Carson City Safe Routes to School Master Plan

Prepared for:

Prepared by:

HEADWAY TRANSPORTATION

alta PLANNING + DESIGN

cfa

Approved: September 9, 2020
Administrative Update: August 15, 2022

Acknowledgements

The following key people/entities participated in the Carson City Safe Routes to School Master Plan. Their creativity, energy, and commitment were critical to the success of this effort.

Carson City Public Works

Lucia Maloney, PMP

Dirk Goering, AICP

Kelly Norman

Dan Anderson

Carson City School District

Ann Cyr
Paula Zona
Daniel Davis
Lisa Hutchinson
Daniel Sadler
Ruthlee Caloiaro
Susan Squires
Linda Hurzel
Dan Brown
Sheri Fletcher
Lee Conley

Consultant Team

Cole Peiffer, AICP	Headway Transportation
Loren Chilson, PE	Headway Transportation
Marissa Harned, PE	Headway Transportation
Dylan Axtell, EI	Headway Transportation
Sam Corbett, AICP	Alta Planning + Design
Courtney Banker	Alta Planning + Design
Chris Heliotes	CFA, Inc

Contents

List of Figures

List of Tables

Executive Summary

Study Elementary Schools
- Bordewich-Bray (BBES)
- Empire (EES)
- Fritsch (FrES)
- Fremont (FES)
- Mark Twain (MTES)
- Seeliger (SES)

Study Middle Schools
- Carson (CMS)
- Eagle Valley (EVMS)

The Carson City Safe Routes to School Master Plan (Plan) focuses on encouraging walking & biking to school and improving the safety of students within a 1-mile radius of the six elementary schools and two middle schools in Carson City, NV. The Plan was developed utilizing in-person site assessments including the use of an aerial drone to captured high quality video footage at each school during pick-up and drop-off periods. The Plan also analyzed existing travel patterns, crash data, and safety concerns from parents and staff to develop a prioritized list of infrastructure improvements and programmatic recommendations which focus on furthering the project goals. Recommendations included in this Plan are sensitive to the wide variety of neighborhood types (urban, suburban, and rural) and their associated roadway contexts.

Utilizing the six E's of Safe Routes to School (SRTS) planning, the Plan includes multi-disciplinary recommendations that build upon existing efforts of the school district (including teachers & parents) and Carson City Public Works staff to create a roadmap to increase safety for children walking and biking to school.

The Six E's of Safe Routes to School Planning

1. Engineering
2. Education
3. Encouragement
4. Engagement
5. Equity
6. Evaluation

Engineering Recommendations

Recommendations were developed based on task force committee meetings, site observations, and analysis of existing crash data and vehicle speed data. Input from school staff, parents, middle school students, and Carson City Public Works staff was also included to create a holistic set of recommendations. The study included an online survey of parents at all eight schools and of students from the two middle schools. Full survey results are included in **Appendix A**. The three major focus areas identified by parents & students are:

1. Improve safety of intersections & crossings
2. Improve sidewalks & pathways
3. Reduce traffic speeds along routes to school

Engineering projects, led by Carson City Public Works, aimed at addressing these focus areas and other safety concerns determined through crash type, severity and contributing factor analysis were divided into three project tiers based on planning level cost estimates, available funding, and timeframe of implementation. Recommended projects in Tiers 1 & 2 are shown in **Figure E**. Tier 3 projects are outlined in the Recommendations section (page **3-6** to **3-7**). The recommended projects can be easily enhanced or modified by incorporating bicycle and pedestrian facility concepts or traffic calming techniques provided in the Carson City Safe Routes to School Infrastructure Design Toolbox included in **Appendix B**. This Toolbox is intended to provide a range of options for implementation based on safety, operational, and maintenance considerations. Total estimated costs for each project tier are detailed in **Table E-1**.

Tier 1 – Quick Win Projects: This tier includes 26 projects with low costs which would provide an immediate benefit and can be implemented rapidly. Tier 1 projects are intended to be implemented as soon as possible with other City projects and programs. The total cost of all Tier 1 projects is estimated to be $204,000. The following elements are included in Tier 1:

- 15 Bus stop improvements
- 6 Traffic operations / safety improvements
- 5 Crosswalk enhancements
- 1 Rectangular Rapid Flashing Beacon (RRFB)

Tier 2 – SRTS Core Projects: Tier 2 consists of 54 projects focused on improving walking and biking to school which will be implementable over the next 20 years. The total cost of all Tier 2 projects is estimated to be $42.1 million. The following improvements are included in Tier 2:

- Intersection crossing enhancements at 52 intersections
- Sidewalk gap closure on 23 roadways
- Bicycle enhancements on 13 roadways
- 6 Rectangular Rapid Flashing Beacons (RRFBs)
- 6 New crosswalks

Tier 3 – Aspirational Projects: These 25 projects represent an ideal conceptual network of low-stress bicycle facilities across Carson City and do not have an associated timeline for implementation. The total cost of all projects in Tier 3 is estimated to be $17 million.

Table E-1. Engineering Recommendations Costs by Project Tier

Engineering Recommendation Tier	Priority Timeframe	Total Estimated Costs (2019)
Tier 1: Quick Win Projects		$204,000
Tier 2: SRTS Core Projects	Near-Term	$12.5 Million
	Medium-Term	$10.6 Million
	Long-Term	$19.0 Million
	Sub-Total:	$42.1 Million
Tier 3: Aspirational Projects		$17 Million

The Tier 2 projects were prioritized as Near-Term, Medium-Term, and Long-Term projects based on a composite score of the following eight prioritization criteria:

1. **Survey Results** - Addresses a specific location identified through parent and student surveys. Addressing this feedback is a priority of the Plan.
2. **Known Safety Issue** – Considers projects that address one or more of the three major focus areas (improve safety of intersections & crossings, improve sidewalks & pathways, reduce traffic speeds along routes to school).
3. **Equity** – Considers median household income to prioritize economically disadvantaged areas.
4. **School Proximity** – Emphasizes projects in close proximity to schools in order to benefit the greatest number of children first.
5. **Community Facility Proximity** – Prioritizes projects in areas of high demand that provide benefits to a greater number of people beyond just school-aged children.
6. **Population Density** – Considers areas of greater population density to provide a benefit to a greater number of people throughout the community.
7. **Cost Efficiency / Feasibility** – Prioritizes projects based on their overall feasibility and planning level cost estimates.
8. **Project Efficiencies** – This factor prioritizes recommended projects which may be incorporated into a planned project on Carson City's current Capital Improvement Program (CIP).

Near-term projects are shown in Tables **E-2 & E-3** with the full prioritized list of Tier 2 projects included on pages **3-3** to **3-4**. Tier 1 & 3 projects were not included in the prioritization process due to the ease of implementation of Tier 1 projects and that Tier 3 projects are beyond the 20 year timeframe. A condensed prioritization matrix is included on Page **3-2** and the full process detailed in **Appendix C**.

The result of this Plan is a prioritized list of projects which will improve pedestrian and bicyclist safety for school aged children, and all Carson City residents, for years to come.

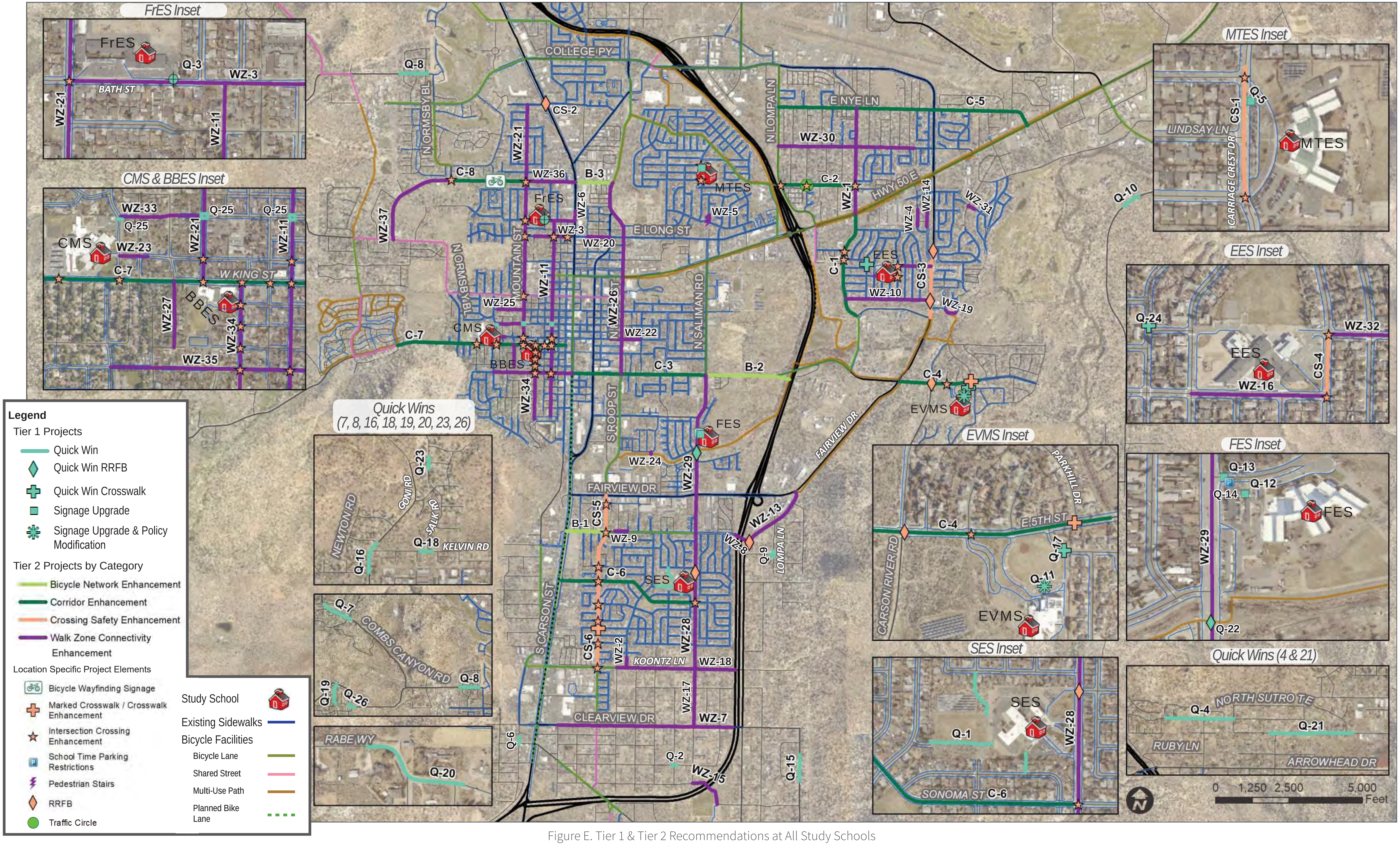


Figure E. Tier 1 & Tier 2 Recommendations at All Study Schools

Table E-2. Tier 2: SRTS Core Near-term Projects

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
C-7	W. King Street	Thames Lane to Curry Street	**A**. Construct multi-use path from Thames Lane to Canyon Park Court **B**. Add physical buffer for bike lane at CMS & BBES **C**. Close sidewalk gaps between Curry Street and Ormsby Boulevard **D**. Install intersection crossing enhancements at Tacoma Avenue, Richmond Avenue, Mountain Street, Thompson Street, Minnesota Street, Division Street	$$$$	47	Near
WZ-33	Telegraph Street	Richmond Avenue to Mountain Street	Construct sidewalk on south side of roadway to eliminate sidewalk gaps and enhance existing sidewalks, as possible	$$	47	Near
CS-4	Monte Rosa Drive	Stanton Drive to Gordonia Avenue	Add intersection crossing enhancements to Stanton Drive & Gordonia Avenue intersections, including striping to prohibit parking close to existing crosswalks	$	45	Near
WZ-28	Saliman Road	Fairview Drive to Koontz Lane	**A**. Intersection crossing enhancements at Sonoma Street **B**. RRFB at Damon Road crosswalk **C**. Sidewalk east side Colorado Street to Fairview Drive **D**. Enhance existing sidewalk as possible	$$$	43	Near
WZ-29	Saliman Road	E. 5th Street to Fairview Drive	Enhance existing sidewalk as possible	$$	43	Near
WZ-21	Mountain Street	Nye Lane to King Street	**A**. Close sidewalk gaps & enhance existing sidewalk where possible **B**. Add intersection crossing enhancements at Winnie Lane, Bath Street, Long Street, Washington Street, Telegraph Street, Musser Street	$$$$$	42	Near
CS-1	Carriage Crest Drive	Slide Mountain Drive to Mountain Park Drive	**A.** Add intersection crossing enhancements at Mountain Park Drive, Slide Mountain Drive, Lindsay Lane intersections **B.** Add center median from 70' south of Slide Mountain Drive to Parent Drop-Off Loop entrance **C.** Consider parking restrictions or removal on Carriage Crest Drive during school pick-up and drop-off periods	$$	39	Near
WZ-16	Gordonia Avenue	Monte Rosa Drive to La Loma Drive	**A.** Widen existing sidewalks on the north side of the roadway **B.** Add center median from Monte Rosa Drive to La Loma Drive	$$	39	Near
WZ-32	Stanton Drive	Monte Rosa Drive to Fairview Drive	Widen existing sidewalk on south side and create center median	$$	39	Near
WZ-11	Division Street	Bath Street to W. 5th Street	**A**. Add intersection crossing enhancements at minor side streets **B**. Enhance & upgrade existing crosswalks through-out the corridor including Musser Street, Telegraph Street, and Long Street **C**. Close sidewalk gaps and widen sidewalks as possible	$$$$	38	Near
WZ-34	Thompson Street	King Street to 550 ft. S. of San Marcus Drive	**A.** Close sidewalk gaps on east side (King Street to 5th Street) **B**. Close sidewalk gaps on west side (5th Street to San Marcus Drive) **C**. Create intersection crossing enhancements at existing W. 2nd St, W. 3rd St, and W. 4th St crosswalks	$$	38	Near
C-6	Sonoma Street	Carson Street to Saliman Road	**A.** Construct bike lanes **B.** Add intersection crossing enhancement at Silver Sage Drive	$	36	Near

Table E-3. Tier 2: SRTS Core Near-term Projects (cont'd)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
CS-3	Fairview Drive	Desatoya Drive to Walker Drive	**A.** Install RRFB at Desatoya Drive **B.** Install RRFB with pedestrian refuge island (painted or hardscape) between Walker Drive and Stanton Drive **C.** Construct Sidewalk on the west side of Fairview Drive from Walker Drive to Edmonds Drive **D**. Enhance existing sidewalk on east side from Lepire Drive to multi-use path **E.** Enhance existing sidewalk on west side from Desatoya Drive to multi-use path south of Butti Way	$$	36	Near
WZ-35	W. 5th Street	Richmond Avenue to Carson Street	**A.** Close sidewalk gaps and enhance existing sidewalk where possible **B.** Add intersection crossing enhancements at Thompson Street & Division Street	$$$$$	36	Near
WZ-10	Desatoya Avenue	Airport Road to Fairview Drive	Widen sidewalks on south side of roadway	$$	35	Near
C-4	E. 5th Street	Fairview Drive to Mexican Ditch Trail	**A.** Construct bike lanes from Fairview Drive to Carson River Road **B.** Construct buffered bike lane from Carson River Road to Mexican Ditch Trail **C.** Add marked crosswalk with pedestrian refuge (painted or hardscape) at Parkhill Drive **D.** Construct pedestrian refuge at Regent Court (painted or hardscape) **E.** Relocate existing crosswalk at Carson River Road & Hells Bells Road approximately 15 feet to the east, add pedestrian refuge Island (painted or hardscape) and RRFB	$$	34	Near
WZ-3	Bath Street	Mountain Street to Carson Street	**A**. Close sidewalk gaps between Curry Street & Mountain Street **B.** Add intersection crossing enhancement (paint or hardscape) at existing mid-block crosswalk and Division Street crosswalks **C.** Add missing & repair damaged ADA Ramps **D.** Repair and enhance existing sidewalks as possible	$$$	34	Near
WZ-36	Winnie Lane	Carson Street to Mountain Street	Enhance existing sidewalks as possible	$$	34	Near

Project Category Key

(light green)	Tier 2: Bicycle Network Enhancements
(peach)	Tier 2: Crossing Safety Enhancements
(purple)	Tier 2: Walk Zone Connectivity Enhancements
(dark green)	Tier 2: Corridor Enhancements (Combined elements from Bicycle Network, Walk Zone Connectivity, and Crossing Safety along specific corridor)

Programmatic Recommendations

The programmatic recommendations listed in the following tables were compiled based on key themes and concerns described by stakeholders, as well as industry best practices. These programs, paired with the Engineering project recommendations in the Plan, give the City a full suite of SRTS strategies and options, commonly referred to as the "6 E's".

Table E-4. Programmatic Engineering Recommendations

Theme	Project Number	Type	Description	Schools	Cost	Priority Timeframe
Engineering School Safety	ENG-1	School Speed Zone Standard	Develop standard for School Speed Zone signage, lane markings, and controls which will create a standard look and feel for School Speed Zones across Carson City. This may include installing flashers at all existing "School Zone When Flashing" signs (S5-1) and replacing existing School Zone Time Specific sign combinations (S4-3P, R2-1, S4-1P) with S5-1 signs. Additionally, a standard may include traffic calming strategies such as in-road message signs (R1-6), intersection bulb-outs, and speed feedback signs.	All	$	Near
	ENG-2	School Speed Zone Standard	Implement School Speed Zone standard at all eight study schools as funding is available.	All	$ - $$	Medium
	ENG-3	School Speed Zone Standard	Ensure that Speed Feedback Signs within a School Zone are programmed to reflect the school zone speed limits during the appropriate hours of the day.	All	$	Near
	ENG-4	School Bus Stop Awareness	Utilize temporary school bus stop signage and public messaging campaigns to increase driver awareness of bus stops during the school year. Initial efforts will focus on locations identified as "Quick Wins" and may expand to other locations following the first year of implementation.	All	$$	Near

Table E-5. Education Recommendations

Theme	Project Number	Type	Description	Schools	Cost	Priority Timeframe
Education	ED-1	Bicycle Safety Education	Develop TA-Set Aside grant application to bolster and expand upon the existing Bicycle Safety Education program at all six elementary schools. Items to include in grant application are new bicycles, easy to use bicycle helmets, funding for on-going maintenance and repairs, and updated curriculum materials	Elementary	$$	Near
	ED-2	Bicycle Safety Education	Work with CCSD to expand the total number of days of bicycle education instruction to provide 3rd, 4th, and 5th grade students with at least 2 class periods of experience on a bike each school year	Elementary	$$	Long
	ED-3	Student Pedestrian Education	Develop / obtain pedestrian safety education curriculum for elementary school students and incorporate these lessons into an expanded Bicycle Safety Education program	Elementary	$	Medium
	ED-4	Student Pedestrian Education	Develop / obtain pedestrian safety education curriculum for middle school students. Disseminate this information to students during the school year or as part of a Bicycle/Pedestrian Safety Program	Middle	$	Medium
	ED-5	Parent / Caregiver Safety Education	Develop and implement a public messaging campaign to make drivers aware of School Zone laws. This campaign can be reused at the beginning of each school year and following long breaks.	All	$$$	Near
	ED-6	Parent / Caregiver Safety Education	Develop and implement public messaging campaign focused on parents and the importance of teaching safe pedestrian habits to their children.	All	$$$	Medium

Table E-6. Encouragement Recommendations

Theme	Project Number	Type	Description	Schools	Cost	Priority Timeframe
Encouragement	E-1	Walking/Biking Encouragement	Start a Walking Wednesday program at each elementary school focused on encouraging students (and parents) to walk or bike to school every Wednesday in order to receive daily prizes and to compete for a bicycle or scooter at the end of the school year.	Elementary	$	Near
	E-2	Bicycle Equipment Program	Work with local non-profits and local businesses to create local bicycle donation and rehabilitation program. Program would obtain and repair older bicycles from the community and fix them up to provide them to Carson City students without a bicycle	All	$$$	Long
	E-3	Walking / Biking Encouragement	Increase number of School Safety Champions to one at each school	All	$	Near
	E-4	Walking / Biking Encouragement	Work with School Safety Champions and School administrations to create a network of parents who are willing and able to supervise Walking School Buses and/or Bike Trains at each of the six elementary schools. Leverage available funding for compensating volunteers.	Elementary	$	Near
	E-5	Active Transportation Challenges / Competitions	Work with schools to develop a Golden Sneaker Challenge between classrooms at each school during Walk to School Day. Expand the challenge to be community wide (between each school) within three years.	All	$	Near

Table E-7. Engagement Recommendations

Theme	Project Number	Type	Description	Schools	Cost	Priority Timeframe
School Zone Engagement	SZ-1	School Speed Zone Engagement	Increase SRO or police presence in school zones during morning and afternoon peak periods to increase enforcement of School Zone laws. Key areas of focus are MTES (prohibiting left-out turns), FES (prohibiting left-out turns & speeding), and ASES (Speeding)	All	$$	Near
	SZ-2	School Speed Zone Task Force	Collaborate with local law enforcement and CCSD to develop a School Speed Zone task force. The task force would conduct intermittent and Nearly visible School Speed Zone engagement programs at each study school throughout the school year.	All	$$$	Medium
	SZ-3	Mobile Speed Feedback Trailers	Work with Carson City Sheriff's Office to place mobile speed feedback trailers on school routes at the beginning of the school year and following extended holiday breaks.	All	$	Long

Table E-8. Equity Recommendations

Theme	Project Number	Type	Description	Schools	Cost	Priority Timeframe
Equity	N/A	Equitable Program of Projects	All engineering projects were evaluated through the prioritization process based on the benefit provided to economically disadvantaged areas. Projects providing direct benefits to these locations were assigned additional points during prioritization. It is recommended that projects be implemented based on priority ranking, as possible, in order to deliver an equitable program of projects.	All	-	-

Table E-9. Program Evaluation Recommendations

Theme	Project Number	Type	Description	Schools	Cost	Priority Timeframe
Program Evaluation	PE-1	Student Hand Tallies	Conduct hand tallies of how students arrived to and will depart from school during a two to three day period twice a year.	All	$	Near
	PE-2	Parent Surveys	Conduct surveys of parents regarding how their child got to and from school and basic demographic information. It is recommended that this be conducted periodically, potentially every three years.	All	$$	Long
	PE-3	Program Report Card	Develop Safe Routes to School Report Card which will be used to celebrate program successes and identify the impacts of program implementation as possible. This report card should be conducted every three years in order to assess benefits of implementation.	All	$	Medium

1. Introduction

The Carson City Safe Routes to School Master Plan provides recommendations to improve safety for students walking and biking to the six public elementary schools and two public middle schools in Carson City with a secondary goal of increasing bus ridership and safety to and from bus stops. This Plan lays out a clear vision for improving walking and biking to school for years to come while being adaptive to future school boundary changes. This Plan includes a prioritized list of infrastructure improvements around schools and programmatic recommendations for the City and Carson City School District that can help improve the safety of school-aged children and their families as they travel to and from school.

What is Safe Routes to School?

A Safe Routes to School (SRTS) Plan provides a variety of multi-disciplinary programs aimed at both **increasing the number of students walking and bicycling to school and reducing the number of vehicle trips** associated with school travel. The Plan is intended to improve traffic safety and air quality around school areas, and address childhood obesity and public health issues through education, encouragement, increased engagement, and engineering. SRTS efforts are led by partnerships among municipalities, school districts, community members, parent volunteers, and law enforcement agencies. As a result, the projects and programs are designed to make walking and bicycling for the school commute more desirable and safer transportation options.

The Six E's Approach

Comprehensive SRTS programs use five complementary strategies, referred to as the "Five E's." This Plan considers a sixth 'E', Equity, as an integral component:

• **Engineering** – Design, implementation, and maintenance of infrastructure that improves safety along school commute routes.

• **Education** – Outreach and lessons that teach students and parents traffic safety skills and the benefits of active travel modes.

• **Encouragement** – Events, clubs, and activities that encourage more walking, bicycling, or carpooling through fun activities and incentives.

• **Engagement** – Strategies to deter the unsafe behavior of drivers, bicyclists, and pedestrians, and encourage all road users to obey traffic laws and share the road.

• **Equity** – An assessment of the distribution of funding / implementation for bicycling and pedestrian programs, policies, and infrastructure improvements, and whether that distribution is appropriate.

• **Evaluation** – Surveys and hand tallies track progress toward program goals, assess successes, and identify ways to improve programs

Why is a SRTS Program Important?

Although most students in the United States walked or biked to school pre-1980's, the number of students walking or bicycling to school has seen a sharp decline. This is due to several factors, including urban growth patterns, school siting requirements that encourage school development in outlying areas, budget cuts that force expanded enrollment boundaries, increased traffic, and parental concerns about safety.

The situation is self-perpetuating. More parents driving their children to school increases traffic at the school site, resulting in concerns about traffic and more parents driving their children to school. A 2005 Centers for Disease Control and Prevention (CDC) survey cited distance and traffic-related danger as the biggest barriers for walking and biking to school, as shown in **Exhibit 4**.

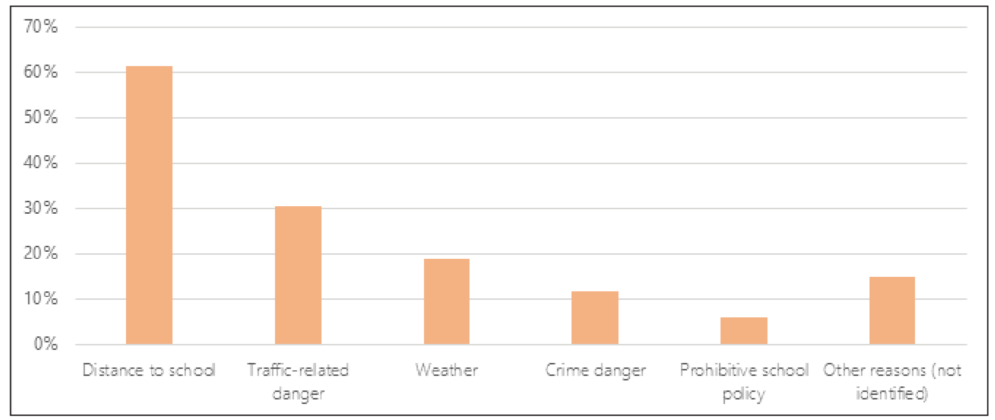


Exhibit 4. Parent reported barriers to school-aged children walking/biking to school (CDC, 2004)

(Source: Centers for Disease Control and Prevention. Barriers to Children Walking to or from School- United States, 2004. MMWR 2013; 54(38):949-952. Available at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm5438a2.htm)

Benefits of a SRTS Program

SRTS programs directly benefit school children, parents, and teachers by creating a **safer travel environment** near schools and **reducing motor vehicle congestion and related air pollution** at school drop-off and pick-up zones. SRTS programs have proven results. SRTS education and encouragement programs have been shown to result in a 25 percent **increase in walking and biking** in as little as five years.

Neighborhoods around schools can enjoy **calmer streets and improved infrastructure.** Students who choose to walk, bike, or ride a scooter are rewarded with the **health benefits** of a more active lifestyle and a **sense of independence.** Walking and bicycling at an early age can form life-long habits for improved health over the long term. People who walk or bike in groups, carpool, or take the bus can build **stronger social bonds** with fellow students and have options for traveling without their parents. Families learn that walking, biking, and ridesharing can be safe, enjoyable, and good for the environment.

SRTS programs help **integrate physical activity into the everyday routine** of school students. Since the mid-1970s the number of children who are overweight has roughly tripled from five percent to almost seventeen percent. Health concerns related to sedentary lifestyles have become the focus of statewide and national efforts to reduce health risks associated with being overweight. Children who walk or bike to school have an overall **higher activity** level than those who are driven to school, even though the journey to school makes only a small contribution to activity levels. Since SRTS efforts also tend to deepen relationships among community members and between parents and law enforcement officials, safety benefits can extend beyond school travel into issues such as greater public safety and neighborhood cohesiveness.

SRTS programs typically benefit the greater community as popular school routes are frequently shared with members of the general public. Like other vulnerable populations in our community, such as older adults, children often walk and bike at slower speeds, have lower visual acuity, and are less able to negotiate traffic conflicts. Thus, designing safer crossings, well-built sidewalks, and traffic calming strategies to help make walking and bicycling safer for students in turn **helps create facilities more accessible for people of all ages and abilities.**

Carson City & Safe Routes to School

This is the first comprehensive Safe Routes to School Master Plan developed for Carson City. As the first, this Plan builds on existing bicycle and pedestrian school safety initiatives and establishes the aspirational vision for increasing walking and biking to school among school-aged children and their parents across Carson City for years to come. The primary focus of this Plan is improving walking and biking within one mile of the six public elementary and two public middle schools in the City, however, many of the recommendations included in this Plan would benefit the larger community, particularly senior citizens, people with disabilities, and those unable to drive a car.

Developing the Plan

This Plan was developed following coordination with the Task Force Committee including staff from all study schools and the school district, principals, School Resource Officers, Crossing Guards, volunteers, parents, Carson City School District Risk Manager, and others along with Carson City Public Works representatives. The project team conducted in-person site assessments and met with school staff at each of the eight study schools in order to assess existing mode shares and travel patterns as well as identify any infrastructure or programmatic needs. Each site assessment included the use of an aerial drone which captured high-quality video footage of the peak pick-up and drop-off activities surrounding each school, as shown in **Exhibit 5**. Viewing pick-up and drop-off periods from this vantage point greatly assisted with identification of travel patterns, pinchpoints, and overall circulation.

The findings from site assessments and meetings with school staff are supplemented by results from surveys of parents and the public at all eight schools and middle school students at both study middle schools. Full survey results are included in **Appendix A**. Based on survey results, the largest issues affecting student commutes to and from school, other than weather and distance, are the safety of intersections and crossings, the speed of traffic along their route, and the presence & quality of sidewalks or paths along their route. Prioritized recommendations, included in the Recommendations chapter, focus on improving these three major factors.

Future School Boundary Considerations

As the population of Carson City changes, so too will the number of elementary and middle schools and their respective boundaries (shown in **Figures 1 & 2**). Two near-term projects that would affect the existing school boundaries include a planned expansion of Eagle Valley Middle School and a new elementary school on the south side of Carson City.

As school boundaries are redrawn, special attention should be placed on minimizing the number of students who would need to cross any corridors with high speeds, high volumes, and a history of high pedestrian and bicyclist crashes (see Table 1 on page 2-2). Parents are more likely to allow their child to walk or bike if they do not need to cross major roadways. Additionally, minimizing the geographic size of a school boundary to the extent possible should be given close consideration as school boundaries are adjusted.

The total geographic size of a school boundary has a unique impact on the proportion of students walking or biking to school. In the case of schools with small school boundaries (Mark Twain & Empire Elementary), the majority of students live within a 1-mile radius of the school and are therefore more likely to walk or bike to school. Additionally, small school boundaries are less likely to include major roadways that a student would need to cross. In contrast, schools with large school boundaries, such as Fremont Elementary, create situations where a majority of students live over 1-mile away from the school and must be either driven by a parent or use a school bus. By creating school zones that minimize the proportion of students living over 1-mile away, the Carson City School District may be able to reduce the total number of bus routes, bus stops, and operating costs.

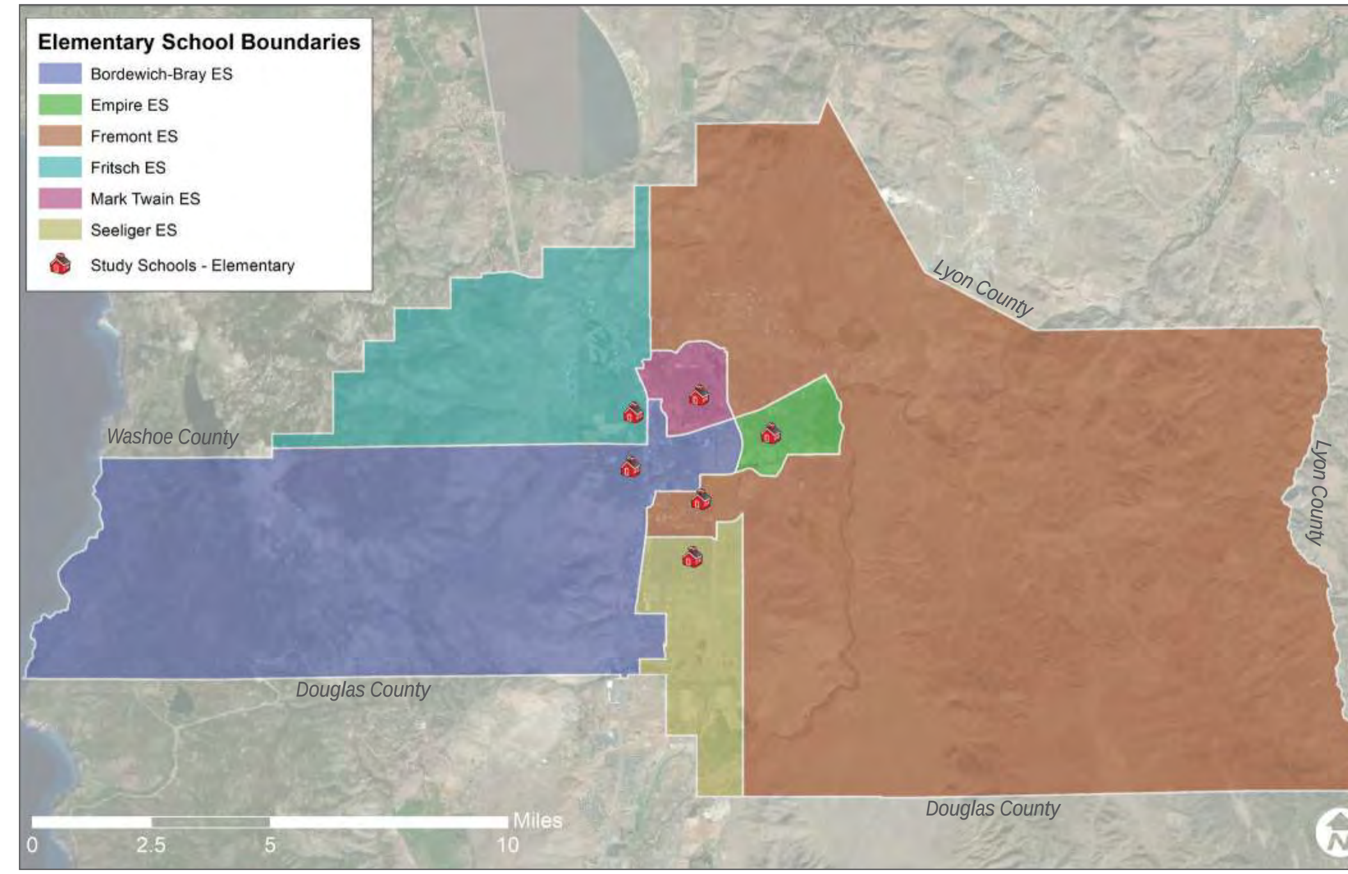


Figure 1. Study Elementary School Boundaries

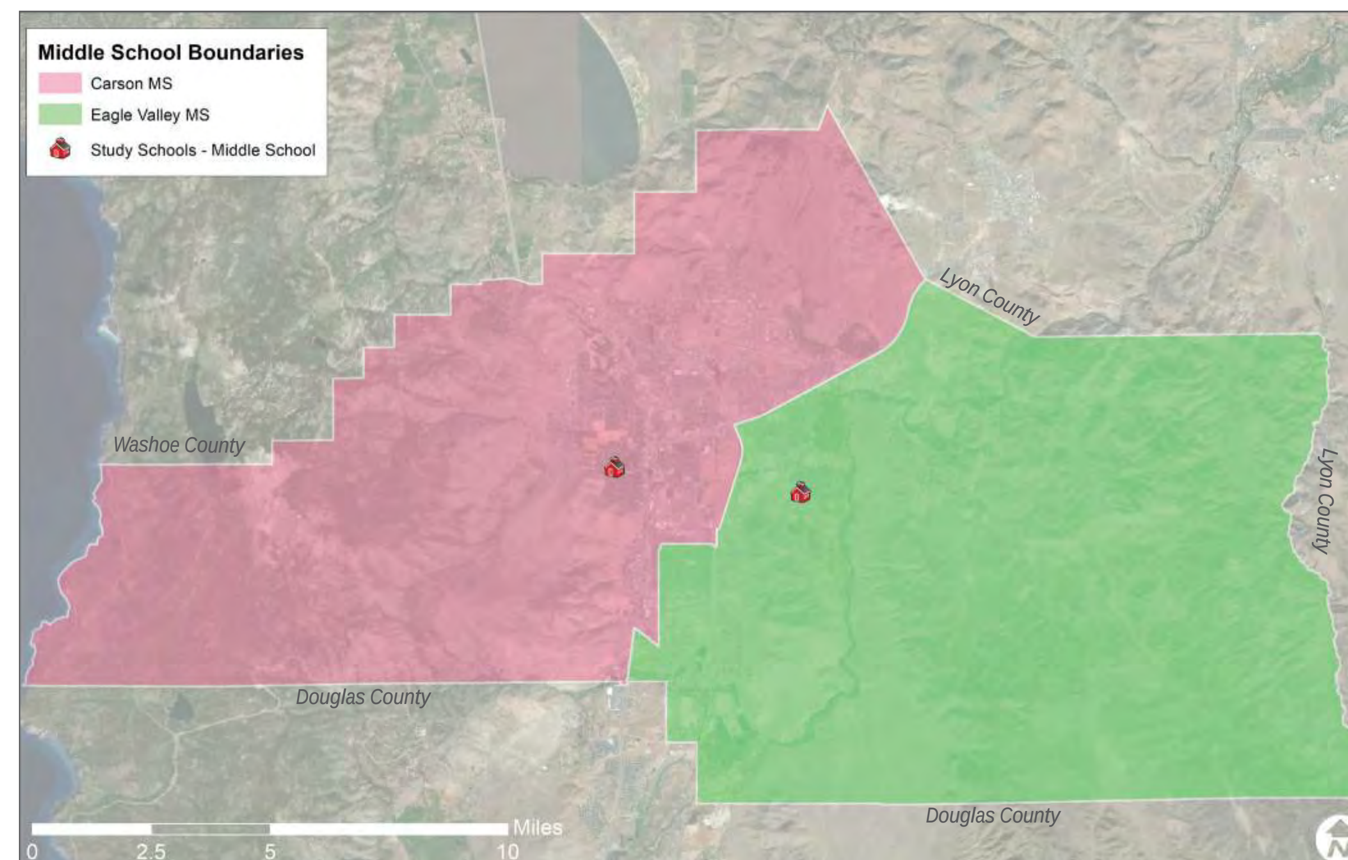


Figure 2. Study Middle School Boundaries

Exhibit 5. Capture of drone video from Eagle Valley Middle School afternoon pick-up shows circulation patterns for all modes near EVMS.

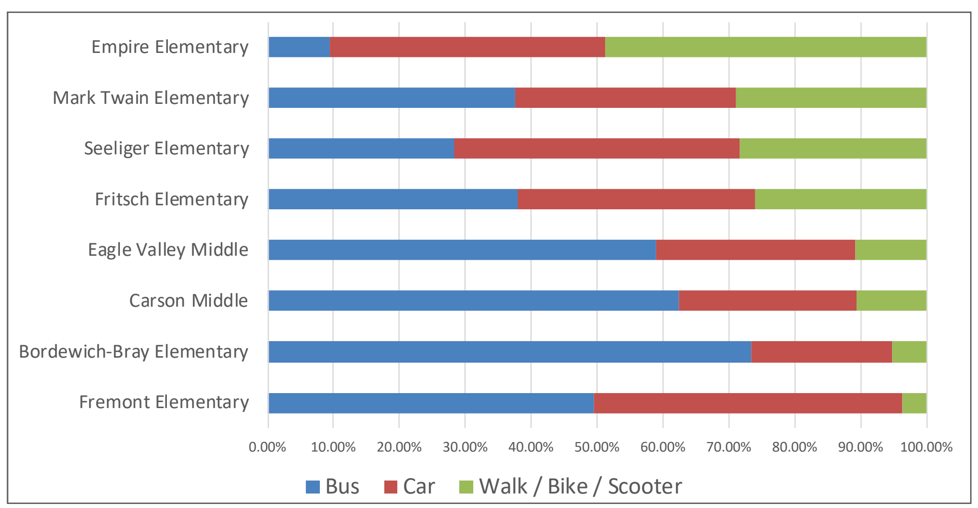
2. Existing Conditions

This chapter provides a summary of the existing conditions across all eight schools with more detailed information about each individual school in the subsequent school profiles.

