identified, add them to a prioritized list that will be upgraded over time as funding is available.

Crosswalk policy resources include:

- Federal Highway Administration Study Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations:

https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

- National Cooperative Highway Research Program Application of Pedestrian Crossing Treatments for Streets and Highways:

http://www.trb.org/Publications/Blurbs/175419.aspx

Shared Mobility Services

Shared mobility services are transportation services – typically offered by private companies – that offer ride-hail services (e.g. Lyft or Uber) for both solo and pooled trips, bike share, and scooter share. Policies for shared mobility services can allow agencies to encourage, prohibit, or direct how they want shared mobility to work in their agency. The policies can also allow for curb space management, clear organization of sidewalk space, and encourage (or discourage) private vendors to come to the City. Curb space management is a practice that requires curb access to be planned, designed, operated, and maintained to enable curb utilization with safe, convenient, and multimodal access for all transportation users.

Suggestion for Potential Improvement

- Adopt a curb management plan to designate how the City will prioritize and proactively plan for curb uses (e.g. parking, passenger loading, commercial loading, ADA loading and parking, bicycle parking, bus-only lanes) and to make sure that the curb has the highest and best use of space.
- Consider putting micro-mobility policies (e.g. permitting, enforcement) in place to prioritize pedestrian and bicyclist safety and keep the sidewalk organized and usable for people of all abilities.

Funding

A dedicated, annual funding stream for bicycle and pedestrian projects ensures that these types of projects will be implemented regularly. Bicycle and pedestrian projects can also be integrated in the other work that the City does, including repaving and other routine maintenance of the roadway network.

Suggestion for Potential Improvement

- Partner with other agencies and continue applying for grant funding for both infrastructure and non-infrastructure projects.
- Integrate bicycle and pedestrian projects into the site plan review process for new development.
- Secure additional funding for repaving projects to allow for “quick build” projects and other bicycle and pedestrian safety improvements to be integrated into those projects.
- Establish a dedicated funding source for pedestrian and bicycle projects.

Collection of Pedestrian and Bicyclist Volumes

Pedestrian and bicyclist volume data is important for understand where people walk and bike. This establishes baseline data prior to project implementation and can help prioritize projects, develop collision rates, and determine appropriate bicycle and pedestrian infrastructure.

Suggestions for Potential Improvement

- Routinely collect pedestrian and bicycle volumes by requiring them to be counted in conjunction with manual intersection turning movement counts. https://mtc.ca.gov/sites/default/files/4_AOC_Tech_Transfer_Seminar_Banner_06032013.pdf
- Geocode pedestrian volume data with GIS software along with other data such as pedestrian control devices and collisions to analyze data for trends or hotspots related to pedestrian safety.

Inventory of Bikeways, Parking, Informal Pathways, and Key Bicycle Opportunity Areas

- Migrate the inventory of bikeways, bike parking, and future bike improvements into a GIS format for quick mapping and sharing.
- Identify a staff person responsible for maintaining the GIS data set.

Inventory of Sidewalks, Informal Pathways, and Key Pedestrian Opportunity Areas

A GIS-based sidewalk inventory enables project identification and prioritization, as well as project coordination with new development, roadway resurfacing, and so on. This data set can be available on the City's website for knowledge sharing with the public as well as agencies.

Suggestion for Potential Improvement

- Create a Citywide inventory of existing and missing sidewalks, informal pathways and key pedestrian opportunity areas in GIS.
- Consider establishing a program to work with property owners to repair damaged sidewalks outside their property. This can be a condition for the sale of the property.

Pedestrian and Bicycle Traffic Control Audit (Signs, Markings, and Signals)

Counties have a wide variety of traffic control devices that regulate how bicyclist and pedestrians should use the street and interact safely with drivers. However, some counties do not have inventories how, when, and where this is installed. Creating a database of this information allows the City's staff to know where infrastructure may be out of date or in needed of updates. For example, countdown signals are important pedestrian safety countermeasure. The 2012 California *Manual of Uniform Traffic Control Devices* (MUTCD) requires the installation of countdown pedestrian signals for all new signals. Likewise, the CA MUTCD also requires installation of bike detection at all actuated signals. Bike detection is a basic building block of the bike network to make sure that bikes can trigger the traffic signal. Inventorying bike detection and countdown signals allows the City's staff to approach safety from a systems perspective and develop projects to close gaps in biking and walking infrastructure over time.

Suggestion for Potential Improvement

- Develop a City-wide crosswalk inventory in GIS and maintain it over time. This would allow for a systemic safety approach to enhancing crosswalks, and allow the City to prioritize all crosswalk enhancement projects City wide for implementation over time and as money is available.

- Ensure that locations with pedestrian desire lines have safe crosswalks. An updated crosswalk policy can help determine the appropriate crossing treatment at uncontrolled locations without marked crosswalks.
- Include maintenance records within the GIS database inventory of signs, markings and signals.
- Develop a proactive monitoring program for ensuring the quality and proper functioning of traffic control devices.

Collision History and Collision Reporting Practices

Safety is typically approach through both proactive and reactive measures. Identifying and responding to collision patterns on a regular basis is an important reactive approach to bicycle and pedestrian safety, which may be combined with other proactive measures. This is the traditional way most cities have approached safety. However, many are now looking to proactive safety to address safety issues on a system wide basis. This is often paired with a policy goal of getting to zero fatality or severe injury collisions (commonly referred to as "Vision Zero").

Suggestion for Potential Improvement

- Adopt a data driven systemic safety approach, which would include a systems approach to identifying, prioritizing, and ultimately implementing safety countermeasure and/or a formal commitment to Vision Zero.
- Work with elected officials and department heads to adopt a Vision Zero policy formally stating the City's commitment to reducing the number of traffic-related fatalities and severe injuries to zero.
- Additionally, with sufficient pedestrian volume data, the City could prioritize collision locations based on collision rates (i.e., collisions/daily pedestrian volume), a practice that results in a more complete safety needs assessment. Treatments could then be identified for each location and programmatic funding allocated in the City's Capital Improvements Program (CIP).
    - The City of Sacramento's Pedestrian Master Plan includes a section on how to prioritize locations based on collision rates: http://www.cityofsacramento.org/transportation/engineering/publications.html

Complete Streets Policy

Complete Streets Policies are formal statements showing a City's commitment to planning and designing for all modes of travel and travelers of all ages and abilities.

City of Montclair developed Complete Streets Policy as part of their 2020 General Plan update process.

Suggestion for Potential Improvement

- The following jurisdictions have established practices for complete streets, including implementation of these policies through multimodal level of service thresholds, and may serve as models:
    - Boston, Massachusetts, Boston's Complete Streets: http://bostoncompletestreets.org/about/

- Philadelphia, Pennsylvania, Philly Free Streets: http://www.phillyfreestreets.com/
- Baltimore, Maryland, Complete Streets Ordinance: https://transportation.baltimorecity.gov/completestreets
- South Bend, Indiana, Complete Streets Policy: https://www.smartgrowthamerica.org/app/legacy/documents/cs/policy/cs-in-south-bend-resolution.pdf
- Town of Ashland, Massachusetts, Complete Streets Policy: https://www.smartgrowthamerica.org/app/legacy/documents/cs/policy/cs-ma-ashland-policy.pdf

Active Transportation Plan

This type of plan includes a large menu of policy, program, and practice suggestions, as well as site-specific (and prototypical) engineering treatment suggestions. Bicycle and Pedestrian Master Plan(s) documents a jurisdiction's vision for improving walkability, bikeability, and bicycle and pedestrian safety; establish policies, programs, and practices; and outline the prioritization and budgeting process for project implementation.

City of Montclair does have an Active Transportation Plan.

Suggestion for Potential Improvement:

- Implement the low-hanging projects in the Bicycle and Pedestrian Master Plan and seek grant funding for major projects
- Pursue additional funding opportunities for programs identified by the Plan.
- Provide regular updates to the Plan, including bicycle and pedestrian facilities and design guidelines that address the needs of bicyclists and pedestrians of all ages and abilities
- Develop high injury networks for walking and biking to identify routes with the highest incidences of fatal and severe injuries for pedestrians and bicyclists. This will create a systematic safety analysis that can help in prioritizing limited resources.
- Consider identifying existing and missing bicycle and pedestrian infrastructure for safety improvement.

Existing Bike Network

Innovative features such as separated bikeways, bicycle boulevards, and buffered bike lanes can decrease the level of traffic stress experienced by bicyclists, make biking more comfortable, and – in so doing - appeal to a wide range of bicyclists. Level of traffic stress refers to the level of comfort or discomfort a bicyclist might experience. Research conducted by the Mineta Institute in San Jose establishes levels of traffic stress on a scale for 1 to 4 with LTS 1 at the level that most children can tolerate and LTS 4 at the level characterized by "strong and fearless" cyclists (see: http://transweb.sjsu.edu/project/1005.html). A bicycle network that is attractive to the majority of the population would have low stress and high connectivity.

Suggestion for Potential Improvement:

- Continue to identify funding sources and implement the proposed projects identified in the Active Transportation Plan.
- Develop design standards for bike boulevards, trails, paths, and landscaping for bicycle network.
- Create a GIS data for existing bike network to identify gaps and opportunities for improvements.

Existing Pedestrian Facilities

Suggestion for Potential Improvement:

- Continue to identify funding sources and implement the proposed projects identified in the Bicycle and Pedestrian Master Plan.
- Create a GIS database for existing pedestrian infrastructure to identify gaps, inventory assets, and create opportunities for systemic safety analysis of all crosswalks.

Bike Network Implementation Practices

Considering the safety and comfort of people biking leads to better bikeway projects that can encourage new biking trips and enhance safety for people biking today and in the future.

Bicycle Level of Traffic Stress (LTS) was originally developed by researchers at the Mineta Transportation Institute. LTS assesses the comfort and connectivity of bicycle networks.

Suggestion for Potential Improvement:

- Prioritize bicycle projects to align with roadway resurfacing and projects that are near school sites.
- Secure enough funding for repaving and other complete streets projects to allow for installation of protected bike facilities and intersection improvements.
- Prioritize Use LTS to strategically implement bikeways and traffic calming treatments that would improve LTS of existing bikeways.

Design Guidelines and Standards

Design guidelines and development standards create a clear set of documents that guide how all transportation improvements should be installed City wide. As a result, they can create a consistent, high-quality biking and walking experience.

City of Montclair has Standards and Specifications, but it does not include design standards for bikeway components. They rely on the MUTCD and the Highway Design Manual.

Suggestion for Potential Improvement

- Consider adopting national bicycle and pedestrian safety best practices for roadway and facility design guidelines and standards:
    - NACTO Urban Street Design Guide: http://www.nyc.gov/html/dot/downloads/pdf/2012-nacto-urban-street-design-guide.pdf
    - CROW Design Manual for Bicycle Traffic

- FHWA Separated Bike Lane Planning and Design Guide https://nacto.org/wp-content/uploads/2016/05/2-4_FHWA-Separated-Bike-Lane-Guide-ch-5_2014.pdf
- MassDOT Separated Bike Lane Planning & Design Guide https://www.mass.gov/lists/separated-bike-lane-planning-design-guide
- ITE Recommended Practice for Accommodating Pedestrians and Bicyclists at Interchanges
- AASHTO Guide for the Development of Bicycle Facilities https://nacto.org/wp-content/uploads/2015/04/AASHTO_Bicycle-Facilities-Guide_2012-toc.pdf

AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities

Roadway Surfaces

The quality of a roadway surface along bikeways is an important consideration when choosing to bike. Rough surface in a bike lane creates an uncomfortable bicycling experience and may also pose safety hazards.

Suggestion for Potential Improvement:

- Prioritize maintenance of roadways where bicycle facilities are present, particularly for closing gaps in the bikeway network or where improved pavement quality is needed on popular bicycle routes.
- Prioritize debris removal on roadways where bicycle facilities are present.
- Assess the needs for new and enhanced crosswalks and curb ramps with each repaving project. Include consideration of lane reductions and quick build projects such as paint and plastic median refuges and bulb outs; high-visibility crosswalks; and advanced yield markings.

Attention to Bicycle and Pedestrian Crossing Barriers

Crossing barriers - such as railroads, freeways, and major arterials - may discourage or even prohibit bicycle access and are often associated with vehicle-bicycle collisions. Large intersections and interchanges and uncontrolled crossings can often deter bicyclists due to high speeds, high number of conflict points with vehicles, and high level of exposure. Identifying and removing barriers and preventing new barriers is essential for improving bicyclist safety and access. Crossing barriers also discourage or even prohibit pedestrian access and can create safety challenges for pedestrians. These can be similar to the biking barriers or present additional challenges.