Existing Walking & Biking Levels

Based on data collected from the aerial drones in conjunction with bus ridership data from the Carson City School District, the estimated percentage of students walking and biking to school at Empire, Fritsch, Seeliger, and Mark Twain Elementary Schools already exceeds the national average of 13 percent (**Figure 3**). Carson Middle School and Eagle Valley Middle School were both estimated to be just under the national average with 11 percent of students walking/biking to school. The total percentage of students walking/biking to school at Bordewich-Bray Elementary School is estimated at 5 percent. This low level of walking/biking compared to other schools in the area is likely due to the fragmented sidewalk network adjacent to the school. Fremont Elementary School was estimated to have the lowest level of walking and biking at 4 percent, which is due in large part to its expansive school boundary. As shown in **Figure 1**, the Fremont school boundary covers the largest portion of Carson City and includes major roadway barriers such as Highway 50 and Interstate 580.

Figure 3. Estimated Mode Shares of Study Schools



Sidewalk Connectivity

The condition of the sidewalk network varies among the study schools. The existing sidewalk networks surrounding Mark Twain and Empire Elementary Schools are largely built-out and fully connected. Sidewalks surrounding the other six study schools have gaps on major north-south and east-west roadways to varying degrees, with the sidewalk network surrounding Bordewich-Bray Elementary School having the largest number of sidewalk gaps (**Exhibit 6**).

Rural Connectivity & Bus Stops

Some portions of Carson City are quite rural which presents unique challenges to creating strong alternative transportation connections for students to access their schools. While school bus stops are provided for these far-flung areas, students often face difficulties in accessing these stops due to a lack of sidewalks and high vehicle speeds along their route to the bus stop. By improving access to and increasing driver awareness of school bus stops, students from these areas may feel safer when traveling to and from their bus stops. This could result in a higher percentage of students riding the bus instead of being driven by a parent or guardian, which is a secondary goal of SRTS.

Exhibit 6. Sidewalk gap on Thompson Street in the Bordewich-Bray School Speed Zone

Bicycle Network Connectivity

The existing bicycle network in Carson City lacks connectivity which often prevents school-aged children from having a safe and direct connection to their school using dedicated bicycle facilities. Approximately half of the study schools have dedicated bicycle facilities directly adjacent to their campus, but due to the vehicle speeds, traffic volumes, and lack of physical separation from vehicles, children often do not feel comfortable using these facilities and parents do not feel comfortable allowing their children to use these facilities. Additionally, at some schools, vehicles picking-up and dropping-off students often park in the bike lane (see **Exhibit 7**) which forces bicyclists out into the roadway creating an increased risk of a vehicle-bicycle crash.

Exhibit 7. Bordewich-Bray drop-off activities often obstruct the bike lane on W. King Street near S. Iris Street

Education

Exhibit 8. Bicycles parked at Seeliger Elementary School

Safety Education

One of the six E's, Education is a major component of keeping students safe on their way to and from school. Ensuring that all users of the transportation system, not just parents and students, understand their role in protecting themselves and helping keep others safe is an ever-present challenge across the country, and it is no different in Carson City. During site visits to all eight study schools, the project team observed unsafe driver, pedestrian, and bicyclist behaviors from riding a bike on the wrong side of the road to drivers exceeding 15 mph and making U-turns in school zones.

Bicycle Safety Program

All six Carson City elementary schools conduct an annual Bicycle Safety Program as part of their Physical Education curriculum. This program has been teaching Carson City children how to be safe bicyclists and how to repair their own bicycles since the mid-1990's. As part of this program, 3rd, 4th, and 5th grade students typically receive one class period of in-class instruction along with one class period of experience riding a bicycle each year. The fleet of bicycles used for this program is maintained by the Carson City School District and rotates to each school based on the scheduling of the Bicycle Safety Program in their overall curriculum.

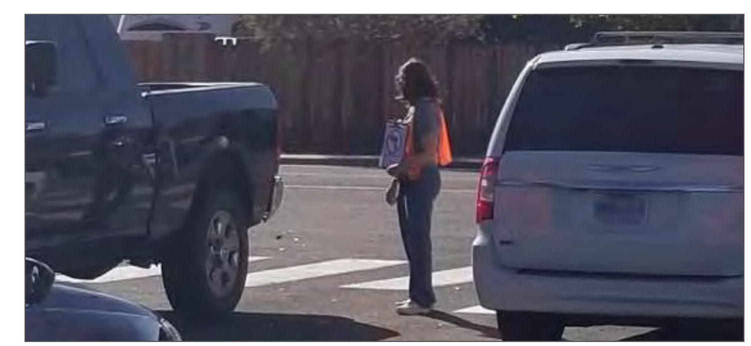


Exhibit 9. Fremont Elementary School staff member reminding drivers of prohibited left-turn during school zone periods

School Zones

A school zone is defined by NRS 484B.063 as "those sections of streets which are adjacent to school property." School zones have a 15 mph speed limit during designated periods of the day while children are traveling to and from school. In addition to a reduced speed limit, vehicles are prohibited from making U-turns and overtaking vehicles while in designated school zones. Some schools also have

Exhibit 10. Existing School Zone Signage in Carson City, NV

additional restrictions, for example, at Mark Twain Elementary and Fremont Elementary drivers are prohibited from making left-turns out of the primary pick-up/drop-off area during school hours. Based on vehicle speed data (see **Appendix D**) and site observations, school zone restrictions are often not observed by drivers. A higher level of engagement may help increase rates of compliance with school zone laws and turning prohibitions.

School Zone Standard

School zone signage and lane striping in Carson City varies from school to school. For example, signage alerting drivers to the timing of school zones may include a description of the timeframes in text or with a flashing beacon to indicate school zone timing (See **Exhibit 10**). The differences between school zones may result in confusion among drivers regarding the existence of a school zone. Creating a consistent look and feel for school zones may help make drivers more aware of school zones across Carson City. Furthermore, speed feedback signs in school zones do not currently alert drivers when they exceed the 15 mph speed limit during designated school zone periods.

Major Barriers

School Area Congestion

Schools typically create a very short but intense period of congestion on roadways surrounding the school campus. While this short burst of activity may feel chaotic to drivers, it is a typical condition of school sites. While the roadway network currently handles the traffic volumes around a majority of schools with only minor issues, traffic circulation issues were identified surrounding Mark Twain Elementary (see page **2-11**).

Exhibit 11. Carriage Crest Drive (looking south) is congested during afternoon pick-up periods. Vehicles waiting to enter the pick-up loop queue on Carriage Crest Drive in both the northbound and southbound directions and on Mountain Park Drive in the eastbound direction.

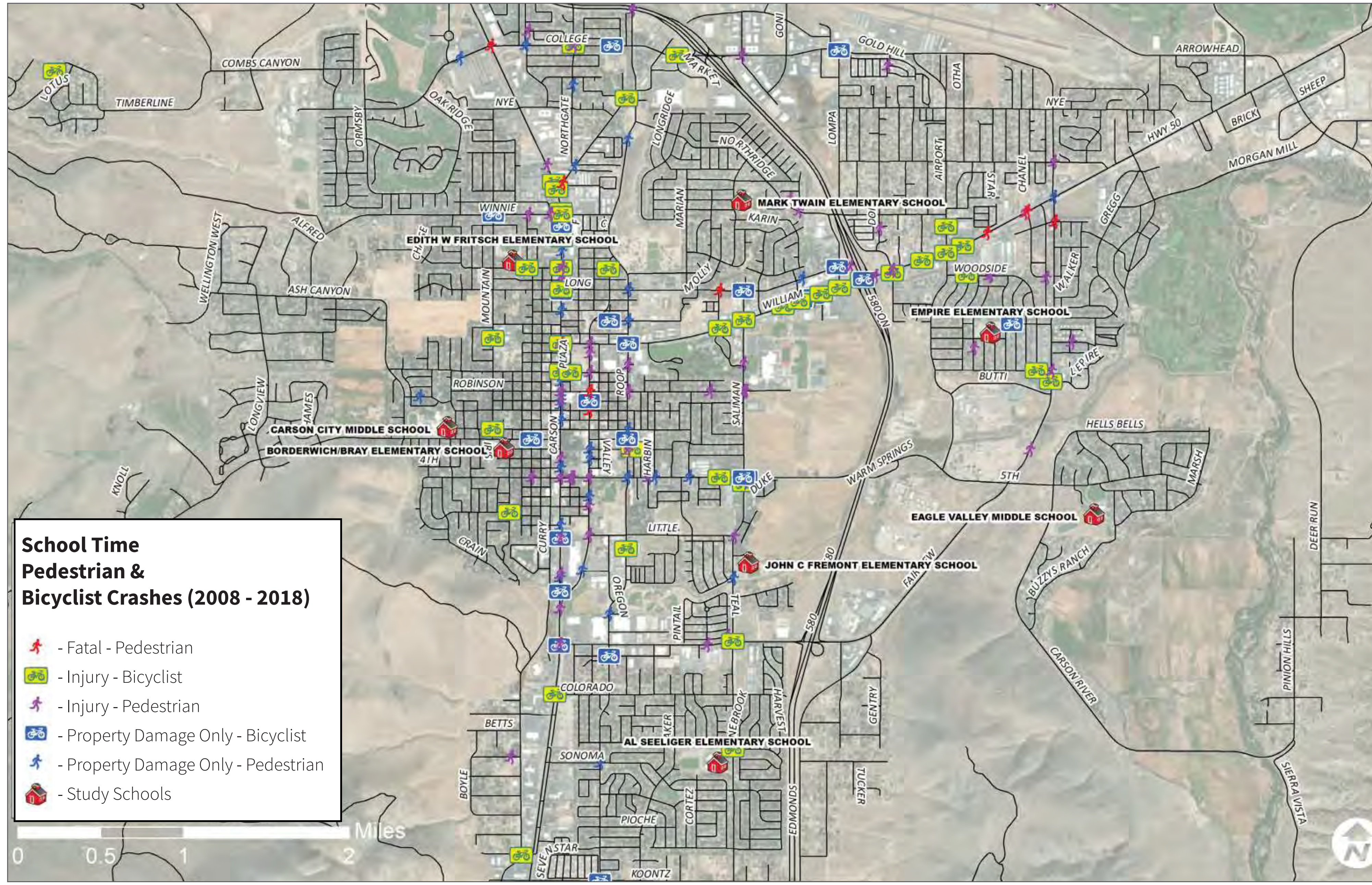


Figure 4. Pedestrian & Bicycle Crashes from 2008-2018 during School Zone Hours (7-9 am & 2-4 pm)

Corridor Crash History

It is typical for major roadways such as freeways and major arterials to act as barriers to pedestrian and bicycle travel due to grade separation, high traffic volumes, high speeds, and wider roadway widths for pedestrians and bicyclists to cross. Such roadways are not only daunting for many school-aged children, but often have a higher number of injury crashes than surrounding minor streets. Based on crash data collected from Nevada Department of Transportation (NDOT), a total of 213 crashes involving a pedestrian and/or bicyclist occured during school zone hours (7-9 am and 2-4 pm) from 2008-2018. The majority of crashes during this time frame occurred on ten streets shown in **Table 1**. Maps highlighting all crashes involving a pedestrian or bicyclist within a mile of each school are included in **Appendix E**.

Table 1. Top Ten Pedestrian/Bicyclist Crash Corridors During School Zones (2008 - 2018)*

Corridor	Crashes	Corridor	Crashes
1. Carson Street	45	6. W 5th St	10
2. William St/US50	25	7. Fairview Dr	9
3. S. Roop St	13	8. E. College Pkwy	6
4. S. Saliman Rd	12	9. SR 529	5
5. S. Stewart St	11	10. W. Robinson St	5

* See Appendix E for Contributing Factors, Severity and Crash Types associated with these corridors during school hours.

Existing Conditions: School Profiles

Bordewich-Bray Elementary

School Information

Bordewich-Bray Elementary School (BBES) is located at the intersection of Thompson Street and W. King Street in an established residential neighborhood on the west side of Carson City. As of 2019, there are approximately 630 students enrolled at the school with an estimated 5 percent of the student population walking or biking (**Figure 5**). The school campus is generally surrounded by residential land uses (**Appendix F**).

Parent Survey Results

As shown in **Figure 6**, the top three issues affecting parent's decisions to allow their children to walk or bike to school are the safety of intersections & crossings, speed of traffic along the route, and quality of sidewalks & pathways. Full survey results are included in **Appendix A**.

Vehicles

Parents dropping-off and picking-up students at Bordewich-Bray ES typically do so from Thompson Street, S. Iris Street, and on the south side of W. King Street near the playground entrance, as shown in **Figure 7**. Observed driver behaviors include making U-turns, parking in red-curbed areas near the Thompson Street crosswalk, and parents/guardians jaywalking with students across W. King Street.

Walking

Typical pedestrian travel patterns include routes with a crossing guard immediately adjacent to the school as shown in **Figure 7**. The majority of pedestrians use the crosswalks with crossing guards and in-road pedestrian safety signs (across W. King Street at Mountain Street and across Thompson Street at W. 2nd Street). As sidewalks have largely been constructed retroactively in this neighborhood, the sidewalk network lacks connectivity adjacent to the school (see **Figure 8**). There is a substantial gap in sidewalk on W. King Street between Thames Lane and Canyon Park Court that is a major barrier for students from the Highlands neighborhood off of Longview Way. Additionally, the school boundary includes portions of Carson City on the east side of Carson Street, a major pedestrian barrier, within one-mile of the school campus.

Bicycling

The bicycle lanes on W. King Street provide direct access to the Bordewich-Bray campus (see **Figure 8**); however, vehicles dropping off and picking up students often block the eastbound bike lane (see **Exhibit 12**) which forces bicyclists into the roadway or onto the sidewalk. The W. King Street bicycle lanes do not connect to any dedicated north-south bicycle facility.

Exhibit 12: The existing eastbound bicycle lane on W. King Street is often obstructed near the Iris Street intersection by vehicles picking-up and dropping-off BBES students.

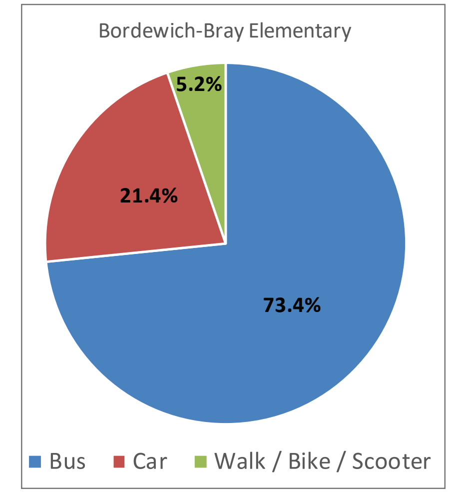


Figure 5. Mode Share (BBES)

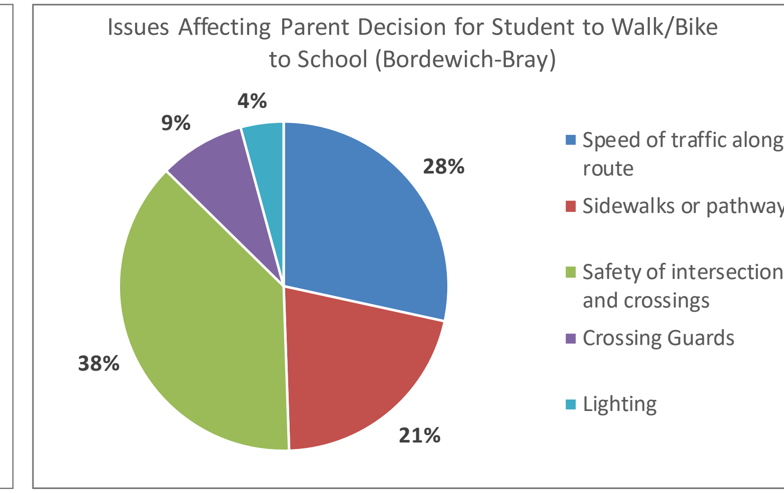


Figure 6. Main Walking / Biking Concerns from Parents (BBES)

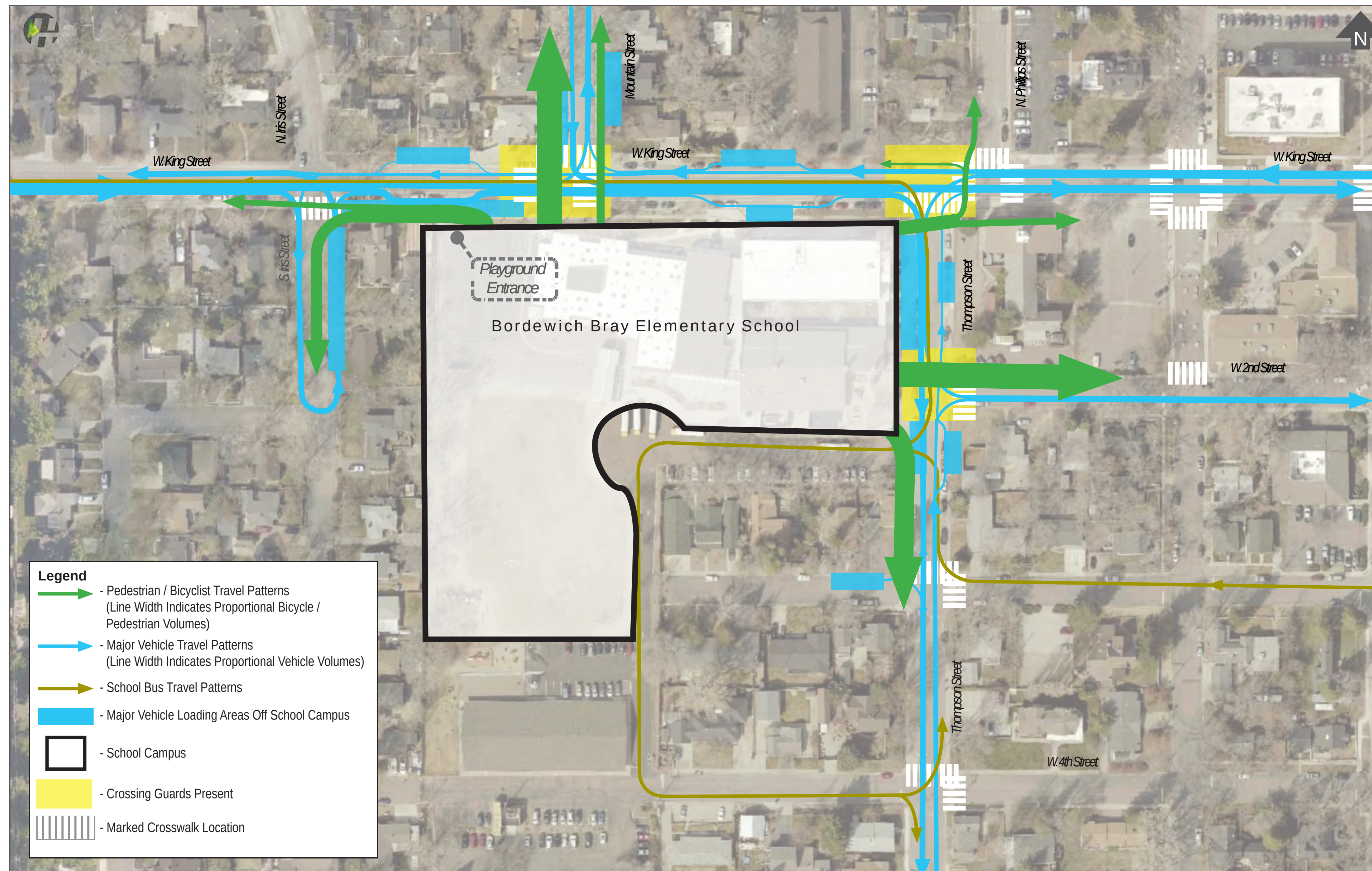


Figure 7. Primary Travel Patterns & School Circulation (BBES)

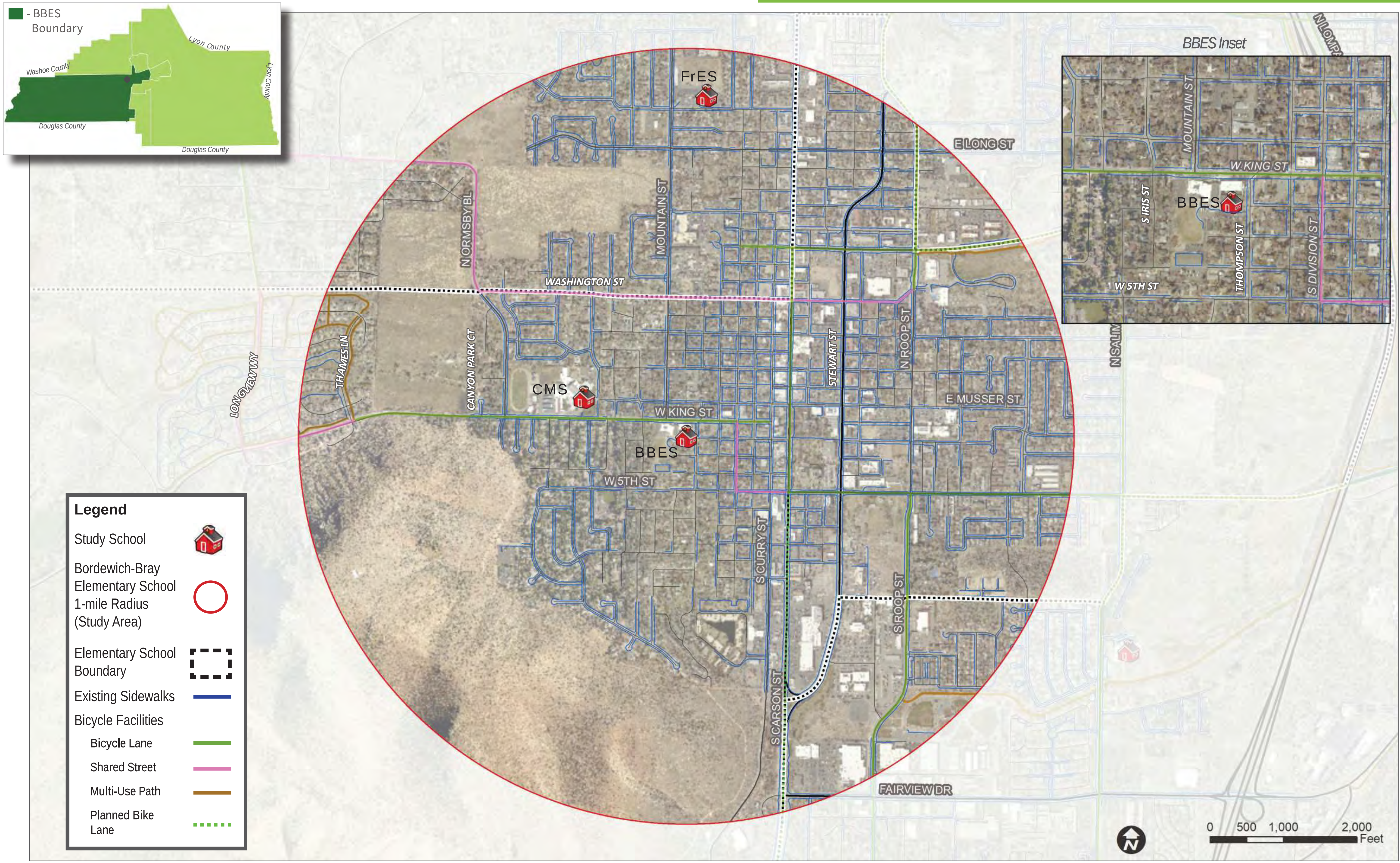


Figure 8. Existing Bicycle & Pedestrian Network (BBES)

Empire Elementary

School Information

Empire Elementary School (EES) is located between Gordonia Avenue, Stanton Drive, Monte Rosa Drive, and La Loma Drive in an established residential neighborhood on the east side of Carson City. Approximately 49 percent of the 660 students enrolled at the school walk or bike (**Figure 9**). The school campus is surrounded by residential land uses (**Appendix F**) and is adjacent to a local park to the north.

Parent Survey Results

As shown in **Figure 10**, the top two issues affecting parent's decision to allow their children to walk or bike to school are the speed of traffic along the route and safety of intersections and crossings. Full survey results are included in **Appendix A**.

Vehicles

Students are dropped off by parents from all sides of EES (**Figure 11**) with La Loma Drive, Monte Rosa Drive, and Gordonia Drive being the busiest areas. Observed driver behaviors include making U-turns, parking in crosswalks, and parents/guardians jaywalking with students across Gordonia Drive, La Loma Drive, and Monte Rosa Drive. Observed vehicle speeds on roadways adjacent to the school are generally not in excess of the 15 mph school zone speed limit with the exception of Fairview Drive. The 85th percentile speed of vehicles entering the school zone on Fairview Drive during the school zone period was found to be nearly 37 mph (**Appendix D**).

Walking

A significant portion of students currently walk or bike to and from EES due in large part to the high quality sidewalk network with minimal sidewalk gaps immediately surrounding the school. There are minor sidewalk gaps on Edmonds Drive, Brown Street, and in the neighborhood to the east of Fairview Drive (**Figure 12**). There is no marked crossing on Fairview Drive between Gordon Street and Pheasant Drive. Based on collected data, typical roadway speeds on Fairview Drive in this location are significantly above the posted 15 mph speed limit during school zone hours (**Appendix D**). Pedestrians and bicyclists enter and exit the school campus on all sides (**Figure 11**), with the northeastern access having the largest portion. The significant influx of pedestrians and bicyclists at the Monte Rosa Drive / Stanton Drive intersection is well-managed by the two crossing guards present at this location (see **Exhibit 13**).

Bicycling

There are no dedicated bicycle facilities providing direct access to the EES campus (**Figure 12**). Bicycle facilities on Airport Road and Lompa Lane are on the periphery of the school zone and do not provide connectivity from residential areas to the school campus, however, roadways in the area are typically low-volume with 25 mph speed limits.

Exhibit 13: Crossing guards at the intersection of Stanton Drive and Monte Rosa Drive handle a major influx of pedestrians following the school day. This intersection is the busiest intersection for pedestrian activity across all eight study schools.

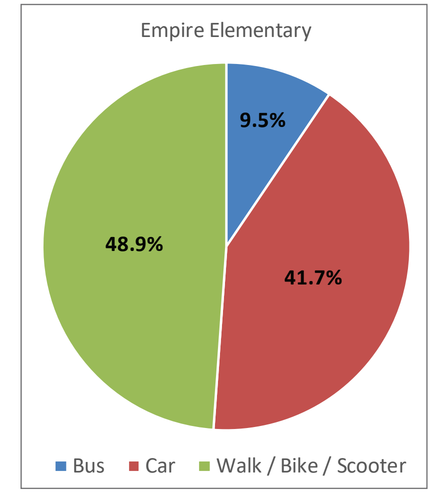


Figure 9. Mode Share (EES)

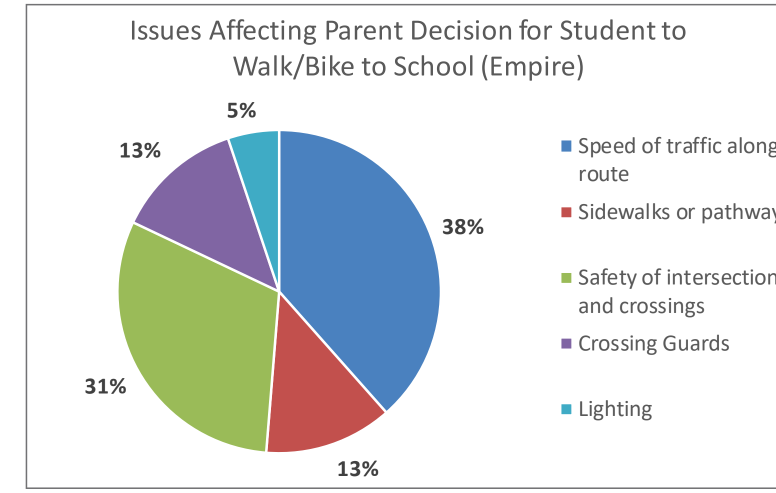


Figure 10. Main Walking / Biking Concerns from Parents (EES)

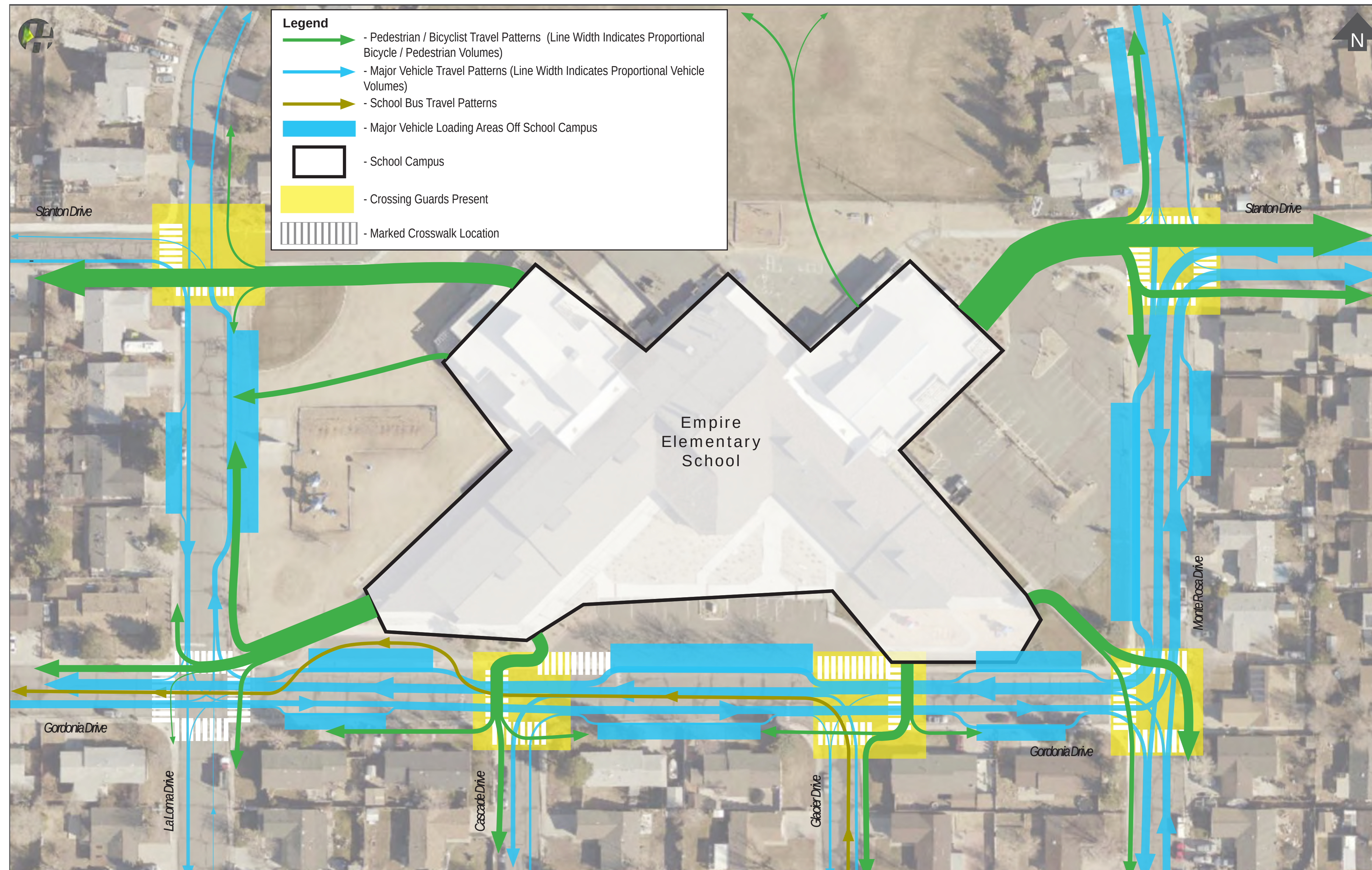


Figure 11. Primary Travel Patterns & School Circulation (EES)

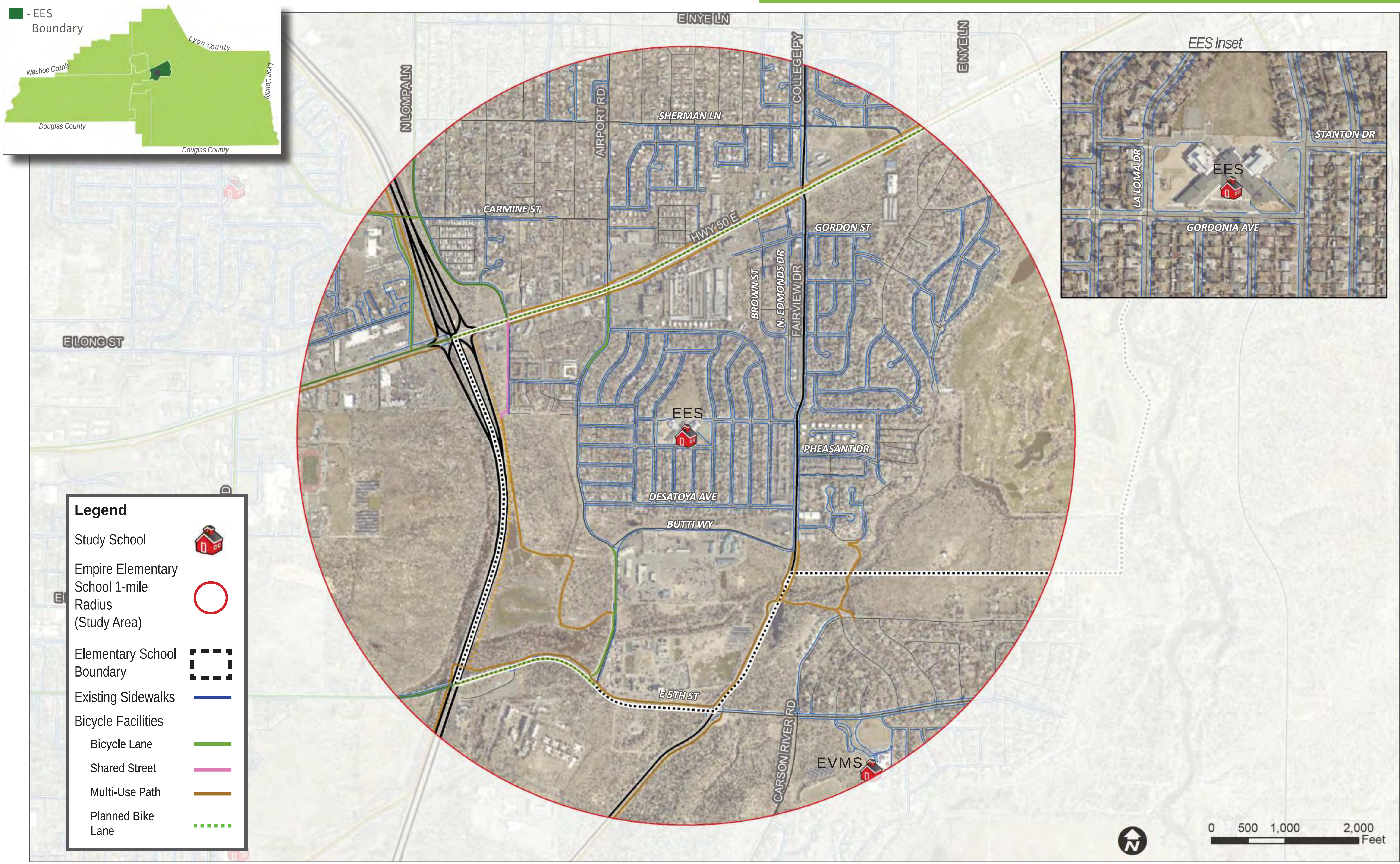


Figure 12. Existing Bicycle & Pedestrian Network (EES)

Fremont Elementary

School Information

Fremont Elementary School (FES) is located on Saliman Road between Firebox Road and Railroad Drive. Approximately 4 percent of the 600 students enrolled in the school walk or bike (**Figure 13**). The school campus is surrounded primarily by residential land uses to the north, south, and west with open space to the east (**Appendix F**).

Parent Survey Results

As shown in **Figure 14**, the top two issues affecting parents' decisions to allow their children to walk or bike to school are the traffic speeds along routes to school and a lack of safe intersections and crossings with the quality of sidewalks / pathways a distant third. Full survey results are included in **Appendix A**.

Vehicles

Students are primarily picked up and dropped off in the designated traffic loop off of Firebox Road with a small portion of parents parking on Cardinal Way and using the marked crosswalk to the south of the school (**Figure 15**). Vehicles waiting to pick-up were observed spilling back onto Saliman Road during the afternoon peak period. Vehicles were observed making left-turns off of Firebox Road during school zone hours despite being prohibited. Parked vehicles obscure the crossing guard from view of westbound vehicles on Firebox Road.

Walking

The majority of students travel to / from school by private automobile or school bus due to the size of the Fremont school boundary which encompasses nearly half of Carson City County. The majority of the school boundary is outside the walk zone and essentially inaccessible to students via walking or biking. Additionally the students who ride the bus often encounter sidewalk gaps or other pedestrian obstacles while reaching their bus stop.

Bicycling

FES is located on Saliman Road which has four vehicle lanes, a striped bike lane in each direction, approximately 6,400 average daily traffic (ADT), and a speed limit of 35 mph. This dedicated bicycle facility provides access to Fremont Elementary, but due to the roadway characteristics this facility may be too stressful or perceived as too dangerous for a child to navigate. The separated multi-use trail (California Trail) located immediately south of the school provides a safe and comfortable bicycle facility for children to use, however this facility does not connect to some of the residential areas zoned for Fremont (see **Exhibit 14**).

Exhibit 14: The existing multi-use path south of FES is a great resource which could be better utilized with improved connectivity to proximate residential neighborhoods.

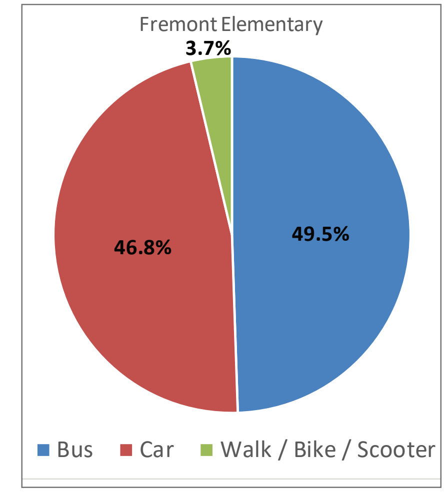


Figure 13. Mode Share (FES)

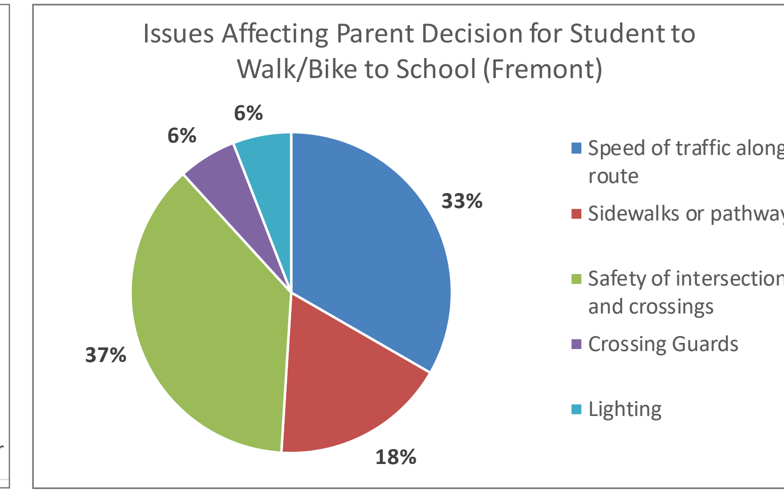


Figure 14. Main Walking / Biking Concerns from Parents (FES)

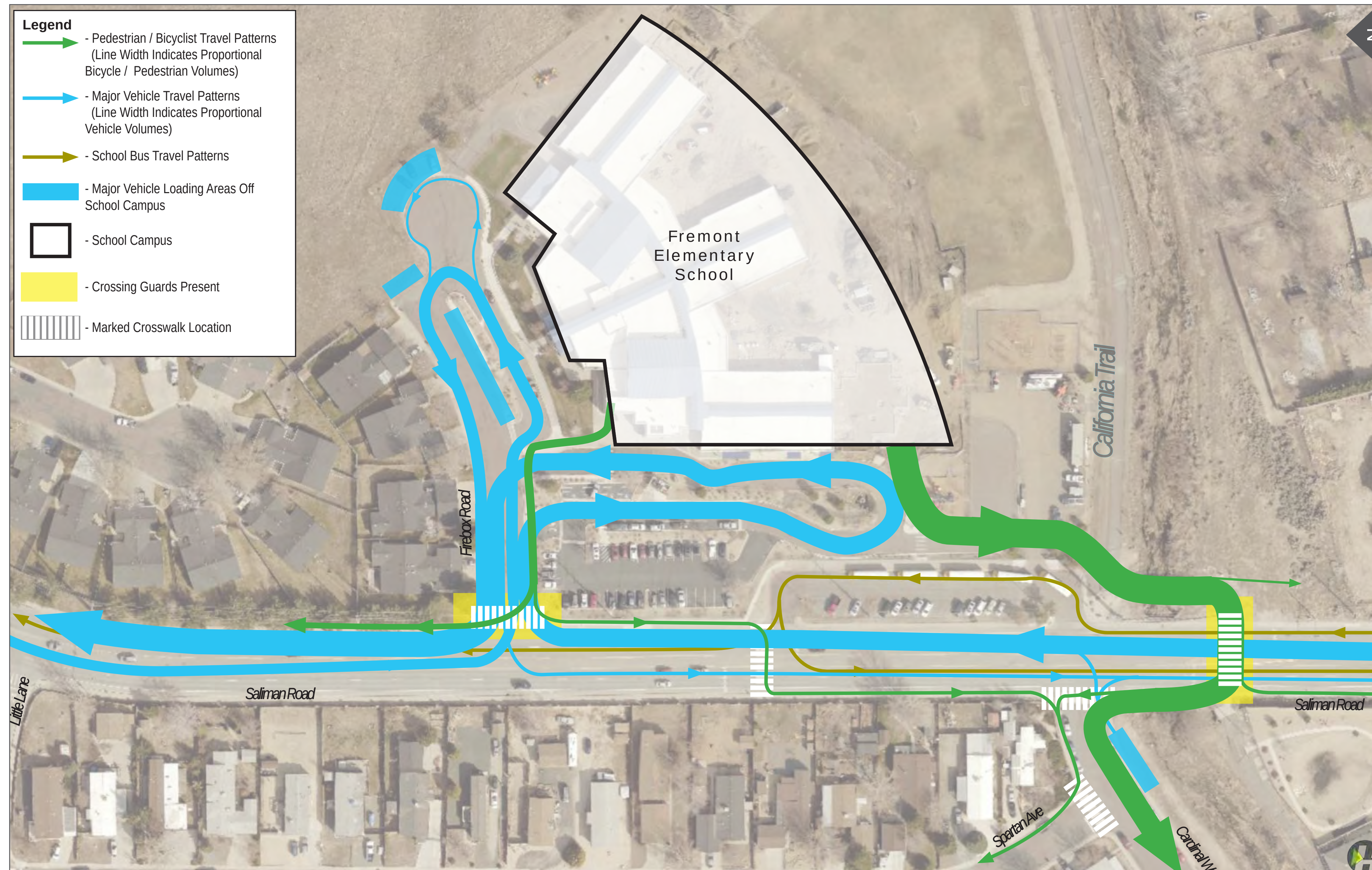


Figure 15. Primary Travel Patterns & School Circulation (FES)

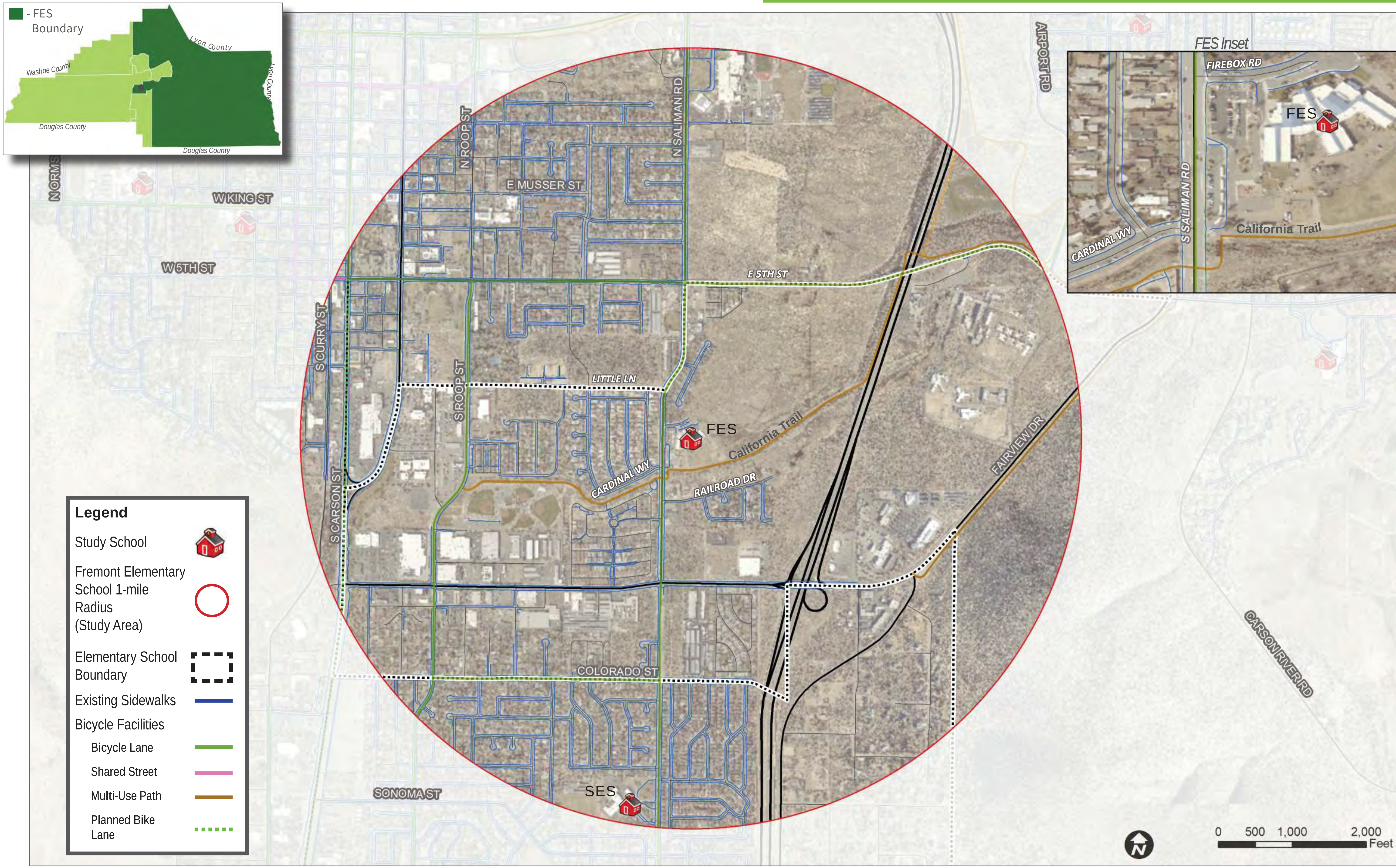


Figure 16. Existing Bicycle & Pedestrian Network (FES)

Fritsch Elementary

School Information

Fritsch Elementary School (FrES) is located on Bath Street between Mountain Street and Division Street. Approximately 26 percent of the 610 enrolled students walk or bike to school (**Figure 17**). The school campus is surrounded by residential neighborhoods with Carson Street, a major commercial corridor, approximately 1,000 feet to the east (**Appendix F**).

Parent Survey Results

As shown in **Figure 18**, the top three issues affecting parents' decisions to allow their children to walk or bike to school are the safety of intersections and crossings, traffic speeds along routes to school, and the quality of sidewalks and pathways. Full survey results are included in **Appendix A**.

Vehicles

Based on collected data, drivers typically adhere to the 15 mph school zone speed on Bath Street with the average speed identified as 15 mph, however some drivers were observed exceeding this limit. Drivers making U-turns were observed throughout the FrES school zone during both morning and afternoon periods. The primary pick-up/drop-off location on the southeast side of the school also includes staff parking which may reduce the capacity of the pick-up/drop-off loop. Students are also picked-up/dropped-off on the south side of Bath Street (**Figure 19**) which results in a large number of parents/guardians jaywalking with their children. Sightlines from the primary pick-up/drop-off exit are obstructed by vehicles parked along Bath Street too close to the driveway.

Walking

A large portion of FrES students walk or bike to school each day. As shown in **Figure 19**, the majority of pedestrians travel east on Bath Street with a large portion of students using the marked crosswalk at Division Street to cross Bath Street. Crossing guards are present at the Bath Street / Mountain Street intersection and the Bath Street / Division Street intersection (see **Exhibit 15**). The sidewalk network in the school walk zone is fairly well connected, however there are sidewalk gaps on major east-west and north-south routes immediately surrounding the school, including on Bath Street, Division Street, Mountain Street, Long Street, Carson Street, and Winnie Lane (**Figure 20**). Curb ramps are missing at multiple crosswalk locations in the area including the crosswalk directly in-front of the FrES building.

Bicycling

FrES does not currently have dedicated bicycle facilities in the vicinity that provide direct access to the school campus (**Figure 20**). The closest dedicated bicycle facility to the school is located on William Street, approximately a half mile away.

Exhibit 15: A crossing guard assists children across Bath Street at Division Street, near Fritsch Elementary School.

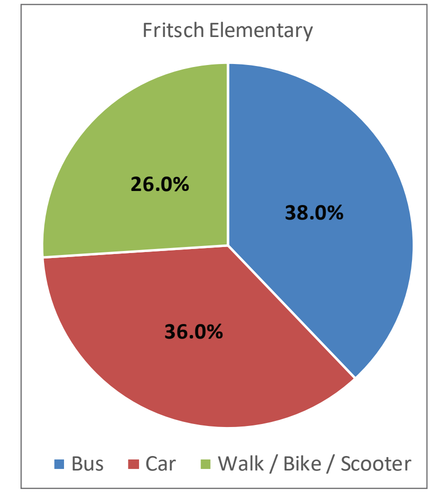


Figure 17. Mode Share (FrES)

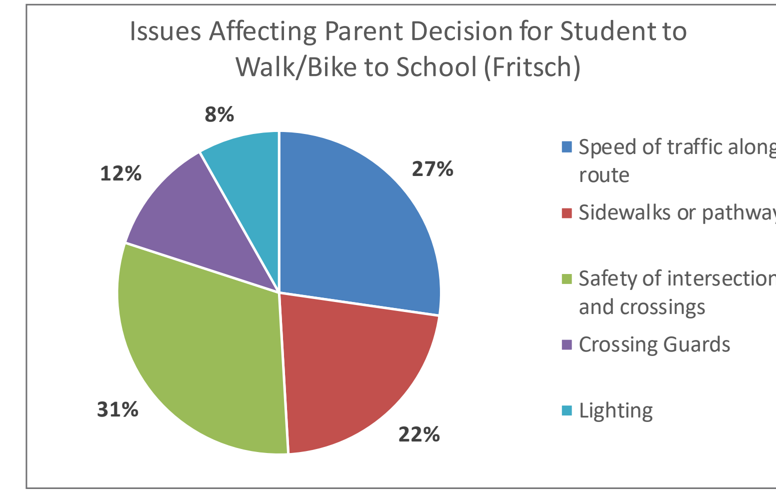


Figure 18. Main Walking / Biking Concerns from Parents (FrES)

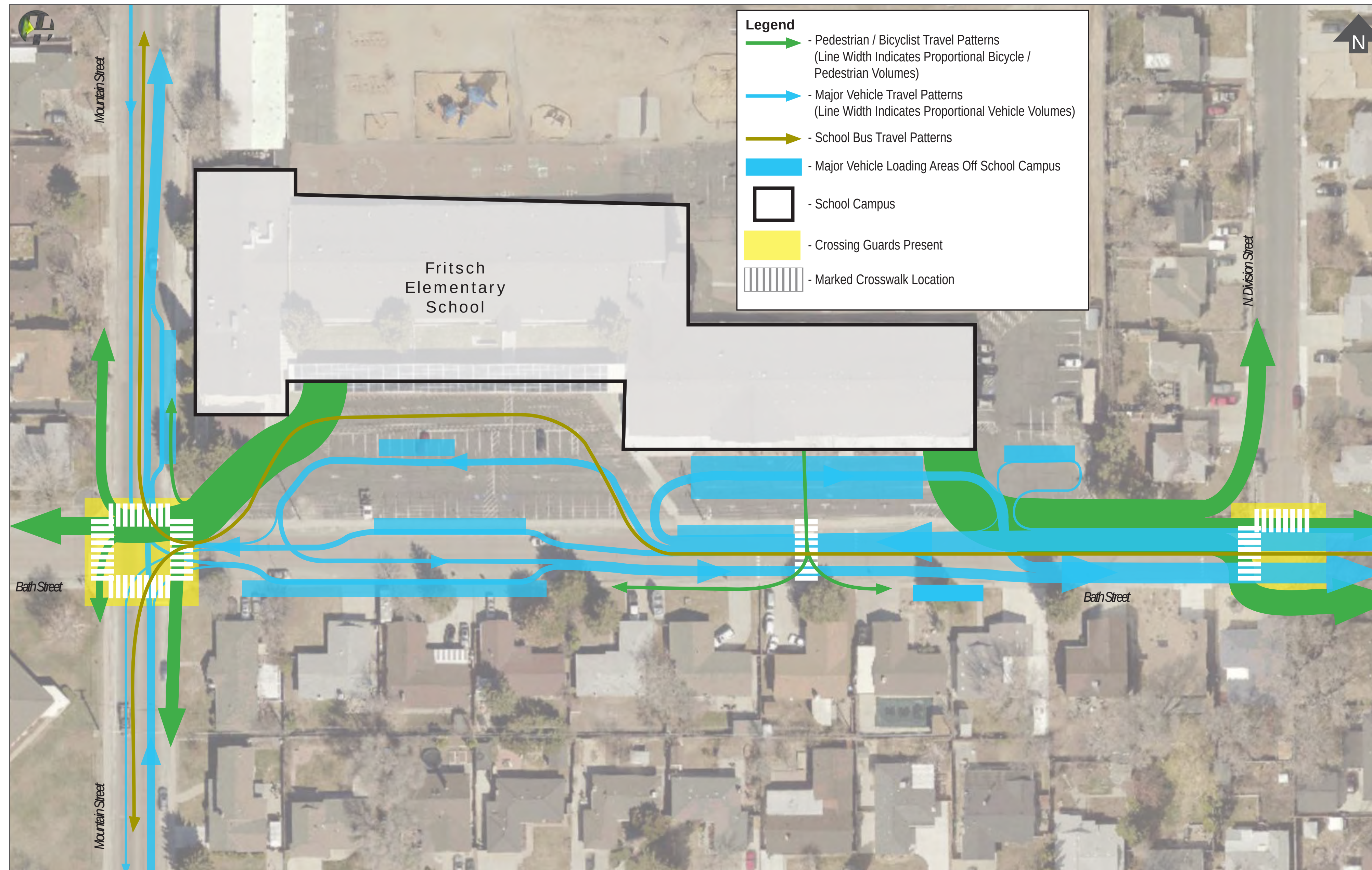


Figure 19. Primary Travel Patterns & School Circulation (FrES)

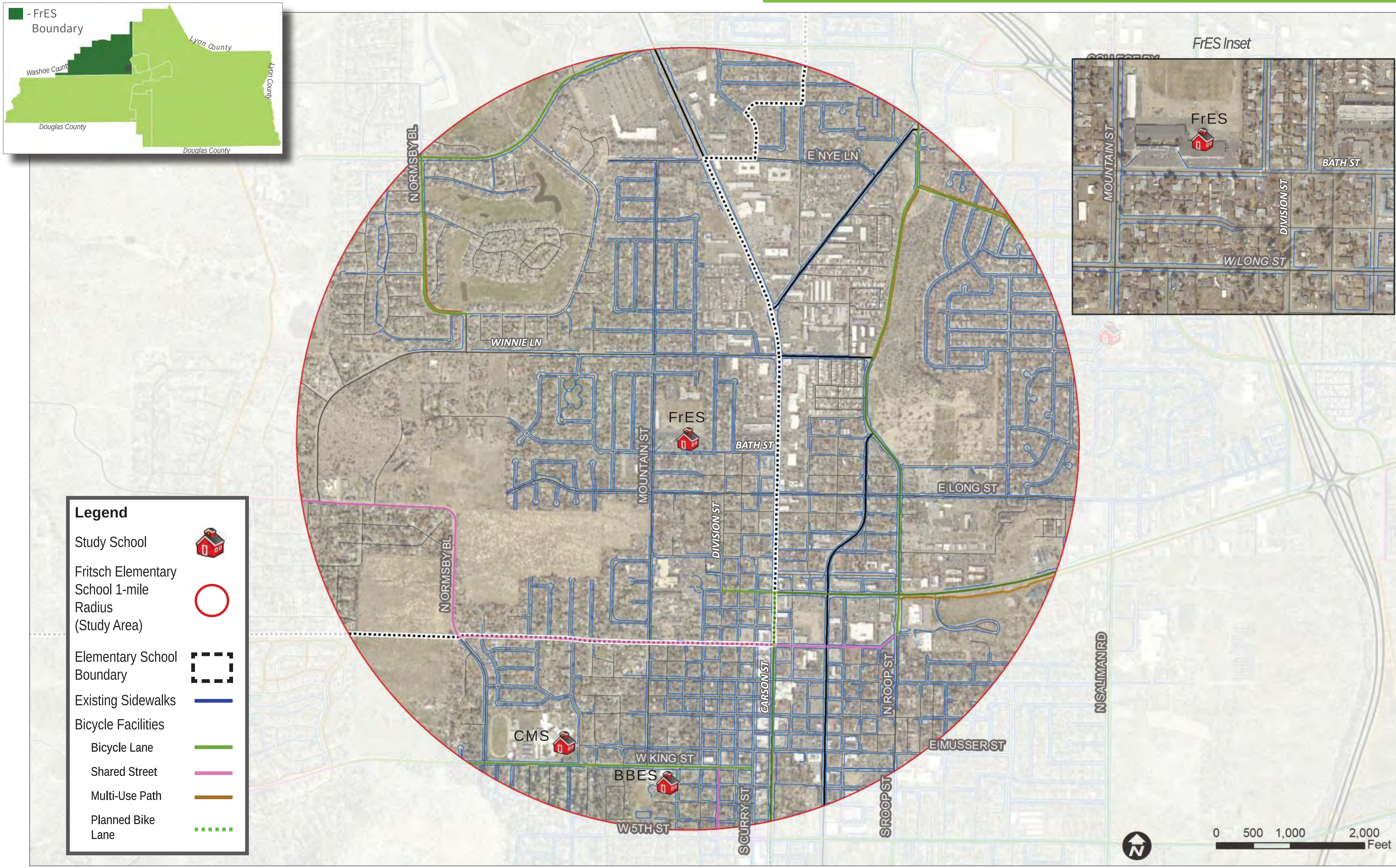


Figure 20. Existing Bicycle & Pedestrian Network (FrES)

Mark Twain Elementary

School Information

Mark Twain Elementary School (MTES) is located on Carriage Crest Drive between Spooner Drive and Hamilton Avenue. Approximately 29 percent of the enrolled 600 students walk or bike to school (**Figure 21**). The school campus is surrounded by a residential neighborhood with a commercial corridor along William Street (Highway 50) to the south (**Appendix F**).

Vehicles

Vehicle circulation surrounding the MTES campus is significantly affected by school traffic. During afternoon pick-up periods, vehicles queueing at the parent pick-up loop spill back into northbound and southbound traffic on Carriage Crest Drive as well as eastbound traffic on Mountain Park Drive. This creates a potentially dangerous condition for pedestrians crossing the street as vehicles traveling through the area have been observed weaving around stopped vehicles and into the opposing vehicle lane. Additionally, drivers were observed turning left out of the parent pick-up loop despite this movement being prohibited during school zone hours.

Parent Survey Results

As shown in **Figure 22**, the top issue overwhelmingly affecting parents' decisions to allow their children to walk or bike to school is the safety of intersections and crossings. The traffic speeds along routes to school were also a concern for over a quarter of respondents. Full survey results are included in **Appendix A**.

Walking

A large portion of MTES students walk or bike to school each day, due in part to the relatively small school boundary and well connected sidewalk network in the area. No major sidewalk gaps were identified in close proximity to the school, only minor sidewalk gaps were identified at the periphery of the school boundary. The crosswalk on Carriage Crest Drive at Mountain Park Drive is the most heavily utilized crosswalk in the area. The crosswalk on Carriage Crest Drive at Lindsay Lane appears to be the least utilized likely due to the lack of a crossing guard and faded markings.

Bicycling

MTES does not currently have dedicated bicycle facilities that provide direct access to the school (**Figure 24**). Bicycle lanes and a 8 foot wide sidewalk are located on Northridge Drive, just north of the school campus, which provides an east-west connection through the neighborhood.

Exhibit 16: MTES students on bicycles crossing Carriage Crest Drive at Slide Mountain Drive after school dismissal with the assistance of a dedicated crossing guard.

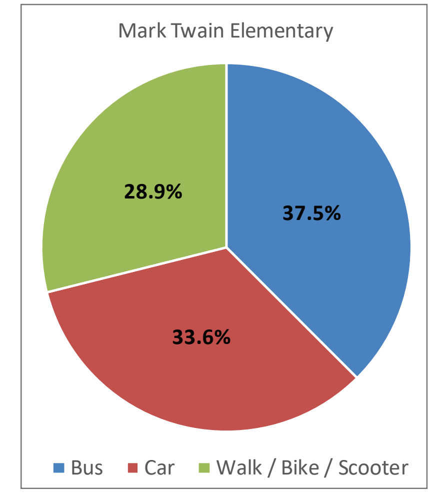


Figure 21. Mode Share (MTES)

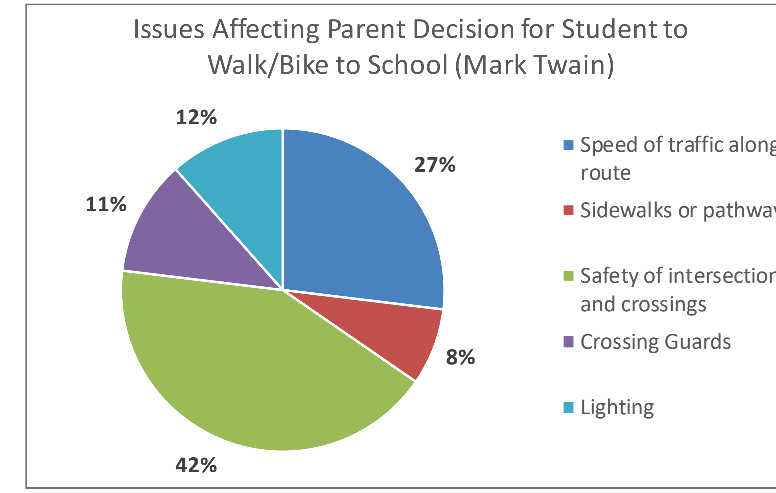


Figure 22. Main Walking / Biking Concerns from Parents (MTES)

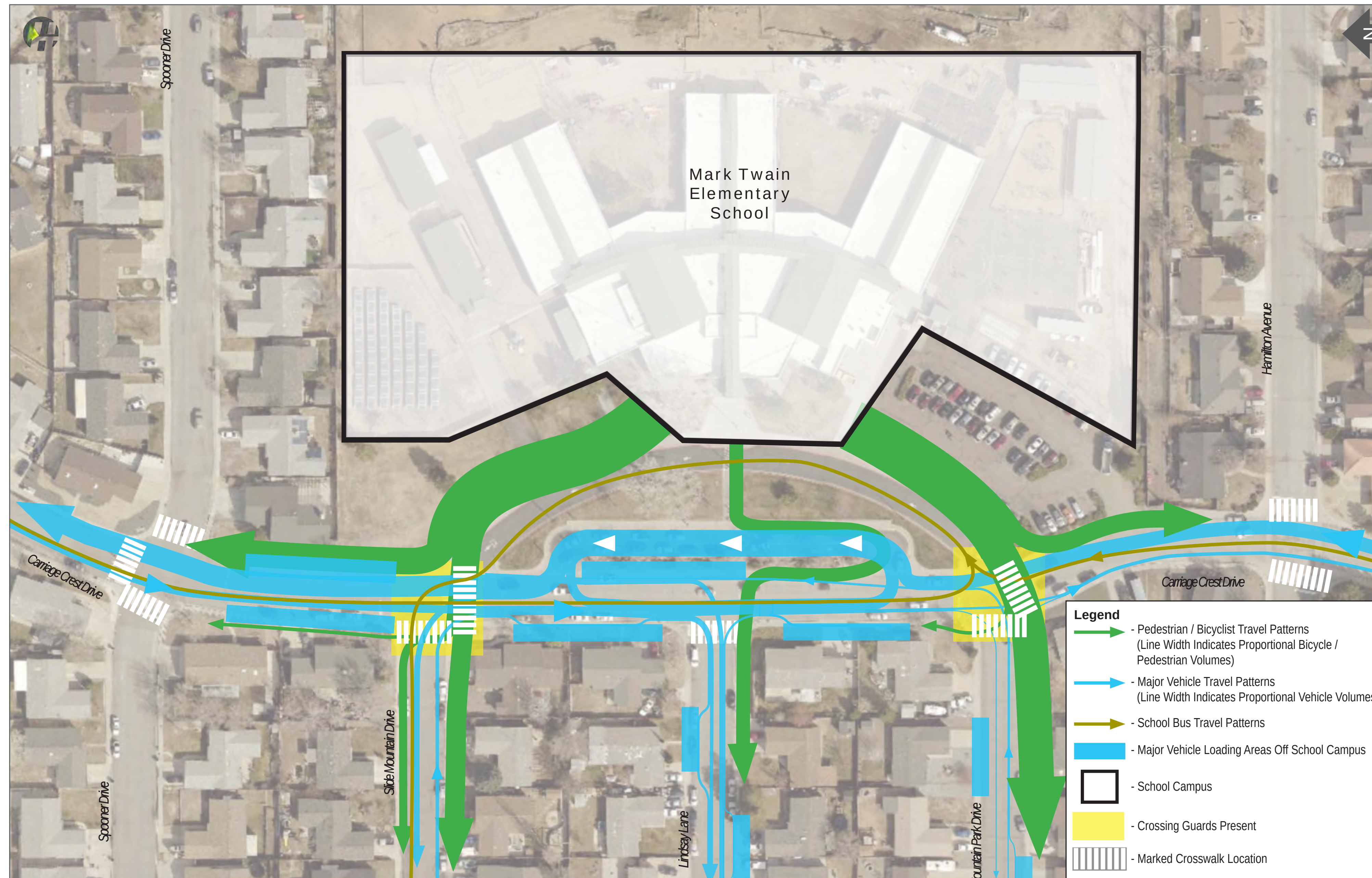


Figure 23. Primary Travel Patterns & School Circulation (MTES)

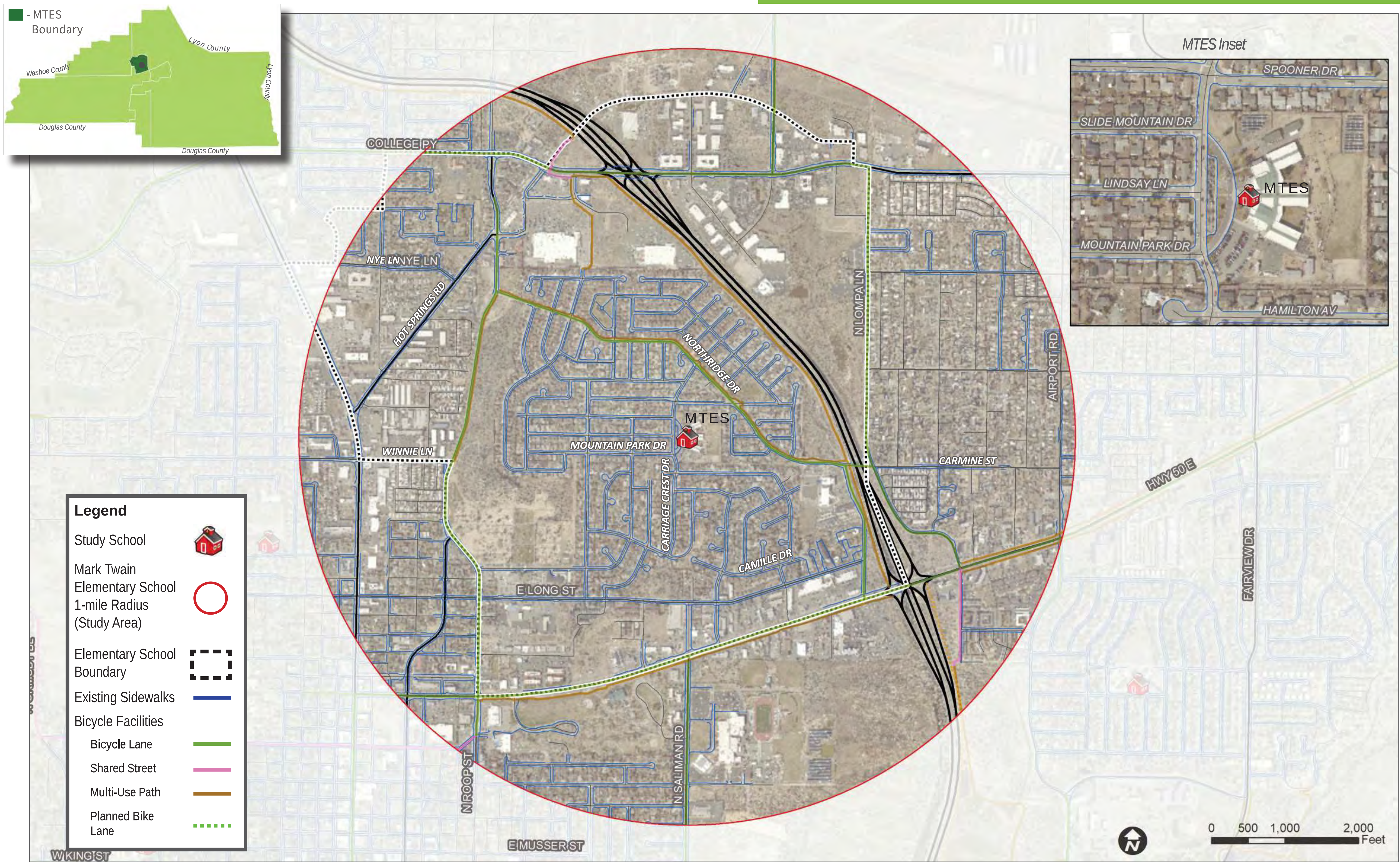


Figure 24. Existing Bicycle & Pedestrian Network (MTES)

Seeliger Elementary

School Information

Seeliger Elementary School (SES) is located on Saliman Road between Shady Oak Drive and Sonoma Street on the south side of Carson City. The school campus is surrounded by residential uses on all sides (**Appendix F**). Approximately 28 percent of the 550 enrolled students walk or bike to school each day (**Figure 25**).

Parent Survey Results

As shown in **Figure 26**, the top three issues affecting parents' decisions to allow their children to walk or bike to school are the lack of safe of intersections and crossings, traffic speeds along routes to school, and sidewalks and pathways. Full survey results are included in **Appendix A**.

Vehicles

Vehicle circulation on the SES campus generally works well with only minor issues. Pick-up and drop-off activities were observed in the bus loop on the northeastern side of the school, which is intended for buses only (**Figure 27**). The southern access loop has the greatest capacity and is the most well utilized. Southbound vehicles turning into the middle access loop were observed spilling back onto Saliman Road despite parking spaces being available. Students are also picked-up/dropped-off from Fremont Street and Cortez Street. Vehicles making U-turns and traveling in excess of the 15 mph school zone speed limit were observed on Saliman Road.

Walking

SES has pedestrian access points on the north, south, and west sides of the school, as well as the main school entrance on the east side. Multiple access points are beneficial for reducing walking distances for students, maintaining a high level of walking and bicycling, and dispersing bicycle and pedestrian traffic away from the vehicle pick-up / drop-off areas in front of the school. The busiest pedestrian crossing location is on Saliman Road at Damon Road. This crosswalk is currently staffed by a crossing guard during peak periods (**Figure 27**). The sidewalk network is fairly well connected in the neighborhoods surrounding the school with only minor gaps. Sidewalks are non-existent in the neighborhoods east of I-580 and south of Kingsley Lane. Additionally, there are only two bridges across I-580 with pedestrian facilities in the SES boundary (Fairview Drive & Clearview Drive), and, these crossings are approximately 0.9 miles and 1.3 miles away from the school building. This is a major barrier for students who live on the east side of I-580.

Bicycling

There are dedicated bicycle lanes on Saliman Road in-front of SES. Saliman Road in front of SES has a posted speed limit of 25 mph, with two northbound and two southbound lanes, and a center turn lane. Although traffic volumes on this section of road are relatively low (2,250 average vehicles per day in 2018 - NDOT), a bicycle lane with no physical separation from vehicles is typically not a comfortable facility for a school-aged child. The only east-west bicycle facility in the school boundary is on Koontz Lane, south of the school (**Figure 28**).

Exhibit 17: Pedestrians can access the SES campus from the main entrance on the east side or from any of the three pedestrian access points on the north, south, and west sides of the school (Figure 27).

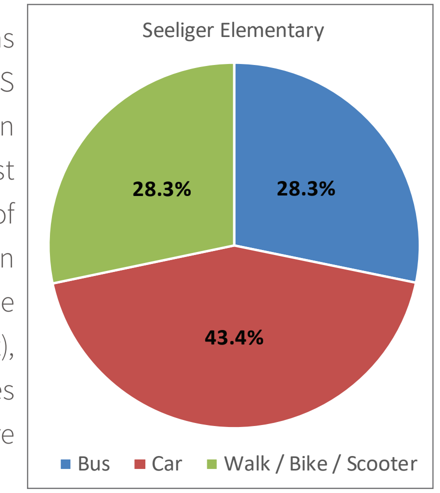


Figure 25. Mode Share (SES)

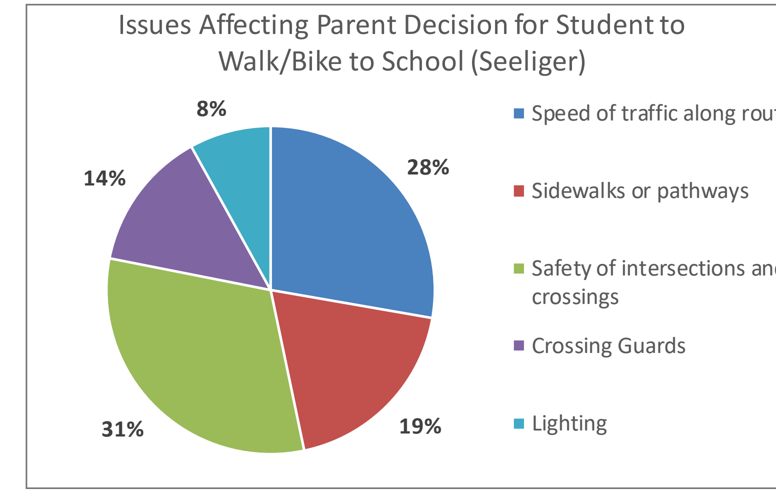


Figure 26. Main Walking / Biking Concerns from Parents (SES)

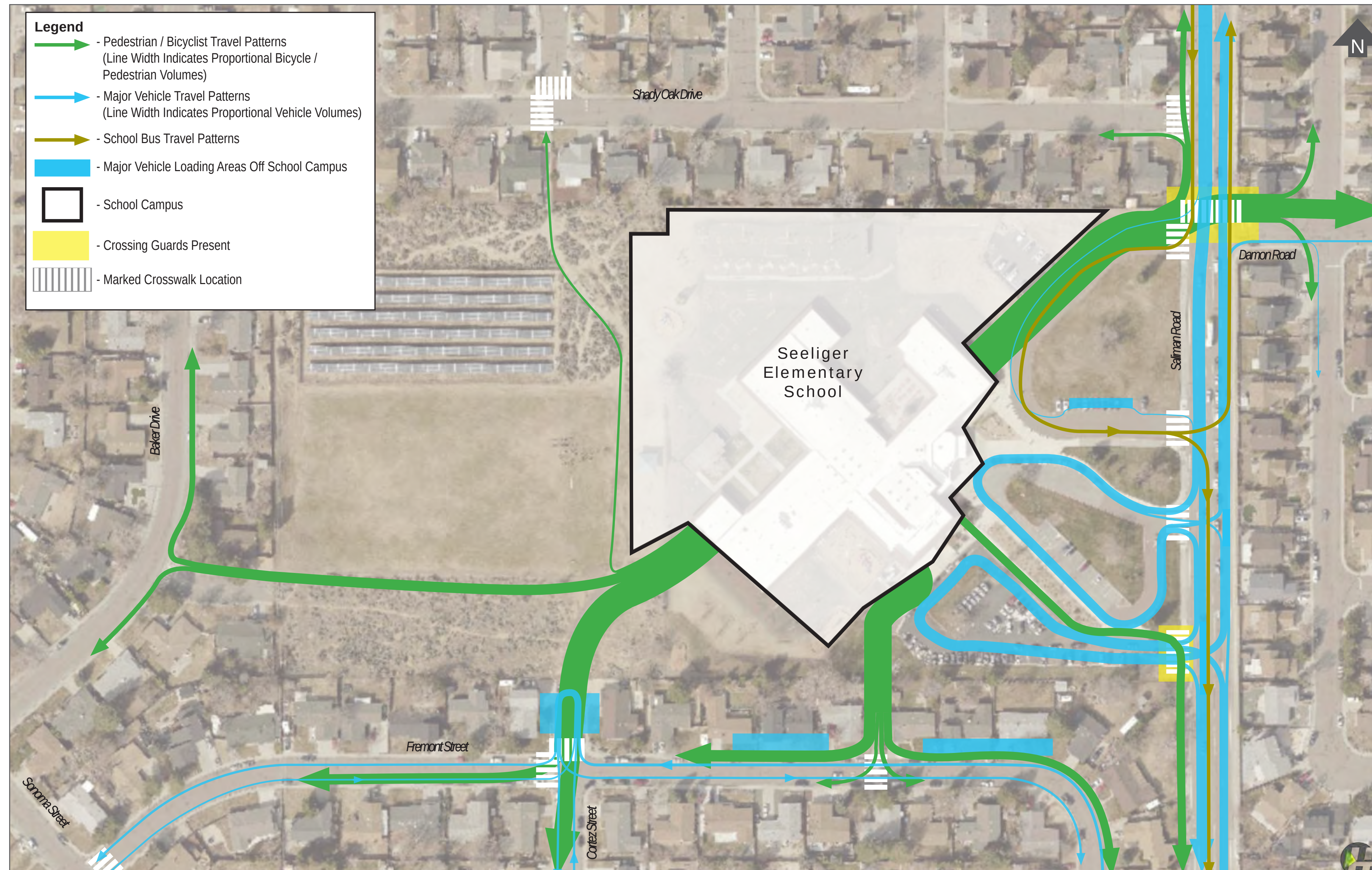


Figure 27. Primary Travel Patterns & School Circulation (SES)

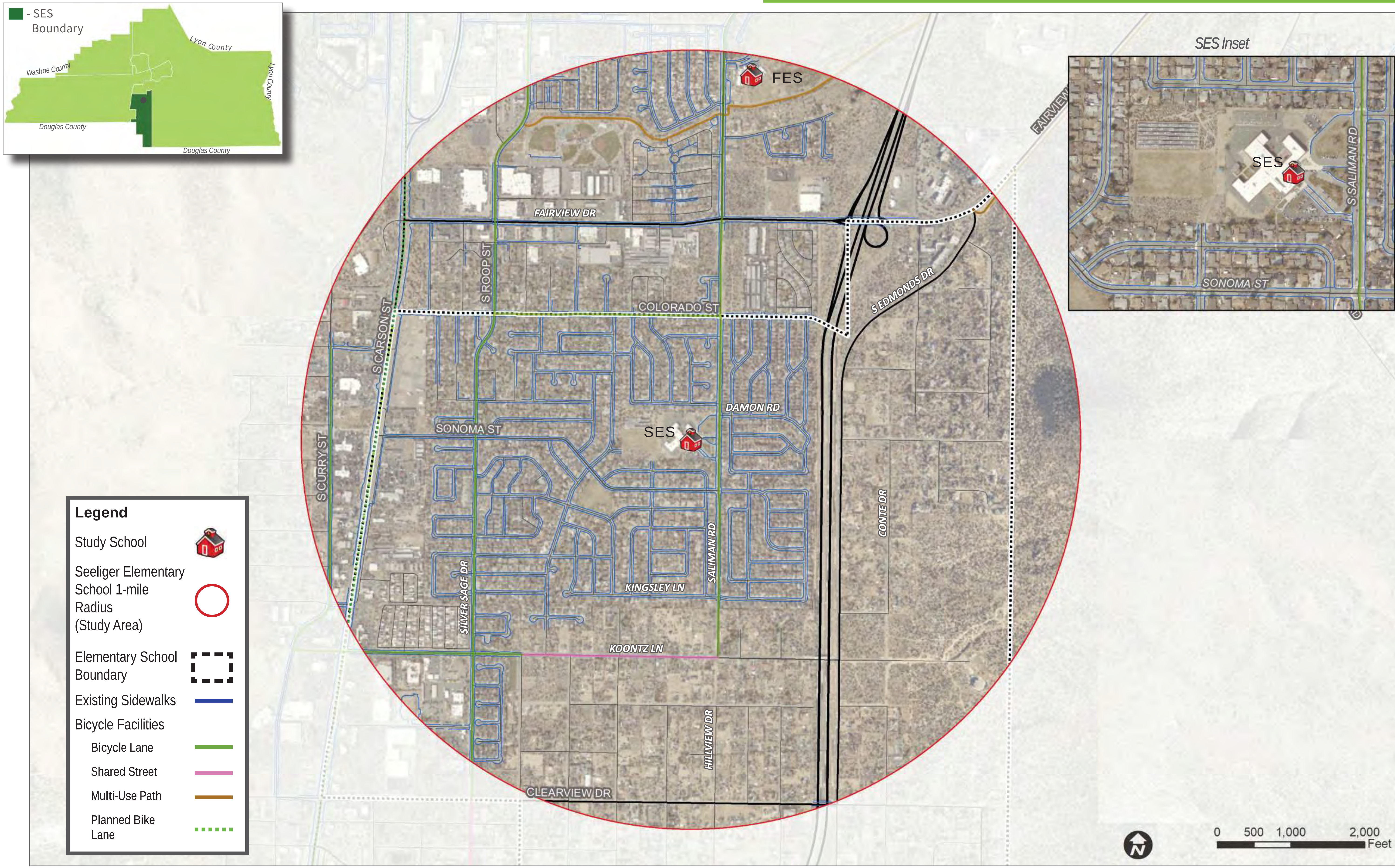


Figure 28. Existing Bicycle & Pedestrian Network (SES)

Carson Middle

School Information

Carson Middle School (CMS) is located on W. King Street between Richmond Drive and Ormsby Boulevard on the west side of Carson City. The school campus is surrounded by residential uses on all sides (**Appendix F**). Approximately 11 percent of the 1,300 enrolled students walk or bike to school each day (**Figure 29**).