City of Montclair uses Rectangular Rapid Flashing Beacon (RRFB) and High Visibility Crosswalk striping at the uncontrolled crossings.

Suggestion for Potential Improvement:

- Use green routinely to highlight conflict zones at large intersection and interchanges.

- To slow speeds at critical intersections, use smaller corner radii using small design vehicles appropriate for urban areas and updated standard plans to reflect this.
- Review design of slip/trap-right lanes at intersections and implement improvements.
- Implement best practice guidance on bicycle accommodation through interchanges and expressways, as appropriate, using the ITE's *Recommended Practice: Guidelines to Accommodate Bicyclist and Pedestrians at Interchanges* plus consideration of protected bike lane design.
- Identify and create an inventory of pedestrian barriers with targeted recommendations for phased improvements.
- Consider pedestrian barriers and needs in doing bicycle barriers assessment.

Traffic Signal and Stop Sign Warrants

Providing all-way stop or signal control at an intersection may improve pedestrian safety by reducing speeds and controlling pedestrian-vehicle conflicts. Installing bicycling signals and limiting stop signs on bicycle routes may enhance bicycle mobility and safety. The CA MUTCD defines warrants for installing signals and stop signs.

Suggestion for Potential Improvement

- Develop specific signal and stop sign warrants that are pedestrian- and bicycle-friendly.

Sidewalk Furniture or Other Sidewalk Zone Policies

Street furniture encourages walking by accommodating pedestrians with benches to rest along the route or wait for transit; trash receptacles to maintain a clean environment; street trees for shade, and so on. Uniform street furniture requirements also enhance the design of the pedestrian realm and may improve economic vitality.

Suggestion for Potential Improvement

- Adopt a Street Furniture Ordinance to include locations and furniture amenities other than those associated with transit stops, as appropriate.

Street Tree Requirements

Street trees enhance the pedestrian environment by providing shade and a buffer from vehicles, which increase pedestrian safety. Street trees may also enhance property values, especially in residential neighborhoods. However, street trees, when improperly selected, planted, or maintained, may cause damage to adjacent public utilities.

Suggestion for Potential Improvement

- Develop a Street Tree Ordinance to provide guidance on permissible tree types and permitting requirements, also specifying a requirement for new trees plantings associated with development projects.

Bicycling Supportive Amenities and Wayfinding

In addition to designating roadway or paths in a bicycle network, supportive amenities (including parking, water fountains, and maintenance stations) can encourage bicycling. Wayfinding can both encourage bicycling and enhance safety by navigating cyclists to facilities that have been enhanced for bicyclist use or to local retail opportunities for economic growth.

Suggestion for Potential Improvement:

- Create and deploy a bicycle wayfinding strategy City wide as recommended in the Bicycle and Pedestrian Master Plan, as well as a Biking Guide.
- Develop a Biking Guide that includes a bike map and bicycle locker and rack locations.

Bicycle Parking Requirements

Safe and convenient bicycle parking is essential for encouraging bicycle travel (especially in-lieu of vehicle travel). Bicycle parking can also facilitate last-mile connections between two modes, such as bicycle parking at a transit station. To be effective, bicycle parking needs to be visible and secure and have enough capacity to accommodate bicycle demand, both long-term and short-term. Long-term and short-term parking can be implemented through a bicycle parking ordinance as in the City of Oakland.

Suggestion for Potential Improvement:

- Implement short-term and long-term, secured bicycle parking at all new development. Refer to the APBP Bicycle Parking Guidelines, 2nd edition (https://www.apbp.org/Publications).
- Locate bicycle racks to be convenient for bicyclists, out of the way of pedestrians, and with good visibility for security, consistent with the APBP Bicycle Parking Guidelines, 2nd edition.
- Consider implementation of "branded" racks for the City (with a unique design or City's symbol).

Pedestrian and Bicycle Safety Education Program

Engineering treatments are often not enough on their own to realize full safety benefits associated with the treatment. Safety education programs complement engineering treatments and increase compliance. Education campaigns target people of all ages, especially school-age children where safe walking and biking habits may be instilled as lifelong lessons.

Suggestion for Potential Improvement

- Conduct a formal education campaign targeting people driving, walking, and biking about street safety. This includes: advertisements on buses and bus shelters, an in-school curriculum, community school courses, public service announcements, and many other strategies. Consider a focus on speed and safe driving.

Enforcement

Enforcement of pedestrian and bicycle right-of-way laws and speed limits is an important complement to engineering treatments and education programs.

The 3-E's of Pedestrian Safety:

Engineering

Education

Enforcement

Suggestion for Potential Improvement

- Implement sustained pedestrian safety enforcement efforts and involve the media. Use enforcement as an opportunity for education by distributing pedestrian safety pamphlets in-lieu of, or in addition to, citations. The Miami-Dade Pedestrian Safety Demonstration Project provides a model for the role of media in the sustained effectiveness of enforcement. Information is available at:

http://www.miamidade.gov/MPO/docs/MPO_ped_safety_demo_eval_report_200806.pdf.

- Train officers in pedestrian safety enforcement principles. The Madison, Wisconsin Department of Transportation has developed a DVD in collaboration with the Madison Police Department to train traffic officers in pedestrian and bicycle issues (for more information see *http://www.walkinginfo.org/library/details.cfm?id=2865*). The Bicycle Transportation Alliance in Portland, Oregon offers Pedestrian Safety Enforcement Training (for more information on this five-hour course see:

  http://www.bta4bikes.org/at_work/pedestriangrants.php).

- Establish a radar gun check-out program for trained community volunteers to record speeding vehicles' license plate numbers and send letters and/or document occurrences. Radar gun check-out programs are available in Albany, Pleasanton, and Thousand Oaks, California, among other cities.

Pedestrian Walking Audit Program

Walking audits provide an interactive opportunity to receive feedback from key stakeholders about the study area and to discuss the feasibility of potential solutions. They can be led by City staff, advocacy groups, neighborhood groups, or consultants.

Suggestion for Potential Improvement

- Include regular walking audits in City wide pedestrian safety program, based on the suggestions of this CSSA. This effort may complement other "green" or health-oriented programs within the City.

Bicycling Safety Audit Program

When City staff and key stakeholders ride along study corridors and experience key route and crossing challenges and best practices, consensus is more readily reached on a vision and action plan for safety enhancements.

- Include regular bicycling audits in the City-wide bicycle safety programs. Encourage interdepartmental participation.

- Routinely conduct bicycle safety audits of key corridors throughout the City, including those with recent improvements, those with heavy bicycle demand, and those with high collision rates.
- Collaborate with schools on projects beyond the school district boundaries.

General Plan: Provision for Pedestrian and Bicycle Nodes

Planning principles contained in a City's General Plan can provide an important policy context for developing pedestrian-oriented, walkable areas. Transit-oriented development, higher densities, and mixed uses are important planning tools for pedestrian-oriented areas. The General Plan identifies pedestrian priority areas, which are zones in which high volumes of pedestrian traffic are encouraged and accommodated along the sidewalk.

Suggestion for Potential Enhancement

- Create an overlay district for pedestrian priority areas with special pedestrian-oriented guidelines, such as relaxing auto Level of Service standards and prioritizing pedestrian improvements. Prioritize sidewalk improvement and completion projects in these nodes.
- Utilize vehicle miles traveled (VMT) for future transportation impact analysis.

Bike Ordinances (Sidewalk Riding)

Suggestion for Potential Improvement:

- Consider an optional helmet ordinance for adults.
- Consider allowing for context-specific flexibility in sidewalk riding policies and enforcement.

Transportation Demand Management (TDM) Programs

TDM programs encourage multimodal travel by incentivizing non-automobile options. As new development occurs, TDM programs can be expanded, formalized, and strengthened.

Suggestions for Potential Improvement

As part of a comprehensive TDM program:

- Hire or identify a part-time TDM Coordinator.
- Create a TDM program and accompanying website with separate pages for employees, residents, and visitors.
- Establish a Transportation Management Association (TMA) for key commercial and business areas to coordinate parking, transit, and other TDM strategies and policies.

General Plan: Densities and Mixed-Use Zones

Planning principles contained in a City's General Plan can provide an important policy context for developing bicycle-oriented and walkable areas. Transit-oriented development, higher densities, and mixed uses are important planning tools for pedestrian-oriented areas.

Suggestion for Potential Improvement

- Utilize vehicle miles traveled (VMT) for future transportation impact analysis.

- Consider allowing moderate to high densities in the downtown and mixed-use zones as well progressive parking policies, such as shared parking and demand-based pricing.
- Consider multi-modal trade-offs in the transportation impact analysis for new development, so that the safety and needs of people walking and biking is weighed heavily and vehicular delay is not the primary performance measure.
- Ensure that wide sidewalks, high quality, protected bike lanes, and intersection safety improvements are included with all new development projects, particularly where densities are higher
- Strongly weigh walking and biking performance measures as well as safety metrics in determining appropriate intersection improvements and street design.

Specific Plans, Overlay Zones, and Other Area Plans

Suggestion for Potential Improvement

- Emphasize bicyclist and pedestrian-oriented design, walkability, and/or placemaking in all new specific plans, overlay zones, and other area plans.

Historic Sites

Historic walking routes or bike trails, such as the famous Freedom Trail in Boston, encourage active transportation and enhance economic vitality.

Suggestion for Potential Improvement

- Continue to implement the goals, policies and programs that support walking trips included in the Historic Preservation and Community Design Element of the General Plan to showcase natural or local sites of interest, and link key features of the City. Maps of the tour route and historic documentation materials could be made available online or as a mobile app in addition to wayfinding signs, maps, and plaques could also be provided throughout the City. Consider other areas of the City for walking tours and historic signs.
- Consider upgrading History Walk signs with larger text to improve legibility and wayfinding.

Economic Vitality

Improving bicycle and pedestrian safety and walkability can enhance economic vitality. Similarly, enhancing economic vitality through innovative funding options such as Business Improvement Districts (BIDs), parking management, and facade improvement programs can lead to more active areas and encourage walking and bicycling.

Suggestion for Potential Improvement

Sample store facades

- Activate the built environment in business areas through BIDs and façade improvement programs.
- Use wayfinding, walking routes, and events to direct pedestrians to commercial areas throughout the area.
- Install bicycle parking in commercial areas and provide safe, comfortable bike facilities in commercial areas to make it convenient and fun to get to local businesses.

Proactive Approach to Institutional Coordination

Institutional coordination associated with multiple agencies is a critical part of the work of any municipality. Non-local control of right-of-way and differing policies regarding pedestrian and bicyclist accommodation can make the work complex.

Coordination with Schools

Neighborhood-sized schools, as opposed to mega schools on the periphery, are a key ingredient for encouraging walking and bicycling to school. In addition, pedestrian and ADA improvements could be prioritized near schools.

The City of Montclair has a Safe Routes to School Plan.

Suggestion for Potential Improvement

- Work with the local school districts to establish a policy on neighborhood-sized and oriented schools as part of a Safe Routes to School plan.
- Work with the school districts to establish suggested walking routes and address potential barriers to pedestrian or bicycle access.

Coordination with Emergency Response

Emergency response requires special roadway design considerations that sometimes conflict with bicycle and pedestrian treatments. One example is the design of turning radii at intersections. Bicyclists and pedestrians benefit from the reduced vehicle speeds of smaller radii, but larger vehicles, such as fire trucks, have more difficulty performing the turn within the smaller space. These conflicts require consensus building between the City and the respective departments. Consensus building could include pilot testing of alternative treatments, such as a model traffic circle in an open field.

Suggestion for Potential Improvement:

- Balance the trade-off between traffic calming safety treatments such as roundabouts or partial street closures and longer emergency response times.
- Encourage emergency and transit responders to participate in test runs of roadway designs that are aimed to reduce speed and improve bicycling access.

Coordination with Health Agencies

Involving non-traditional partners such as public health agencies, pediatricians, etc., in the planning or design of pedestrian and bicycle facilities may create opportunities to be more proactive with pedestrian and bicycle safety, identify pedestrian and bicycle safety challenges and education venues, and secure funding. Additionally, under-reporting of pedestrian-vehicle and bicycle-vehicle collisions could be a

problem that may be partially mitigated by involving the medical community in pedestrian and bicycle safety planning.[1]

Coordination with Transit Agencies

Providing safe and comfortable biking and walking routes to transit stops and stations, and the ability to take bicycles on-board transit vehicles increases the likelihood of multi-modal trips.

Suggestion for Potential Improvement:

- Work with transit agencies, Caltrans, and other relevant partners to improve access and safety to stations and bus stops.

[1] Sciortino, S., Vassar, M., Radetsky, M. and M. Knudson, "San Francisco Pedestrian Injury Surveillance: Mapping, Underreporting, and Injury Severity in Police and Hospital Records," *Accident Analysis and Prevention*, Volume 37, Issue 6, November 2005, Pages 1102-1113

4. Complete Streets Audit Results and Suggestions

Overview

This Chapter presents the observations and recommendations made during the walking audit and windshield survey conducted in the City of Montclair on May 19, 2021. The recommendations are based on best practices and discussions with the participant group regarding local needs and feasibility. A glossary of the candidate treatment options is presented in **Appendix A**.

Walking audits are typically conducted to understand the needs, issues, and opportunities associated with walking and biking in the study area. Participants, which in this case consisted of Fehr & Peers transportation engineers and planners, walk the corridor as a group. The public and stakeholders were not included due to COVID-19.

During a walking audit, positive practices are observed, and issues and opportunity areas are noted. Observations are based on how motorists are behaving around pedestrians and bicyclists and how pedestrians and bicyclists are behaving, especially at intersections (for example, if pedestrians are crossing at unmarked locations to avoid certain intersections, why might they feel the need to do so?).

The suggestions in this report are based on limited field observations and general knowledge of best practices in complete streets design and safety. As this report is conceptual in nature, the City should conduct more detailed studies before finalizing and implementing any physical changes. Conditions may exist in the focus areas that were not observed and are not compatible with recommendations in this report. City staff may conduct further analysis to refine or discard the recommendations in this report if they are contextually inappropriate or do not improve pedestrian safety or accessibility due to conditions including, but not limited to, high vehicular traffic volume or speeds, physical limitations on space or sight distance, or other unsafe conditions.

4.1 Selection of Focus Areas

The evaluation team worked with City staff to select focus areas for the walking audits based on the following criteria:

- Collision hot spot locations
- Key commercial corridors or school zones
- Availability of prototypical sites for broader Citywide application of safety projects

Three focus areas were selected for the analysis:

1. Arrow Highway (from Mills Ave to Benson Ave)
2. Moreno Street (from Monte Vista Ave to Benson Ave)
3. Central Avenue (from Arrow Highway to Palo Verde Street)

Each of these locations are in the vicinity of the Arrow Highway Mixed-Use District (AHMUD) Specific Plan, the Montclair Place District Specific Plan, and the North Montclair Downtown Specific Plan (NMDSP) 2017 amendment. Future development associated with those specific plans presents the opportunity for safety improvements on the corridors. The following sections present the key issues identified during the walking audit, along with recommendations responding to the issues at each site. Focus area summary graphics, with a compilation of all recommendations, have been prepared.

4.2 Location #1: Arrow Highway (from Mills Ave to Benson Ave)

Arrow Highway is an arterial roadway that extends from Live Oak Avenue in Irwindale to the eastern border of Montclair, where it continues into Upland as 8th Street. The posted speed limit on Arrow Highway is 45 mph. Arrow Highway has two travel lanes in each direction, with a center turn lane corridor-wide and turn pockets at signalized intersections. Some stretches of Arrow Highway allow on-street parking. Sidewalks are present along both sides of Arrow Highway, and no bike facilities are provided. Land uses along the corridor are primarily commercial and light industrial.

Between 2016 and 2020, there were 59 total collisions on the study corridor, with five resulting in severe injury, and one being fatal. The corridor had one pedestrian and four bike collisions, none of which resulted in a severe injury or fatality. The collision data showed a high number of broadside and left turn collisions.

Observations

The following observations were noted during the site visit:

- The intersection with Central Avenue has a permissive left turn phase.
- There are utility poles located on the sidewalks, particularly west of Central Avenue, that cause an obstruction to pedestrians.
- The signalized intersections do not have stop bars on all legs.
- There is a general misalignment between the signal heads and the travel lanes they serve at the signalized intersections.
- Some curb ramps along the corridor are not ADA compliant due to a lack of truncated domes.
- Travel lanes are wide, including an 18 ft curb lane in the eastbound and westbound directions.
- “Botts’ Dots” are used in lieu of striping throughout the corridor.

A cyclist using the curb lane on Arrow Highway near Vernon Avenue, without the benefit of a bicycle facility

Suggested Improvements

Based on observations during the site visit and discussions with City staff, the following improvements are suggested for pedestrian, bicycle, and motor vehicle activity at this location:

- Implement a road diet from Mills Avenue to Benson Avenue by providing two travel lanes, a median and turn lane, parking, and buffered bike lanes to encourage slower speeds, better bicycle accessibility, improve visibility from side streets, and reduce crossing distance for pedestrians.
    - Figures 4-4 and 4-5 describe a suggested typical section with the road diet
    - The corridor's current ADT of about 15,000 falls below the typical road diet threshold of 20,000-25,000, supporting the feasibility of a road diet.
    - This improvement provides an opportunity for coordination with neighboring jurisdictions, such as Upland, given the typical section further east on Arrow Highway.
- When signal heads are upgraded at the intersection with Central Avenue, add one indication per through lane.
- Add retroreflective backplates on signal heads at the intersection with Central Avenue to increase visibility to drivers and decrease signal violations
- Convert permissive and protected/permissive left turn phases at Central Avenue to fully protected in all directions, (with stacked signal heads) to help mitigate conflict between users.
- Increase all red time and implement red light cameras (if compliant with City policy) at Central Avenue to reduce conflicts related to red-light running.
- Add a high-visibility crosswalk (such as triple four) with curb cuts and safety enhancements, such as pedestrian-activated flashing beacons, at the intersection with Vernon Avenue to allow better pedestrian safety and accessibility.
- Add new intersection lighting to illuminate users at Vernon Avenue.
- Add a leading pedestrian interval to the signal timing to reduce vehicle-pedestrian conflicts at the intersections with Monte Vista Avenue and Fremont Avenue.
- Add advance stop bars to signalized intersections to discourage crosswalk encroachment by drivers.
- Install ADA compliant curb ramps corridor-wide to help increase access for people with limited mobility, or those pushing strollers or using wheelchairs.

- Add medians with pedestrian refuges to unsignalized intersections in combination with a road diet or other safety enhancements, such as curb extensions, hybrid beacons, or rectangular flashing beacons to improve pedestrian safety.
- Consider trail crossing with enhanced safety features for future San Antonio Creek multi-use trail.
- Replace Botts' Dots along the corridor with 8" striping to provide continuous lane demarcation and improve lane visibility.
- Relocate the sidewalk obstructions (utility poles) to improve pedestrian accessibility.

Arrow Highway

Mills Avenue to Benson Avenue

MONTCLAIR

Implement a Road Diet from Mills Av to Benson Av by providing two travel lanes, a median and turn lane, parking, and **Buffered Bike Lanes** to encourage slower speeds, provide better bicycle accessibility, improve visibility from side streets, and reduce crossing distances for pedestrians. The corridor's current ADT of about 15,000 falls below the typical road diet threshold of 20,000-25,000, supporting the feasibility of a road diet.

Add Medians with Pedestrian Refuges to Unsignalized Intersections in combination with a road diet or other safety enhancements, such as curb extensions, hybrid beacons, or rectangular flashing beacons to improve pedestrian safety.

Consider Trail Crossing with Enhanced Safety Features for future San Antonio Creek multi-use trail

Add a Leading Pedestrian Interval to the Signal Timing to reduce vehicle-pedestrian conflicts

Replace Botts' Dots along the Corridor with 8" Striping to provide continuous lane demarcation

Conceptual, Not For Construction. Detailed Analysis and Engineering Design Required.

Arrow Highway

Central Avenue to Vernon Avenue

MONTCLAIR

Install ADA-Compliant Curb Ramps throughout the corridor to help increase access for people with limited mobility, or those pushing strollers or using wheelchairs

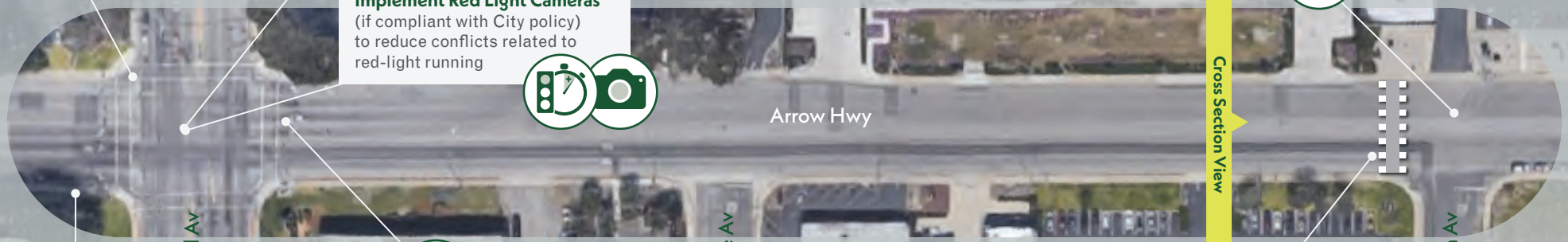
Implement a Road Diet from Mills Av to Benson Av by providing two travel lanes, a median and turn lane, parking, and **Buffered Bike Lanes** to encourage slower speeds, provide better bicycle accessibility, improve visibility from side streets, and reduce crossing distances for pedestrians. The corridor's current ADT of about 15,000 falls below the typical road diet threshold of 20,000-25,000, supporting the feasibility of a road diet.

Add Retroreflective Backplates on Signal Heads to increase visibility to drivers and decrease signal violations

Add Protected Left Turns with Stacked Signal Heads (instead of doghouse signal heads) in all directions, which can mitigate conflicts between vehicles or other users and minimize preemptive starts

Increase All Red Time and Implement Red Light Cameras (if compliant with City policy) to reduce conflicts related to red-light running

Add New Intersection Lighting to help illuminate users



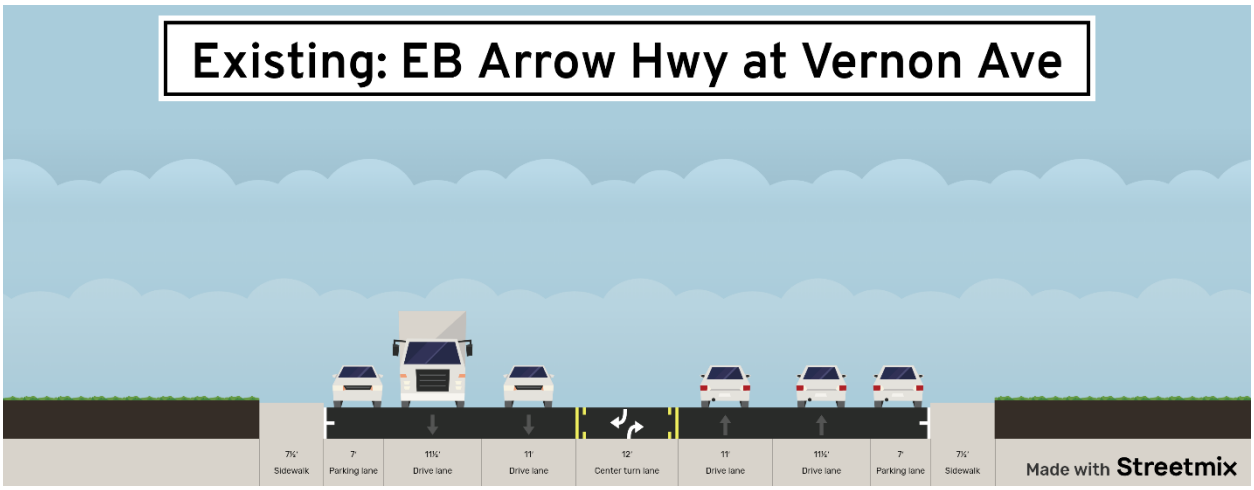
Remove Sidewalk Obstructions by relocating utility poles to improve pedestrian accessibility

Add Advance Stop Bars to discourage crosswalk encroachment by drivers

Add Triple-4 High-Visibility Crosswalk with curb cuts and safety enhancements, such as **Pedestrian-Activated Flashing Beacons** to allow better pedestrian safety and accessibility

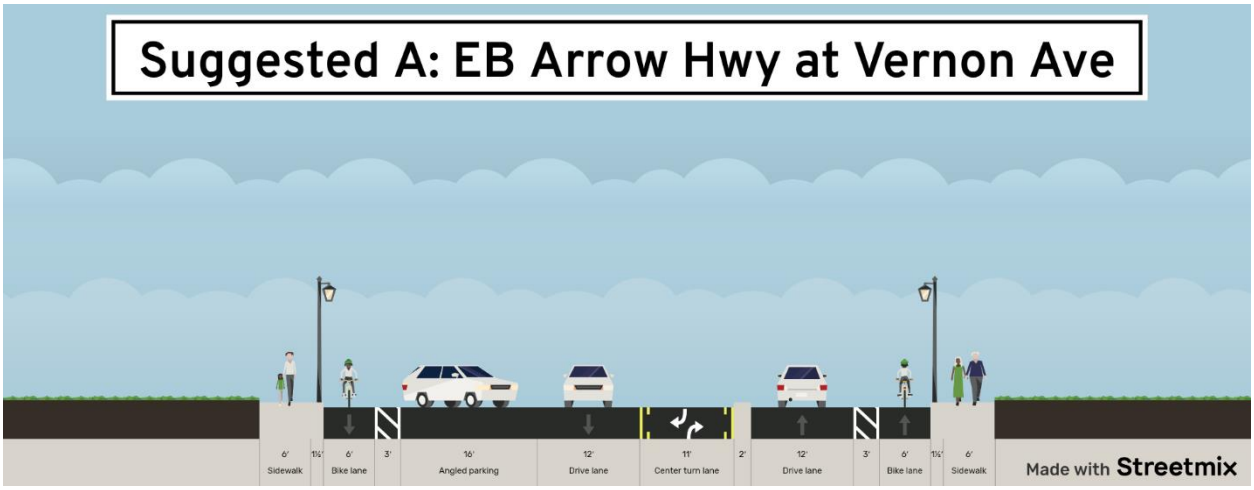
Conceptual, Not For Construction. Detailed Analysis and Engineering Design Required.