Parent & Student Survey Results

As shown in **Figure 30**, the top three issues affecting Carson Middle School parents' decisions to allow their children to walk or bike to school are the safety of intersection crossings, speed of traffic along the route, and sidewalks/pathways. Student survey results indicate that improving the safety of intersections and crossings, and improving the quality of sidewalks and pathways would have the greatest impacts on walking and bicycling (**Figure 31**). Full survey results are included in **Appendix A**.

Vehicles

The majority of students accessing CMS by vehicle do so from the pick-up / drop-off loop, Richmond Avenue, or the north side of W. King Street near the main student entrance (**Figure 32**). Students are also dropped-off on Richmond Avenue and Tacoma Avenue south of W. King Street and use the marked crosswalks at these locations to cross W. King Street. Drivers on W. King Street were found to largely adhere to the 15 mph speed limit and the number of observed U-turns in the area was minimal.

Walking

The pedestrian network in the immediate CMS vicinity is incomplete with sidewalk gaps on major east-west and north-south roadways including W. King Street, Telegraph Street, Mountain Street, and Musser Street. Beyond the area immediately surrounding the school, there are sidewalk gaps on both major and minor roadways as well. The crosswalks on W. King Street have in-road message signs and are well utilized, especially by students who are dropped off on Richmond Avenue and Tacoma Avenue south of W. King Street. The majority of pedestrians observed leaving the school traveled east on W. King Street, Musser Street, or Telegraph Street (**Figure 32**). Students commuting to school from the neighborhood between I-580, William Street, Colorado Street, and Carson Street do not have access to school bus routes and must cross Carson Street to access the school campus on foot. Students using the school bus also encounter sidewalk connectivitiy issues and high vehicle speeds when accessing their bus stops.

Bicycling

There are dedicated bicycle lanes on W. King Street in front of the school campus (**Figure 33**). Vehicles dropping-off/picking-up students frequently impede the westbound bicycle lane during school hours. The W. King Street bike lanes connect with the multi-use path system in the Highlands neighborhood west of Thames Lane, however, the roadway context and bike lane widths west of Canyon Park Court make this route daunting for most middle school students.

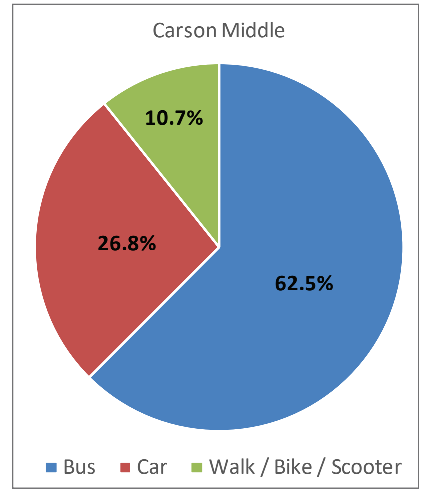


Figure 29. Mode Share (CMS)

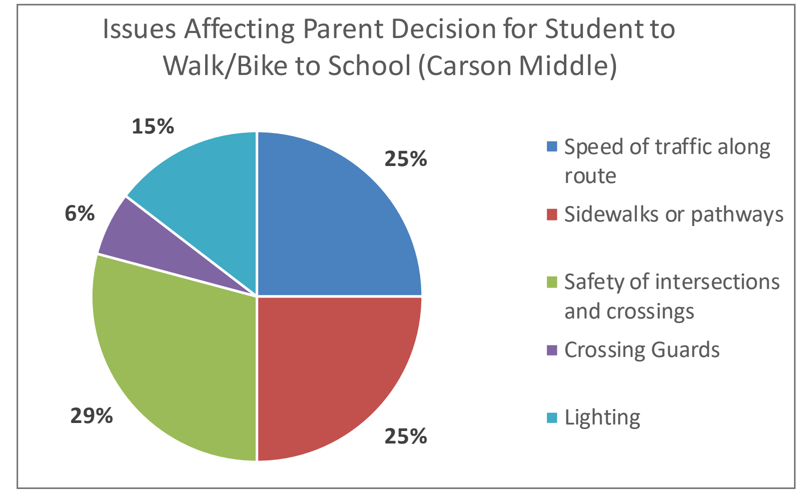


Figure 30. Main Walking / Biking Concerns from Parents (CMS)

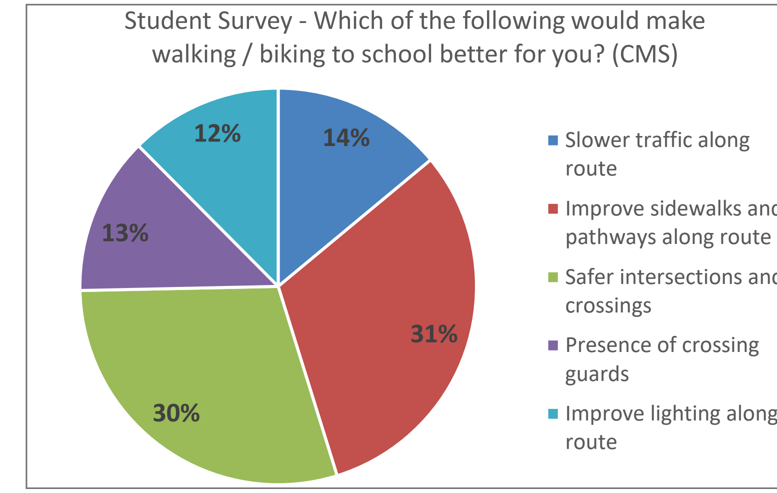


Figure 31. Main Walking / Biking Concerns from Students (CMS)

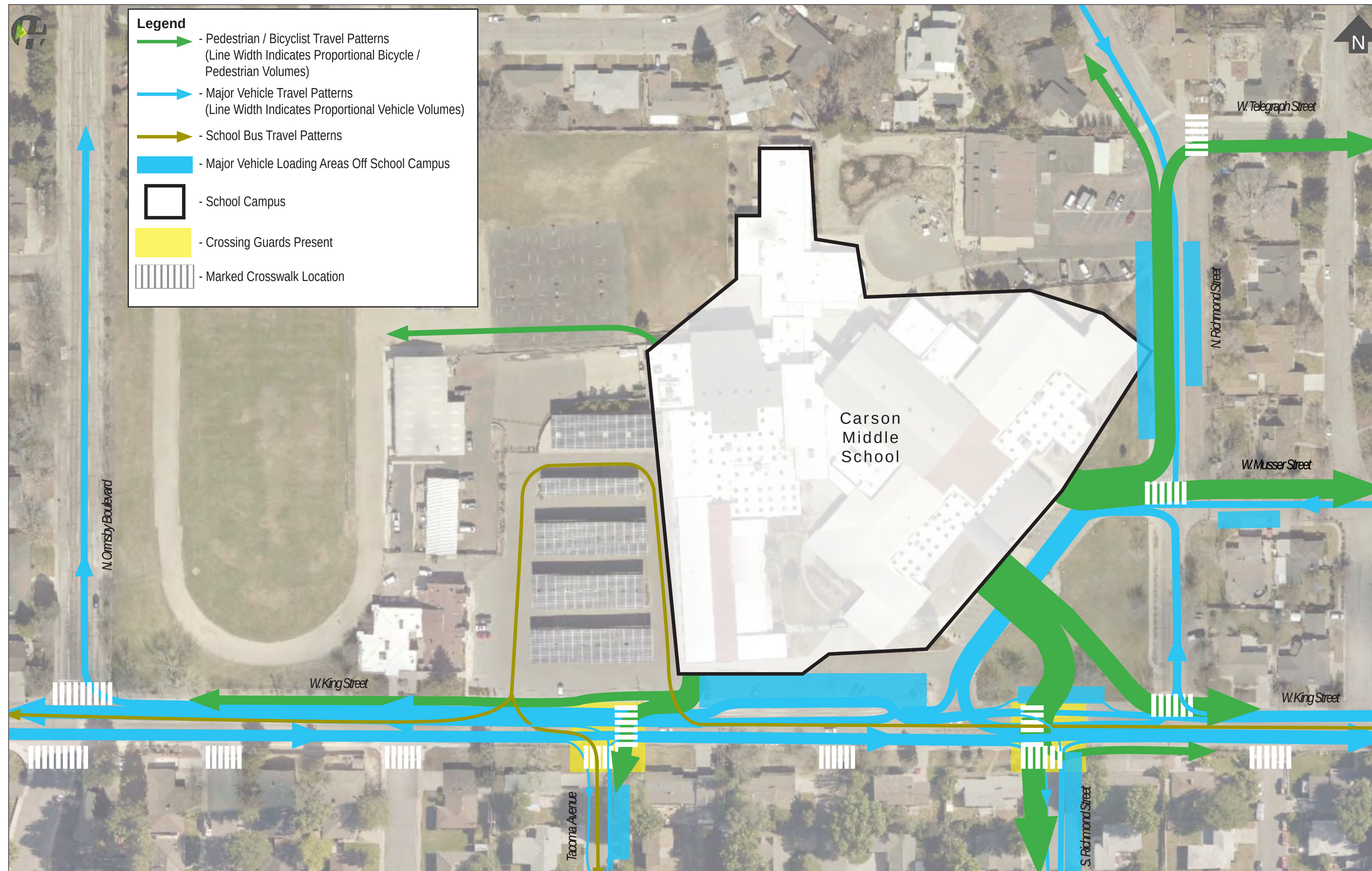


Figure 32. Primary Travel Patterns & School Circulation (CMS)

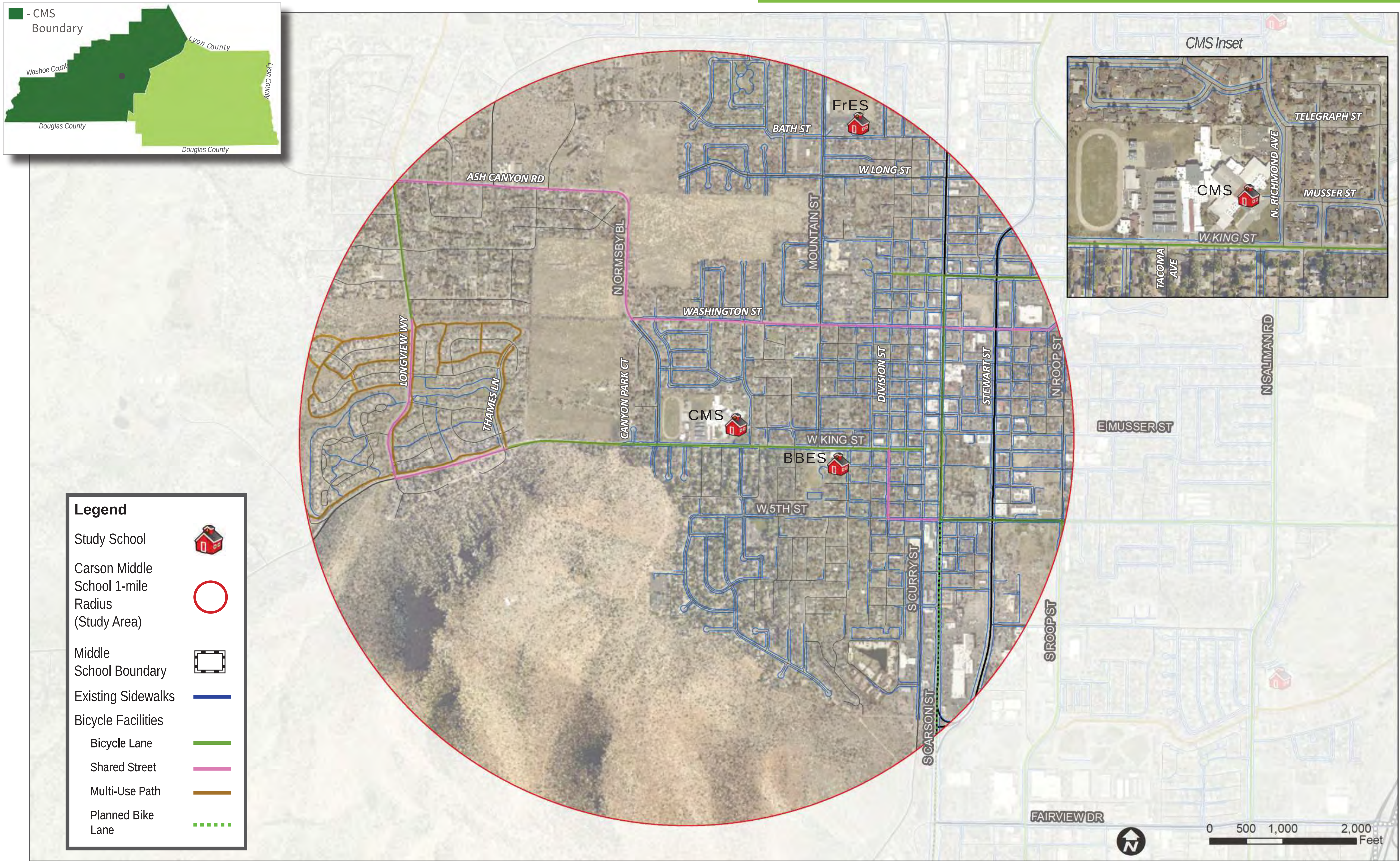


Figure 33. Existing Bicycle & Pedestrian Network (CMS)

Eagle Valley Middle

School Information

Eagle Valley Middle School (EVMS) is located on E. 5th Street between Regent Court and Hidden Meadow Drive on the east side of Carson City. The school campus is surrounded by residential neighborhoods and open space (**Appendix F**). Approximately 11 percent of the 660 enrolled students walk or bike to school each day (**Figure 34**).

Parent & Student Survey Results

As shown in **Figure 35**, the top three issues affecting parents' decisions to allow their children to walk or bike to school are the lack of safe intersections and crossings, traffic speeds along routes to school, and the quality of sidewalks and pathways. Survey results from EVMS students indicate the two factors that would have the largest impact on their commute would be improved sidewalks & pathways and safer intersections & crossings (**Figure 36**). Full results for the parent and student surveys are included in **Appendix A**.

Vehicles

The two pick-up/drop-off loops appear to work well during peak periods with minor queues (**Figure 37**). The drop-off loop immediately in front of the school sometimes creates a bottleneck as parents leaving the campus must wait for parked vehicles to back out of their parking spaces. Vehicles were observed making U-turns at breaks in the center median along E. 5th St.

Walking

Students walking to and from EVMS typically do so from the residential neighborhood to the north, near Empire Elementary School. Children leaving the school typically cross E. 5th Street at Regent Court (where there is a crossing guard present) to reach Hells Bells Road and utilize the multi-use paths on Fairview Drive and the Snake Hill Trail (trail connecting Hells Bells Road and Lepire Drive). Students walking north typically cross Fairview Drive at two marked crosswalks at Desatoya Drive (where two crossing guards are typically present) or at the pedestrian activated flasher approximately halfway between Desatoya Drive and E. 5th Street (at the multi-use path crossing). Some students cross Hidden Meadow Drive and E. 5th Street at Parkhill Drive to access the multi-use paths to the north. There are currently no marked crosswalks at either crossing location and Parkhill Drive does not have any sidewalks.

Bicycling

There are currently no bicycle facilities that provide direct access to the EVMS campus (**Figure 38**). There is a high quality north-south multi-use path on Fairview Drive to the west and a high quality east-west multi-use path from E. 5th Street west of the school however these paths lack connectivity to many surrounding neighborhoods and high traffic areas. The school has two bike racks on campus with another located in the Xeriscape Park to the northeast of the school.

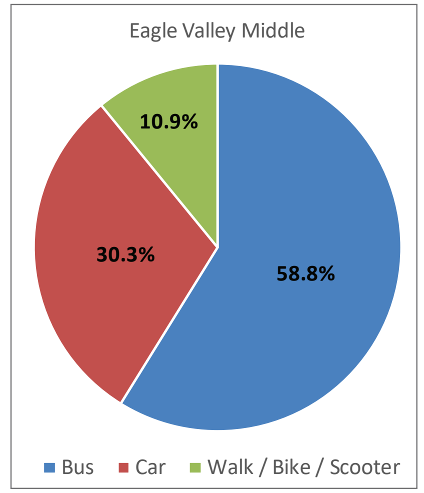


Figure 34. Mode Share (EVMS)

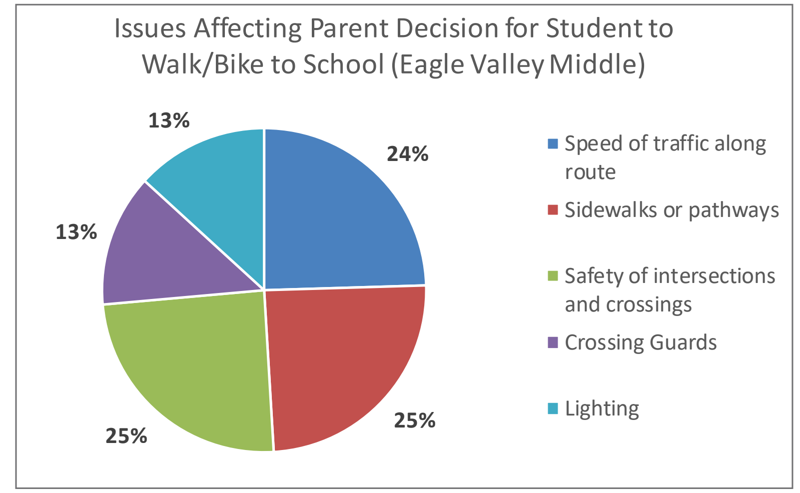


Figure 35. Main Walking / Biking Concerns from Parents (EVMS)

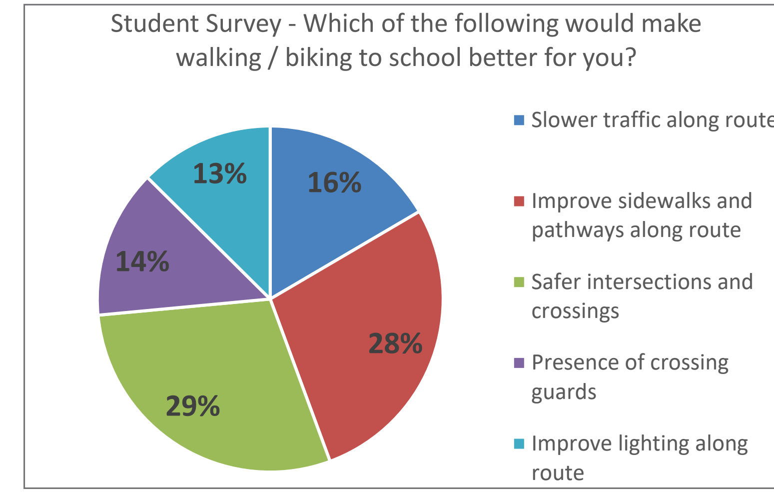


Figure 36. Main Walking / Biking Concerns from Students (EVMS)

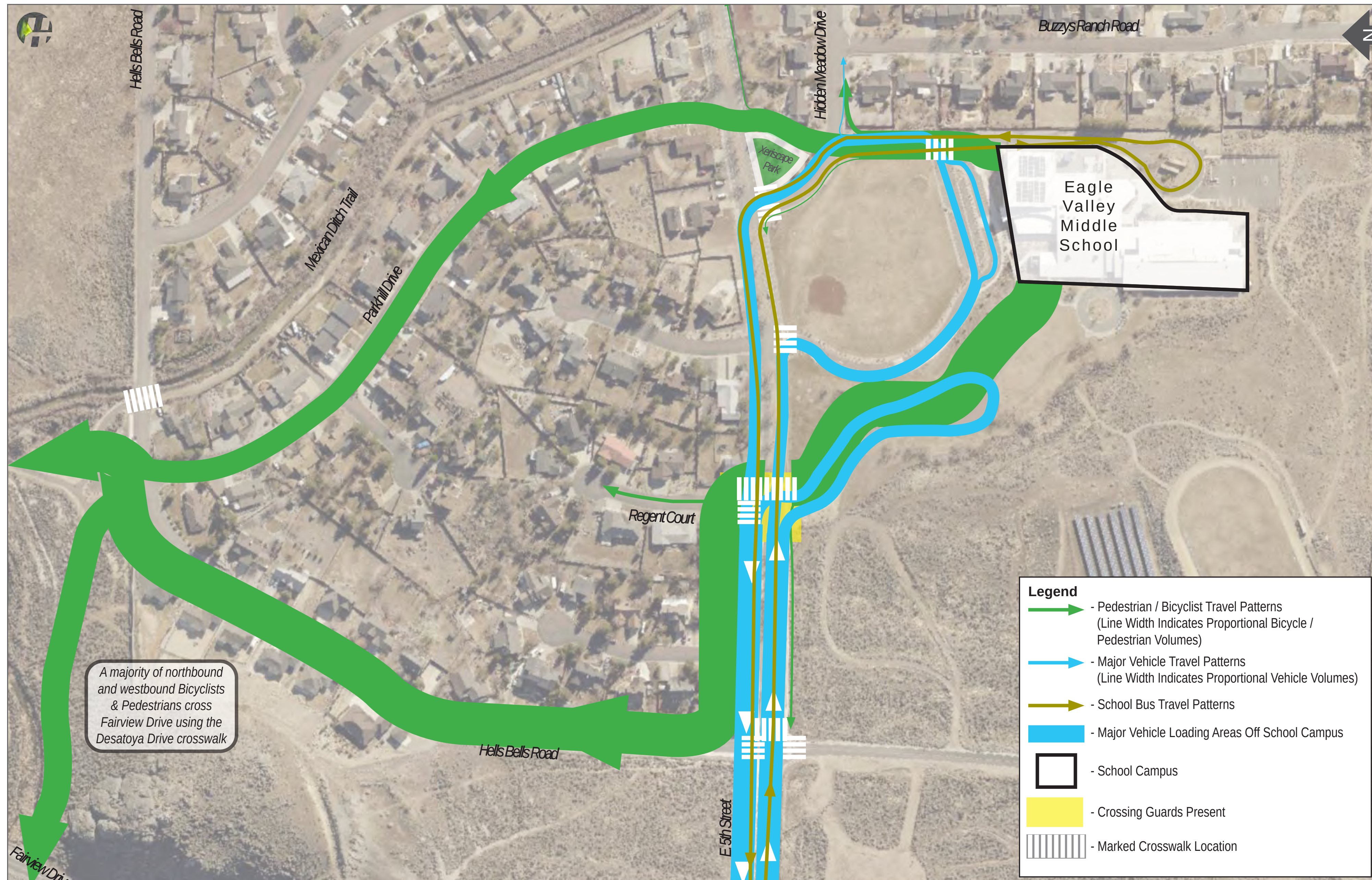


Figure 37. Primary Travel Patterns & School Circulation (EVMS)

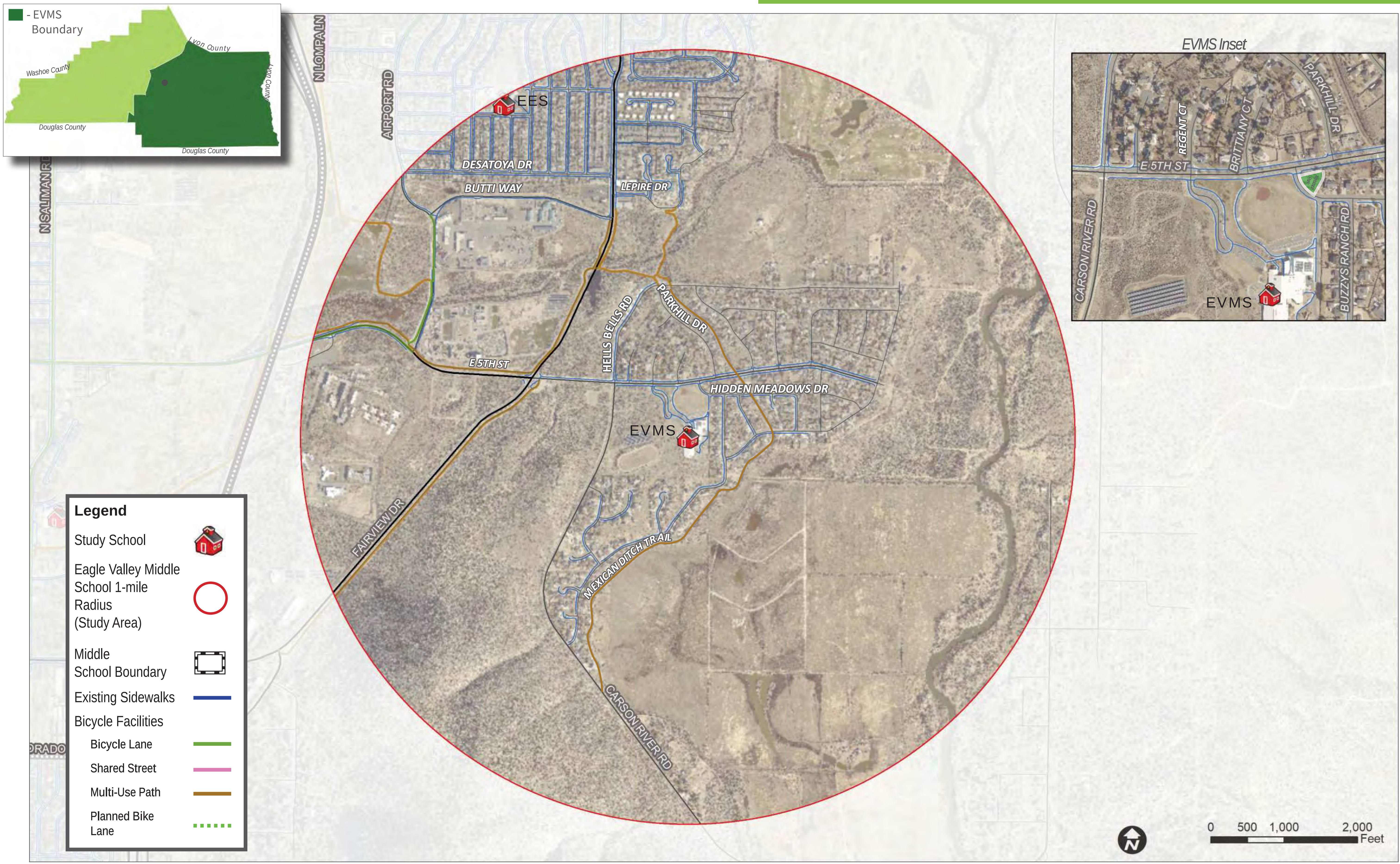


Figure 38. Existing Bicycle & Pedestrian Network (EVMS)

3. Engineering Recommendations

Recommendation Development

The project team conducted engineering and programmatic reviews of each of the eight study schools. The engineering review included evaluation of site conditions and circulation patterns, as well as a review of relevant data including recent crash history, crash severity, contributing factors and the location and condition of bicycle and pedestrian facilities. The programmatic review consisted of in-person interviews with staff, including the physical education teachers from each school. This review focused on the current efforts of each school to support their students walking or biking, as well as identifying known safety concerns, such as speeding which is a contributing factor to many crashes. The findings from these reviews were used in conjunction with results of the parent and student surveys, which identified three major areas of focus:

1. Improve safety of intersections & crossings
2. Improve sidewalks & pathways
3. Reduce traffic speeds along routes to school

These areas of focus, along with specific safety concerns identified for each school form the basis of the recommendations included in this Plan.

The recommended projects are divided into three Tiers:

Tier 1 – Quick Wins

There are a total of 26 Tier 1 projects. Tier 1 projects involve minimal capital and infrastructure improvements, such as changes to signage or red curb. It is anticipated that the City would implement these projects as soon as possible to provide immediate benefits for students walking, biking, and riding buses to school.

Tier 2 – SRTS Core Projects

Tier 2 projects are intended to be implemented over the next 20 years, Tier 2 projects were further prioritized using the criteria in **Table 2** in order to provide guidance on allocating funding to the most impactful projects first. These projects are divided into four categories based on the primary safety issue addressed.

Bicycle Network Enhancements - Projects focused on enhancing and expanding the existing bicycle network to improve safety and connectivity for children bicycling to school

Crossing Safety Enhancements - Projects focused on improving roadway crossings

Walk Zone Connectivity Enhancements - Projects focused on improving pedestrian connectivity within the school walk zone (1-mile surrounding the study school)

With a major focus on improving pedestrian connections within walk zones, the Walk Zone Connectivity category has the largest number of projects of any category.

Corridor Enhancements - Projects focused on elements from multiple project categories on a specific corridor

Tier 3 – Aspirational Projects

A total of 25 projects which represent an ideal conceptual network of low-stress bicycle facilities across Carson City. Projects focus on providing children with a safe and comfortable bicycling experience on their journey to school. These projects are conceptual and require further analysis before being programmed.

Tier 1 & Tier 2 projects are shown spatially in **Figure 39** with Tier 1 projects defined in **Table 5** and Tier 2 projects defined in **Tables 6-1** to **6-3**. Tier 3 projects are highlighted in **Table 7** and shown in **Figure 40.** These tables represent the Master list of SRTS projects for Carson City.

School Profiles

School profiles include recommended projects within a mile of each school which provide a direct benefit to the profiled school. Some projects are listed on multiple school profiles because they are within one mile of and provide direct benefits to multiple schools. It is important to note that "Key Projects" identified in each school profile represent a "front-door first" approach to implementation. Focusing initial efforts on projects closest to each schools' front door would benefit the greatest number of students first and would increase the effectiveness of projects further from the schools' front-door. "Highlighted Projects" shown in school profiles are projects which are unique in nature and require further explanation.

Prioritization Process

To guide implementation of the proposed SRTS projects, a prioritization framework was developed. This enables the City to identify the most critical projects and phase the implementation of projects over time. Tier 2 projects, which involve more significant capital and infrastructure improvements than Tier 1 projects, were evaluated using the prioritization criteria in **Table 2**. These criteria include findings from the community survey, ability to address key safety issues, connections to schools and other community facilities, demographic data, cost efficiency and

Table 2. Prioritization Criteria Summary

Prioritization Criteria	Rationale	Range of Points
Survey	School administrators, parents, middle school students, and community members noted specific locations needing improvements in the community survey.	0 - 10
Addresses Known Safety Issue	Community members shared that vehicle speeds, crash severity, intersection crossing, contributing factors, and connecting sidewalks/pathways are the most important improvements needed.	0 - 9
Equity	Lower-income households are disproportionaletly represented in severe and fatal injury crashes.	0 - 6
Proximity to Study Schools	Improving access to schools in this study is a primary purpose of this Plan.	0 - 16
Proximity to Community Facilities	Projects in areas of high demand provide benefit to a greater number of people.	0 - 6
Population Density	Projects in areas of high population density provide a benefit to a greater number of people.	0 - 4
Cost Efficiency / Feasibility	Lower cost projects can generally be implemented more rapidly and allow limited resources to be distributed more widely.	0 - 8
In CIP	This Plan aims to support the City's Capital Improvement Plan (CIP) and prioritizes recommendations that are consistent with or complement projects within the CIP.	0 - 8
	Total Points Possible:	67

feasibility, and consistency with the City's planned capital improvements (the full prioritization matrix and scoring is included in **Appendix C**). Projects received an individual score for each criterion as well as a combined score based on the sum of all nine factors evaluated. Total scores falling within the top third are considered near-term projects; total scores falling in the middle third are considered medium-term; and scores falling in the lower third are considered long-term projects.

Implementation Plan

The results of the prioritization process are meant to be a starting point for assisting the City with implementation. Some projects may be implemented as part of routine roadway maintenance programs; in fact, projects received points if they overlap with the City's current Capital Improvement Program (CIP). As funding sources become available and the CIP is updated, the City should consider all available opportunities to implement the proposed projects as quickly as possible. Should opportunities arise to complete lower priority projects, in conjunction with CIP projects those should be considered as well.

Near-Term Projects listed in **Tables 6-1** to **6-3**, reflect the proposed improvements that scored the highest through the prioritization process. It is recommended that the City allocate funding and dedicate resources to planning, designing, and constructing these projects first. These projects may require significant planning efforts including community engagement and dedicated funding sources to be considered by the City. The near-term projects that are less infrastructure-intensive and lower in cost should be considered for immediate implementation in the coming fiscal years.

Medium-Term Projects scored in the middle third of projects and are recommended for implementation after the near-term projects have been completed. As appropriate, these projects may be combined with near-term projects to strengthen the network, address gap closures, and to complement other projects.

Long-Term Projects are projects scoring in the lowest third of the prioritization process. Many of these projects did not receive any public comments through the community survey and do not overlap with projects in the City's CIP. However, all projects have been developed to close network gaps and improve walking/biking, and improve bus access for students, and should therefore be implemented where possible.

Cost Estimates

Planning level cost estimates were developed for each recommended engineering project based on planning level project concepts, including programmatic engineering recommendations listed in **Table 25-1** in Chapter 4. These cost estimates include curb ramps and minor modifications to drainage but do not include costs for rights-of-way or major stormwater enhancements. Cost estimates for Tier 3 projects represent permanent installations, such as concrete medians. Temporary installations or low-cost materials such as paint and removable bollards would significantly reduce costs for such projects. **Table 3** shows the estimated range of costs for each engineering project.

Table 3 Planning Level Cost Estimate Order of Magnitude Cost Ranges

Cost Estimate Symbol	Cost Estimate Range
$	Less than $99,000
$$	$100,000 - $499,000
$$$	$500,000 - $999,000
$$$$	$1,000,000 - $1,999,999
$$$$$	$2,000,000 - $2,999,999
$$$$$$	$3,000,000 - $6,000,000

Intersection Crossing Enhancements

No two intersections are exactly alike and the solutions for improving crossing safety at intersections should be applied based on the roadway context and local travel travel patterns. In order to avoid being overly prescriptive in the type and design of enhancements to crossing safety at intersections, this Plan uses the term "Intersection Crossing Enhancements" as a catch-all term. This term is intended to encompass a wide range of crossing enhancements including curb extensions (highlighted below), pedestrian signalization improvements, pedestrian refuge islands, and enhanced marked crosswalks (see the **Carson City Safe Routes to School Design Toolbox** in **Appendix B** for more detail). It is important to note that concrete curb extensions were assumed in the cost estimates in order to provide a higher level of potential cost. Costs may be reduced by using different materials in the application of a curb extension or a different intersection crossing enhancement that is less intensive. Materials such as paint or removable bollards would be significantly less costly than concrete and would allow Carson City to pilot projects in order to assess their impacts and safety benefits.

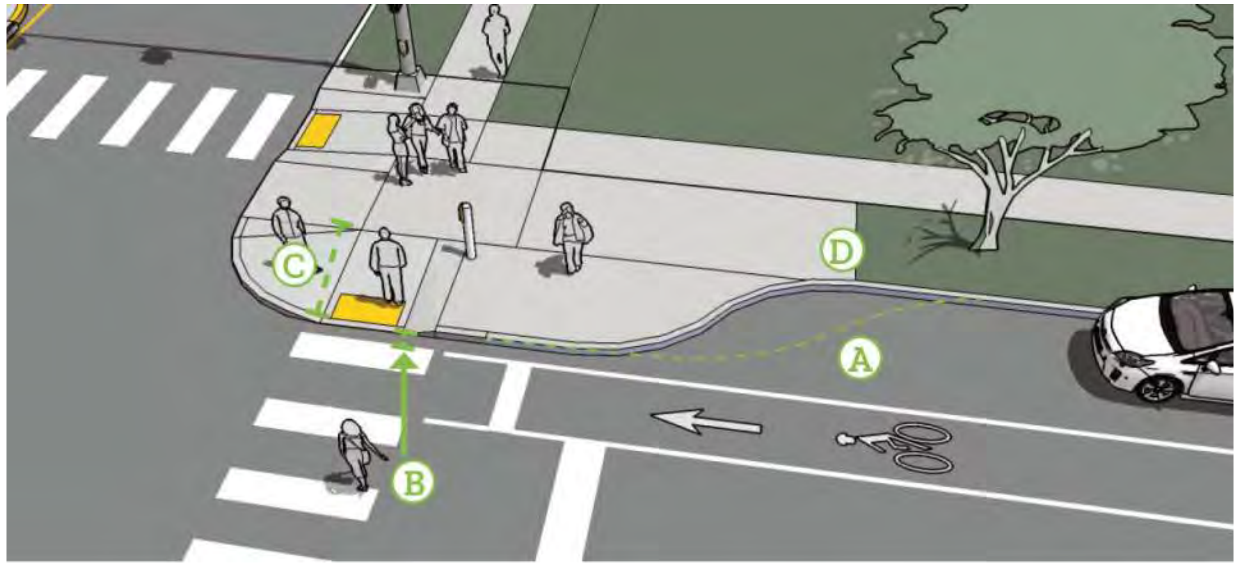
Walk Zone Sidewalk Gap Closure

The sidewalk network in some portions of Carson City is incomplete, especially on minor roadways. With a major focus on improving the quality, condition, and overall network of sidewalks within school walk zones, closing sidewalk gaps on all streets within each school walk zone would be ideal. The planning level cost of constructing sidewalks within walk zones on all roads not addressed by a Tier 1-3 project was developed based on existing sidewalk data in 1/3 mile increments, as shown in **Table 4**. The estimates assume a 6-foot wide sidewalk with minimal stormwater enhancements, curb ramps, and no right-of-way needs.