FIGURE 4-3 ARROW HIGHWAY SUGGESTIONS FOR IMPROVEMENT (EXISTING SECTION VIEW)



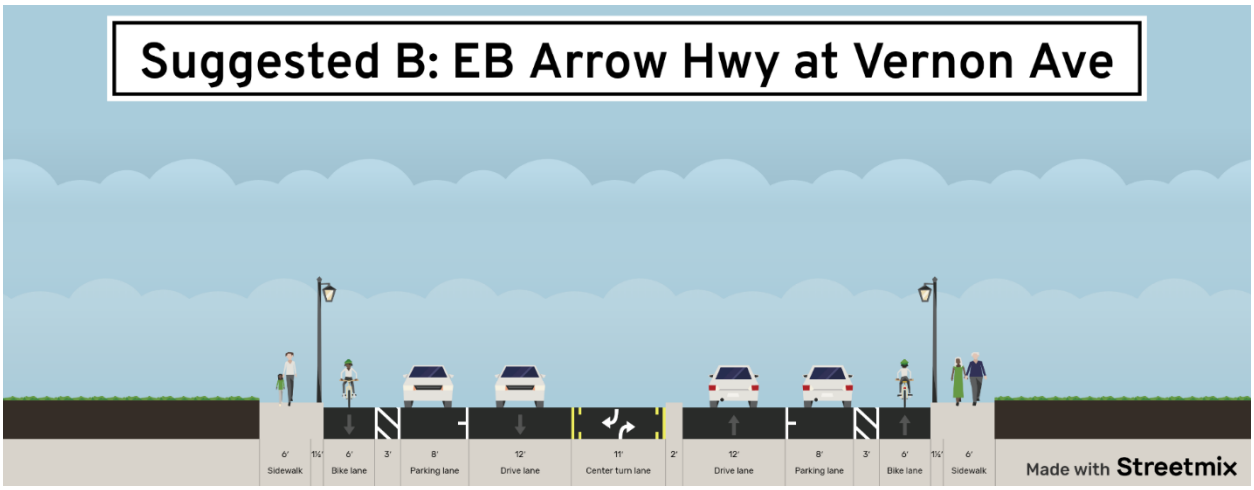
Existing cross section, consisting of two travel lanes and a parking lane in each direction as well as a center turn lane

FIGURE 4-4 ARROW HIGHWAY SUGGESTIONS FOR IMPROVEMENT (SUGGESTED SECTION VIEW A)



Suggested cross section (A), consisting of one travel lane in each direction, a median with left turn pockets, an angled parking lane, buffered bike lanes, and improved street lighting

FIGURE 4-5 ARROW HIGHWAY SUGGESTIONS FOR IMPROVEMENT (SUGGESTED SECTION VIEW B)



Suggested cross section (B), consisting of one travel lane in each direction, a median with left turn pockets, striped parallel parking lanes, buffered bike lanes, and improved street lighting

4.3 Location #2: Moreno Street (from Monte Vista Ave to Benson Ave)

Moreno Street is an east/west arterial roadway that extends from Mills Avenue at the western border of the City of Montclair, then becomes W 7th Street in the City of Upland. Moreno Street has a posted speed limit of 40 mph, with two travel lanes in each direction and turn pockets at the signalized intersections. A center median is present from Monte Vista Avenue to about 300 feet east of Central Avenue, east of which there is a center turn lane. On-street parking is present east of Central Avenue. Sidewalks are present on both sides of the corridor, and no bike facilities are provided along Moreno Street. The Foothill Transit routes 480 and 492 travel along Moreno Street between Monte Vista Avenue and Central Avenue. Land uses along Moreno Street consist of residential, commercial, and light industrial uses, moving west to east along the corridor.

Between 2016 and 2020, there were 80 total collisions on the study corridor, with four resulting in severe injury, and none being fatal. The corridor had seven pedestrian and three bike collisions, with three of the pedestrian collisions resulting in a severe injury or fatality. The collision data showed a high number of left turn collisions and pedestrian-involved collisions.

Observations

The following observations were noted during the site visit:

- There are two left turn lanes for each leg of the intersection with Central Avenue.
- The medians extend into the crosswalks at the intersection with Central Avenue.
- The roadway width is reduced east of Central Avenue.
- The right turn pocket on the eastbound approach to Central Avenue is very long (over 600 feet).
- The signalized intersections at Benson Ave, Central Ave, Fremont Ave, Lindero Ave, and Monte Vista Ave do not have stop bars on all legs.
- There are utility boxes located in the sidewalks, particularly at the northwest corner of the intersection with Central Avenue, that causes an obstruction to pedestrians.
- The intersection with Plaza Lane lacks a marked pedestrian crossing.
- There is a general misalignment between the signal heads and the travel lanes they serve at the signalized intersections.
- “Botts’ Dots” are used in lieu of striping throughout the corridor.
- Some curb ramps along the corridor are not ADA compliant due to a lack of truncated domes.

The median nose at the intersection of Moreno St & Central Ave, which presents an obstacle to pedestrians

Suggested Improvements

Based on those observations during the site visit, the following improvements are suggested for pedestrian, bicycle and motor vehicle activity at this location:

- Increase all-red time at the intersection with Central Avenue to reduce conflicts related to red-light running.
- Shorten the right-turn pocket at the eastbound approach of Central Avenue to minimize the conflict zone between vehicles and cyclists, if a bike lane is implemented.
    - This recommendation is contingent on future uses of the Montclair Place mall
- Install a median fence on the west and south legs prevent mid-block crossings.
- Add a high-visibility crosswalk with curb cuts and safety enhancements at the intersection with Plaza Lane to increase pedestrian accessibility and safety.
- Remove the existing median nose and place an extension on the intersection side of the crosswalk to clear the pedestrian path and discourage vehicles from taking sharp left turns.
- At Plaza Lane, modify existing median to incorporate a pedestrian refuge island to reduce pedestrian exposure.
- At signalized intersections along the corridor, add protected left turns in the eastbound and westbound directions or add leading pedestrian intervals, pedestrian countdown signal heads, and Triple 4 crosswalks to mitigate conflicts between vehicles or other users.
- Install ADA compliant curb ramps, high visibility crosswalks, and pedestrian push buttons at signalized intersections corridor-wide to increase access for people with limited mobility or those pushing strollers or using wheelchairs (accessibility upgrades).
- Extend the raised median to Benson Ave to reduce left turn conflicts at driveways and side streets.
- Replace Botts' Dots along the corridor with 8" striping to provide continuous lane demarcation and improve lane visibility.
- Relocate the sidewalk obstructions (utility box) to allow for better pedestrian accessibility.
- Consider the following modifications to allow for bike lanes on the corridor

- Given the current left turn volumes below 300 vehicle per hour, reduce the number of left turn lanes in the eastbound and westbound approaches to Central Avenue, from two lanes in each direction to one.
- Narrowing of the curb lane in locations where the width is greater than 16 feet
- Narrowing of the median
- Contingent on future repurposing of the Montclair Place mall, a road diet to remove one travel lane
- Figure 4-9 describes a suggested typical section with these modifications

Moreno Street

Monte Vista Avenue to Benson Avenue

MONTCLAIR

Depending on future trends, a combination of **Lane Narrowing, Removal of Double Left Turn Lanes, and Median Narrowing** can help to slow vehicles and provide space for **On-Street Bicycle Facilities**

San Antonio Creek Channel

Remove Existing Median Nose and Place an Extension on the Intersection Side of the Crosswalk to clear the pedestrian path and discourage vehicles from taking sharp left turns

Replace Botts' Dots along the Corridor with 8" Striping to provide continuous lane demarcation

Extend the Raised Median to Benson Av to reduce left turn conflicts at driveways and side streets

Monte Vista Av

Central Av

Benson Av

Add Protected Left Turns in the eastbound and westbound directions

OR

Add Leading Pedestrian Intervals, Pedestrian Countdown Signal Heads, and Triple 4 High-Visibility Crosswalks to mitigate conflicts between vehicles or other users

Install ADA-Compliant Curb Ramps and Pedestrian Push Buttons to help increase access for pedestrians and people with limited mobility, or those pushing strollers or using wheelchairs

10

Conceptual, Not For Construction. Detailed Analysis and Engineering Design Required.

Moreno Street

Plaza Lane to Central Avenue

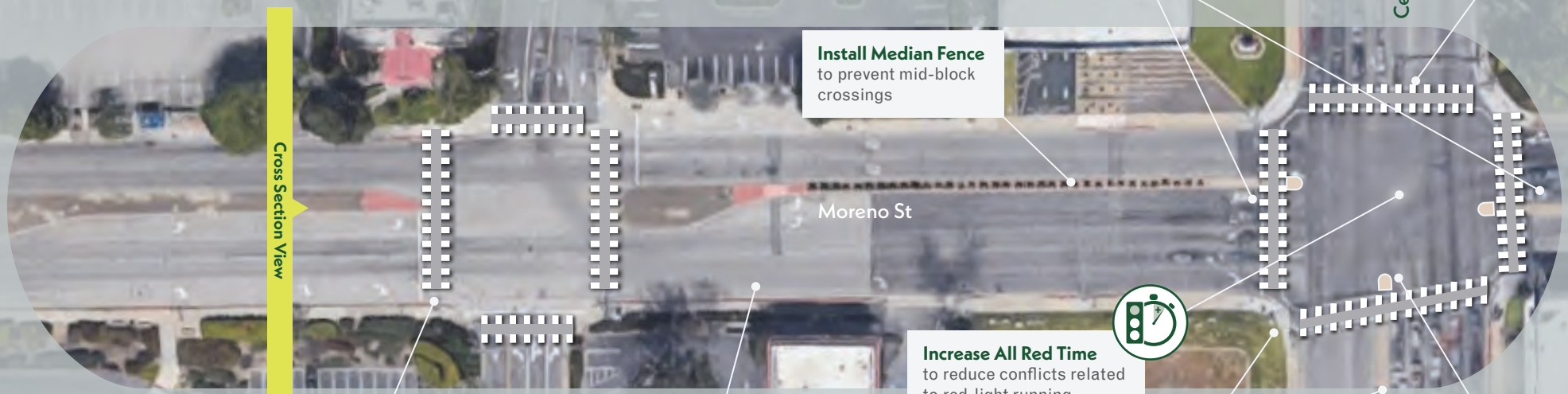
MONTCLAIR

Depending on future trends, a combination of **Lane Narrowing, Removal of Double Left Turn Lanes, and Median Narrowing** can help to slow vehicles and provide space for **On-Street Bicycle Facilities**

At Plaza Ln, Modify Existing Median to Incorporate a Pedestrian Refuge Island to reduce pedestrian exposure

Given the current left turn volumes below 300 vehicle per hour, **Reduce the Number of Left Turn Lanes on the East and West Legs** of the intersection from 2 to 1 to provide space for safety enhancements, such as a **Pedestrian Refuge Island**

Add Triple-4 High-Visibility Crosswalks to help make drivers more aware of pedestrians.