It may not be feasible to construct sidewalks in all locations or on both sides of the roadway due to low benefits, high construction costs, or neighborhood preferences.

Table 4. Planning Level Cost Estimate for minor street sidewalk gap closure

Planning Level Cost Estimate Walk Zone Connectivity (Increments of 1/3 Mile)	Study Schools to 1/3 Mile	1/3 Mile to 2/3 Mile	2/3 Mile to 1 Mile
	$18.4 Million	$39.8 Million	$44.2 Million



SRTS Infrastructure Design Toolbox (Appendix B)
Highlight: Curb Extension Design Features

- (A) For purposes of efficient street sweeping, the minimum radius for the reverse curves of the transition is 10 ft and the two radii should be balanced to be nearly equal.
- (B) When a bike lane is present, the curb extensions should terminate one foot short of the parking lane to enhance bicyclist access.
- (C) Reduces pedestrian crossing distance by 6-8 ft.
- (D) Planted curb extensions may be designed as a bioswale for stormwater management.

Tier 1 – Quick Wins

Table 5. Tier 1 Recommendations

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-1	Seeliger Paths	Footpaths to Seeliger Elementary School from: Cortez Street, Schell Avenue, and off Shady Oak Drive	Repave paths and extend pavement to school grounds	$
Q-2	Appion Way	150 ft East & West of Muldoon Street	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-3	Bath Street	At FrES Parent Drop-Off Loop Exit	Extend existing red curb by 20 feet to the east	$
Q-4	Bonanza Drive	W. Sutro Terrace to Manzanita Terrace	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-5	Carriage Crest Drive	At MTES Parent Drop Off Exit	Relocate existing "No Left-Out" signage to more visible location	$
Q-6	Cochise Street	150 ft North & South of Overland Street / Cochise Street intersection	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-7	Combs Canyon Road	Lakeview Road to Meadowood Road	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-8	Combs Canyon Road	Harvard Drive to Dartmouth Drive	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-9	De Ann Drive / Lompa Lane	150 ft on all sides of De Ann Drive / Lompa Lane Intersection	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-10	Deer Run Road	150 feet on either side of Deer Run Road / BLM Access (located 2,150 feet south of Brunswick Canyon Road)	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-11	EVMS Drop Off Loop	Parking Area in Drop Off Loop	Restrict parking to staff & deliveries only in front of school (reroute traffic around parking lot immediately in front of school)	$
Q-12	FES Drop Off Loop	At existing temporary "Single Lane Pick-Up" Sign	Install permanent sign	$
Q-13	Firebox Road	At Saliman Road	Install in-road message sign stating No Left-Out	$
Q-14	Firebox Road	At Saliman Road	Update existing red curb along Firebox Road to be more visible	$
Q-15	Gentry Lane	200 ft South of Heidi Circle	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-16	Goni Road	Jefferson Dr to Franklin Rd	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-17	Hidden Meadows Drive	Eagle Valley MS Bus Entrance	Install marked crosswalk	$
Q-18	Kelvin Road	200 Ft East and West of Kelvin Road / Salk Road intersection	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-19	Prospect Drive	Timberline Drive to Lotus Circle	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-20	Rabe Way	400 ft West of Coffey Drive & 150 ft. East of Parker Drive	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-21	S. Sutro Terrace	Bryce Drive to Emerson Drive	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-22	Saliman Road	At Cardinal Way	Install RRFB at existing crosswalk south of Cardinal Way	$
Q-23	Salk Road	150 ft North & South of Avery Road	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$
Q-24	Siskiyou Drive	Stanton Drive	Install marked crosswalk	$
Q-25	Telegraph Street	3 Intersections: Telegraph Street & Mountain Street Telegraph Street & Division Street Telegraph Street & Richmond Avenue	Install marked crosswalk	$
Q-26	Timberline Drive	Prospect Drive to 100 ft East of Westwood Drive	Utilize temporary signage to increase awareness of bus stop locations **(ENG-4)**	$

Tier 2 – SRTS Core Projects

Table 6-1. Tier 2 Recommendations (Part 1)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
B-1	Colorado Street	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to existing bike lanes or similar multi-modal improvement	$	23	Medium
B-2	E. 5th Street	Saliman Road to I-580	Construct multi-use path or separated facility with connection to existing multi-use path on either side of I-580	$$$	19	Long
B-3	Winnie Lane	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to Roop Street or similar multi-modal improvement	$	29	Medium
C-1	Airport Road	Butti Way to E. 5th Street	A. Construct bike lane from Butti Way to Highway 50 or similar multi-modal improvement B. Add intersection crossing enhancements at Airport Road / Douglas Drive and Airport Road / Menlo Drive	$$	31	Medium
C-2	Carmine Street	Airport Road to Lompa Lane	**A.** Traffic Circle at Dori Way & Carmine Street **B.** Close sidewalk gaps between Airport Road & Dori Way **C.** Intersection crossing enhancements at Dori Way, Lompa Lane, and Airport Road	$$$	25	Medium
C-3	E. 5th Street	Saliman Road to Carson Street	**A.** Enhance existing sidewalks **B.** Widen existing bike lane to 5'	$$$	27	Medium
C-4	E. 5th Street	Fairview Drive to Mexican Ditch Trail	**A.** Construct bike lanes from Fairview Drive to Carson River Road or similar multi-modal improvement **B.** Construct buffered bike lane from Carson River Road to Mexican Ditch Trail or similar multi-modal improvement **C.** Add marked crosswalk with pedestrian refuge (painted or hardscape) at Parkhill Drive **D.** Construct pedestrian refuge at Regent Court (painted or hardscape) **E.** Relocate existing crosswalk at Carson River Road & Hells Bells Road approximately 15 feet to the east, add pedestrian refuge Island (painted or hardscape) and RRFB	$$	34	**Near**
C-5	Nye Lane	Lompa Lane to Highway 50	Construct bike lanes & close sidewalk gaps	$$$$$$	21	Long
C-6	Sonoma Street	Carson Street to Saliman Road	**A.** Construct bike lanes or similar multi-modal improvement **B.** Add intersection crossing enhancement at Silver Sage Drive	$	36	**Near**
C-7	W. King Street	Thames Lane to Curry Street	**A.** Construct multi-use path from Thames Lane to Canyon Park Court or similar multi-modal improvement **B.** Add physical buffer for bike lane at CMS & BBES **C.** Close sidewalk gaps between Curry Street and Ormsby Boulevard **D.** Install intersection crossing enhancements at Tacoma Avenue, Richmond Avenue, Mountain Street, Thompson Street, Minnesota Street, Division Street	$$$$	47	**Near**
C-8	Winnie Lane	Mountain Street to Ormsby Blvd	**A.** Enhance existing sidewalks where possible **B.** Add bike lanes from Mountain Street to Ormsby Boulevard **C.** Add wayfinding signage at Victoria Avenue directing bicyclists towards the multi-use path on north side **D.** Enhance crosswalks at Ormsby Boulevard, Mountain Street, and Victoria Avenue **E.** Enhance street lighting at Mountain Street and Winnie Lane **F.** Remove overgrown vegetation to improve visibility	$$	33	Medium

Project Category Key

(light blue)	Tier 1: Quick Win Projects
(light green)	Tier 2: Bicycle Network Enhancements
(peach)	Tier 2: Crossing Safety Enhancements
(purple)	Tier 2: Walk Zone Connectivity Enhancements
(dark green)	Tier 2: Corridor Enhancements (Combined elements from Bicycle Network, Walk Zone Connectivity, and Crossing Safety along specific corridor)

Table 6-2. Tier 2 Recommendations (Part 2)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
CS-1	Carriage Crest Drive	Slide Mountain Drive to Mountain Park Drive	**A.** Add intersection crossing enhancements at Mountain Park Drive, and Slide Mountain Drive intersections **B.** Add center median from 70' south of Slide Mountain Drive to Parent Drop-Off Loop entrance **C.** Consider parking restrictions or removal on Carriage Crest Drive during school pick-up and drop-off periods	$$	39	**Near**
CS-2	Carson Street	Nye Lane	Construct RRFB and associated crossing enhancements or alternatively a traffic signal	$$	23	Medium
CS-3	Fairview Drive	Desatoya Drive to Walker Drive	**A.** Install RRFB at Desatoya Drive **B.** Install RRFB with pedestrian refuge island (painted or hardscape) between Walker Drive and Stanton Drive **C.** Construct Sidewalk on the west side of Fairview Drive from Walker Drive to Edmonds Drive **D.** Enhance existing sidewalk on east side from Lepire Drive to multi-use path **E.** Enhance existing sidewalk on west side from Desatoya Drive to multi-use path south of Butti Way	$$	36	**Near**
CS-4	Monte Rosa Drive	Stanton Drive to Gordonia Avenue	Add intersection crossing enhancements to Stanton Drive & Gordonia Avenue intersections, including striping to prohibit parking close to existing crosswalks	$	45	**Near**
CS-5	Roop Street/Silver Sage Drive	Fairview Drive to Sonoma Avenue	Add intersection crossing enhancements at minor side-street approaches south of Fairview Drive	$$	17	Long
CS-6	Silver Sage Drive	Sonoma Avenue to Koontz Lane	**A.** Add crosswalk at Pioche Street **B.** Add intersection crossing enhancements at Koontz Lane intersection and minor side-street approaches between Koontz Lane & Sonoma Avenue	$$$	11	Long
WZ-1	Airport Road	Nye Lane to Highway 50	**A.** Close sidewalk gaps **B.** Enhance existing sidewalk as possible	$$$$	23	Medium
WZ-2	Baker Drive	Koontz Lane to 175 ft. S. of Kerinne Circle	Construct sidewalk	$$	9	Long
WZ-3	Bath Street	Mountain Street to Carson Street	**A.** Close sidewalk gaps between Curry Street & Mountain Street **B.** Add intersection crossing enhancement (paint or hardscape) at existing mid-block crosswalk and Division Street crosswalks **C.** Add missing & repair damaged ADA Ramps **D.** Repair and enhance existing sidewalks as possible	$$$	34	**Near**
WZ-4	Brown Street	420 ft. N. of Reeves Street to 170 ft. S. of Reeves Street	Construct sidewalk	$$	17	Long
WZ-5	Camille Drive	Sunland Drive	Install staircase and ramp for multi-use connectivity	$$	18	Long
WZ-6	Carson Street	Bath Street to 420 ft. N. of Bath Street	Construct sidewalk	$	30	Medium
WZ-7	Clearview Drive	Oak Street to I-580	Construct paved shoulder for bikes/pedestrians/bus stop accessibility	$$	16	Long
WZ-8	Colorado Street	Colorado Terminus to Edmonds Drive	**A.** Construct multi-use bridge over I-580 from the Colorado Street terminus to Edmonds Drive **B.** Marked crosswalk with RRFB at Colorado Street & Edmonds Drive intersection (Due to funding constraints, the City may select one pedestrian bridge project to pursue, either **WZ-15** or **WZ-8**)	$$$$$$	20	Long
WZ-9	Colorado Street	Birch Street to 125 ft W. of Utah Street	Construct sidewalk on north side of roadway	$$	15	Long
WZ-10	Desatoya Avenue	Airport Road to Fairview Drive	Widen sidewalks on south side of roadway	$$	35	**Near**
WZ-11	Division Street	Bath Street to W. 5th Street	**A.** Add intersection crossing enhancements at minor side streets **B.** Enhance & upgrade existing crosswalks through-out the corridor including Musser Street, Telegraph Street, and Long Street **C.** Close sidewalk gaps and widen sidewalks as possible	$$$$	38	**Near**
WZ-12	Division Street	5th Street to southern terminus of Division Street	Close sidewalk gaps	$$	31	Medium
WZ-13	S. Edmonds Drive	Fairview Drive to Colorado Street Bridge	Construct multi-use path on west/north side to connect to existing path	$$	22	Medium

Table 6-3. Tier 2 Recommendations (Part 3)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
WZ-14	N. Edmonds Drive	320 ft N. of Reeves Street to 100 ft N. Brown Street	Construct sidewalk on west side of roadway	$$	18	Long
WZ-15	Edmonds Sports Complex	Between Edmonds Sports Complex and Appion Way / Hillview Drive intersection	**A.** Construct multi-use bridge over I-580 from the southeastern corner of Appion Way / Hillview Drive intersection to the Edmonds Sports Complex (Due to funding constraints, the City may select one pedestrian bridge project to pursue, either **WZ-15** or **WZ-8**)	$$$$$$	12	Long
WZ-16	Gordonia Avenue	Monte Rosa Drive to La Loma Drive	**A.** Widen existing sidewalks on the north side of the roadway **B.** Add center median from Monte Rosa Drive to La Loma Drive	$$	39	**Near**
WZ-17	Hillview Drive	Kingsley Lane to Clearview Drive	Construct paved shoulder or multi-use path to connect with existing multi-use path on Saliman Road at Kingsley Lane	$$	21	Long
WZ-18	Koontz Lane	Center Drive to I-580	Construct paved shoulder for bikes/pedestrians/bus stop accessibility	$$$	15	Long
WZ-19	Lepire Drive	Snake Mountain Multi-use path to Cassidy Court	Construct sidewalk from Snake Mountain multi-use path to the existing sidewalk on the north side of Lepire Drive	$$	26	Medium
WZ-20	Long Street	Curry Street to Sierra Circle & Fall Street to Stewart Street	**A.** Close sidewalk gaps (Curry Street to Sierra Circle & Fall Street to Stewart Street) **B.** Crosswalks and intersection enhancements at Division Street, Curry Street, and Marian Avenue	$$$	30	Medium
WZ-21	Mountain Street	Nye Lane to King Street	**A.** Close sidewalk gaps & enhance existing sidewalk where possible **B.** Add intersection crossing enhancements at Winnie Lane, Bath Street, Long Street, Washington Street, Telegraph Street, Musser Street	$$$$$	42	**Near**
WZ-22	Musser Street	Harbin Avenue to Anderson Street	**A.** Close sidewalk gaps **B.** Enhance sidewalk where possible	$$	17	Long
WZ-23	Musser Street	Richmond Avenue to Winters Drive	Construct sidewalk	$	26	Medium
WZ-24	Reavis Lane	Create Pedestrian Connection to Multi-Use Path	Construct multi-use bridge between existing multi-use trail and sidewalk on south side of Reavis Lane	$$	18	Long
WZ-25	Robinson Street	Richmond Avenue to Mountain Street	Construct sidewalk	$$	21	Long
WZ-26	Roop Street	Winnie Lane to E. 5th Street	**A.** Close sidewalk gaps (Telegraph Street to E. 5th Street) **B.** Enhance existing sidewalks as possible	$$$	29	Medium
WZ-27	S. Iris Street	4th Street to King Street	Construct sidewalk	$$$	27	Medium
WZ-28	Saliman Road	Fairview Drive to Koontz Lane	**A.** Intersection crossing enhancements at Sonoma Street **B.** RRFB at Damon Road crosswalk **C.** Sidewalk east side Colorado Street to Fairview Drive **D.** Enhance existing sidewalk as possible	$$$	43	**Near**
WZ-29	Saliman Road	E. 5th Street to Fairview Drive	Enhance existing sidewalk as possible	$$	43	**Near**
WZ-30	Sherman Lane	Lompa Lane to Chanel Lane	Construct sidewalk	$$$$$	17	Long
WZ-31	Stampede Drive	Gregg Street East to Existing Sidewalk	Construct sidewalk on south side corner to existing sidewalk	$$	14	Long
WZ-32	Stanton Drive	Monte Rosa Drive to Fairview Drive	Widen existing sidewalk on south side and create center median	$$	39	**Near**
WZ-33	Telegraph Street	Richmond Avenue to Mountain Street	Construct sidewalk on south side of roadway to eliminate sidewalk gaps and enhance existing sidewalks, as possible	$$	47	**Near**
WZ-34	Thompson Street	King Street to 550 ft. S. of San Marcus Drive	**A.** Close sidewalk gaps on east side (King Street to 5th Street) **B.** Close sidewalk gaps on west side (5th Street to San Marcus Drive) **C.** Create intersection crossing enhancements at existing W. 2nd St, W. 3rd St, and W. 4th St crosswalks	$$	38	**Near**
WZ-35	W. 5th Street	Richmond Avenue to Carson Street	**A.** Close sidewalk gaps and enhance existing sidewalk where possible **B.** Add intersection crossing enhancements at Thompson Street & Division Street	$$$$$	36	**Near**
WZ-36	Winnie Lane	Carson Street to Mountain Street	Enhance existing sidewalks as possible	$$	34	**Near**
WZ-37	Winnie Lane	Ash Canyon Road to Ormsby Blvd	Extend multi-use path on north side to Ash Canyon Road	$$	21	Medium

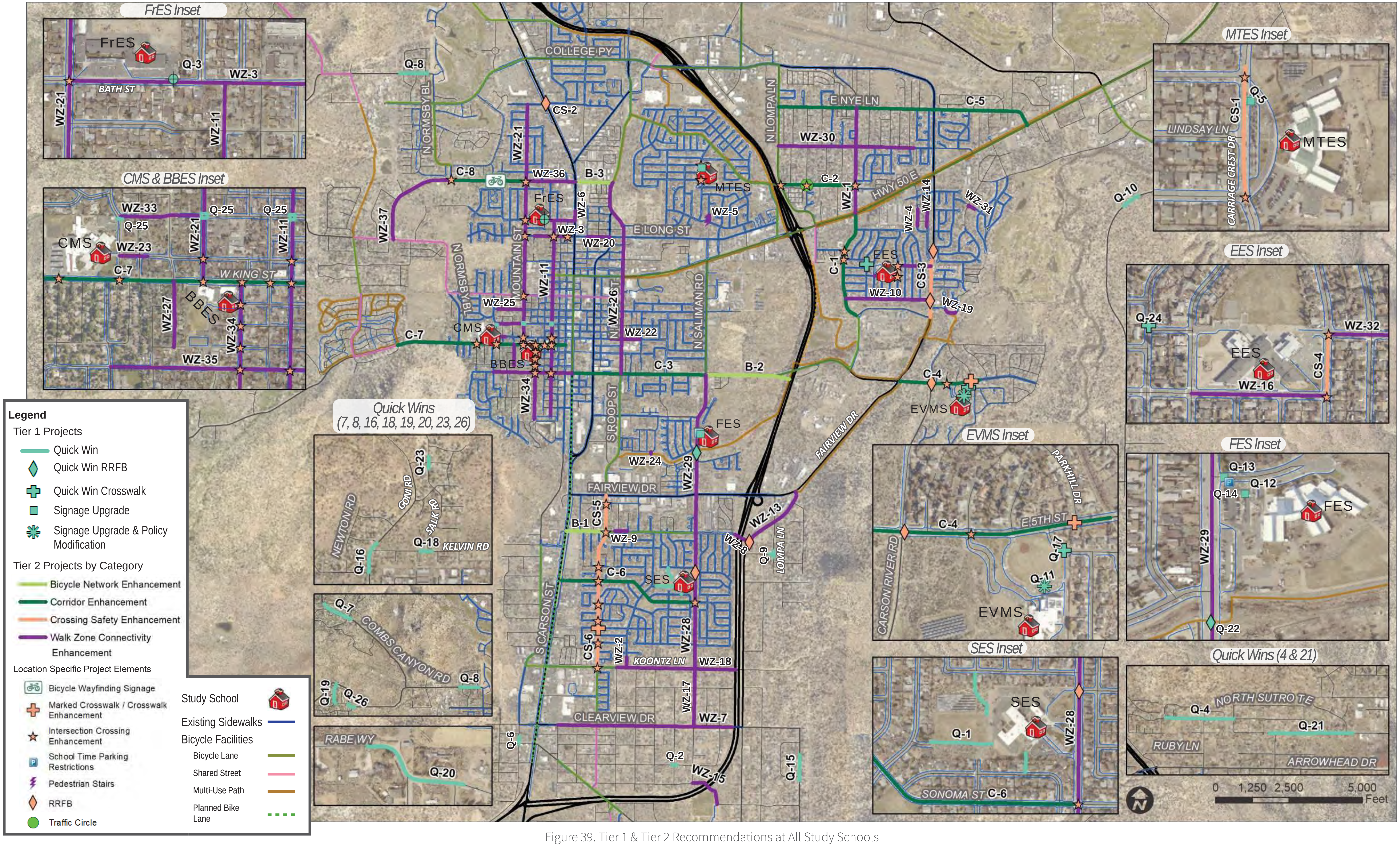


Figure 39. Tier 1 & Tier 2 Recommendations at All Study Schools

Tier 3 – Aspirational Projects

The Aspirational projects are intended to be implemented by Carson City Public Works when and if they are deemed to be operationally and fiscally feasible. However, many of the facility types which include additional separation between vehicles and bicyclists may be piloted or implemented in combination with a Tier 2 project or on its own in the near-term with low-cost materials including paint and removable bollards as seen in the examples of protected intersections below.

In Carson City, designing for **"all ages and abilities"** would provide students and the large senior population with a safe and comfortable way to travel without a vehicle. Guidance from the National City Transportation Officials (NACTO) on designing for "all ages and abilities" (see **Appendix B**) identifies numerous facility types based on the speed and traffic volumes of the roadway which anyone from the age of 8 to 80 would feel comfortable riding. Common "all ages and abilities" bicycle facility types include multi-use paths, protected cycle tracks, buffered bike lanes, and bike boulevards of which only multi-use paths are currently present in the Carson City context.

Tier 3 projects represent steps to create an ideal bicycle network which would provide safe & comfortable bicycle access to all study schools. However, these projects require further consideration to roadway capacity, long-range transportation planning, budget constraints, and local context. Aspirational projects include facility types which are suitable for **"all ages and abilities",** however, alternative facilities types included in the Design Toolbox **(Appendix B)** may replace the facility types identified in **Table 7.** This Design Toolbox is intended to provide a wide variety of potential "all ages and abilities" design solutions to select from during project design.

Exhibit 18. Bicycle Design Toolbox Examples
Top: Bicycle Boulevard with Median Islands Example (**Appendix B**)
Middle: Buffered Bike Lanes Example (**Appendix B**)
Bottom: One-way Protected Cycle Track Example (**Appendix B**)

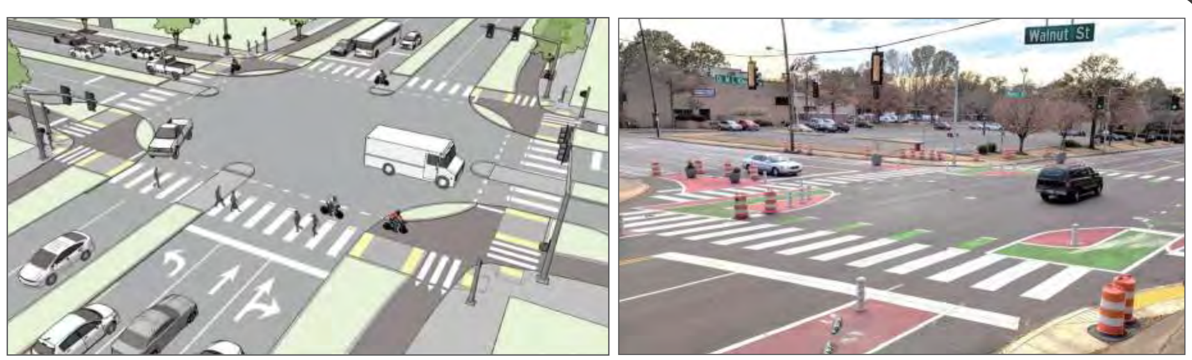


Exhibit 19. Protected Intersection Design Concept (see **Appendix B**) with Example from Memphis, TN of using low-cost and removable materials (Right)

Table 7. Tier 3 Recommendations (Aspirational Projects)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
A-1	Airport Road	Nye Lane to Highway 50	**A.** Construct buffered bike lanes or similar multi-modal improvement **B.** Protected intersection at Airport Road / Highway 50 or similar multi-modal improvement	$$$$
A-2	Ash Canyon Road / Ormsby Boulevard	Longview Way to Washington Street	Construct multi-use path from Longview Way to Washington Street or similar multi-modal improvement	$$$
A-3	Carmine Street	Airport Road to Lompa Lane	Construct bike boulevard or similar multi-modal improvement	$$
A-4	Carriage Crest Drive	Northridge Drive to Sunland Ave	Construct bike boulevard or similar multi-modal improvement	$
A-5	Division Street	Bath Street to W. 5th Street	Construct bike boulevard or similar multi-modal improvement	$$$$
A-6	Fairview Drive	Nye Lane to Butti Way	Construct protected cycle track with protected intersection at Highway 50 or similar multi-modal improvement	$$$$
A-7	Fairview Drive	Edmonds Drive to Saliman Road	Construct protected cycle track / multi-use path or similar multi-modal improvement	$$$
A-8	Little Lane	Saliman Road to Roop Street	Construct buffered bike lanes or similar multi-modal improvement	$
A-9	Long Street	Mountain Street to Russell Way	**A.** Buffered bike lane from Mountain Street to Saliman Road or similar multi-modal improvement **B.** Bike lane from Saliman Road to Russell Way or similar multi-modal improvement	$$
A-10	Mountain Street	Nye Lane to King Street	Construct buffered bike lanes or similar multi-modal improvement	$$$$$
A-11	Northgate Lane	Arrowhead Drive to Nye Lane	Construct protected cycle track or similar multi-modal improvement	$$
A-12	Ormsby Boulevard	Oak Ridge Drive to Winnie Lane	Construct bike lanes or similar multi-modal improvement	$
A-13	Robinson Street	Roop Street to Saliman Road	Construct bike lanes or similar multi-modal improvement	$
A-14	Roop Street	Winnie Lane to E. 5th Street	Construction protected cycle track or similar multi-modal improvement	$$$$
A-15	Roop Street	5th Street to Fairview Street	Enhance existing facility to buffered bike lanes or similar multi-modal improvement	$$
A-16	Roop Street	5th Street to Sonoma Avenue	Enhance existing facility to buffered bike lanes or similar multi-modal improvement	$$
A-17	Roop Street	College Parkway to Bernhard Way	Construct protected cycle track or similar multi-modal improvement	$$
A-18	Saliman Road	Fairview Drive to Koontz Lane	Buffered bike lane with potential lane reduction or similar multi-modal improvement	$$
A-19	Saliman Road	E. 5th Street to Fairview Drive	Upgrade bike lane to cycle track with protected intersection at Fairview Drive or similar multi-modal improvement	$$$$
A-20	Silver Sage Drive	Sonoma Avenue to Koontz Lane	Enhance existing facility to buffered bike lanes or similar multi-modal improvement	$$
A-21	Telegraph Street	Richmond Avenue to Roop Street	Bike Boulevard (consider diverters at Mountain Street, Division Street, Stewart Street & Roop Street) or similar improvement	$$$
A-22	Thompson Street	King Street to 550 ft. S. of San Marcus Drive	Construct bike boulevard or similar multi-modal improvement	$$
A-23	W. 5th Street	Richmond Avenue to Carson Street	**A.** Bike lanes Richmond Avenue to Minnesota Street or similar multi-modal improvement **B.** Buffered bike lane Minnesota Street to Carson Street or similar multi-modal improvement	$$
A-24	W. Nye Lane	Hot Springs Road to Mountain Street	**A.** Construct bike boulevard or similar multi-modal improvement **B.** Intersection crossing enhancements **C.** Median islands **D.** Speed cushions (as appropriate)	$$
A-25	Washington Street	Phillips Street to Roop Street	**A.** Buffered bike lane Philips Street to Minnesota Street or similar multi-modal improvement **B.** Bike lane Minnesota Street to terminus or similar multi-modal improvement	$

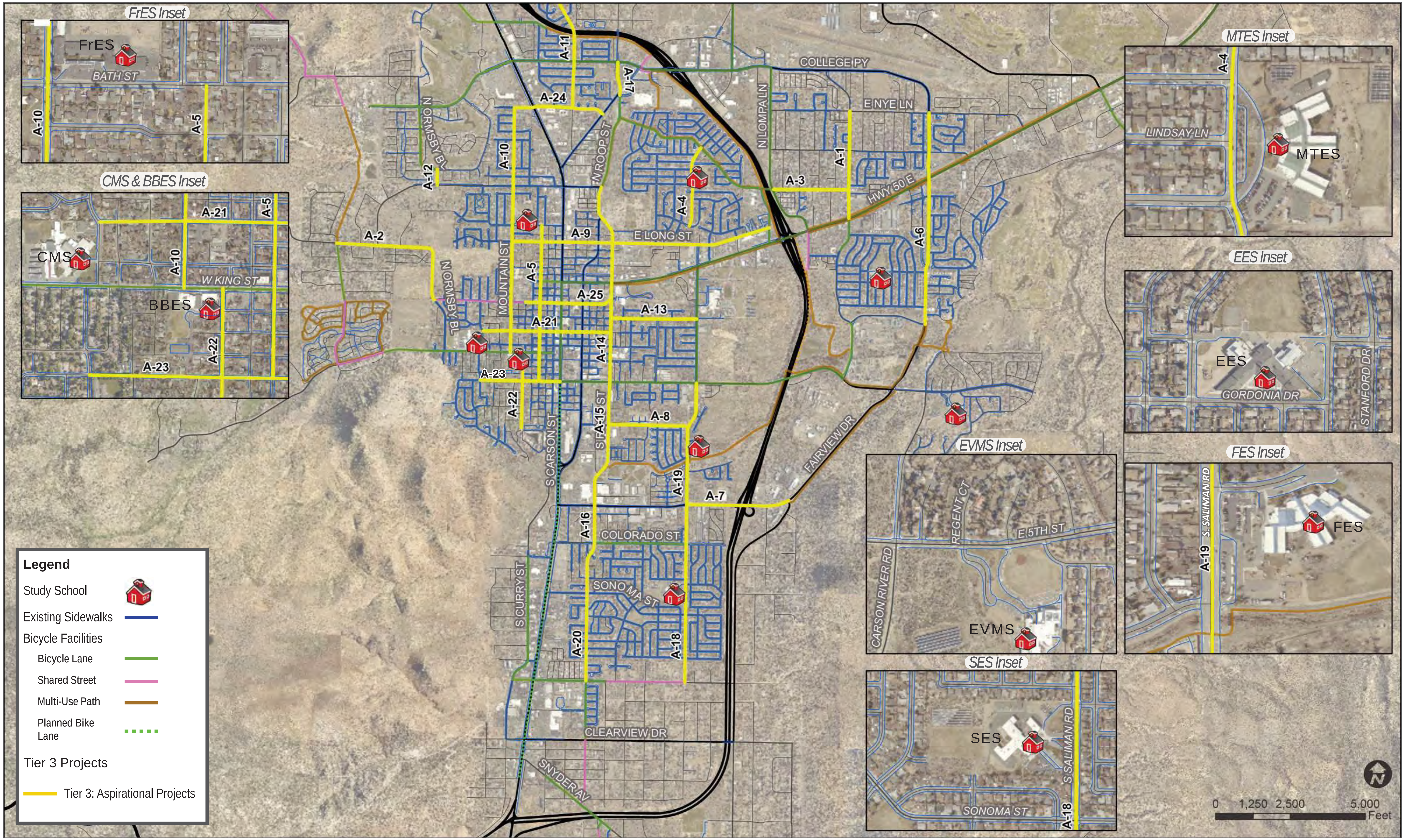


Figure 40. Tier 3 Recommendations at All Study Schools

Recommendations: School Profiles

Bordewich-Bray Elementary

Focus Areas

The number of students walking and biking to school at Bordewich-Bray Elementary is relatively low compared to other schools around Carson City despite survey responses indicating that BBES staff provide the most encouragement for their students walking and biking than any other school (**Appendix A**). The results of the parent survey and field observations indicate that improving the safety of intersections and crossings and improving the quality and presence of sidewalks are key focus areas for BBES. The two recommendations highlighted below represent the highest priority projects to improve pedestrian and bicyclist safety immediately in front of the school. Together, these two projects would enhance intersection crossings at seven intersections surrounding BBES and close numerous sidewalk gaps.

Exhibit 20. Project **C-7** would improve pedestrian visibility at crosswalks (W. King Street & Mountain Street)

Key Projects

W. King Street (**C-7**)

This near-term project includes enhancements to intersection crossings at four of the busiest intersections for pedestrian activity along W. King Street (Mountain Street, Thompson Street, Minnesota Street, and Division Street). These enhancements would reduce crossing distances for pedestrians and make crosswalks more visible to drivers. This project would also close multiple sidewalk gaps in front of Bordewich-Bray on W. King Street between Curry Street and Ormsby Boulevard. It is recommended that parking on the north side of W. King Street be prohibited between Phillips Street and Iris Street and a buffer between the westbound bike lane and vehicle lane would be striped. As part of this project, it is also recommended that the eastbound bike lane be protected by the parking lane on the south side of the street (similar to **Exhibit 21**). This configuration would ensure that the existing bike lane is free from obstructions during pick-up and drop-off periods, eliminate jaywalking from vehicles parked on the north side of W. King Street, improve pedestrian crossings at Mountain Street, and reduce vehicle speeds throughout the day.

Exhibit 21. Parking protected bike lanes would improve existing crosswalks and bike lanes in front of BBES on W. King Street

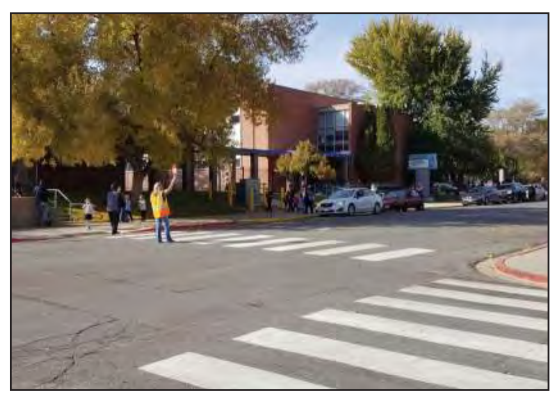


Exhibit 22. The Thompson Street & 2nd Street intersection would benefit from reduced crossing distances and slower vehicle speeds through the intersection (**WZ-34**)

Thompson Street (**WZ-34**)

There are multiple pedestrian crossings on Thompson Street, particularly between W. King Street and W. 5th Street. It is recommended that intersection crossing enhancements be installed to help reduce vehicle speeds entering the intersection, make pedestrians more visible to vehicles, and reduce crossing distances. To improve the pedestrian environment along the corridor, this project also includes the closure of numerous existing sidewalk gaps between W. King Street and San Marcus Drive.

Table 8. Tier 1 Recommendations (BBES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost Estimate
Q-6	Cochise Street	150 ft North & South of Overland Street / Cochise Street intersection	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-25	Telegraph Street	3 Intersections: Telegraph Street & Mountain Street Telegraph Street & Division Street Telegraph Street & Richmond Avenue	Install marked crosswalk	$

Table 9. Tier 2 Recommendations (BBES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
C-7	W. King Street	Thames Lane to Curry Street	**A.** Construct multi-use path from Thames Lane to Canyon Park Court or similar multi-modal improvement **B.** Add physical buffer for bike lane at CMS & BBES **C.** Close sidewalk gaps between Curry Street and Ormsby Boulevard **D.** Install intersection crossing enhancements at Tacoma Avenue, Richmond Avenue, Mountain Street, Thompson Street, Minnesota Street, Division Street	$$$$	47	**Near**
WZ-33	Telegraph Street	Richmond Avenue to Mountain Street	Construct sidewalk on south side of roadway to eliminate sidewalk gaps and enhance existing sidewalks, as possible	$$	47	**Near**
WZ-21	Mountain Street	Nye Lane to King Street	**A.** Close sidewalk gaps & enhance existing sidewalk where possible **B.** Add intersection crossing enhancements at Winnie Lane, Bath Street, Long Street, Washington Street, Telegraph Street, Musser Street	$$$$$	42	**Near**
WZ-11	Division Street	Bath Street to W. 5th Street	**A.** Add intersection crossing enhancements at minor side streets **B.** Enhance & upgrade existing crosswalks through-out the corridor including Musser Street, Telegraph Street, and Long Street **C.** Close sidewalk gaps and widen sidewalks as possible	$$$$	38	**Near**
WZ-34	Thompson Street	King Street to 550 ft. S. of San Marcus Drive	**A.** Close sidewalk gaps on east side (King Street to 5th Street) **B.** Close sidewalk gaps on west side (5th Street to San Marcus Drive) **C.** Create intersection crossing enhancements at existing W. 2nd St, W. 3rd St, and W. 4th St crosswalks	$$	38	**Near**
WZ-35	W. 5th Street	Richmond Avenue to Carson Street	**A.** Close sidewalk gaps and enhance existing sidewalk where possible **B.** Add intersection crossing enhancements at Thompson Street & Division Street	$$$$$	36	**Near**
WZ-3	Bath Street	Mountain Street to Carson Street	**A.** Close sidewalk gaps between Curry Street & Mountain Street **B.** Add intersection crossing enhancement (paint or hardscape) at existing mid-block crosswalk and Division Street crosswalks **C.** Add missing & repair damaged ADA Ramps **D.** Repair and enhance existing sidewalks as possible	$$$	34	**Near**
WZ-12	Division Street	5th Street to southern terminus of Division Street	Close sidewalk gaps	$$	31	Medium
WZ-6	Carson Street	Bath Street to 420 ft. N. of Bath Street	Construct sidewalk	$	30	Medium
WZ-20	Long Street	Curry Street to Sierra Circle & Fall Street to Stewart Street	**A.** Close sidewalk gaps (Curry Street to Sierra Circle & Fall Street to Stewart Street) **B.** Crosswalks and intersection enhancements at Division Street, Curry Street, and Marian Avenue	$$$	30	Medium
WZ-26	Roop Street	Winnie Lane to E. 5th Street	**A.** Close sidewalk gaps (Telegraph Street to E. 5th Street) **B.** Enhance existing sidewalks as possible	$$$	29	Medium
C-3	E. 5th Street	Saliman Road to Carson Street	**A.** Enhance existing sidewalks **B.** Widen existing bike lane to 5'	$$$	27	Medium
WZ-27	S. Iris Street	4th Street to King Street	Construct sidewalk	$$$	27	Medium
WZ-23	Musser Street	Richmond Avenue to Winters Drive	Construct sidewalk	$	26	Medium
WZ-25	Robinson Street	Richmond Avenue to Mountain Street	Construct sidewalk	$$	21	Long
WZ-22	Musser Street	Harbin Avenue to Anderson Street	**A.** Close sidewalk gaps **B.** Enhance sidewalk where possible	$$	17	Long

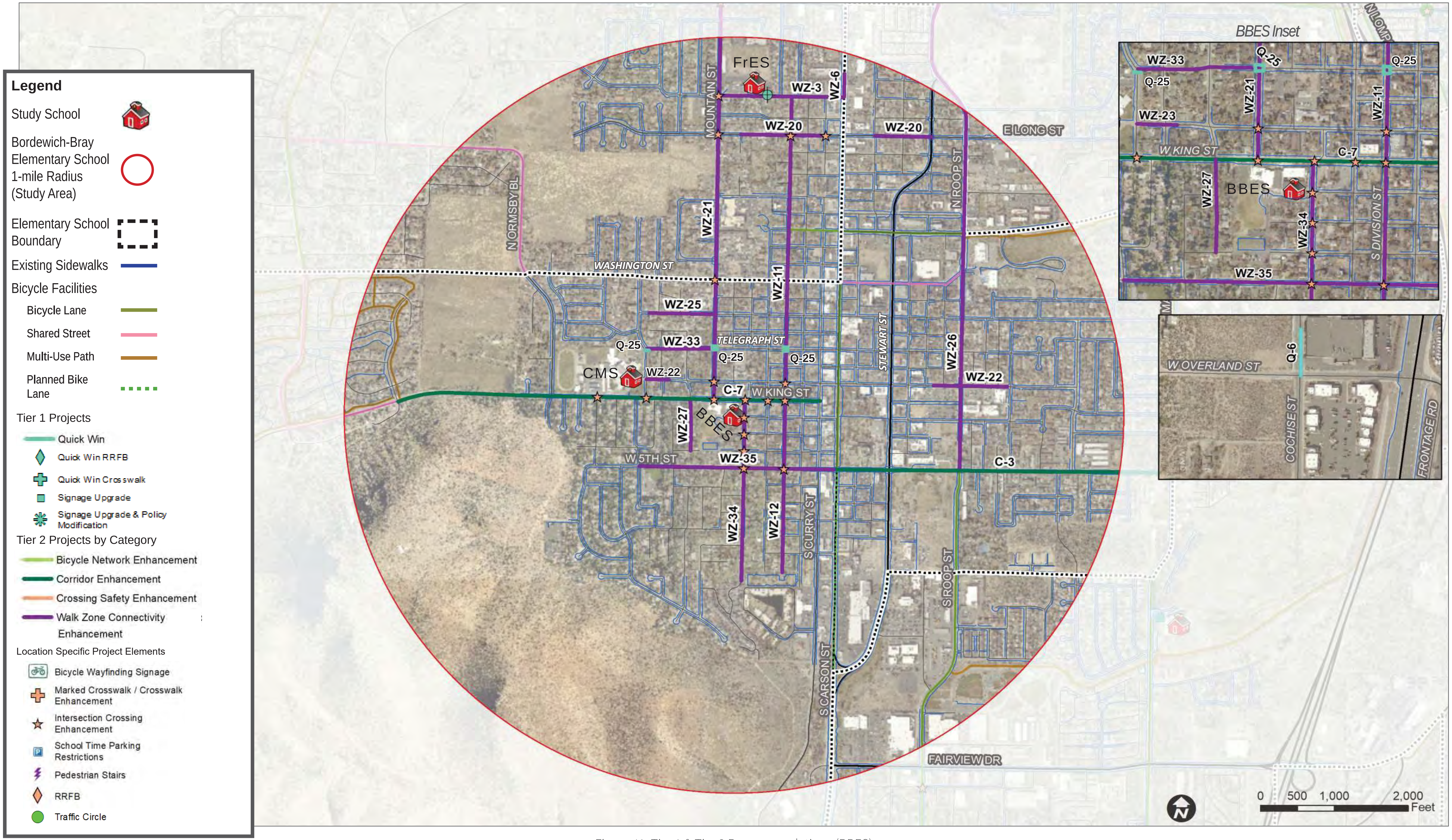


Figure 41. Tier 1 & Tier 2 Recommendations (BBES)

Empire Elementary

Focus Areas

Empire Elementary School (EES) currently has the highest rate of students walking and biking to school of any elementary school included in this study. The existing sidewalk network in the area is nearly completely connected with only a small number of sidewalk gaps throughout the school boundary. The survey results indicate that the two largest concerns for parents letting their child walk or bike to school are the speed of traffic along their route to school and the safety of intersections and crossings. The recommended projects shown in **Table 11** are geared toward addressing these concerns through traffic calming techniques, new Rectangular Rapid Falshing Beacons (RRFBs), and enhancements to existing crosswalks.