Install Median Fence to prevent mid-block crossings

Increase All Red Time to reduce conflicts related to red-light running

Install Median Fence

Add Triple-4 High-Visibility Crosswalks with curb cuts and safety enhancements, such as relocating utility poles to allow better pedestrian safety and accessibility

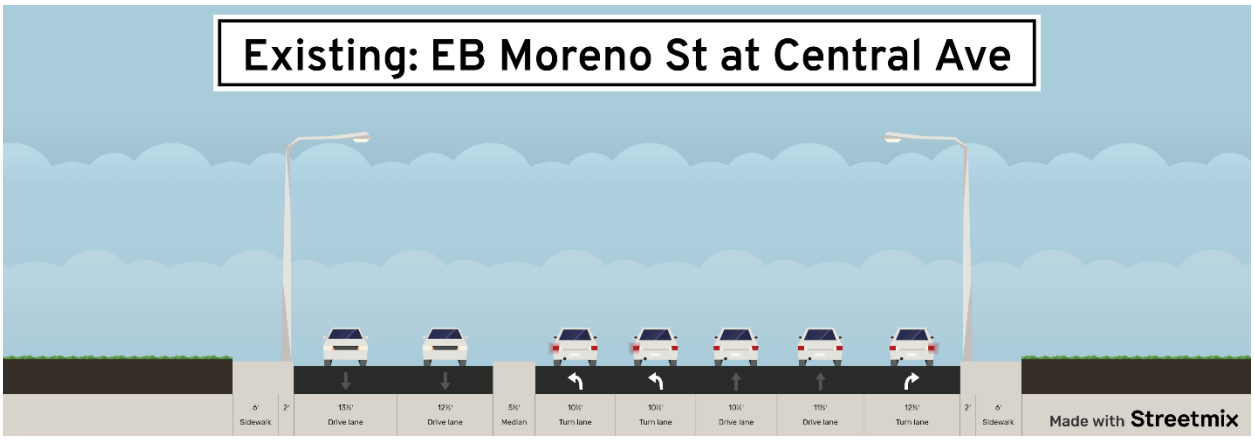
Shorten Right-Turn Pocket to minimize the conflict zone between vehicles and bicyclists, if a bike lane is implemented

Install ADA-Compliant Curb Ramps and Pedestrian Push Buttons to help increase access for people with limited mobility, or those pushing strollers or using wheelchairs

Remove the Existing Median Nose on the East, South and West Legs, and **Place an Extension on the Intersection Side of the Crosswalk** to clear the pedestrian path and discourage vehicles from taking sharp left turns

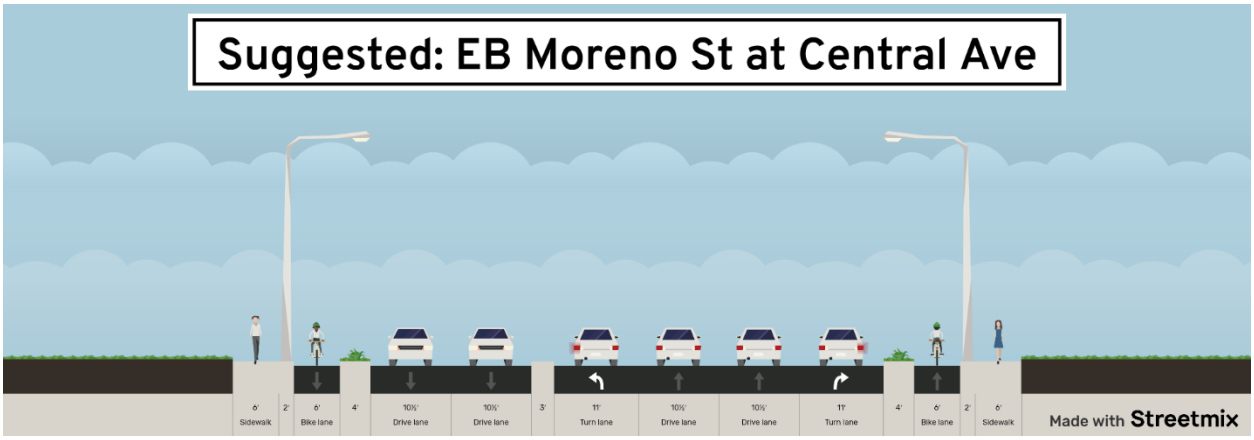
Conceptual, Not For Construction. Detailed Analysis and Engineering Design Required.

FIGURE 4-8 MORENO STREET SUGGESTIONS FOR IMPROVEMENT (EXISTING SECTION VIEW)



Existing cross section, consisting of two through lanes, two left turn lanes, a right turn lane, and a median.

FIGURE 4-9 MORENO STREET SUGGESTIONS FOR IMPROVEMENT (SUGGESTED SECTION VIEW)



Suggested cross section, consisting of two through lanes in each direction, one left turn lane, and separated bike lanes

4.4 Location #3: Central Avenue (from Arrow Hwy to Palo Verde Street)

Central Avenue is an arterial roadway that extends from Foothill Boulevard in Upland to CA-71 in Chino Hills, where it continues as Soquel Canyon Parkway. Central Avenue has a posted speed limit of 40 mph along the study corridor. Along the study corridor, Central Avenue has three travel lanes in each direction with a center median and left-turn pockets. Sidewalks are present on both sides of the corridor. No bike facilities are provided along Central Avenue. The Foothill Transit Silver Streak travels along Central Avenue north of the 10 Freeway, and routes 480 and 492 travel along Central Avenue north of Moreno Street. Land uses along Central Avenue consist of commercial uses.

Between 2016 and 2020, there were 102 total collisions on the study corridor, with four resulting in severe injury, and none being fatal. The corridor had four pedestrian and five bike collisions, with one of the pedestrian collisions resulting in a severe injury or fatality. The collision data showed a high number of left turn collisions and bicycle-involved collisions.

Observations

The following observations were noted during the site visit:

- There are two left turn lanes for each leg of the intersection with Moreno Street.
- The medians extend into the crosswalks at the intersection with Moreno Street.
- The signalized intersections at Moreno St, Olive St, and Arrow Highway do not have stop bars on all legs.
- Land uses near the intersection with Arrow Highway generate pedestrian activity.
- There is a general misalignment between the signal heads and the travel lanes they serve at the signalized intersections.
- Some curb ramps along the corridor are not ADA compliant due to a lack of truncated domes.
- “Botts’ Dots” are used in lieu of striping throughout the corridor.

A faded crosswalk across Central Avenue, which decreases visibility of the pedestrian right-of-way

Suggested Improvements

Based on those observations during the site visit, the following improvements are suggested for pedestrian, bicycle, and motor vehicle activity at this location:

- Add medians with pedestrian refuges along the corridor to increase pedestrian safety.
- Widen the sidewalks to 10 feet for greater comfort and safety.
- Narrow travel lanes to 10 or 11 feet to help slow vehicles.
- Upgrade crosswalks to high-visibility throughout the corridor.
- Implement a road diet on the corridor to remove one travel lane in each direction to encourage slower vehicle speeds and free-up space for on-street bicycle facilities.
    - Figure 4-12 describes a suggested typical section with these modifications

The above recommendations for this corridor are the same as those in the Montclair General Plan concept for Central Avenue. Further study of vehicle operations is needed to evaluate the feasibility of a road diet.

Central Avenue

Arrow Highway to Palo Verde Street

MONTCLAIR

Central Av

Arrow Hwy

Widen Sidewalks to 10′
for greater comfort & safety

Olive St

Implement a Road Diet
by removing one travel lane in each direction to encourage slower speeds and free-up space for **On-Street Bicycle Facilities**

Upgrade to Triple 4 High-Visibility Crosswalks throughout the corridor

NOTE
Recommendations for Central Av are the same as those in the *Montclair General Plan*. Further study of vehicle operations needed to evaluate the feasibility of a road diet.

Moreno St

Add Medians with Pedestrian Refuges along the Corridor
to increase pedestrian safety

Cross Section View

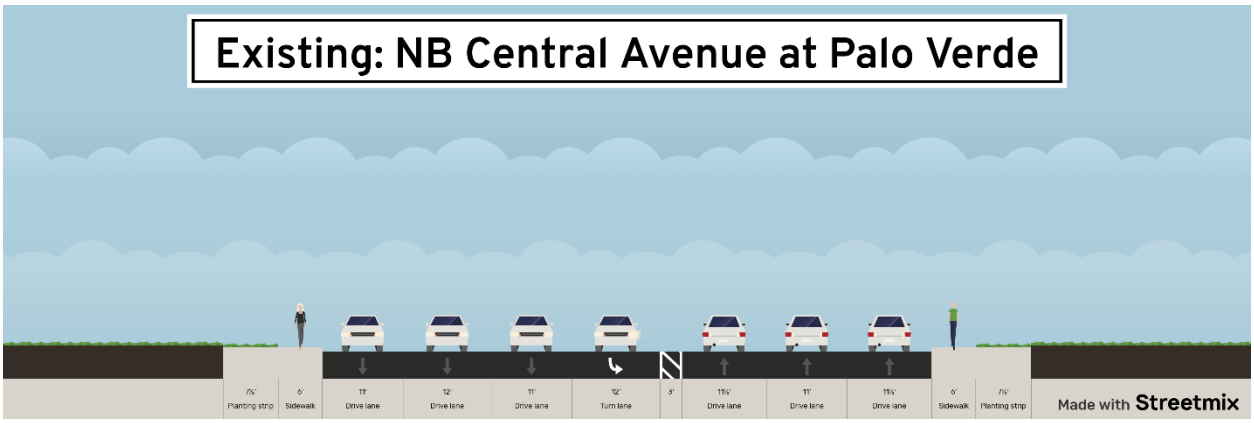
10

Narrow Travel Lanes to 10′ or 11′
to help to slow vehicles

Palo Verde St

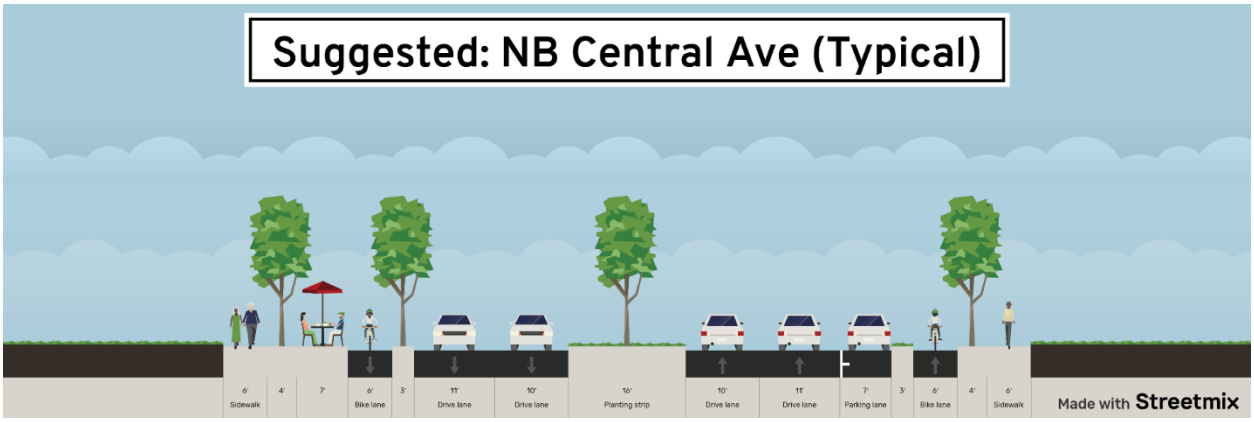
Conceptual, Not For Construction. Detailed Analysis and Engineering Design Required.

FIGURE 4-11 CENTRAL AVENUE SUGGESTIONS FOR IMPROVEMENT (EXISTING SECTION VIEW)



Existing cross section, consisting of three travel lanes in each direction

FIGURE 4-12 CENTRAL AVENUE SUGGESTIONS FOR IMPROVEMENT (SUGGESTED SECTION VIEW)



Suggested corridor typical cross section, consisting of two travel lanes in each direction, a parking lane in one direction, separated bike lanes, and a median

Appendix A: Glossary of Pedestrian Improvement Measures

PEDESTRIAN IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Traffic Control Countermeasures			
Traffic Signal or All-Way Stop	Conventional traffic control devices with warrants for use based on the Manual on Uniform Control Devices (MUTCD).	Reduces pedestrian-vehicle conflicts and slows traffic speeds.	Must meet warrants based on traffic and pedestrian volumes; however, exceptions are possible based on demonstrated pedestrian safety concerns (collision history).
HAWK Beacon Signal	HAWK (High Intensity Activated Crosswalks) are pedestrian-actuated signals that are a combination of a beacon flasher and a traffic control signal. When actuated, HAWK displays a yellow (warning) indication followed by a solid red light. During pedestrian clearance, the driver sees a flashing red "wig-wag" pattern until the clearance interval has ended and the signal goes dark.	Reduces pedestrian-vehicle conflicts and slows traffic speeds.	Useful in areas where it is difficult for pedestrians to find gaps in automobile traffic to cross safely, but where normal signal warrants are not satisfied. Appropriate for multi-lane roadways.
Overhead Flashing Beacons	Flashing amber lights are installed on overhead signs, in advance of the crosswalk or at the entrance to the crosswalk.	The blinking lights during pedestrian crossing times increase the number of drivers yielding for pedestrians and reduce pedestrian-vehicle conflicts. This measure can also improve conditions on multi-lane roadways.	Best used in places where motorists cannot see a traditional sign due to topography or other barriers.
Stutter Flash	The Overhead Flashing Beacon is enhanced by replacing the traditional slow flashing incandescent lamps with rapid flashing LED lamps. The beacons may be push-button activated or activated with pedestrian detection.	Initial studies suggest the stutter flash is very effective as measured by increased driver yielding behavior. Solar panels reduce energy costs associated with the device.	Appropriate for multi-lane roadways.

PEDESTRIAN IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
In-Roadway Warning Lights	Both sides of a crosswalk are lined with pavement markers, often containing an amber LED strobe light. The lights may be push-button activated or activated with pedestrian detection.	This measure provides a dynamic visual cue and is increasingly effective in bad weather.	Best in locations with low bicycle ridership, as the raised markers present a hazard to bicyclists. May not be appropriate in areas with heavy winter weather due to high maintenance costs. May not be appropriate for locations with bright sunlight. The lights may cause confusion when pedestrians fail to activate them and/or when they falsely activate.
High-Visibility Signs and Markings	High-visibility markings include a family of crosswalk striping styles including the "ladder" and the "triple four." One style, the zebra-style crosswalk pavement markings, were once popular in Europe, but have been phased out because the signal-controlled puffin is more effective (see notes). High-visibility fluorescent yellow green signs are made of the approved fluorescent yellow-green color and posted at crossings to increase the visibility of a pedestrian crossing ahead.	FHWA recently ended its approval process for the experimental use of fluorescent yellow crosswalk markings and found that they had no discernible benefit over white markings.	Beneficial in areas with high pedestrian activity, as near schools, and in areas where travel speeds are high and/or motorist visibility is low.
In-Street Pedestrian Crossing Signs	This measure involves posting regulatory pedestrian signage on lane edge lines and road centerlines. The In-Street Pedestrian Crossing sign may be used to remind road users of laws regarding right of way at an unsignalized pedestrian crossing. The legend STATE LAW may be shown at the top of the sign if applicable. The legends STOP FOR or YIELD TO may be used in conjunction with the appropriate symbol.	This measure is highly visible to motorists and has a positive impact on pedestrian safety at crosswalks.	Mid-block crosswalks, unsignalized intersections, low-speed areas, and two-lane roadways are ideal for this pedestrian treatment. The STOP FOR legend shall only be used in states where the state law specifically requires that a driver must stop for a pedestrian in a crosswalk.
Pedestrian Crossing Flags	Square flags of various colors, which are mounted on a stick and stored in sign-mounted holders on both side of the street at crossing locations; they are carried by pedestrians while crossing a roadway.	This measure makes pedestrians more visible to motorists.	Appropriate for mid-block and uncontrolled crosswalks with low visibility or poor sight distance.

PEDESTRIAN IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Advanced Yield Lines	Standard white stop or yield limit lines are placed in advance of marked, uncontrolled crosswalks.	This measure increases the pedestrian's visibility to motorists, reduces the number of vehicles encroaching on the crosswalk, and improves general pedestrian conditions on multi-lane roadways. It is also an affordable option.	Useful in areas where pedestrian visibility is low and in areas with aggressive drivers, as advance limit lines will help prevent drivers from encroaching on the crosswalk. Addresses the multiple-threat collision on multi-lane roads.
Geometric Treatments			
Pedestrian Overpass/ Underpass	This measure consists of a pedestrian-only overpass or underpass over a roadway. It provides complete separation of pedestrians from motor vehicle traffic, normally where no other pedestrian facility is available, and connects off-road trails and paths across major barriers.	Pedestrian overpasses and underpasses allow for the uninterrupted flow of pedestrian movement separate from the vehicle traffic.	Grade separation via this measure is most feasible and appropriate in extreme cases where pedestrians must cross roadways such as freeways and high-speed, high-volume arterials. This measure should be considered a last resort, as it is expensive and visually intrusive.
Road Diet (aka Lane Reduction)	The number of lanes of travel is reduced by widening sidewalks, adding bicycle and parking lanes, and converting parallel parking to angled or perpendicular parking.	This is a good traffic calming and pedestrian safety tool, particularly in areas that would benefit from curb extensions but have infrastructure in the way. This measure also improves pedestrian conditions on multi-lane roadways.	Roadways with surplus roadway capacity (typically multi-lane roadways with less than 15,000 to 17,000 ADT) and high bicycle volumes, and roadways that would benefit from traffic calming measures.
Median Refuge Island	Raised islands are placed in the center of a roadway, separating opposing lanes of traffic with cutouts for accessibility along the pedestrian path.	This measure allows pedestrians to focus on each direction of traffic separately, and the refuge provides pedestrians with a better view of oncoming traffic as well as allowing drivers to see pedestrians more easily. It can also split up a multi-lane road and act as a supplement to additional pedestrian tools.	Recommended for multi-lane roads wide enough to accommodate an ADA-accessible median.

PEDESTRIAN IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Staggered Median Refuge Island	This measure is similar to traditional median refuge islands; the only difference is that the crosswalks in the roadway are staggered such that a pedestrian crosses half the street and then must walk towards traffic to reach the second half of the crosswalk. This measure must be designed for accessibility by including rails and truncated domes to direct sight-impaired pedestrians along the path of travel.	Benefits of this tool include an increase in the concentration of pedestrians at a crossing and the provision of better traffic views for pedestrians. Additionally, motorists are better able to see pedestrians as they walk through the staggered refuge.	Best used on multi-lane roads with obstructed pedestrian visibility or with off-set intersections.
Curb Extension	Also known as a pedestrian bulb-out, this traffic-calming measure is meant to slow traffic and increase driver awareness. It consists of an extension of the curb into the street, making the pedestrian space (sidewalk) wider.	Curb extensions narrow the distance that a pedestrian has to cross and increases the sidewalk space on the corners. They also improve emergency vehicle access and make it difficult for drivers to turn illegally.	Due to the high cost of installation, this tool would only be suitable on streets with high pedestrian activity, on-street parking, and infrequent (or no) curb-edge transit service. It is often used in combination with crosswalks or other markings.
Reduced Curb Radii	The radius of a curb can be reduced to require motorists to make a tighter turn.	Shorter radii narrow the distance that pedestrians have to cross; they also reduce traffic speeds and increase driver awareness (like curb extensions), but are less difficult and expensive to implement.	This measure would be beneficial on streets with high pedestrian activity, on-street parking, and no curb-edge transit service. It is more suitable for wider roadways and roadways with low volumes of heavy truck traffic.
Curb Ramps	Curb ramps are sloped ramps that are constructed at the edge of a curb (normally at intersections) as a transition between the sidewalk and a crosswalk.	Curb ramps provide easy access between the sidewalk and roadway for people using wheelchairs, strollers, walkers, crutches, handcarts, bicycles, and also for pedestrians with mobility impairments who have trouble stepping up and down high curbs.	Curb ramps must be installed at all intersections and mid-block locations where pedestrian crossings exist, as mandated by federal legislation (1973 Rehabilitation Act and 1990 Americans with Disabilities Act). Where feasible, separate curb ramps for each crosswalk at an intersection should be provided rather than having a single ramp at a corner for both crosswalks.

PEDESTRIAN IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Raised Crosswalk	A crosswalk whose surface is elevated above the travel lanes.	Attracts drivers' attention; encourages lower travel speeds by providing visual and tactile feedback when approaching the crosswalk.	Appropriate for multi-lane roadways, roadways with lower speed limits that are not emergency routes, and roadways with high levels of pedestrian activity, such as near schools, shopping malls, etc.
Improved Right-Turn Slip-Lane Design	Right-turn slip lanes (aka channelized right-turn lanes) are separated from the rest of the travel lanes by a pork chop-shaped striped area. This measure separates right-turning traffic and streamlines right-turning movements. Improved right-turn slip lanes would provide pedestrian crossing islands within the intersection and be designed to optimize the right-turning motorist's view of the pedestrian and of vehicles to his or her left.	This measure reduces the pedestrian's crossing distance and turning vehicle speeds.	Appropriate for intersections with high volumes of right-turning vehicles.
Chicanes	A chicane is a sequence of tight serpentine curves (usually an S-shape curve) in a roadway, used on city streets to slow cars.	This is a traffic-calming measure that can improve the pedestrian environment and pedestrian safety.	Chicanes can be created on streets with higher volumes, given that the number of through lanes is maintained; they can also be created on higher-volume residential streets to slow traffic. Chicanes may be constructed by alternating parallel or angled parking in combination with curb extensions.
Pedestrian Access and Amenities			
Marked Crosswalk	Marked crosswalks should be installed to provide designated pedestrian crossings at major pedestrian generators, crossings with significant pedestrian volumes (at least 15 per hour), crossings with high vehicle-pedestrian collisions, and other areas based on engineering judgment.	Marked crosswalks provide a designated crossing, which may improve walkability and reduce jaywalking.	Marked crosswalks alone should not be installed on multi-lane roads with more than about 10,000 vehicles/ day. Enhanced crosswalk treatments (as presented in this table) should supplement the marked crosswalk.

PEDESTRIAN IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Textured Pavers	Textured pavers come in a variety of materials (for example, concrete, brick, and stone) and can be constructed to create a textured pedestrian surface such as a crosswalk or sidewalk. Crosswalks are constructed with the pavers, or can be made of stamped concrete or asphalt.	Highly visible to motorists, this measure provides a visual and tactile cue to motorists and delineates a separate space for pedestrians, as it provides a different texture to the street for pedestrians and motorists. It also aesthetically enhances the streetscape.	Appropriate for areas with high volumes of pedestrian traffic and roadways with low visibility and/or narrow travel ways, as in the downtown area of towns and small cities.
Anti-Skid Surfacing	Surface treatment is applied to streets to improve skid resistance during wet weather. This is a supplementary tool that can be used to reduce skidding in wet conditions.	Improves driver and pedestrian safety.	Appropriate for multi-lane roadways and roadways with higher posted speed limit and/or high vehicle volumes or collision rates.
Accessibility Upgrades	Treatments such as audible pedestrian signals, accessible push buttons, and truncated domes should be installed at crossings to accommodate disabled pedestrians.	Improves accessibility of pedestrian facilities for all users.	Accessibility upgrades should be provided for all pedestrian facilities following a citywide ADA Transition Plan.
Pedestrian Countdown Signal	Displays a "countdown" of the number of seconds remaining for the pedestrian crossing interval. In some jurisdictions the countdown includes the walk phase. In other jurisdictions, the countdown is only displayed during the flashing don't walk phase.	Increases pedestrian awareness and allows them the flexibility to know when to speed up if the pedestrian phase is about to expire.	The forthcoming 2009 MUTCD is expected to require all pedestrian signals to incorporated countdown signals within ten years. The signals should be prioritized for areas with pedestrian activity, roadways with high volumes of vehicular traffic, multi-lane roadways, and areas with elderly or disabled persons (who may walk slower than others may).
Transit			
High-Visibility Bus Stop Locations	This measure should include siting bus stops on the far side of intersections, with paved connections to sidewalks where landscape buffers exist.	Provides safe, convenient, and inviting access for transit users; can improve roadway efficiency and driver sight distance.	Appropriate for all bus stops subject to sight distance and right-of-way constraints.

PEDESTRIAN IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Transit Bulb	Transit bulbs or bus bulbs, also known as nubs, curb extensions, or bus bulges are a section of sidewalk that extends from the curb of a parking lane to the edge of the through lane.	Creates additional space at a bus stop for shelters, benches, and other passenger amenities.	Appropriate at sites with high patron volumes, crowded city sidewalks, and curbside parking.
Enhanced Bus Stop Amenities	Adequate bus stop signing, lighting, a bus shelter with seating, trash receptacles, and bicycle parking are desirable features at bus stops.	Increase pedestrian visibility at bus stops and encourage transit ridership.	Appropriate at sites with high patron volumes.