Key Projects

Gordonia Avenue (**WZ-16**), Stanton Drive (**WZ-32**), Monte Rosa Drive (**CS-4**)

These three projects work hand in hand to help reduce vehicle speeds and create a safer and more inviting pedestrian environment around the school. Removing vehicle parking on the north side of Gordonia Avenue between Monte Rosa Drive and La Loma Drive would allow for a wide sidewalk to accommodate the large influx of pedestrians during school pick-up and drop-off times. This would also reduce the crossing distance for pedestrians and create a more accommodating pedestrian environment. The addition of a center median on Gordonia Avenue (from Monte Rosa Drive to La Loma Drive) and Stanton Drive (from Monte Rosa Drive to Fairview Drive) would reduce speeds and prevent illegal U-turns within the school zone. Widening the sidewalk on the north side of Stanton Drive would provide additional space for pedestrians and may be utilized by students on bicycles as well. Intersection enhancements on Monte Rosa Drive at the Stanton Drive and Gordonia Avenue intersections would reduce crossing distances for pedestrians and prevent vehicles parking too close to crosswalks and impairing pedestrian visibility.

Exhibit 23. Widening sidewalks on Gordonia Avenue would provide additional space for pedestrians to walk side by side (**WZ-16**)

Fairview Drive (**CS-3**)

This near-term project intends to improve intersection crossing safety at three intersections along Fairview Drive. The intersection enhancement most impactful to EES students includes constructing an RRFB with a marked crosswalk across Fairview Drive south of Walker Drive, and creating a sidewalk connection on the west side of the street from the new RRFB crossing location to the existing sidewalk at the intersection of Fairview Drive and N. Edmonds Drive. Currently, there is no marked crosswalk across Fairview Drive between Gordon Street and Pheasant Drive which are over half a mile apart. Creating a high quality crossing location between these two roadways would reduce the distance a pedestrian must walk to safely cross Fairview Drive from the residential neighborhood located on the east side of Fairview Drive between Quinn Drive and Sweetwater Drive.

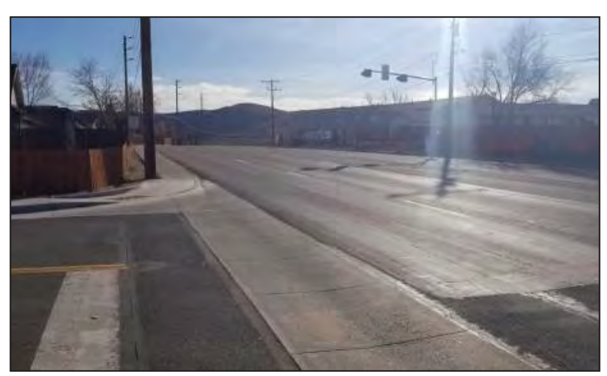


Exhibit 24. Fairview Drive at Walker Drive, looking south (**CS-3**)

Table 10. Tier 1 Recommendations (EES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-24	Siskiyou Drive	Stanton Drive	Install marked crosswalk	$

Table 11. Tier 2 Recommendations (EES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
CS-4	Monte Rosa Drive	Stanton Drive to Gordonia Avenue	Add intersection crossing enhancements to Stanton Drive & Gordonia Avenue intersections, including striping to prohibit parking close to existing crosswalks	$	45	**Near**
WZ-16	Gordonia Avenue	Monte Rosa Drive to La Loma Drive	**A.** Widen existing sidewalks on the north side of the roadway **B.** Add center median from Monte Rosa Drive to La Loma Drive	$$	39	**Near**
WZ-32	Stanton Drive	Monte Rosa Drive to Fairview Drive	Widen existing sidewalk on south side and create center median	$$	39	**Near**
CS-3	Fairview Drive	Desatoya Drive to Walker Drive	**A.** Install RRFB at Desatoya Drive **B.** Install RRFB with pedestrian refuge island (painted or hardscape) between Walker Drive and Stanton Drive **C.** Construct Sidewalk on the west side of Fairview Drive from Walker Drive to Edmonds Drive **D.** Enhance existing sidewalk on east side from Lepire Drive to multi-use path **E.** Enhance existing sidewalk on west side from Desatoya Drive to multi-use path south of Butti Way	$$	36	**Near**
WZ-10	Desatoya Avenue	Airport Road to Fairview Drive	Widen sidewalks on south side of roadway	$$	35	**Near**
C-4	E. 5th Street	Fairview Drive to Mexican Ditch Trail	**A.** Construct bike lanes from Fairview Drive to Carson River Road **B.** Construct buffered bike lane from Carson River Road to Mexican Ditch Trail or similar multi-modal improvement **C.** Add marked crosswalk with pedestrian refuge (painted or hardscape) at Parkhill Drive **D.** Construct pedestrian refuge at Regent Court (painted or hardscape) **E.** Relocate existing crosswalk at Carson River Road & Hells Bells Road approximately 15 feet to the east, add pedestrian refuge Island (painted or hardscape) and RRFB	$$	34	**Near**
C-1	Airport Road	Butti Way to E. 5th Street	A. Construct bike lane from Butti Way to Highway 50 B. Add intersection crossing enhancements at Airport Road / Douglas Drive and Airport Road / Menlo Drive	$$	31	Medium
WZ-19	Lepire Drive	Snake Mountain Multi-use path to Cassidy Court	Construct sidewalk from Snake Mountain multi-use path to the existing sidewalk on the north side of Lepire Drive	$$	26	Medium
C-2	Carmine Street	Airport Road to Lompa Lane	**A.** Traffic Circle at Dori Way & Carmine Street **B.** Close sidewalk gaps between Airport Road & Dori Way **C.** Intersection crossing enhancements at Dori Way, Lompa Lane, and Airport Road	$$$	25	Medium
WZ-1	Airport Road	Nye Lane to Highway 50	**A.** Close sidewalk gaps **B.** Enhance existing sidewalk as possible	$$$$	23	Medium
B-2	E. 5th Street	Saliman Road to I-580	Construct multi-use path or separated facility with connection to existing multi-use path on either side of I-580	$$$	19	Long
WZ-14	N. Edmonds Drive	320 ft N. of Reeves Street to 100 ft N. Brown Street	Construct sidewalk on west side of roadway	$$	18	Long
WZ-4	Brown Street	420 ft. N. of Reeves Street to 170 ft. S. of Reeves Street	Construct sidewalk	$$	17	Long
WZ-30	Sherman Lane	Lompa Lane to Chanel Lane	Construct sidewalk	$$$$$	17	Long
WZ-31	Stampede Drive	Gregg Street East to Existing Sidewalk	Construct sidewalk on south side corner to existing sidewalk	$$	14	Long

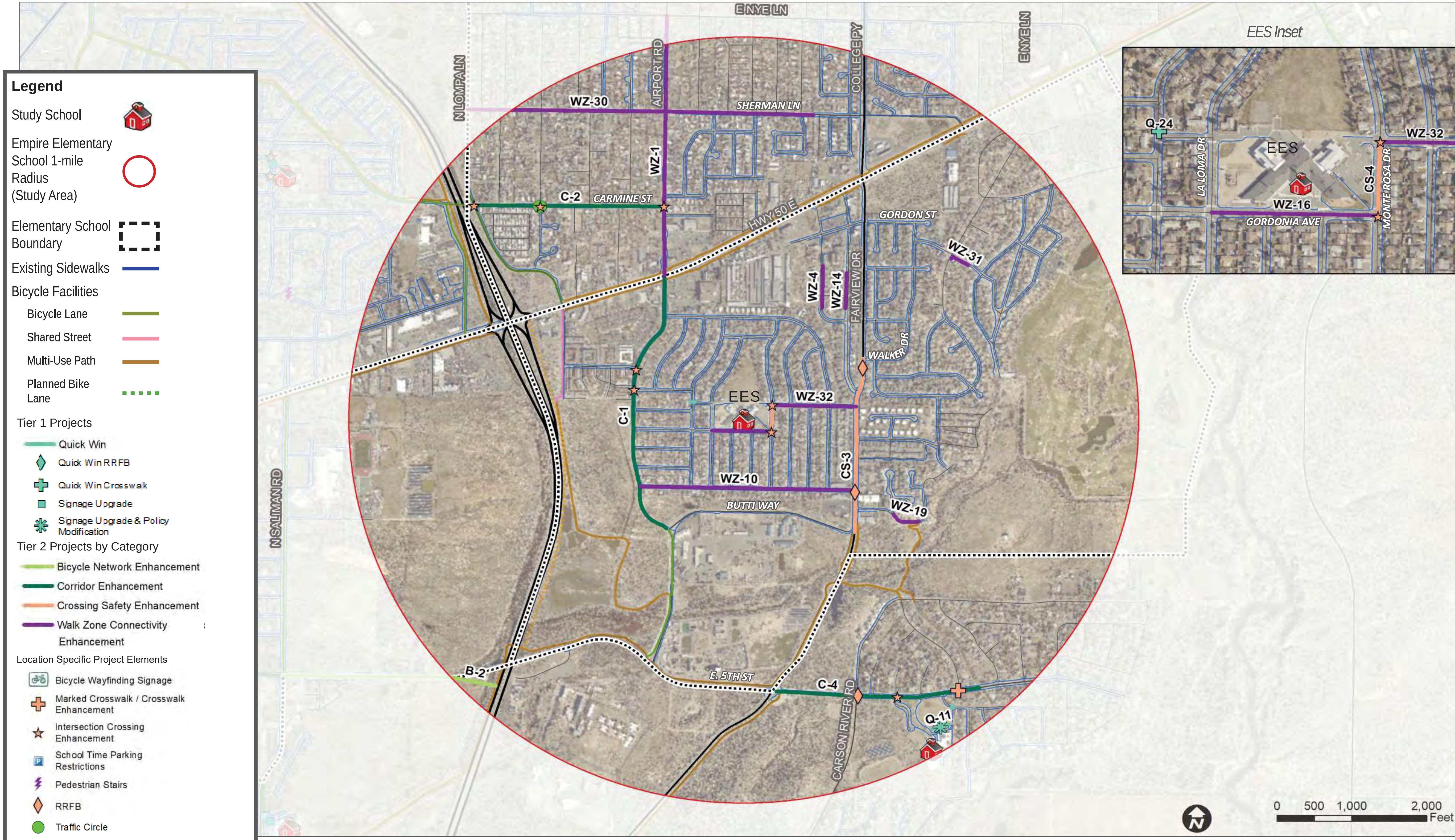


Figure 42. Tier 1 & Tier 2 Recommendations (EES)

Fremont Elementary

Focus Areas

Due to the current Fremont Elementary School (FES) boundary, the proportion of Fremont students who are within a walkable or bikeable distance is low. With a majority of students being driven by a parent or using the school bus, a special emphasis was placed on improving safe access to bus stops for FES students. These projects (**Q-16**, **Q-18**, **Q-21**, **Q-23**, and **C-5**) would help enhance driver awareness of students and improve access at up to 15 current Fremont bus stops. With a large number of students being driven by a parent, the single vehicle access to FES from Firebox Road is frequently congested. This is due in large part to vehicles turning left out of Firebox Road despite efforts from staff and the existing signage prohibiting this movement. A combination of "No Left Out" in-road signage (**Q-22**) and increased engagement (**ENG-1**) may help reduce this issue. Parents wanting to travel south on Saliman Road following pick-up or drop-off of students would need to take an alternative route or may park on Cardinal Way and walk to the school via the two crosswalks on Saliman Road.

Key Projects

Saliman Road (**Q-22**)

The existing crosswalk that connects the California Trail on either side of Saliman Road experiences a large number of pedestrian crossings throughout the day, particularly around the pick-up and drop-off times at FES. A high quality crossing enhancement, such as an RRFB, would improve crossing safety for students and local residents alike. Due to the location and low cost of this project, this RRFB could be installed in a relatively short period of time and is designated as a Tier 1 Project.

Exhibit 25. Saliman Road at the existing crosswalk south of Cardinal Way (**Q-22**)

Saliman Road (**WZ-29**)

Although the current number of students walking and biking to FES is low, this near-term project anticipates the impact of future development in the area and the need to accommodate a large number of students walking and biking to school. Constructing a wider sidewalk throughout the corridor would make the pedestrian environment more inviting by increasing the distance between vehicles and pedestrians traveling along Saliman Road.

Exhibit 26. Existing stormwater spillway to be traversed by recommended pedestrian bridge (**WZ-24**)

Highlighted Project

Reavis Lane (**WZ-24**)

The existing multi-use path (California Trail) connecting Roop Street to Saliman Road is located on the south side of an existing stormwater spillway. Residents on the north side of the spillway do not have an easy way to access the California Trail or FES without significant out of direction travel. A multi-use bridge over the spillway would create a more connected pedestrian network in the Fremont area and would reduce walking distances for students.

Table 12. Tier 1 Recommendations (FES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-10	Deer Run Road	150 feet on either side of Deer Run Road / BLM Access (located 2,150 feet south of Brunswick Canyon Road)	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-12	FES Drop Off Loop	At existing temporary "Single Lane Pick-Up" sign	Install permanent sign	$
Q-13	Firebox Road	At Saliman Road	Install in-road message sign stating "No Left-Out"	$
Q-14	Firebox Road	At Saliman Road	Update existing red curb along Firebox Road to be more visible	$
Q-16	Goni Road	Jefferson Dr to Franklin Rd	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-18	Kelvin Road	200 ft east and west of Kelvin Road / Salk Road intersection	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-21	S. Sutro Street	Bryce Drive to Emerson Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-22	Saliman Road	Cardinal Way to Firebox Road	Install RRFB at existing crosswalk south of Cardinal Way	$
Q-23	Salk Rd	150 ft North & South of Avery Rd	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$

Table 13. Tier 2 Recommendations (FES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
WZ-33	Telegraph Street	Richmond Avenue to Mountain Street	Construct sidewalk on south side of roadway to eliminate sidewalk gaps and enhance existing sidewalks, as possible	$$	47	**Near**
WZ-28	Saliman Road	Fairview Drive to Koontz Lane	**A**. Intersection crossing enhancements at Sonoma Street **B**. RRFB at Damon Road crosswalk **C**. Sidewalk east side Colorado Street to Fairview Drive **D**. Enhance existing sidewalk as possible	$$$	43	**Near**
WZ-29	Saliman Road	E. 5th Street to Fairview Drive	Enhance existing sidewalk as possible	$$	43	**Near**
WZ-26	Roop Street	Winnie Lane to E. 5th Street	**A**. Close sidewalk gaps (Telegraph Street to E. 5th Street) **B**. Enhance existing sidewalks as possible	$$$	29	Medium
C-3	E. 5th Street	Saliman Road to Carson Street	**A**. Enhance existing sidewalks **B**. Widen existing bike lane to 5'	$$$	27	Medium
B-1	Colorado Street	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to existing bike lanes or similar multi-modal improvement	$	23	Medium
WZ-13	S. Edmonds Drive	Fairview Drive to Colorado Street Bridge	Construct multi-use path on west/north side to connect to existing path	$$	22	Medium
WZ-8	Colorado Street	Colorado Terminus to Edmonds Drive	**A**. Construct multi-use bridge over I-580 from the Colorado Street terminus to Edmonds Drive **B**. Marked crosswalk with RRFB at Colorado Street & Edmonds Drive intersection	$$$$$$	20	Long
B-2	E. 5th Street	Saliman Road to I-580	Construct multi-use path or separated facility with connection to existing multi-use path on either side of I-580	$$$	19	Long
WZ-24	Reavis Lane	Create Pedestrian Connection to Multi-Use Path	Construct multi-use bridge between existing multi-use trail and sidewalk on south side of Reavis Lane	$$	18	Long
CS-5	Roop Street/Silver Sage Drive	Fairview Drive to Sonoma Avenue	Add intersection crossing enhancements at minor side-street approaches south of Fairview Drive	$$	17	Long
WZ-22	Musser Street	Harbin Avenue to Anderson Street	**A**. Close sidewalk gaps **B**. Enhance sidewalk where possible	$$	17	Long
WZ-9	Colorado Street	Birch Street to 125 ft W. of Utah Street	Construct sidewalk on north side of roadway	$$	15	Long

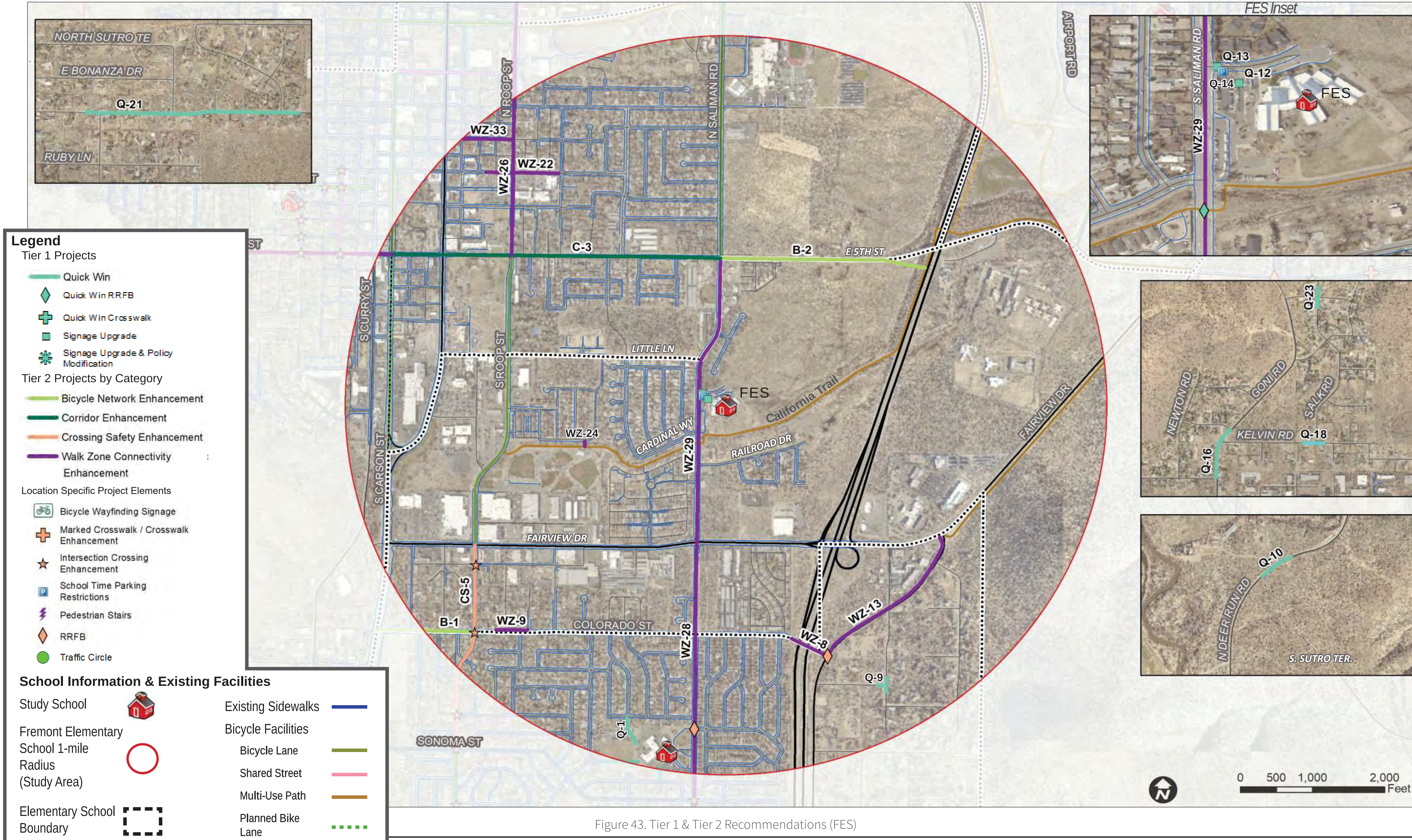


Figure 43. Tier 1 & Tier 2 Recommendations (FES)

Fritsch Elementary

Focus Areas

The three most common factors Fritsch ES (FrES) parents identified in the survey which would improve walking & biking to school are improving the safety of intersections & crossings (30%), reducing traffic speeds along routes to school (27%), and improving sidewalks & pathways (22%). These three focus areas comprise nearly 80 percent of the responses from FrES and are therefore the focus of a majority of the recommendations benefiting the school. The key projects highlighted below are all near-term projects that would provide a significant improvement to the pedestrian network in the FrES boundary. Additionally, multiple Quick Win projects have been identified that could improve safety for pedestrians through increased driver awareness at bus stops (**Table 14**).

Key Projects

Bath Street (**WZ-3**)

Bath Street provides access to the front door of the Fritsch Elementary School building. The existing sidewalk along Bath Street is in poor condition with gaps in many locations. A significant portion of students walk along Bath Street to access FrES (even those in private vehicles), therefore focusing improvements on this roadway would benefit a large number of students. This near-term project includes intersection crossing enhancements at the existing mid-block crosswalk in front of the school and at the Division Street intersection. The Bath Street / Moutain Street intersection is addressed by the Mountain Street project (**WZ-21**). The existing sidewalk width along Bath Street does not allow for multiple pedestrians to pass each other easily. During student pick-up and drop-off periods the influx of pedestrians in the area can create sidewalk congestion. It is recommended that the existing sidewalks be widened to the extent possible and new sidewalks be constructed to the maximum possible width to fill existing gaps.

Division Street (**WZ-11**)

Division Street is a primary north-south connection for students south of Bath Street and east of Mountain Street. This near-term project addresses the existing sidewalk gaps along Division Street, while also enhancing crosswalks at Musser Street, Telegraph Street, Long Street, and all other minor side streets and at Musser Street, Telegraph Street, and Long Street. This project also recommends widening the existing sidewalk to the extent possible throughout the corridor in order to improve the existing pedestrian environment and allow for pedestrian passing zones throughout the corridor.

Exhibit 27. Existing sidewalk gaps on Division Street south of Bath Street would be address by project **WZ-11**

Mountain Street (**WZ-21**)

Mountain Street is the primary north-south corridor through the FrES boundary. This near-term project addresses existing intersection safety and sidewalk gap concerns throughout the corridor. The intersections of six well utilized east-west corridors (Winnie Lane, Bath Street, Long Street, Washington Street, Telegraph Street, and Musser Street) would be enhanced with intersection crossing treatments intended to increase pedestrian visibility, reduce crossing distances, and reduce vehicle speeds entering and exiting the intersection.

Exhibit 28. School crossing-guard assisting children to cross at the intersection of Bath Street & Mountain Street (**WZ-21**)

Table 14. Tier 1 Recommendations (FrES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-3	Bath Street	At FrES Parent Drop-Off Loop Exit	Extend existing red curb by 20 feet to the east	$
Q-4	Bonanza Drive	W. Sutro Terrace to Manzanita Terrace	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-7	Combs Canyon Road	Lakeview Road to Meadowood Road	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-8	Combs Canyon Road	Harvard Drive to Dartmouth Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-19	Prospect Drive	Timberline Drive to Lotus Circle	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-26	Timberline Drive	Prospect Drive to 100 ft East of Westwood Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$

Table 15. Tier 2 Recommendations (FrES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
WZ-33	Telegraph Street	Richmond Avenue to Mountain Street	Construct sidewalk on south side of roadway to eliminate sidewalk gaps and enhance existing sidewalks, as possible	$$	47	**Near**
WZ-21	Mountain Street	Nye Lane to King Street	**A**. Close sidewalk gaps & enhance existing sidewalk where possible **B**. Add intersection crossing enhancements at Winnie Lane, Bath Street, Long Street, Washington Street, Telegraph Street, Musser Street	$$$$$	42	**Near**
WZ-11	Division Street	Bath Street to W. 5th Street	**A**. Add intersection crossing enhancements at minor side streets **B**. Enhance & upgrade existing crosswalks through-out the corridor including Musser Street, Telegraph Street, and Long Street **C**. Close sidewalk gaps and widen sidewalks as possible	$$$$	38	**Near**
WZ-3	Bath Street	Mountain Street to Carson Street	**A**. Close sidewalk gaps between Curry Street & Mountain Street **B**. Add intersection crossing enhancement (paint or hardscape) at existing mid-block crosswalk and Division Street crosswalks **C**. Add missing & repair damaged ADA Ramps **D**. Repair and enhance existing sidewalks as possible	$$$	34	**Near**
WZ-36	Winnie Lane	Carson Street to Mountain Street	Enhance existing sidewalks as possible	$$	34	**Near**
C-8	Winnie Lane	Mountain Street to Ormsby Blvd	**A.** Enhance existing sidewalks where possible **B.** Add bike lanes from Mountain Street to Ormsby Boulvard **C.** Add wayfinding signage at Victoria Avenue directing bicyclists towards the multi-use path on north side **D.** Enhance crosswalks at Ormsby Boulevard, Mountain Street, and Victoria Avenue **E.** Enhance street lighting at Mountain Street and Winnie Lane **F.** Remove overgrown vegetation to improve visibility	$$	33	Medium
WZ-6	Carson Street	Bath Street to 420 ft. N. of Bath Street	Construct sidewalk	$	30	Medium
WZ-20	Long Street	Curry Street to Sierra Circle & Fall Street to Stewart Street	**A**. Close sidewalk gaps (Curry Street to Sierra Circle & Fall Street to Stewart Street) **B**. Crosswalks and intersection enhancements at Division Street, Curry Street, and Marian Avenue	$$$	30	Medium
B-3	Winnie Lane	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to Roop Street or similar multi-modal improvement	$	29	Medium
WZ-26	Roop Street	Winnie Lane to E. 5th Street	**A**. Close sidewalk gaps (Telegraph Street to E. 5th Street) **B**. Enhance existing sidewalks as possible	$$$	29	Medium
WZ-23	Musser Street	Richmond Avenue to Winters Drive	Construct sidewalk	$	26	Medium
CS-2	Carson Street	Nye Lane	Construct RRFB and associated crossing enhancements or alternatively a traffic signal	$$	23	Medium
WZ-37	Winnie Lane	Ash Canyon Road to Ormsby Blvd	Extend multi-use path on north side to Ash Canyon Road	$$	21	Medium
WZ-25	Robinson Street	Richmond Avenue to Mountain Street	Construct sidewalk	$$	21	Long
WZ-22	Musser Street	Harbin Avenue to Anderson Street	**A**. Close sidewalk gaps **B**. Enhance sidewalk where possible	$$	17	Long

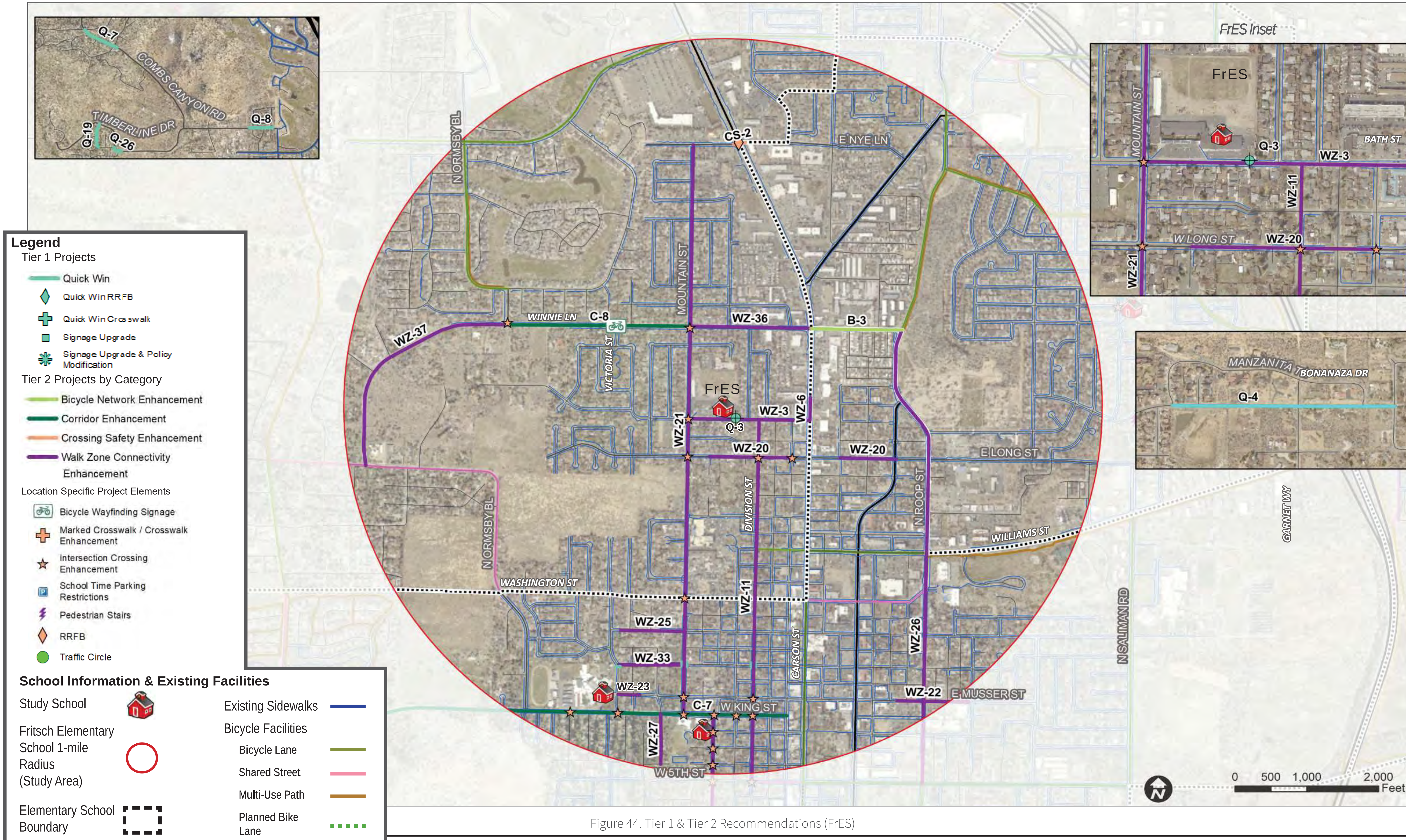


Figure 44. Tier 1 & Tier 2 Recommendations (FrES)

Mark Twain Elementary

Focus Areas

Mark Twain Elementary School (MTES) currently has a high level of students walking and biking to school (approximately 39%). This is due to the high-quality pedestrian network and low speed residential streets throughout the majority of the boundary. The survey results indicate that the primary concerns for parents are the safety of intersections & crossings (42%) and the speed of vehicles along routes to school (27%). Based on this data and site observations, recommendations were primarily focused on addressing these two concerns with an emphasis on Carriage Crest Drive.

Key Project

Carriage Crest Drive (**CS-1**)

Carriage Crest Drive is typically congested with vehicles during normal pick-up and drop-off periods. Parents waiting to pull into the pick-up area in front of the school queue in both directions on Carriage Crest Drive and also on eastbound Mountain Park Drive. This is due in part to drivers making left-turns out of the pick-up area despite existing signage prohibiting that movement. Relocating the existing signage (**Q-5**) and adding a center median island on Carriage Crest Drive would discourage vehicles from turning left out of the pick-up area and making U-turns on Carriage Crest Drive in the school zone. Additionally, a center median island may help reduce vehicle speeds through the area during all hours of the day. Intersection enhancements that reduce pedestrian crossing distances, increase pedestrian visibility, and reduce vehicle speeds would be constructed at the Mountain Park Drive and Slide Mountain Drive intersections as part of this project. Restricting parking on the east side of Carriage Crest Drive during school pick-up times or throughout the day would reduce the potential for collisions between northbound traffic and vehicles leaving a parking space. The combination of this near-term project with the proposed Engineering School Safety (**ENG-1** in Programmatic Projects) would provide a significant benefit to pedestrian safety and speed reduction in this school speed zone.

Exhibit 29. Carriage Crest Drive congestion at the entrance of the school during pick-up and drop-off creates an increased potential for crashes throughout the school zone (**CS-1**)

Exhibit 30. Intersection crossing enhancements (**CS-1**) would improve pedestrian visibility at two intersections immediately in front of MTES, including at Slide Mountain Drive (shown here)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-5	Carriage Crest Drive	At MTES Parent Drop Off Exit	Relocate existing "No Left-Out" signage to more visible location	$

Table 16. Tier 1 Recommendations (MTES)

Highlighted Project

Camille Drive (**WZ-5**)

The pedestrian network surrounding Mark Twain Elementary is generally well connected, however, it follows the roadway network with no exclusive pedestrian routes. An exclusive pedestrian connection between the Camille Drive cul-de-sac and Sunland Drive would improve the pedestrian experience and create additional pedestrian connections and access to Sunland Vista Park, a great community resource.

Exhibit 31. (Left) Map of project location; (Right) the current pedestrian access connection Camille Drive / Sunland Drive to the Camille Drive cul-de-sac

Table 17. Tier 2 Recommendations (MTES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
CS-1	Carriage Crest Drive	Slide Mountain Drive to Mountain Park Drive	**A.** Add intersection crossing enhancements at Mountain Park Drive and Slide Mountain Drive intersections **B.** Add center median from 70' south of Slide Mountain Drive to Parent Drop-Off Loop entrance **C.** Consider parking restrictions or removal on Carriage Crest Drive during school pick-up and drop-off periods	$$	39	**Near**
WZ-3	Bath Street	Mountain Street to Carson Street	**A.** Close sidewalk gaps between Curry Street & Mountain Street **B.** Add intersection crossing enhancement (paint or hardscape) at existing mid-block crosswalk and Division Street crosswalks **C.** Add missing & repair damaged ADA Ramps **D.** Repair and enhance existing sidewalks as possible	$$$	34	**Near**
WZ-36	Winnie Lane	Carson Street to Mountain Street	Enhance existing sidewalks as possible	$$	34	**Near**
C-1	Airport Road	Butti Way to E. 5th Street	**A.** Construct bike lane from Butti Way to Highway 50 **B.** Add intersection crossing enhancements at Airport Road / Douglas Drive and Airport Road / Menlo Drive	$$	31	Medium
WZ-6	Carson Street	Bath Street to 420 ft. N. of Bath Street	Construct sidewalk	$	30	Medium
WZ-20	Long Street	Curry Street to Sierra Circle & Fall Street to Stewart Street	**A.** Close sidewalk gaps (Curry Street to Sierra Circle & Fall Street to Stewart Street) **B.** Crosswalks and intersection enhancements at Division Street, Curry Street, and Marian Avenue	$$$	30	Medium
B-3	Winnie Lane	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to Roop Street or similar multi-modal improvement	$	29	Medium
WZ-26	Roop Street	Winnie Lane to E. 5th Street	**A.** Close sidewalk gaps (Telegraph Street to E. 5th Street) **B.** Enhance existing sidewalks as possible	$$$	29	Medium
C-2	Carmine Street	Airport Road to Lompa Lane	**A.** Traffic Circle at Dori Way & Carmine Street **B.** Close sidewalk gaps between Airport Road & Dori Way **C.** Intersection crossing enhancements at Dori Way, Lompa Lane, and Airport Road	$$$	25	Medium
WZ-1	Airport Road	Nye Lane to Highway 50	**A.** Close sidewalk gaps **B.** Enhance existing sidewalk as possible	$$$$	23	Medium
C-5	Nye Lane	Lompa Lane to Highway 50	Construct bike lanes & close sidewalk gaps	$$$$$$	21	Long
WZ-5	Camille Drive	Sunland Drive	Install staircase and ramp for multi-use connectivity	$$	18	Long
WZ-30	Sherman Lane	Lompa Lane to Chanel Lane	Construct sidewalk	$$$$$	17	Long

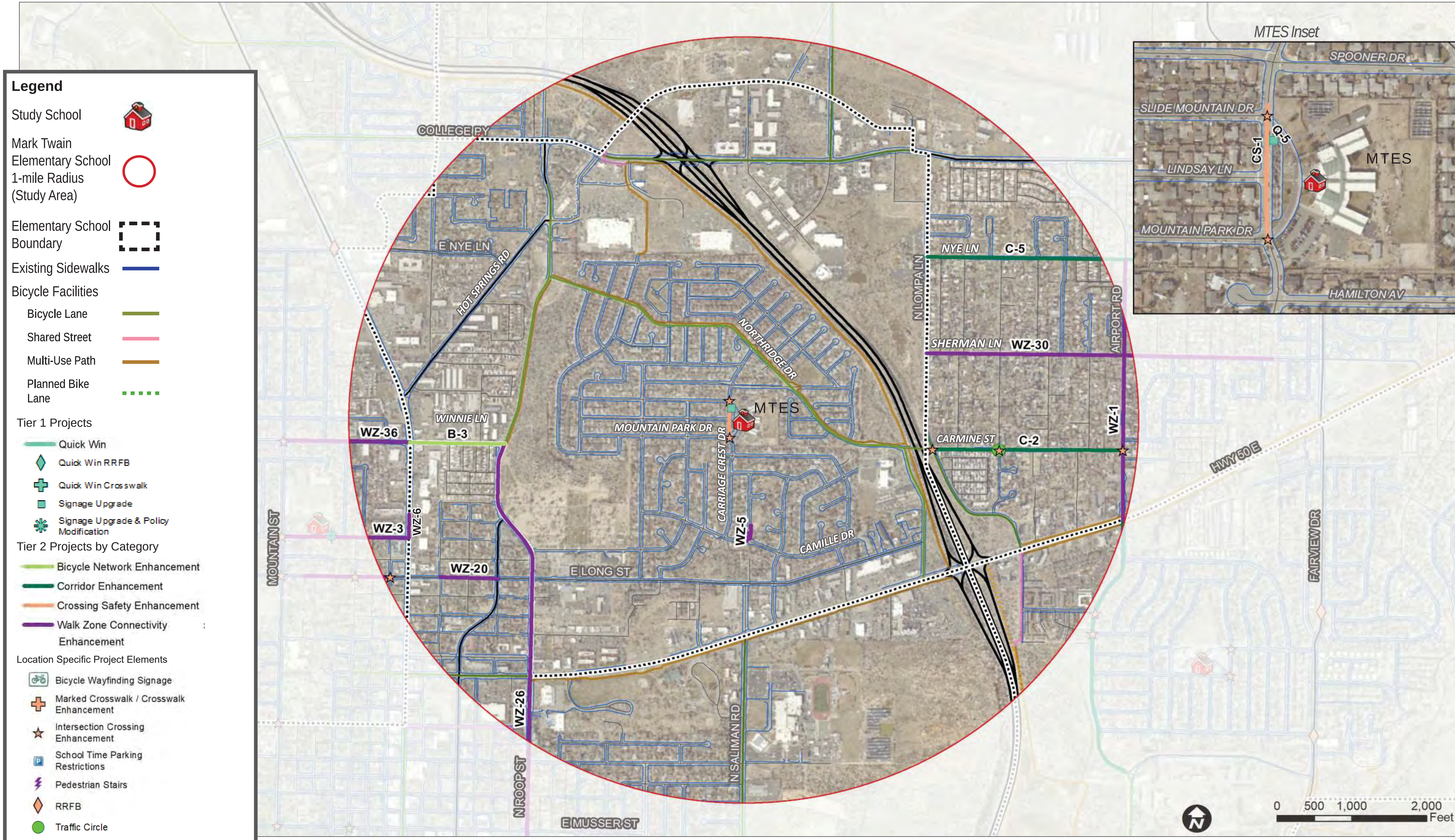


Figure 45. Tier 1 & Tier 2 Recommendations (MTES)

Seeliger Elementary

Focus Areas

The Seeliger Elementary School (SES) boundary comprises two distinct residential neighborhood types which vary not only in aesthetic qualities but in pedestrian & bicycle amenities. The neighborhood south of Kingsley Lane and east of Silver Sage Drive, as well as the neighborhood east of I-580 generally lack sidewalks and are more rural in nature. Recommendations for this portion of the SES walk zone strive to provide safe and comfortable facilities to accommodate pedestrian traffic while reducing costs and maintaining a rural aesthetic. Parent survey results indicate that the safety of intersections and crossings (31%) and traffic speeds along routes to school (24%) were the highest-ranking safety concerns for walking and biking to school. Recommendations are focused on these specific concerns and include pedestrian activated flashers and intersection crossing enhancements that are intended to reduce vehicle speeds along the corridor and through intersections while improving pedestrian visibility and safety.

Key Projects

Saliman Road (**WZ-28**)

As shown in the existing conditions chapter (**Figure 27**), a significant portion of pedestrians and bicyclists utilize the Damon Road crosswalk during school pick-up and drop-off periods. Outside of these periods, this is also a major pedestrian crossing for residents between Colorado Street and Sonoma Street. The addition of a Rectangular Rapid Flashing Beacon (RRFB) would help increase pedestrian visibility throughout the day at this well utilized crosswalk. This project also includes intersection crossing enhancements at the Saliman Road / Sonoma Street intersection that would reduce pedestrian crossing distances, increase pedestrian visibility, and reduce vehicle speeds at the intersection. Increasing sidewalk widths throughout the corridor would provide additional space for pedestrians to comfortably walk side by side and create a more welcoming pedestrian environment (**Exhibit 32**).

Exhibit 32. It is recommended that sidewalks on Saliman Road (**WZ-28**) be widen.

Sonoma Avenue (**C-6**)

This project includes the addition of standard bike lanes on Sonoma Street to provide a dedicated space for bicyclists on the roadway. This would enhance the existing bicycle network and improve the safety for bicyclists. Intersection crossing enhancements are also recommended to reduce crossing distances, improve pedestrian visibility, and reduce vehicle speeds at the Sonoma Street / Silver Sage Drive intersection.

Highlighted Project

Silver Sage Drive (**CS-6**)

Silver Sage Drive is a major north-south roadway through the SES school boundary. Currently the nearest marked crosswalks across Silver Sage Drive are located at the intersections of Sonoma Street and Koontz Lane, which are just over half a mile apart. The addition of a marked crosswalk at Pioche Street is recommended to reduce the distance between crosswalks to just over one quarter mile. Intersection crossing enhancements are also recommended to reduce crossing distances and vehicle speeds through minor street intersections along Silver Sage Drive.

Table 18. Tier 1 Recommendations (ASES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-1	Seeliger Paths	Footpaths to Seeliger Elementary School from: Cortez Street, Schell Avenue, and off Shady Oak Drive	Repave paths and extend pavement to school grounds	$
Q-2	Appion Way	150 ft East & West of Muldoon Street	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-9	De Ann Drive / Lompa Lane	150 ft on all sides of De Ann Drive / Lompa Lane Intersection	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-15	Gentry Lane	200 ft South of Heidi Circle	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-20	Rabe Way	400 ft West of Coffey Drive & 150 ft. East of Parker Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$

Table 19. Tier 2 Recommendations (ASES)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
WZ-28	Saliman Road	Fairview Drive to Koontz Lane	**A**. Intersection crossing enhancements at Sonoma Street **B**. RRFB at Damon Road crosswalk **C**. Sidewalk east side Colorado Street to Fairview Drive **D**. Enhance existing sidewalk as possible	$$$	43	**Near**
WZ-29	Saliman Road	E. 5th Street to Fairview Drive	Enhance existing sidewalk as possible	$$	43	**Near**
C-6	Sonoma Street	Carson Street to Saliman Road	**A**. Construct bike lanes or similar multi-modal improvement **B**. Add intersection crossing enhancement at Silver Sage Drive	$	36	**Near**
B-1	Colorado Street	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to existing bike lanes or similar multi-modal improvement	$	23	Medium
WZ-13	S. Edmonds Drive	Fairview Drive to Colorado Street Bridge	Construct multi-use path on west/north side to connect to existing path	$$	22	Medium
WZ-17	Hillview Drive	Kingsley Lane to Clearview Drive	Construct paved shoulder or multi-use path to connect with existing multi-use path on Saliman Road at Kingsley Lane	$$	21	Long
WZ-8	Colorado Street	Colorado Terminus to Edmonds Drive	**A**. Construct multi-use bridge over I-580 from the Colorado Street terminus to Edmonds Drive **B**. Marked crosswalk with RRFB at Colorado Street & Edmonds Drive intersection	$$$$$$	20	Long
WZ-24	Reavis Lane	Create Pedestrian Connection to Multi-Use Path	Construct multi-use bridge between existing multi-use trail and sidewalk on south side of Reavis Lane	$$	18	Long
CS-5	Roop Street/Silver Sage Drive	Fairview Drive to Sonoma Avenue	Add intersection crossing enhancements at minor side-street approaches south of Fairview Drive	$$	17	Long
WZ-7	Clearview Drive	Oak Street to I-580	Construct paved shoulder for bikes/pedestrians/bus stop accessibility	$$	16	Long
WZ-9	Colorado Street	Birch Street to 125 ft W. of Utah Street	Construct sidewalk on north side of roadway	$$	15	Long
WZ-18	Koontz Lane	Center Drive to I-580	Construct paved shoulder for bikes/pedestrians/bus stop accessibility	$$$	15	Long
CS-6	Silver Sage Drive	Sonoma Avenue to Koontz Lane	**A**. Add crosswalk at Pioche Street **B**. Add intersection crossing enhancements at Koontz Lane intersection and minor side-street approaches between Koontz Lane & Sonoma Avenue	$$$	11	Long
WZ-2	Baker Drive	Koontz Lane to 175 ft. S. of Kerinne Circle	Construct sidewalk	$$	9	Long

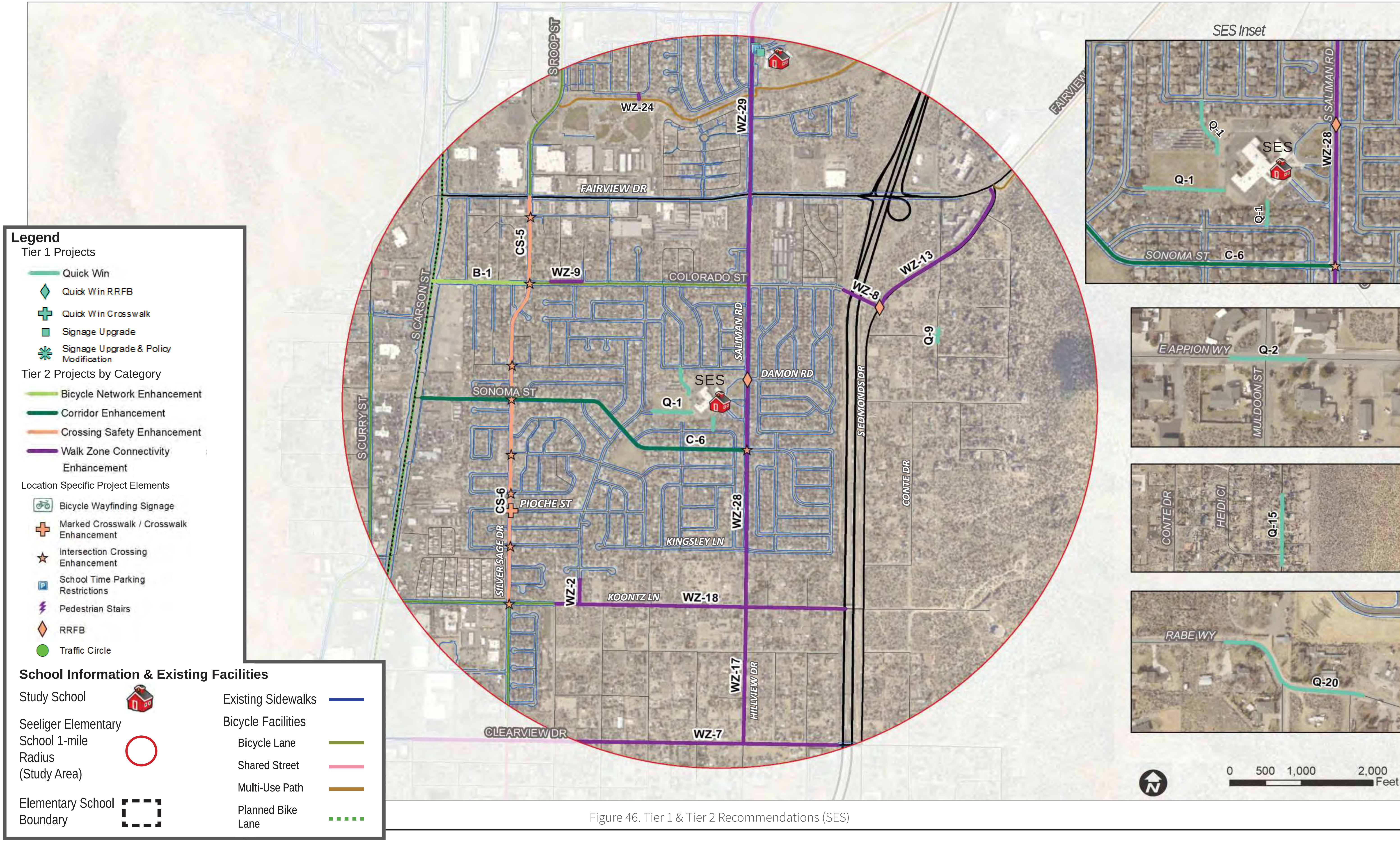


Figure 46. Tier 1 & Tier 2 Recommendations (SES)

Carson Middle

Focus Areas

Recommendations for Carson Middle School are focused on improving sidewalks and pathways and improving the safety of intersections and crossings. Additionally, concerns regarding access to school bus stop locations expressed by school staff resulted in a number of Quick Win projects which are focused on increasing driver awareness of school children at ten current Carson Middle School bus stop locations.

The number of recommendations reflect the fact that Carson Middle School has the largest student body and its' school boundary covers the largest portion of the Carson City urban area. As middle school boundaries change with the anticipated expansion of Eagle Valley Middle School, projects identified under Carson Middle School may fall under the updated Eagle Valley Middle School boundary.

Key Project

W. King Street (**C-7**)

This project would benefit students at Carson Middle School and Bordewich-Bray Elementary School simultaneously. This project includes adding a multi-use path on the north side of W. King Street (Kings Canyon Road) to create a connection between the neighborhood west of Thames Lane (Highlands) and both Carson MS and Bordewich-Bray ES. Intersection crossing enhancements are also recommended at the Tacoma Avenue, N. Richmond Avenue, and S. Richmond Avenue intersections to reduce crossing distances, improve pedestrian visibility, and reduce vehicle speeds through these intersections. Physical separation between the westbound bike lane and westbound vehicle traffic in front of Carson Middle School could also be created by removing parking on the north side of the road. Due to the high parking utilization on this portion of W. King Street during pick-up and drop-off periods, this project element may be best implemented in conjunction with the proposed expansion of Eagle Valley Middle School and corresponding reduction in the number of Carson Middle School students.

Table 20. Tier 1 Recommendations (CMS)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-3	Bath Street	At FrES Parent Drop-Off Loop Exit	Extend existing red curb by 20 feet to the east	$
Q-4	Bonanza Drive	W. Sutro Terrace to Manzanita Terrace	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-6	Cochise Street	150 ft North & South of Overland Street / Cochise Street intersection	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-7	Combs Canyon Road	Lakeview Road to Meadowood Road	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-8	Combs Canyon Road	Harvard Drive to Dartmouth Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-16	Goni Road	Jefferson Dr to Franklin Rd	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-18	Kelvin Road	200 Ft East and West of Kelvin Road / Salk Road intersection	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-19	Prospect Drive	Timberline Drive to Lotus Circle	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-21	S. Sutro Terrace	Bryce Drive to Emerson Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-23	Salk Road	150 ft North & South of Avery Road	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-25	Telegraph Street	3 Intersections: Telegraph Street & Mountain Street Telegraph Street & Division Street Telegraph Street & Richmond Avenue	Install marked crosswalk	$
Q-26	Timberline Drive	Prospect Drive to 100 ft East of Westwood Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$

Table 21. Tier 2 Recommendations (CMS)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score	Priority Timeframe
C-7	W. King Street	Thames Lane to Curry Street	**A**. Construct multi-use path from Thames Lane to Canyon Park Court or similar multi-modal improvement **B**. Add physical buffer for bike lane at CMS & BBES **C**. Close sidewalk gaps between Curry Street and Ormsby Boulevard **D**. Install intersection crossing enhancements at Tacoma Avenue, Richmond Avenue, Mountain Street, Thompson Street, Minnesota Street, Division Street	$$$$	47	**Near**
WZ-33	Telegraph Street	Richmond Avenue to Mountain Street	Construct sidewalk on south side of roadway to eliminate sidewalk gaps and enhance existing sidewalks, as possible	$$	47	**Near**
WZ-21	Mountain Street	Nye Lane to King Street	**A**. Close sidewalk gaps & enhance existing sidewalk where possible **B**. Add intersection crossing enhancements at Winnie Lane, Bath Street, Long Street, Washington Street, Telegraph Street, Musser Street	$$$$$	42	**Near**
WZ-11	Division Street	Bath Street to W. 5th Street	**A**. Add intersection crossing enhancements at minor side streets **B**. Enhance & upgrade existing crosswalks through-out the corridor including Musser Street, Telegraph Street, and Long Street **C**. Close sidewalk gaps and widen sidewalks as possible	$$$$	38	**Near**
WZ-34	Thompson Street	King Street to 550 ft. S. of San Marcus Drive	**A**. Close sidewalk gaps on east side (King Street to 5th Street) **B**. Close sidewalk gaps on west side (5th Street to San Marcus Drive) **C**. Create intersection crossing enhancements at existing W. 2nd St, W. 3rd St, and W. 4th St crosswalks	$$	38	**Near**
WZ-35	W. 5th Street	Richmond Avenue to Carson Street	**A**. Close sidewalk gaps and enhance existing sidewalk where possible **B**. Add intersection crossing enhancements at Thompson Street & Division Street	$$$$$	36	**Near**
WZ-3	Bath Street	Mountain Street to Carson Street	**A**. Close sidewalk gaps between Curry Street & Mountain Street **B**. Add intersection crossing enhancement (paint or hardscape) at existing mid-block crosswalk and Division Street crosswalks **C**. Add missing & repair damaged ADA Ramps **D**. Repair and enhance existing sidewalks as possible	$$$	34	**Near**
WZ-12	Division Street	5th Street to southern terminus of Division Street	Close sidewalk gaps	$$	31	Medium
WZ-20	Long Street	Curry Street to Sierra Circle & Fall Street to Stewart Street	**A**. Close sidewalk gaps (Curry Street to Sierra Circle & Fall Street to Stewart Street) **B**. Crosswalks and intersection enhancements at Division Street, Curry Street, and Marian Avenue	$$$	30	Medium
WZ-26	Roop Street	Winnie Lane to E. 5th Street	**A**. Close sidewalk gaps (Telegraph Street to E. 5th Street) **B**. Enhance existing sidewalks as possible	$$$	29	Medium
C-3	E. 5th Street	Saliman Road to Carson Street	**A**. Enhance existing sidewalks **B**. Widen existing bike lane to 5'	$$$	27	Medium
WZ-27	S. Iris Street	4th Street to King Street	Construct sidewalk	$$$	27	Medium
WZ-23	Musser Street	Richmond Avenue to Winters Drive	Construct sidewalk	$	26	Medium
WZ-37	Winnie Lane	Ash Canyon Road to Ormsby Blvd	Extend multi-use path on north side to Ash Canyon Road	$$	21	Medium
WZ-25	Robinson Street	Richmond Avenue to Mountain Street	Construct sidewalk	$$	21	Long
WZ-22	Musser Street	Harbin Avenue to Anderson Street	**A**. Close sidewalk gaps **B**. Enhance sidewalk where possible	$$	17	Long

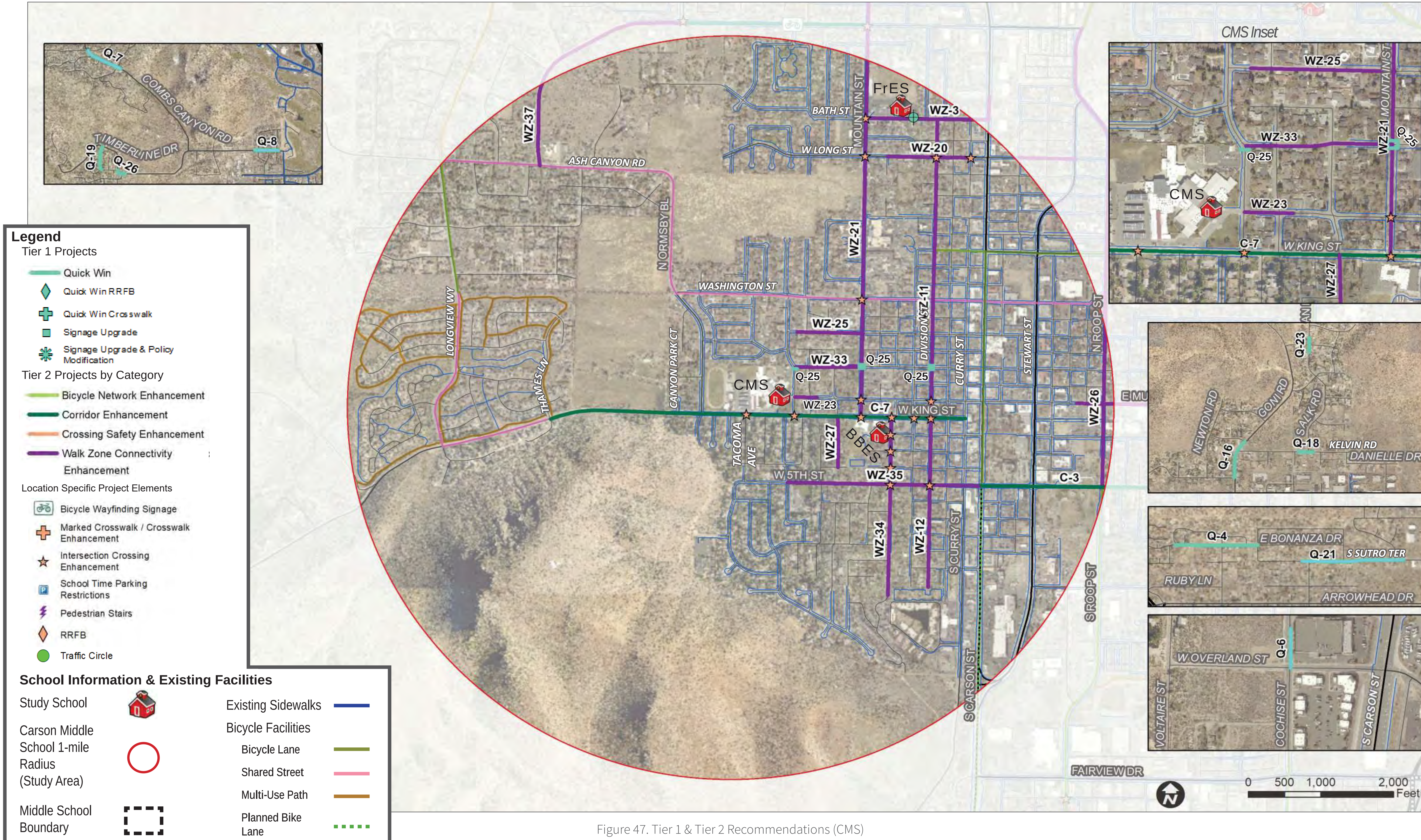


Figure 47. Tier 1 & Tier 2 Recommendations (CMS)

Eagle Valley Middle

Focus Areas

The majority of students walking and biking to Eagle Valley Middle School do so from the Empire Elementary School neighborhood. Recommendations focused on improving safety for Empire ES students also provide a direct benefit to many Eagle Valley MS students walking and biking from that area. Programming of projects that provide benefits to students from both schools would provide a substantial benefit. The survey results of the Eagle Valley Middle School students indicates that their primary safety concerns centered around improving the safety of intersections and crossings and improving sidewalks and pathways in the area; these safety concerns are mirrored by Eagle Valley Middle School parents. These two major focus areas helped to guide the development of the recommendations listed below.

It is important to note that if the EVMS school boundary changes following the planned expansion of the school, some projects which are identified under the Carson Middle School section of this report would apply instead to Eagle Valley Middle School.

Key Projects

E. 5th Street (**C-4**)

This project would improve pedestrian crossing safety at three well utilized locations along E. 5th Street immediately in-front of EVMS. Relocating the existing crosswalk at Hells Bells Road and adding a pedestrian refuge and a Rectangular Rapid Flashing Beacon (RRFB) is expected to improve vehicle yielding rates and allow pedestrians to cross safely throughout all hours of the day. The existing Regent Court crosswalk would be enhanced with the addition of a pedestrian refuge to improve crossing safety, particularly during hours when a crossing-guard is not present. During site visits, students were observed using Parkhill Drive to access the multi-use trail system to the north of EVMS. To access Parkhill Drive, students must cross Hidden Meadows Drive (**Q-17**) and E. 5th Street. A marked crosswalk with a pedestrian refuge island is recommended on the west leg of the Parkhill Drive / E. 5th Street intersection. This would allow students to travel along their desired route through the Hidden Meadows Xeriscape Park and on to Parkhill Drive.

Exhibit 33. Looking south across E. 5th Street from Parkhill Drive (**C-4**)

Buffered bike lanes are recommended on E. 5th Street from Carson River Road to the Mexican Ditch Trail. It is important to note that due to vehicles parking along E. 5th Street during school pick-up and drop-off periods (**Exhibit 34**), increased engagement may be necessary to ensure the buffered bicycle lanes are not utilized for parking during these periods.

Exhibit 34. Vehicles currently park on the south side of E. 5th Street (shown above). Buffered bike lanes (**C-4**) may require additional parking enforcement

Fairview Drive (**CS-3**)

This near-term project would enhance the existing sidewalks along Fairview Drive from the end of the multi-use path to Desatoya Avenue. This segment of Fairview Drive is well utilized by Eagle Valley Middle school students during morning and afternoon periods. Widening the sidewalk would provide additional space for passing and create a more welcoming pedestrian environment. Furthermore, a RRFB is recommended at the Fairview Drive / Desatoya Avenue intersection to improve the safety and increase driver awareness throughout the day. Based on data collected at this location, vehicle speeds are significantly above the posted 15 mph during school speed zone periods (**Appendix D**).

Exhibit 35. (Top) Existing crosswalk on Fairview Drive at Desatoya Avenue (Right) Crossing guard assisting students across Fairview Drive at Desatoya Avenue

Table 22. Tier 1 Recommendations (EVMS)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-2	Appion Way	150 ft East & West of Muldoon Street	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-9	De Ann Drive / Lompa Lane	150 ft on all sides of De Ann Drive / Lompa Lane Intersection	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-10	Deer Run Road	150 feet on either side of Deer Run Road / BLM Access (located 2,150 feet south of Brunswick Canyon Road)	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-11	EVMS Drop Off Loop	Parking Area in Drop Off Loop	Restrict parking to staff & deliveries only in front of school (reroute traffic around parking lot immediately in front of school)	$
Q-15	Gentry Lane	200 ft South of Heidi Circle	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-17	Hidden Meadows Drive	Eagle Valley MS Bus Entrance	Install marked crosswalk	$
Q-20	Rabe Way	400 ft West of Coffey Drive & 150 ft. East of Parker Drive	Utilize temporary signage to increase awareness of bus stop locations (**ENG-4**)	$
Q-24	Siskiyou Drive	Stanton Drive	Install marked crosswalk	$

Table 23. Tier 2 Recommendations (EVMS)

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
CS-4	Monte Rosa Drive	Stanton Drive to Gordonia Avenue	Add intersection crossing enhancements to Stanton Drive & Gordonia Avenue intersections, including striping to prohibit parking close to existing crosswalks	$	45
WZ-16	Gordonia Avenue	Monte Rosa Drive to La Loma Drive	**A.** Widen existing sidewalks on the north side of the roadway **B.** Add center median from Monte Rosa Drive to La Loma Drive	$$	39
WZ-32	Stanton Drive	Monte Rosa Drive to Fairview Drive	Widen existing sidewalk on south side and create center median	$$	39
CS-3	Fairview Drive	Desatoya Drive to Walker Drive	**A.** Install RRFB at Desatoya Drive **B.** Install RRFB with pedestrian refuge island (painted or hardscape) between Walker Drive and Stanton Drive **C.** Construct Sidewalk on the west side of Fairview Drive from Walker Drive to Edmonds Drive **D.** Enhance existing sidewalk on east side from Lepire Drive to multi-use path **E.** Enhance existing sidewalk on west side from Desatoya Drive to multi-use path south of Butti Way	$$	36
WZ-10	Desatoya Avenue	Airport Road to Fairview Drive	Widen sidewalks on south side of roadway	$$	35
C-4	E. 5th Street	Fairview Drive to Mexican Ditch Trail	**A.** Construct bike lanes from Fairview Drive to Carson River Road or similar multi-modal improvement **B.** Construct buffered bike lane from Carson River Road to Mexican Ditch Trail or similar multi-modal improvement **C.** Add marked crosswalk with pedestrian refuge (painted or hardscape) at Parkhill Drive **D.** Construct pedestrian refuge at Regent Court (painted or hardscape) **E.** Relocate existing crosswalk at Carson River Road & Hells Bells Road approximately 15 feet to the east, add pedestrian refuge Island (painted or hardscape) and RRFB	$$	34
C-1	Airport Road	Butti Way to E. 5th Street	A. Construct bike lane from Butti Way to Highway 50 or similar multi-modal improvement B. Add intersection crossing enhancements at Airport Road / Douglas Drive and Airport Road / Menlo Drive	$$	31
WZ-19	Lepire Drive	Snake Hill Trail (Multi-use path) to Cassidy Court	Construct sidewalk from Snake Mountain multi-use path to the existing sidewalk on the north side of Lepire Drive	$$	26

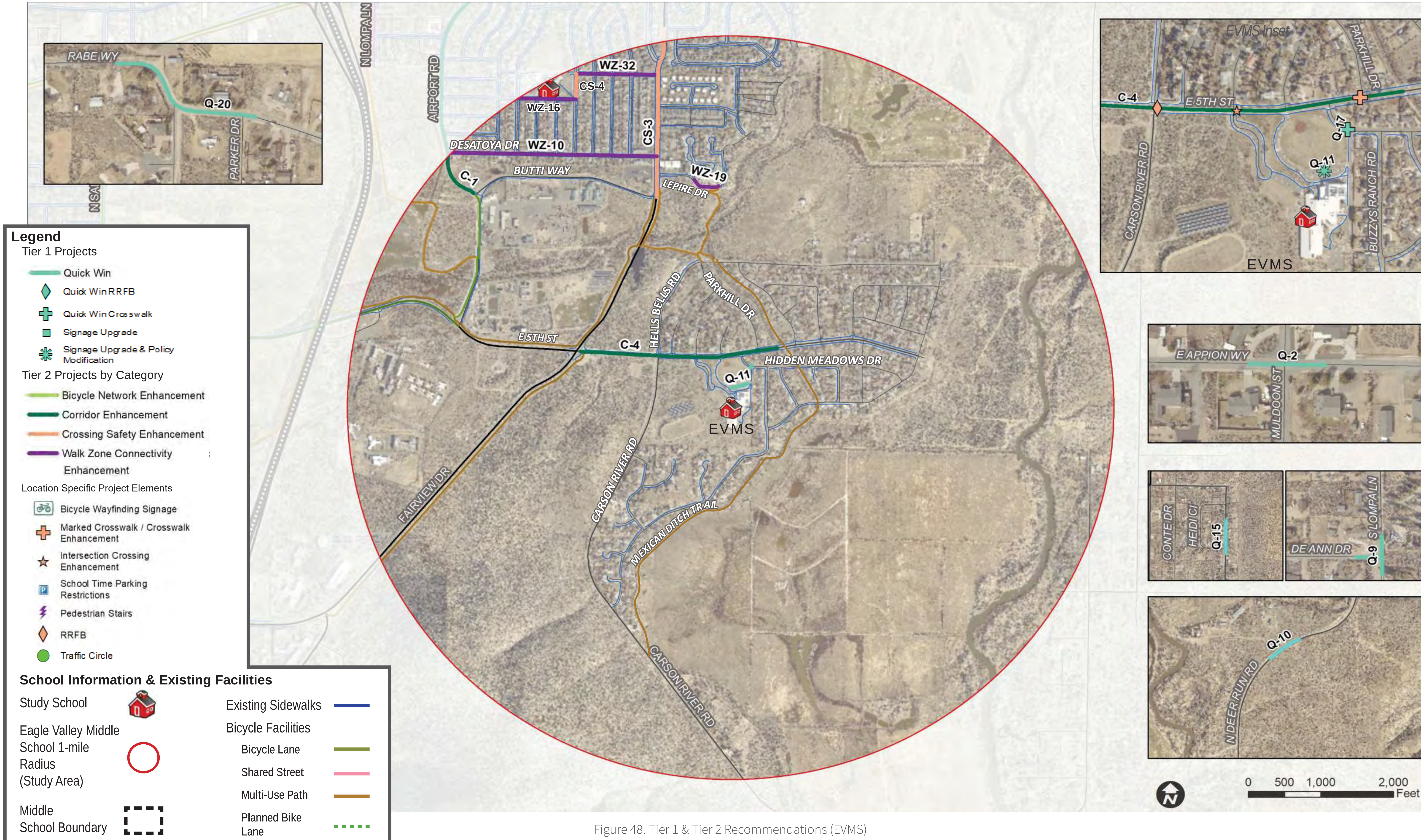


Figure 48. Tier 1 & Tier 2 Recommendations (EVMS)

4. Programmatic Recommendations

Non-infrastructure programs can complement the physical improvements recommended in this Plan by encouraging more students to walk and bike, educating students and parents about active transportation to enhance safety, and addressing both perceived and real personal safety issues. Safe Routes to School (SRTS) programs are also a way for the City to engage directly with school staff, students, and parents to understand other issues that may hinder their ability to walk, bike, and roll to school. The primary goals of SRTS programs have many other secondary goals, including:

- Teaching children the rules of the road, so they are more prepared to navigate their community on foot and bike, and eventually become safe drivers;
- Encouraging active modes of getting to school, which will help students arrive at school more alert and ready to learn; and
- Reducing traffic congestion around schools and cut-through traffic on residential streets due to school drop-off/pick-up.

The programmatic recommendations listed in **Tables 25-1 & 25-2** were compiled based on key themes and concerns described by stakeholders, as well as industry best practices. While every effort has been made to make the programs & recommendations of the Carson City SRTS Master Plan comprehensive, the list is not exhaustive, but rather intended to provide options that can be selected for implementation or further development. These programs, paired with the infrastructure ("Engineering") recommendations in the Plan, give the City a full suite of SRTS strategies, commonly referred to as the "6 Es" (Engineering, Education, Encouragement, Engagement, Equity, and Evaluation.

Programmatic recommendations are shown based on the which of the "6 Es" they fall under. As recommendations for elementary and middle school students vary, it is important to note that not all recommendations apply to each school. The type of school that each recommendation applies to is shown in the "Schools" column. Specific programmatic recommendations that require further explanation are highlighted in this Chapter.

The cost estimate ranges for "Engineering" recommendations, described in **Table 3** on page **3-2**, apply to the Engineering School Safety recommendations shown in **Table 25-1**. Cost estimates for all other programmatic recommendations represent an order of magnitude cost that includes estimated capital costs and staffing costs required to accomplish each recommendation. Programmatic cost estimate ranges are shown in **Table 24**. Prioritization of these projects is based on the overall feasibility of the project, existing efforts from Carson City Public Works staff, available resources, and potential benefit. It is assumed that these projects would be implemented across Carson City as they become feasible. If the City has an opportunity to implement a lower priority project ahead of a project with a higher priority, the City should take advantage of the opportunity to implement any of the recommendations.

Table 25-1. Programmatic Recommendations (Part 1)

Theme	Project Number	Type	Description	Schools	Cost	Priority
Engineering School Safety	ENG-1	School Speed Zone Standard	Develop standard for School Speed Zone signage, lane markings, and controls which will create a standard look and feel for School Speed Zones across Carson City. This may include installing flashers at all existing "School Zone When Flashing" signs (S5-1) and replacing existing School Zone Time Specific sign combinations (S4-3P, R2-1, S4-1P) with S5-1 signs. Additionally, a standard may include traffic calming strategies such as in-road message signs (R1-6), intersection bulb-outs, and speed feedback signs.	All	$	Near
Engineering School Safety	ENG-2	School Speed Zone Standard	Implement School Speed Zone standard at all eight study schools as funding is available.	All	$ - $$	Medium
Engineering School Safety	ENG-3	School Speed Zone Standard	Ensure that Speed Feedback Signs within a School Zone are programmed to reflect the school zone speed limits during the appropriate hours of the day.	All	$	Near
Engineering School Safety	ENG-4	School Bus Stop Awareness	Utilize temporary school bus stop signage and public messaging campaigns to increase driver awareness of bus stops during the school year. Initial efforts will focus on locations identified as "Quick Wins" and may expand to other locations following the first year of implementation.	All	$$	Near
Education	ED-1	Bicycle Safety Education	Develop TA-Set Aside grant application to bolster and expand upon the existing Bicycle Safety Education program at all six elementary schools. Items to include in grant application are new bicycles, easy to use bicycle helmets, funding for on-going maintenance and repairs, and updated curriculum materials	Elementary	$$	Near
Education	ED-2	Bicycle Safety Education	Work with CCSD to expand the total number of days of bicycle education instruction to provide 3rd, 4th, and 5th grade students with at least 2 class periods of experience on a bike each school year	Elementary	$$	Long
Education	ED-3	Student Pedestrian Education	Develop / obtain pedestrian safety education curriculum for elementary school students and incorporate these lessons into an expanded Bicycle Safety Education program	Elementary	$	Medium
Education	ED-4	Student Pedestrian Education	Develop / obtain pedestrian safety education curriculum for middle school students. Disseminate this information to students during the school year or as part of a Bicycle/Pedestrian Safety Program	Middle	$	Medium
Education	ED-5	Parent / Caregiver Safety Education	Develop and implement a public messaging campaign to make drivers aware of School Zone laws. This campaign can be reused at the beginning of each school year and following long breaks.	All	$$$	Near
Education	ED-6	Parent / Caregiver Safety Education	Develop and implement public messaging campaign focused on parents and the importance of teaching safe pedestrian habits to their children.	All	$$$	Medium

Table 24. Programmatic Recommendations Order of Magnitude Cost Estimate Ranges

Cost Estimate Symbol	Cost Estimate Range
$	Less than $19,999
$$	$20,000 - $49,999
$$$	$50,000 - $100,000

Parent/Caregiver Safety Education

Parent/caregiver SRTS education can take the form of social media posts, email blasts, automated calls, backpack flyers, or any other channel schools use to reach out to parents. Some of the key messages to include when communicating SRTS to parents include: reminding them to obey seatbelt laws, cell phone laws, and speed limits; outlining drop-off/pick-up procedures; encouraging them to choose active modes of travel; and practicing safe behaviors while walking, biking, and driving. The National Center for Safe Routes to School includes resources for such efforts.

Table 25-2. Programmatic Recommendations (Part 2)

Theme	Project Number	Type	Description	Schools	Cost	Priority
Encouragement	E-1	Walking/Biking Encouragement	Start a Walking Wednesday program at each elementary school focused on encouraging students (and parents) to walk or bike to school every Wednesday in order to receive daily prizes and to compete for a bicycle or scooter at the end of the school year.	Elementary	$	Near
Encouragement	E-2	Bicycle Equipment Program	Work with local non-profits and local businesses to create local bicycle donation and rehabilitation program. Program would obtain and repair older bicycles from the community and fix them up to provide them to Carson City students without a bicycle	All	$$$	Long
Encouragement	E-3	Walking / Biking Encouragement	Increase number of School Safety Champions to one at each school	All	$	Near
Encouragement	E-4	Walking / Biking Encouragement	Work with School Safety Champions and School administrations to create a network of parents who are willing and able to supervise Walking School Buses and/or Bike Trains at each of the six elementary schools. Leverage available funding for compensating volunteers.	Elementary	$	Near
Encouragement	E-5	Active Transportation Challenges / Competitions	Work with schools to develop a Golden Sneaker Challenge between classrooms at each school during Walk to School Day. Expand the challenge to be community wide (between each school) within three years.	All	$	Near
School Zone Engagement	SZ-1	School Speed Zone Engagement	Increase SRO or police presence in school zones (as possible) during morning and afternoon peak periods to increase enforcement of School Zone laws. Key areas of focus are MTES (prohibiting left-out turns), FES (prohibiting left-out turns & speeding), and ASES (Speeding)	All	$$	Near
School Zone Engagement	SZ-2	School Speed Zone Task Force	Collaborate with local law enforcement and CCSD to develop a School Speed Zone task force. The task force would conduct intermittent and Nearly visible School Speed Zone engagement programs at each study school throughout the school year.	All	$$$	Medium
School Zone Engagement	SZ-3	Mobile Speed Feedback Trailers	Work with Carson City Sheriff's Office to place mobile speed feedback trailers on school routes at the beginning of the school year and following extended holiday breaks.	All	$	Long
Equity	N/A	Equitable Program of Projects	All engineering projects were evaluated through the prioritization process based on the benefit provided to economically disadvantaged areas. Projects providing direct benefits to these locations were assigned additional points during prioritization. It is recommended that projects be implemented based on priority ranking, as possible, in order to deliver an equitable program of projects.	All	-	-
Program Evaluation	PE-1	Student Hand Tallies	Conduct hand tallies of how students arrived to and will depart from school during a two to three day period at each school once per year.	All	$	Near
Program Evaluation	PE-2	Parent Surveys	Conduct surveys of parents regarding how their child got to and from school and basic demographic information. It is recommended that this be conducted periodically, potentially every three years.	All	$$	Long
Program Evaluation	PE-3	Program Report Card	Develop Safe Routes to School Report Card which will be used to celebrate program successes and identify the impacts of program implementation as possible. This report card should be conducted every three years in order to assess benefits of implementation.	All	$	Medium

Pedestrian & Bike Safety Education Programs for Students

Pedestrian and bicycle safety skills can be taught in the classroom or during PE using lesson plans that provide pedestrian and bike education for students, including rules of the road and how to be safe while walking and biking. The curriculum can be structured for appropriate grade and age levels, which can be implemented as part of school-wide, communitywide, or statewide programs. The existing Bicycle Safety Education Program at Carson City elementary schools is in need of updated materials, new bicycles, and funding to maintain the fleet.