Appendix B: Glossary of Bicycling Improvement Measures

BICYCLING IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
LINKS /ROADWAY SEGMENTS			
A. Road Design and Operations to Slow Traffic			
Traffic Calming	There are a variety of measures too numerous to list here. See ITE Institute of Transportation Engineers, "Traffic Calming: State of the Practice".	Reduces motor vehicle speeds, which improves safety for all modes and increases bicyclist's comfort.	Urban and suburban settings; suggested for urban major streets with prevailing speeds of 35 mph and higher and for suburban major streets with prevailing speeds 45 mph or higher; and for all local streets with speeds of 30+ mph.
Bicycle Boulevard	A minor street on which traffic control devices are designed and placed to encourage cycling; these include: unwarranted stop signs along bike route are removed; crossing assistance at major arterials is provided (see examples in Nodes-Section E below).	Allows cyclists to maintain their travel speeds, significantly reducing their travel time; provides cyclists with a low volume, low speed street where motorists are aware that it is a bicycle-priority street.	On minor streets with less than 3000 vehicles per day especially useful when Bike Blvd is parallel to and within ¼ mile of a major arterial with many desirable destinations.
Signal Coordination at 15 -25 mph	The signal timing along a corridor is set so that traffic which receives a green light at the first intersection will subsequently receive a green light at all downstream intersections if they travel at the design speed; aka a "green wave."	Encourages motorists to travel at slower speeds, provides a more comfortable experience for cyclists and increases overall traffic safety; also allows cyclists to hit the green lights, so that they can maintain their travel speeds, significantly reducing their travel time.	Urban settings, typically downtown and other areas with relatively short blocks and with traffic signals at every intersection.
Woonerf/Shared Space	A shared space concept where the entire public right of way is available for all modes, often with no sidewalks, and with no lane striping, and little if any signage.	Access for motor vehicles is maintained, unlike a pedestrian zone, but motor vehicle speeds are constrained to 5 mph by design and the presence of other modes. Safety for all modes is improved.	Low volume residential streets where families can gather, and children are encouraged to play; also commercial areas with high pedestrian volumes, bicyclists and transit.
B. Road Design to Provide Bicycle Infrastructure			
Bike Lanes	A painted lane for the exclusive use of bicyclists; it is one-way and is 5 feet minimum in width. They can be retrofitted onto an existing street by either a) narrowing existing wide travel lanes; b) removing a parking lane; c) removing a travel lane, or d) widening the roadway. A common method to retrofit bike lanes is described below.	Provides cyclists with their own travel lane so that they can safely pass and be passed by motor vehicles.	Roadways with over 4000 vehicles per day (if less than 4000 vehicles per day see Bicycle Boulevards above).

BICYCLING IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Road Diet (aka Lane Reduction)	One to two travel lanes are replaced with a bike lane in each direction, and in most cases by also adding left-turn lanes at intersections or a center two-way left-turn lane; variations include widening sidewalks, and replacing parallel parking with angled or perpendicular parking.	Improves traffic safety for all modes by: a) eliminating the double-threat to pedestrians posed by the two or more travel lanes in each direction; b) providing bike lanes for cyclists; c) providing a left-turn pocket for motorists, reducing rear-end collisions and improving visibility to oncoming traffic.	Classic application is a four-lane undivided roadway with less than 15,000 to 17,000 ADT though conversions of four-lane streets may work up to 23,000 ADT. Also applies to three-lane roadways and to 5 or 6-lane undivided roadways
Buffer adjacent to bike lanes	A three to five-foot buffer area is provided on one or both sides of the bike lane.	Right-side buffer (between bike lane and on-street parking): Removes cyclists from the door zone; Left-side (between bike lane and adjacent travel lane): provides greater separation from passing motor vehicle traffic.	This measure is particularly beneficial in the following conditions: Right-side: on streets with parallel on-street parking particularly in cities with a collision history of dooring; Left-side: on streets with traffic with prevailing speeds of 40 mph and higher.
Cycle Tracks	A bikeway within the roadway right of way that is separated from both traffic lanes and the sidewalks by either a parking lane, street furniture, curbs or other physical means.	Reduces sidewalk riding, provides greater separation between motorists and cyclists.	Urban settings with parallel sidewalks and heavy traffic.
C Other Traffic Control Devices			
Except Bicycles placard	A Regulatory sign placard for use with other regulatory signs.	Increases or maintains the access and circulation capabilities of bicyclists.	Used at locations where the restriction in question does not apply to bicyclists, such as No Left Turn or Do Not Enter.
Sharrows	A pavement legend that indicates the location within the travel lane where bicyclists are expected to occupy.	The sharrow encourages cyclists to ride outside of the door zone and studies have shown that sharrows reduce the incidence of cyclists riding on the sidewalk and wrong-way riding.	Two or more lane city streets where the right-most lane is too narrow for a motor vehicle to safely pass a cyclist within the travel lane.
Bike Lanes May Use Full Lane sign (MUTCD R4-11)	Regulatory Sign	Informs motorists and cyclists that cyclists may be travelling in the center of a narrow lane.	Two or more lane city streets where the right-most lane is too narrow for a motor vehicle to safely pass a cyclist within the travel lane.
Share the Road sign (MUTCD W-11/ W16-1p)	Warning sign and placard	Informs motorists to expect cyclists on the roadway.	Two-lane roads particularly in rural areas where shoulders are less than four feet.
Bike Directional Signs (MUTCD D1 series or similar)	Informational signs indicating place names and arrows, with distances as a recommended option (D1-2C)	Informs bicyclists of the most common destination served by the bike route in question.	Particularly useful to direct cyclists to a facility such as a bike bridge or to use a street to access a major destination that might not otherwise be readily apparent.

BICYCLING IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
D. New infrastructure to improve bicycle connectivity			
Bike Path	A paved pathway for the exclusive use of non-motorized traffic within its own right of way;	Provides additional connectivity and route options that otherwise would not be available to bicyclists.	Wherever a continuous right of way exists, typically found along active or abandoned railroad ROW, shorelines, creeks, and river levees.
Pathway connections	Short pathway segments for non-motorized traffic, for example, that join the ends of two cul-de-sacs or provide other connectivity not provided by road network.	Provides short-cuts for bicyclists that reduce their travel distance and travel time.	Varies by community; suggested at the end of every newly constructed cul-de-sac.
Bicycle Overpass/ Underpass	A bicycle overpass or underpass is a bridge or tunnel built for the exclusive use of non-motorized traffic and is typically built where at-grade crossings cannot be provided such as to cross freeways, rivers, creeks and railroad tracks. They can also be built to cross major arterials where, for example, a bike path must cross a major roadway.	A bike bridge / tunnel complements a local roadway system that is discontinuous due to man-made or natural barriers. They reduce the distance traveled by cyclists, and provide a safer conflict-free crossing, particularly if it is an alternative to a freeway interchange.	Grade separation via this measure is most feasible and appropriate when it would provide direct access to major bicyclist destinations such as a school or college, employment site, major transit station or would reduce the travel distance by one mile or more.
NODES / INTERSECTIONS			
E. Intersection Design for Motor Vehicles			
Reduced Curb Radii	The radius of a curb is reduced to require motorists to make the turn at slower speeds and to make a tighter turn.	Shorter curb radii reduce the speed of turning traffic thereby enabling a more comfortable weave between through cyclists and right-turning motorists.	This measure is suitable for downtown settings, at all cross streets with minor streets, all residential streets and all roadways that are not designated truck routes.
Remove/Control Free Right-Turn Lanes	Where a separate right-turn lane continues as its own lane after the turn, it may be redesigned to eliminate the free turn. A short-term solution is to control the turning movement with a stop sign or signal control and to redesign the island as discussed below.	Improves bicyclist safety since this design forces through cyclists on the cross street to end up in between two lanes of through motor vehicle traffic.	All locations where there are free right-turn lanes except those leading onto freeway on-ramps.
Remove/Redesign Right-Turn Slip-Lane Design	Right-turn slip lanes (aka channelized right-turn lanes) are separated from the rest of the travel lanes by a pork chop-shaped raised island which typically is designed to facilitate fast right turns, and right-turning vehicles are often not subject to the traffic signal or stop sign.	Improves bicyclist safety by slowing right-turning motorists and facilitates the weave between through bicyclists and right-turning motorists.	All locations with a channelized right-turn.

BICYCLING IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Remove Optional Right-Turn Lane in Combination with a Right-Turn Only Lane	At locations where there is an optional right-turn lane in combination with a right-turn only lane, convert the optional right-turn lane to a through-only lane.	Improves bicyclist safety since cyclists have no way of knowing how to correctly position themselves in the optional (through /right turn) lane.	All locations where there is an optional right-turn lane in combination with a right-turn only lane per HDM 403.6(1) (except on freeways).
Redesign Ramp Termini	Redesign high speed free flow freeway ramps to intersection local streets as standard intersections with signal control.	Improves bicyclist and pedestrian safety on intersections of local streets with freeway ramps.	All freeway interchanges with high speed ramps
F. Intersection Design Treatments - Bicycle-Specific			
Bicycle Signal Detection and Pavement Marking	Provide signal detectors that also detect bicyclists in the rightmost through lane and in left-turn lanes with left-turn phasing. Provide pavement marking to indicate to cyclists where to position themselves in order to activate the detector.	Enables cyclists to be detected when motor vehicles are not present to trigger the needed signal phase. Improves bicyclists' safety.	Per CA MUTCD 4D.105 and CVC 21450.5, all new and modified traffic detection installations must detect bicyclists; All other traffic-actuated signals may be retrofitted to detect bicyclists as soon as feasible.
Bicycle Signal Timing	Provides signal timing to account for the speed of cyclists to cross an intersection.	Improves bicyclists' safety by reducing the probability of a bicyclist being in an intersection when the phase terminates and being hit by traffic that receives the next green phase.	Signal timing that accounts for cyclists is particularly important for cyclists on a minor street approach to a major arterial which crosses a greater distance due to the width of the arterial, hence requiring a longer time interval.
Bicycle Signal Heads	A traffic signal indication in the shape of a bicycle, with full red, yellow green capability.	Improves bicyclist safety by providing a bicycle -only phase, where appropriate, given the geometry and phasing of the particular intersection.	Where intersection geometry is such that a bicycle-only phase is provided and/or bicycle signal heads would improve safety at the intersection. See also CA MUTCD for warrants for bicycle signal heads.
Widen Bike Lane at Intersection Approach	Within the last 200 feet of an intersection, widen the bike lane and narrow the travel; for example from 5 foot bike lane and 12 feet travel lane would become a 7 foot bike lane and 10 foot travel lane.	Improves cyclist safety by encouraging right-turning motorists to enter the bike lane to turn right, (as required by the CVC), which reduces the chance of a right-turn hook collision in which a through cyclist remains to the right of a right-turning motorist.	On roads with bike lanes approaching an intersection without a right-turn only lane and there is noncompliance with right-turning vehicles merging into the bike lane as required by the CVC and UVC.
Bike Lane inside Right-Turn Only Lane ("Combined Bicycle/Right-Turn Lane")	Provide a bike lane line inside and on the left side of a right-turn only lane.	Encourages cyclists to ride on the left side of the right-turn only lane thus reducing the chance of a right hook collision, where a cyclist remains to the right of a right-turning motorist.	On roads with bike lanes approaching an intersection with a right-turn only lane and there is not enough roadway width to provide a bike lane to the left of the right-turn lane.

BICYCLING IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Bike Boxes	Area between an Advance Stop Line and a marked crosswalk which is designates as the queue space for cyclists to wait for a green light ahead of queued motor vehicle traffic; sometimes painted green.	Primary benefits are to reduce conflicts between bicyclists and right-turning traffic at the onset of the green signal phase, and to reduce vehicle and bicyclist encroachment in a crosswalk during a red signal phase.	Locations where there are at least three cyclists at the beginning of the green phase and moderate to high pedestrian volumes.
Marked Crosswalk with Distinct Marked Area for Bicyclists separate from Pedestrians	A marked crosswalk that has two distinct areas, one for pedestrians and one for bicyclists.	Reduces conflicts between bicyclists and pedestrians by indicating the part of the crosswalk intended for the two different modes.	At a typical intersection, cyclists would not be riding within the crosswalk, so this measure is intended for those few locations where the intersection design is such that bicyclists are tracked into a crosswalk such as at a midblock bike path crossing or possibly a cycle track.
Pedestrian Countdown Signal	Displays a "countdown" of the number of seconds remaining for the pedestrian crossing interval. In some jurisdictions the countdown includes the walk phase. In other jurisdictions, the countdown is only displayed during the flashing don't walk phase.	While designed for pedestrians, this measure also assists bicyclists in knowing how much time they have to left to cross the intersection.	The 2012 MUTCD requires all pedestrian signals to incorporated countdown signals within ten years
G. Geometric Countermeasures to Assist crossing a Major Street			
Median Refuge Island	A raised island placed in the center of a roadway, separating opposing lanes of traffic, with ramps for cyclists and ADA accessibility	This measure allows bicyclists to cross one direction of traffic at a time; it allows drivers to see bicyclists crossing from the center more easily.	Suggested for multilane roads at uncontrolled crossings where an 8-foot (min.) wide by 15-foot (min.) long median can be provided.
Staggered Refuge Pedestrian Island	This measure is similar to traditional median refuge islands; the only difference is that the crosswalk is staggered such that a pedestrian crosses one direction of traffic street and then must turn to their right facing oncoming to reach the second part of the crosswalk. This measure must be designed for accessibility by including rails and truncated domes to direct sight-impaired pedestrians along the path of travel.	Benefits of this measure include forcing the bicyclists and pedestrians to face the oncoming motorists, increasing their awareness of the impending conflict. Additionally, can improve motorists' visibility to those persons in the crosswalk.	Best used on multilane roads with obstructed pedestrian visibility or with off-set intersections

BICYCLING IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Raised Crosswalk/Speed Table	A crosswalk whose surface is elevated above the travel lanes at the same level as the approaching sidewalk. For bicyclists, a typical location would be at a bike path crossing, where the bike path elevation would remain constant while roadway cross traffic would experience a speed-hump type effect.	Attracts drivers' attention to the fact there will be non-motorized users crossing the roadway and slows traffic by providing a speed-hump effect for motorists approaching the crosswalk.	Appropriate for multi-lane roadways, roadways with lower speed limits that are not emergency routes, and roadways with high levels of pedestrian activity, such as near schools, shopping malls, etc.
H. Traffic Control Countermeasures to Assist Crossing a Major Street			
Traffic Signal or All-Way Stop Sign	Conventional traffic control devices with warrants for use based on the Manual on Uniform Control Devices (MUTCD)	Provides the gap needed in traffic flow so that cyclists can cross the street, reducing bicycle-vehicle conflicts and risk-taking by cyclists to	Must meet warrants based on traffic/ pedestrian / bicycle volumes, collision history, and/ or other factors.
Modern Roundabout	A traffic circle combined with splitter island on all approaches and entering traffic must YIELD to traffic within the roundabout; typically designed for traffic speed within the roundabout of between 15 and 23 mph.	Slows traffic on cross street so that cyclists can more easily cross.	Roundabouts are a better alternative than an All-Way Stop signs when the side street volume is approximately 30 % of the total intersection traffic volume and total peak hour volume is less than 2300 vehicles per day.
Hawk Beacon Signal	HAWK (High Intensity Activated Crosswalks) are pedestrian-bicyclist actuated signals that are a combination of a beacon flasher and a traffic control signal. When actuated, HAWK displays a yellow (warning) indication followed by a solid red light. During the cross-street phase, the driver sees a flashing red “wig-wag” pattern until the clearance interval has ended and the signal goes dark.	Provides the need gaps in traffic so bicyclists can safely cross the street, can be timed separately for bicycles and pedestrians. Reduces pedestrian-vehicle conflicts and slows traffic speeds	Useful in areas where it is difficult for bicyclists /pedestrians to find gaps in automobile traffic to cross safely, but where normal signal warrants are not satisfied. Appropriate for multilane roadways.
Rectangular Rapid Flashing Beacon (RRFB/Stutter Flash)	A warning sign that also contains rapid flashing LED lamps. The beacon may be push-button activated or activated with pedestrian detection.	Initial studies suggest the stutter flash is very effective as measured by increased driver yielding behavior. Solar panels reduce energy costs associated with the device.	Locations not controlled by any measures listed above. Appropriate for multi-lane roadways.
In-Roadway Warning Lights	Both sides of a crosswalk are lined with pavement markers, often containing an amber LED strobe light. The lights may be push-button activated or activated with pedestrian detection.	This measure provides a dynamic visual cue of the uncontrolled crosswalk and is especially effective at night and in bad weather.	Locations not controlled by any measures listed above. Best in locations with low bicycle ridership on the cross street, as the raised markers may present difficulty to bicyclists. May not be appropriate in areas with heavy winter weather due to high maintenance costs. May not be appropriate for locations with bright sunlight.

BICYCLING IMPROVEMENT MEASURES

Measure	Description	Benefits	Application
Bicycle Crossing Sign (MUTCD W11-1) or Trail Crossing sign (MUTCD W11-15/W11-15p)	Warning Sign and placard.	Alerts motorists to a location where bicyclists or bicyclists and pedestrians will be crossing the roadway at an uncontrolled location.	Typical application is at bike path crossing of a roadway. (At a typical pedestrian crosswalk at an intersection, use the Pedestrian warning sign W11-2)
In-Street Pedestrian Crossing Signs (MUTCD R1-6)	This measure involves posting this regulatory sign on road centerlines that read, "YIELD for Pedestrians in crosswalk". (Depending on state law, the word STOP may replace the word YIELD).	This measure improves the visibility of the crossing to motorists and has a positive impact on pedestrian safety at crosswalks.	Mid-block crosswalks, unsignalized intersections, low-speed areas, and two-lane roadways.
Advanced Yield Lines	Standard white stop or yield limit lines are placed 20-50 feet in advance of marked, uncontrolled crosswalks.	This measure increases the pedestrian's visibility to motorists, reduces the number of vehicles encroaching on the crosswalk, and improves general pedestrian conditions on multi-lane roadways. It is also an affordable option.	Useful in areas where pedestrian visibility is low and in areas with aggressive drivers, as advance limit lines will help prevent drivers from encroaching on the crosswalk. Addresses the multiple-threat collision on multi-lane roads.
Transit			
Bike Racks on Buses	A rack on the front of the bus that typically holds two or three bicycles.	Increases the trip length distance that a person can make.	Appropriate for all buses; most urban transit agencies have already implemented this measure.
Bikes allowed inside buses when bike rack is full	A policy adopted by a transit agency that allows passengers to bring bicycles inside the bus when the bike rack is full and there is room inside.	Prevents cyclists from needless being left behind to wait for the next bus if the bike rack is full yet there is room inside the bus.	Appropriate for all buses; most urban transit agencies have already implemented this measure.
Folding bikes allowed inside buses	A policy adopted by a transit agency that treats a folding bicycle as luggage, thereby allowing it inside the bus at all times.	Removes cyclists' uncertainty as to whether they will be able to fit their bike either on the bike rack or inside the bus; thus, they can reliably plan on being able to catch their intended bus.	Appropriate for all buses; most urban transit agencies have already implemented this measure.

Appendix C: Resource List and References

RESOURCE LIST
A Guide for Reducing Collisions Involving Pedestrians (NCHRP Report 500) http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_500v10.pdf
Pedestrian and Bicycle Information Center http://www.walkinginfo.org/
National Center for Safe Routes to School http://www.saferoutesinfo.org/
Safety Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Locations (HRT-04-100) http://www.thrc.gov/safety/pubs/04100/index.htm
How to Develop a Pedestrian Safety Action Plan (FHWA-SA-05-12) http://www.walkinginfo.org/pp/howtoguide2006.pdf
Improving Pedestrian Safety at Unsignalized Crossings (NCHRP Report 562) http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_562.pdf
Road Safety Audits: Case Studies (FHWA-SA-06-17) http://safety.fhwa.dot.gov/rsa/rsa_cstudies.htm
Pedestrian Road Safety Audit Guidelines and Prompt Lists http://drusilla.hsrc.unc.edu/cms/downloads/PedRSA.reduced.pdf
PEDSAFE: The Pedestrian Safety Guide and Countermeasure Selection System (FHWA-SA-04-003) http://www.walkinginfo.org/pedsafe/
Pedestrian and Bicycle Crash Analysis Tool (PBCAT) http://www.bicyclinginfo.org/bc/pbcat.cfm
FHWA, A Resident's Guide for Creating Safe and Walkable Communities http://safety.fhwa.dot.gov/ped_bicycle/ped/ped_walkguide/index.htm
FHWA, Pedestrian Safety Guide for Transit Agencies (FHWA-SA-07-017) http://safety.fhwa.dot.gov/ped_bicycle/ped/ped_transguide/
FHWA Pedestrian Safety Training Courses:
Developing a pedestrian safety action plan (two-day course) *next California course:* http://www.google.com/calendar/embed?src=lssandt@email.unc.edu
Designing for pedestrian safety (two-day course) *next California course:* http://www.google.com/calendar/embed?src=lssandt@email.unc.edu
Planning and designing for pedestrian safety (three-day course) *next California course:* http://www.google.com/calendar/embed?src=lssandt@email.unc.edu
Adapted from FHWA Pedestrian Road Safety Audit Guidelines and Prompt Lists

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CROW, Design Manual for Bicycle Traffic, The Netherlands
http://www.crow.nl/nl/Publicaties/publicatiedetail?code=REC25
From the CROW English website, http://www.crow.nl/English
CROW is The Netherlands technology platform for transport, infrastructure and public space. It is a not-for-profit organization in which the government and businesses work together in pursuit of their common interests through the design, construction and management of roads and other traffic and transport facilities. Active in research and in issuing regulations, CROW focuses on distributing knowledge products to all target groups.

Transport for London, London Cycling Design Standards, UK http://www.tfl.gov.uk/businessandpartners/publications/2766.aspx

Thompson, Laura and Julie Bondurant, Trail Planning in California, Solano Press, 2009

Fundamentals of Traffic Engineering, 16th Edition, Chapter 21: Bicycle Facilities; UC Berkeley Institute of Transportation Studies, 2007

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Appendix D: Street Connectivity

Importance of Street Connectivity

Providing direct paths for bicyclists and pedestrians via well-connected street networks is important for encouraging bicycling and walking by helping people overcome real and perceived senses of distance.

Street connectivity is also associated with public health benefits. The SMARTRAQ Project analysis in Atlanta, Georgia, found that doubling the current regional average intersection density, from 8.3 to 16.6 intersections per square kilometer was associated with a reduction in average per capita vehicle mileage of about 1.6 percent. Furthermore, the Frank et al. (2006) study of King County, Washington, found that per-household VMT declines with increased street connectivity, all else held constant.

Policies for Street Connectivity

A network of safe, direct, and comfortable routes and facilities: A 2004 PAS report recommends that pedestrian (and bicycle) path connections to be every 300 to 500 feet; for motor vehicles, they recommend 500 to 1,000 feet.[2] [3] For new development, such standards can be implemented through ordinances, like those of the regional government of Portland Oregon, Metro, which requires street connectivity in its Regional Transportation Plan and in the development codes and design standards of its constituent local governments.[4]

Measuring Connectivity

The following discussion of measuring street connectivity is provided as a resource and not officially a part of regular BSA processes. However, individuals are certainly encouraged to make such calculations. Jennifer Dill (2004) presents the following measures of street connectivity:

- Intersection density
- Street density
- Average block length
- Link/node ratio
- Connected node ratio = intersections/ (intersections + cul-de-sacs)
- Alpha index = number of actual circuits/ maximum number of circuits
    - Where a circuit is a finite, closed path starting and ending at a single node
- Gamma index = number of links in the network/ maximum possible number of links between nodes
- Effective walking area = number of parcels within a one-quarter mile walking distance of a point/ total number of parcels within a one-quarter mile radius of that point
- Route directness = route distance/ straight-line distance for two selected points

Dill suggests that route directness (RD) is perhaps the best connectivity measure to reflect minimizing trip distances, but may be difficult to use in research and policy. However, it may be applied in practice by randomly selecting origin-destination pairs and calculating a sample for the subject area.

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[2] Susan Handy, Robert G. Paterson, and Kent Butler, 2004, *Planning for Street Connectivity: Getting from Here to There,* PAS Report #515 (Chicago: APA Planners Press).

[3] For more information on this topic, see American Association of State Highway and Transportation Officials (AASHTO), *AASHTO Guide for the Design of Pedestrian Facilities* (Washington, D.C., AASHTO, 2004); *AASHTO Guide for the Development of Bicycle Facilities* (Washington, D.C., AASHTO, 1999; updated 2009); Institute of Traffic Engineers (ITE), Traffic Calming Guidelines and ITE *Context-Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*? (Washington, D.C.: ITE, 2006), http://www.ite.org/bookstore/RP036.pdf (accessed September 3, 2008).

[4] The regional government of Portland Oregon, Metro, requires street connectivity in its Regional Transportation Plan and in the development codes and design standards of its constituent local governments as follows: local and arterial streets be spaced no more than 530 feet apart (except where barriers exist), bicycle and pedestrian connections must be made (via pathways or on road right of ways) every 330 feet, Cul de sacs (or dead-end streets) are discouraged and can be no longer than 200 feet, and have no more than 25 dwelling units.

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About SafeTREC

SafeTREC's mission is the reduction of transportation-related injuries and fatalities through research, education, outreach, and community service. Motor vehicle crashes are the number one cause of death for people aged 1 to 34 in the U.S.—and a major cause of minor and debilitating injuries for all age groups.