Walking School Bus

Exhibit 36. Walking School Bus

A walking school bus is a group of students walking to school with one or more adults (Exhibit 36). It is a great way to get students excited about walking to school because they get to spend the morning school trip with family and friends. A walking school bus can be an informal arrangement between neighboring families or more formal with established “bus routes,” designated “bus stops,” and led by a “bus driver” who walks participants into school. A similar concept for bicyclists is called a “Bike Train” and may be implemented in a similar fashion.

School Safety Champion

A School Safety Champion is typically a school parent or staff member who is engaged and highly motivated to help improve pedestrian and bicyclist safety surrounding their childs’ school. These individuals can help maximize the benefits of SRTS programs by being a liason between the school and the Safe Routes to School Coordinator while coordinating walk to school days, student hand tallies, Walking School Buses, and Golden Sneaker Challenges. The existing Safety Champion program, operated by CCPW, may be expanded upon to increase influence and reach of the existing program.

Golden Sneaker Challenge

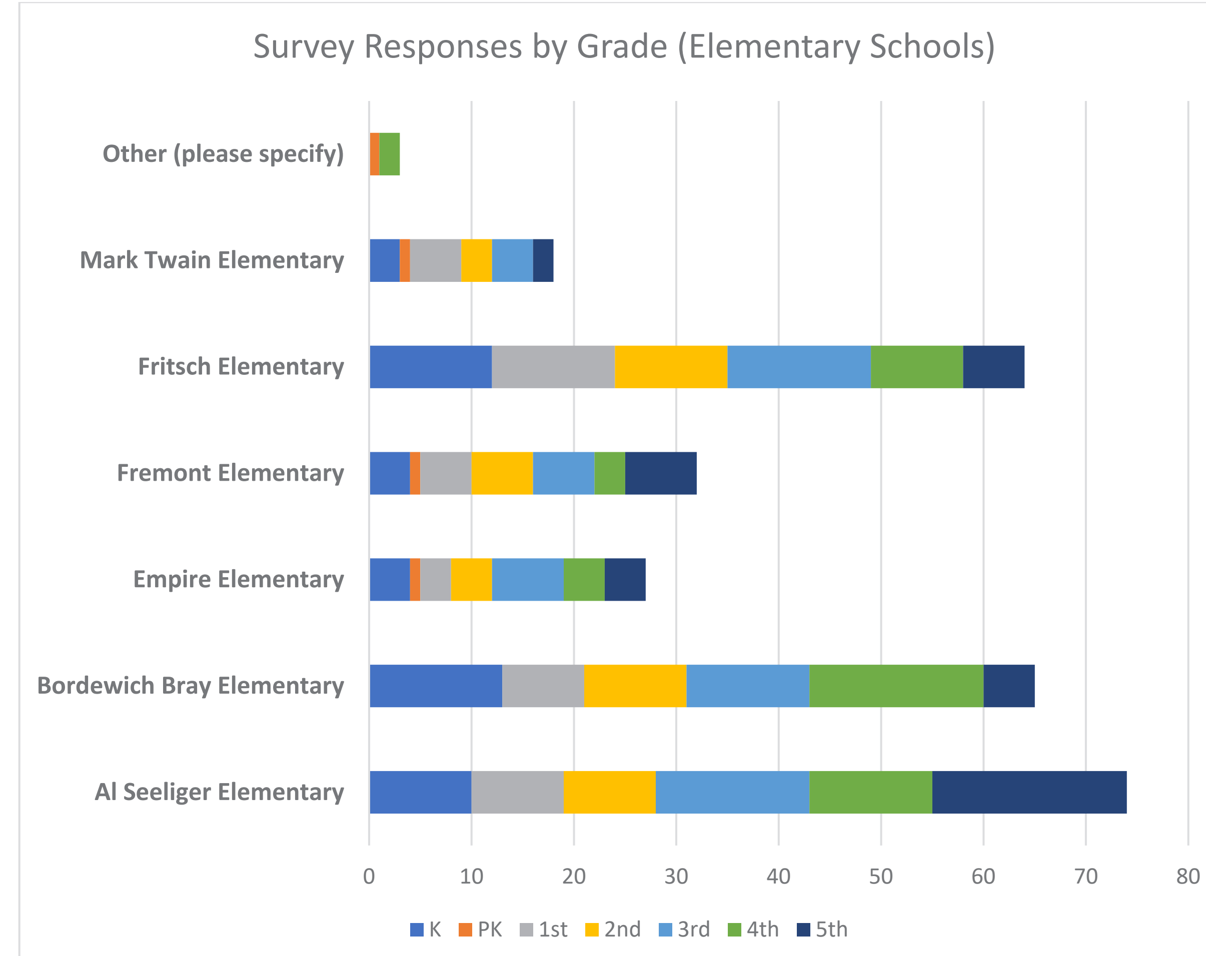
Exhibit 37. Golden Sneaker Award Example

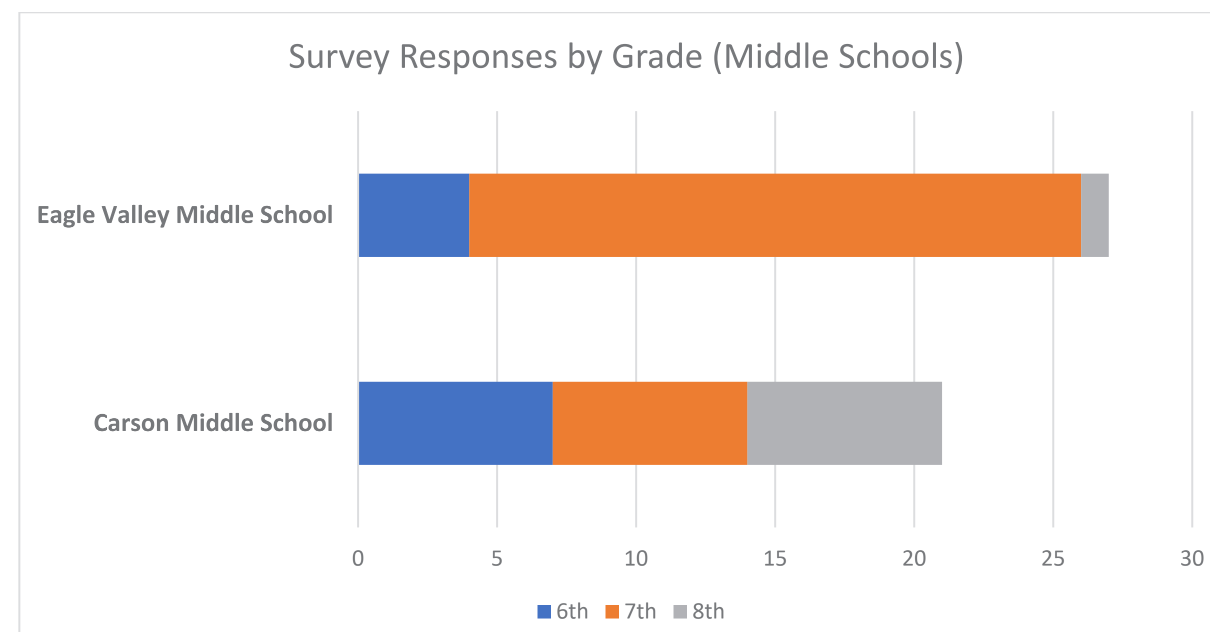
A golden sneaker challenge is a fun way to get kids to walk and bike to school while competing against other classrooms or other schools. The challenge typically lasts two weeks and is focused on having the largest number of students who travel to and from school by alternative transportation modes. This typically includes walking, biking, skateboarding, and any other human powered motor, but the challenge may be expanded to include other modes. At the end of the challenge, the classroom with the largest percentage of students who took an alternative form of transportation over the time period in question receives a Golden Sneaker Award and some form of prize, often a pizza party. This type of challenge can be implemented at a single school and expanded to include all schools over time.

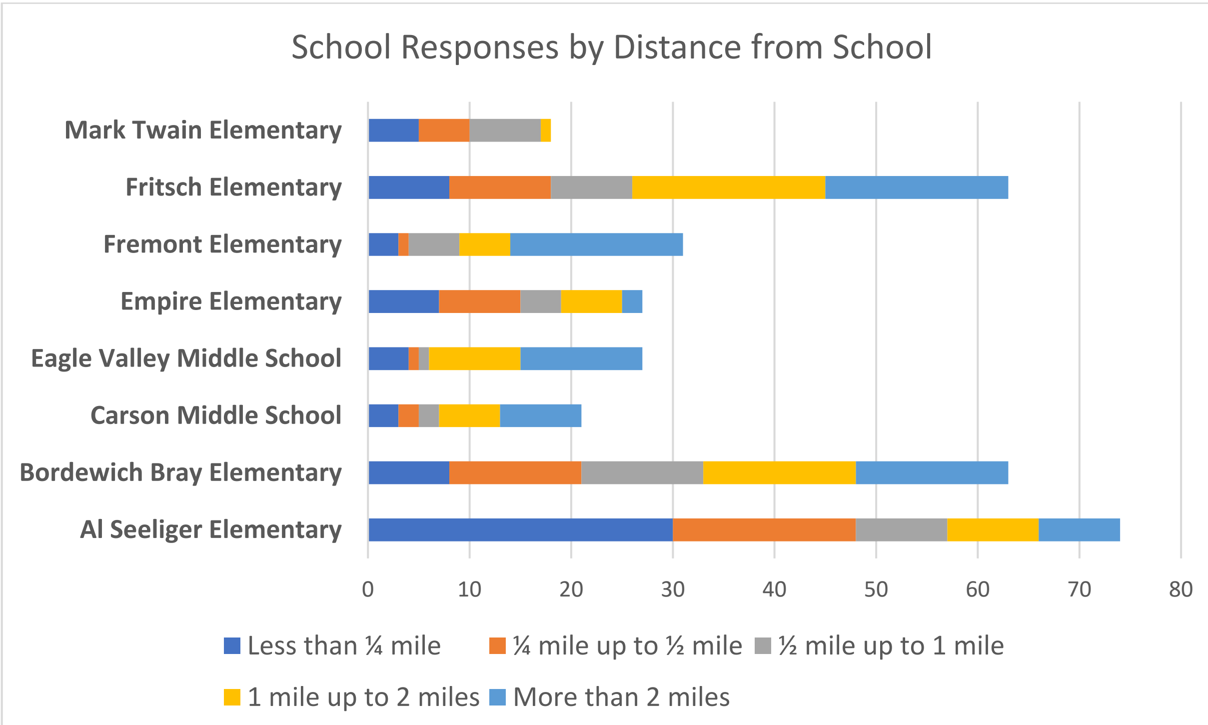
Appendix A

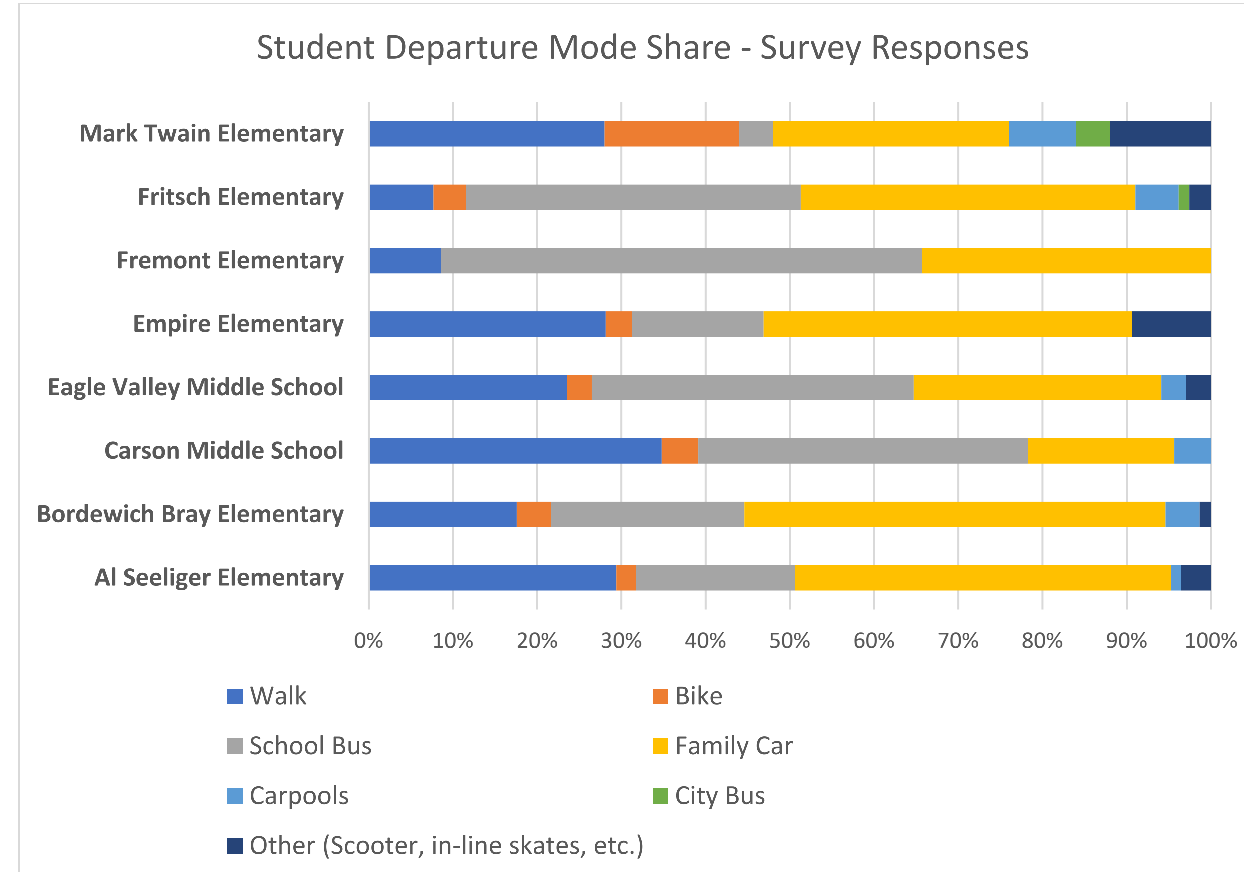
Parent & Middle School Student Survey Results

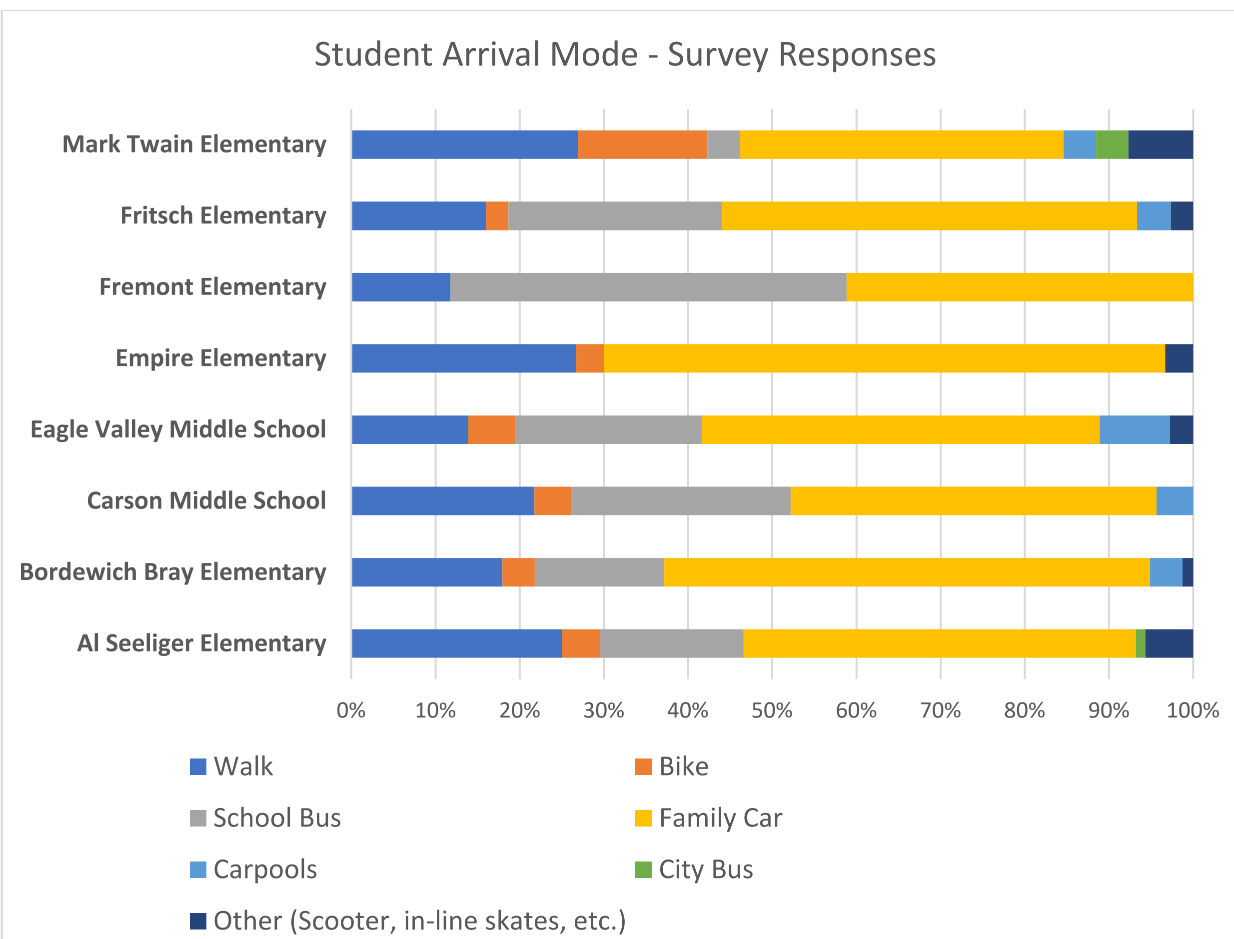
Carson City Safe Routes to School Master Plan - Parent Survey Results

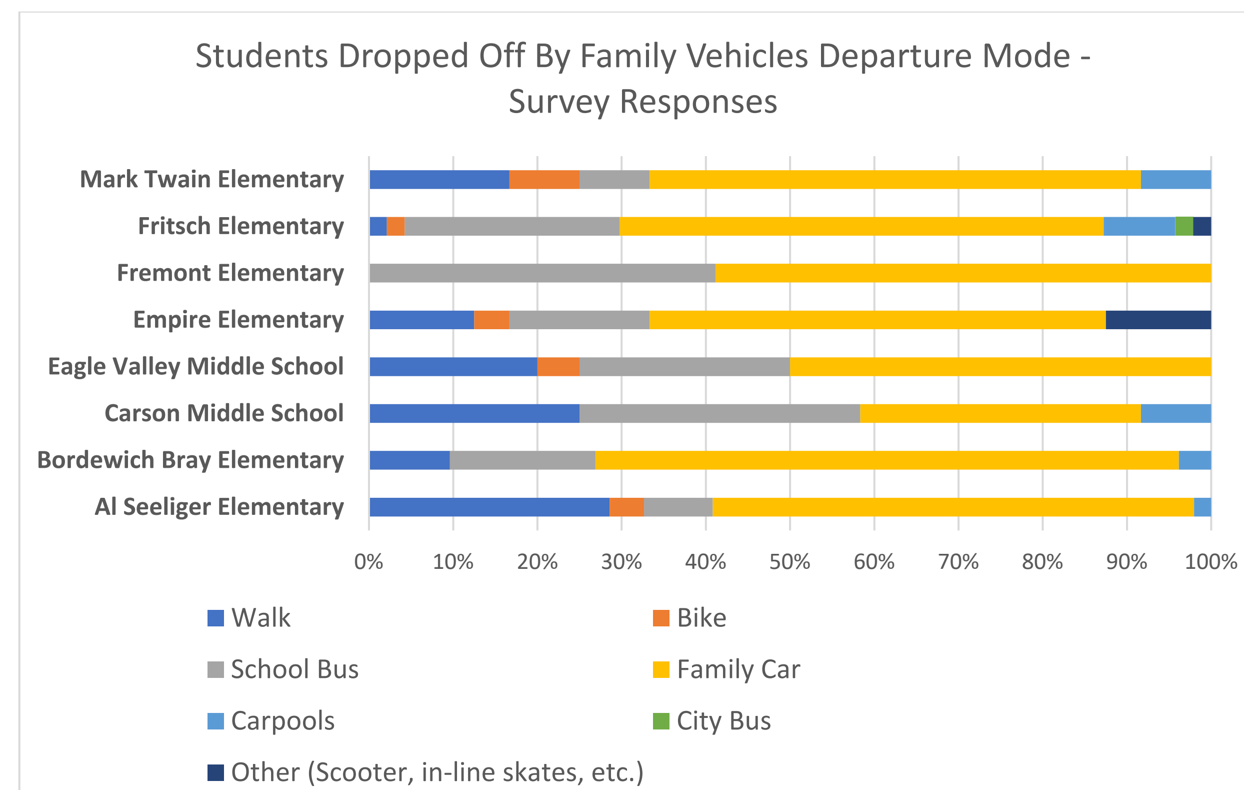


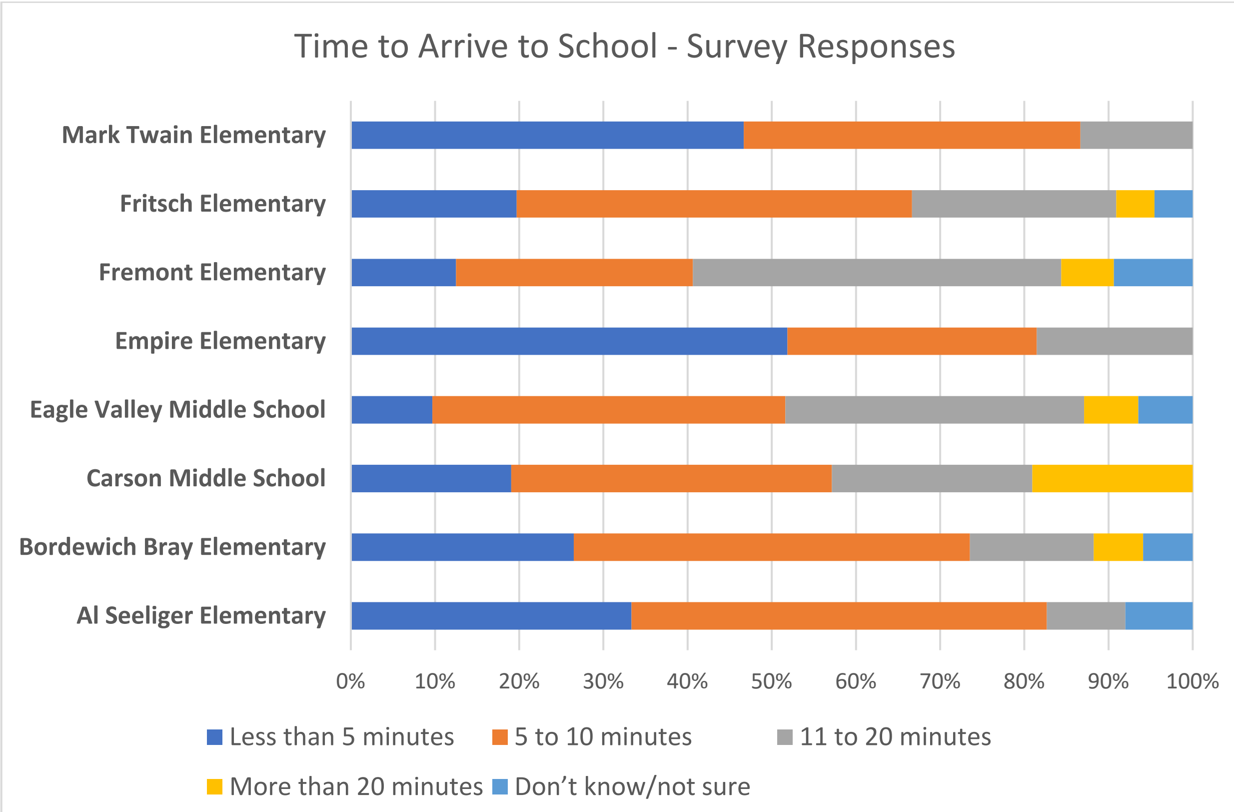



School Responses by Distance from School
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0
10
20
30
40
50
60
70
80
Less than ¼ mile
¼ mile up to ½ mile
½ mile up to 1 mile
1 mile up to 2 miles
More than 2 miles

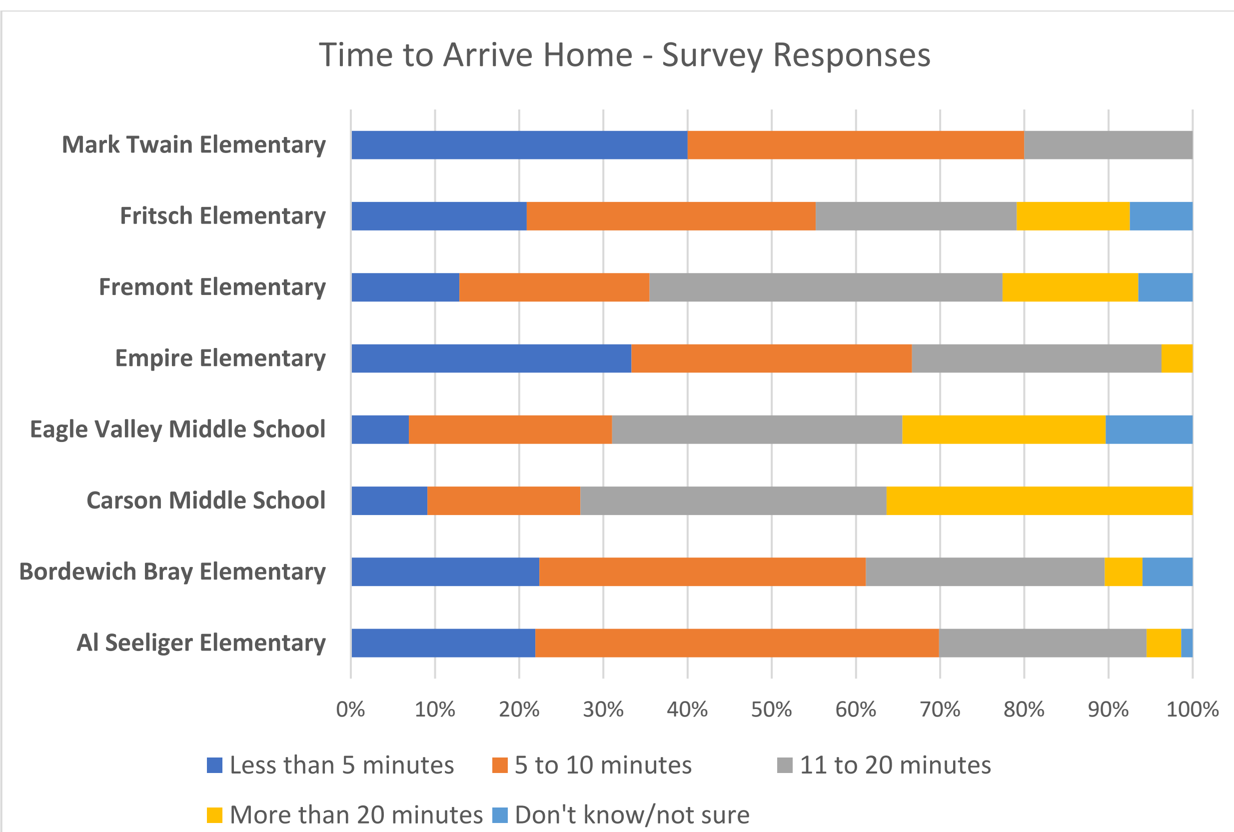

Student Departure Mode Share - Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Walk
Bike
School Bus
Family Car
Carpools
City Bus
Other (Scooter, in-line skates, etc.)


Student Arrival Mode - Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Walk
Bike
School Bus
Family Car
Carpools
City Bus
Other (Scooter, in-line skates, etc.)

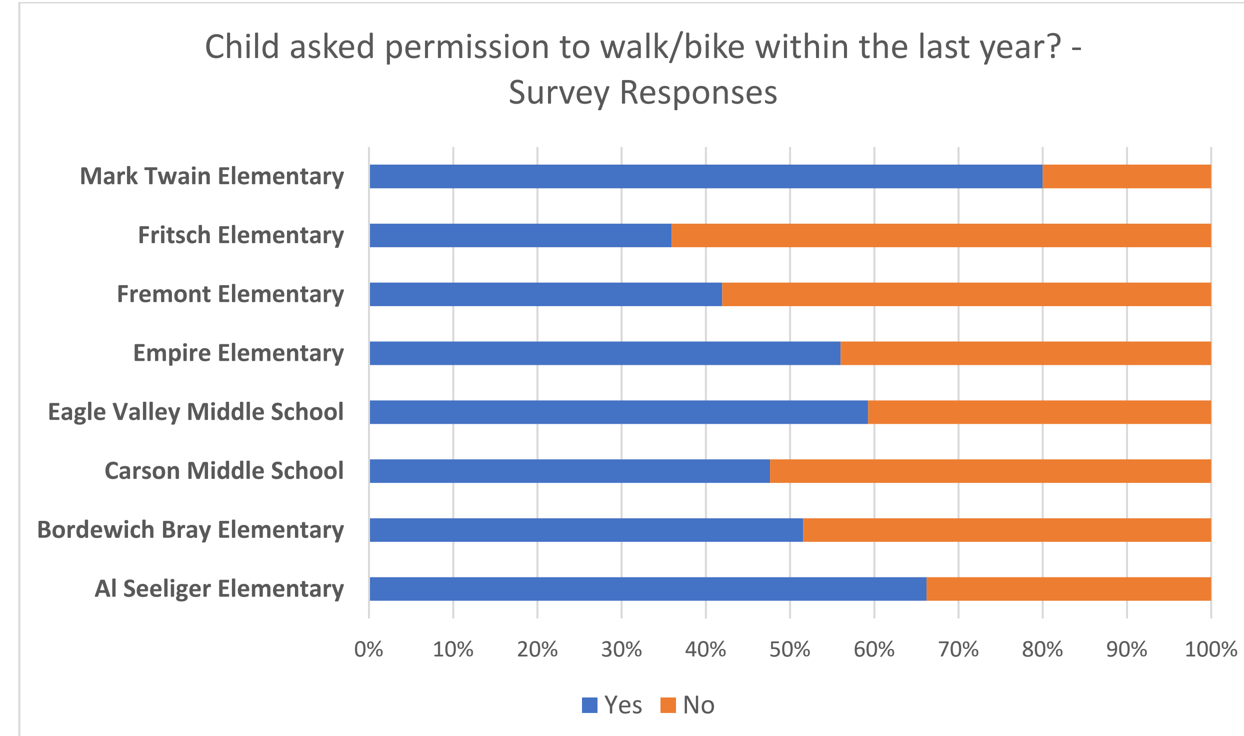

Students Dropped Off By Family Vehicles Departure Mode - Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Walk
Bike
School Bus
Family Car
Carpools
City Bus
Other (Scooter, in-line skates, etc.)



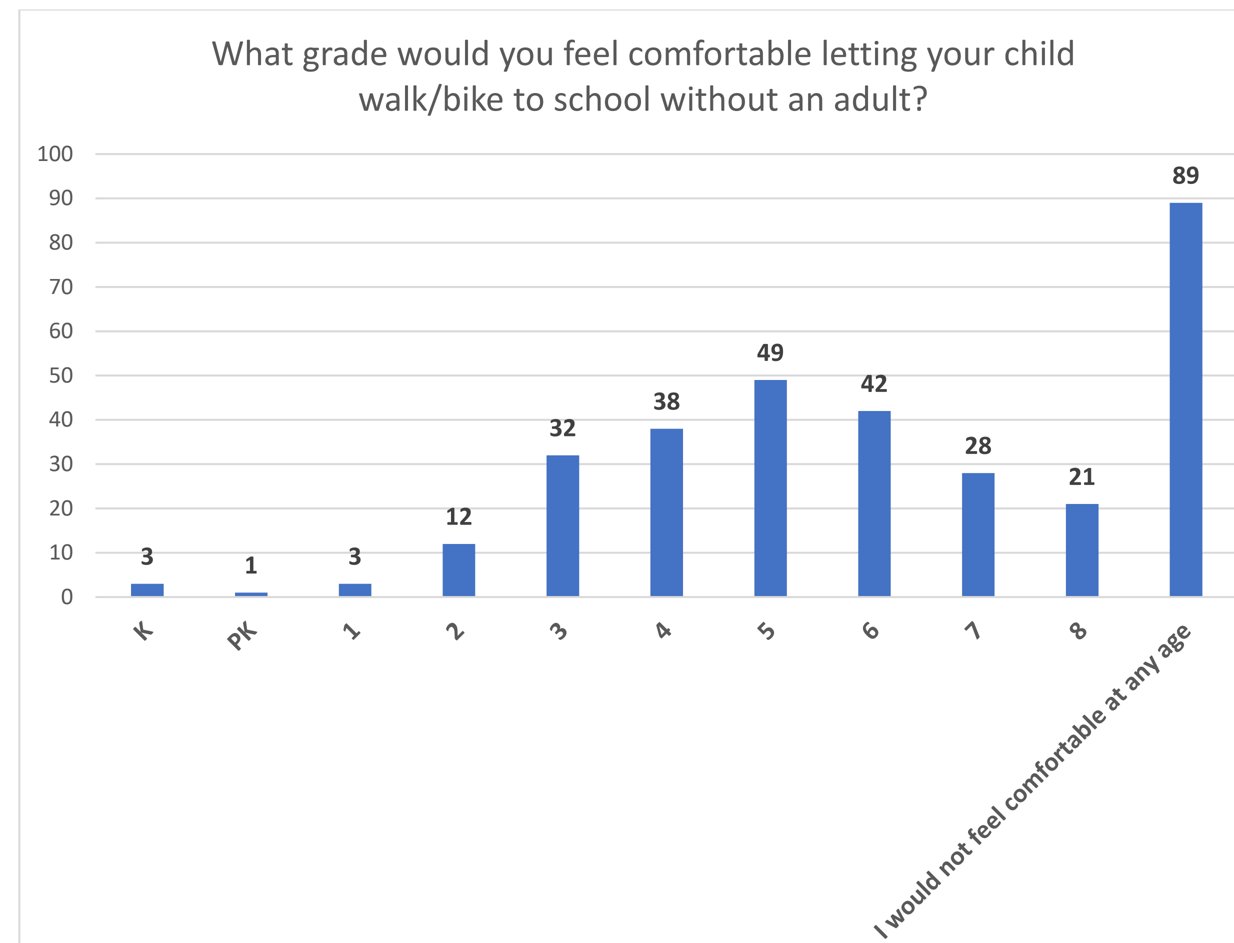
Time to Arrive to School - Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Less than 5 minutes
5 to 10 minutes
11 to 20 minutes
More than 20 minutes
Don't know/not sure



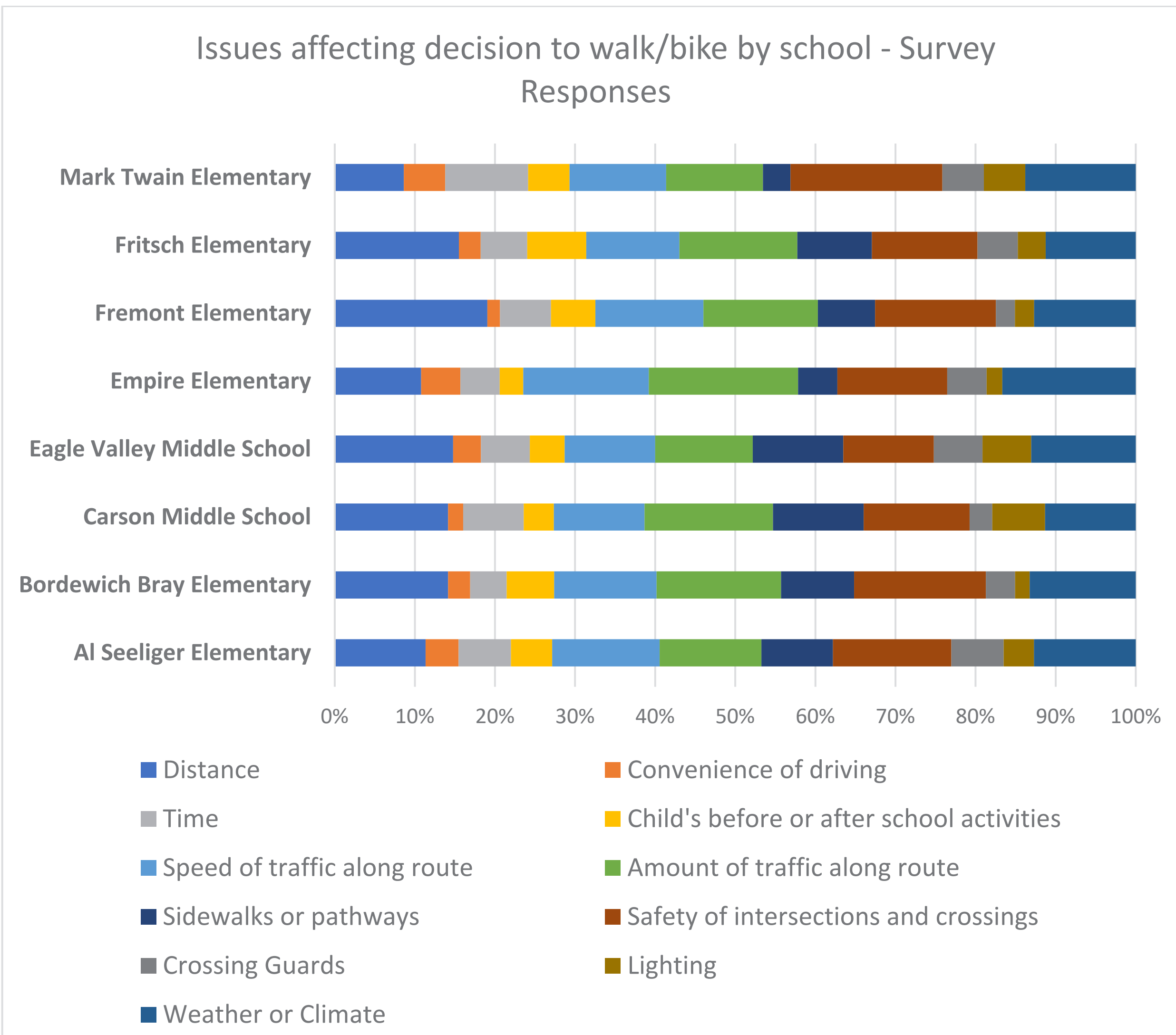
Time to Arrive Home - Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Less than 5 minutes
5 to 10 minutes
11 to 20 minutes
More than 20 minutes
Don't know/not sure

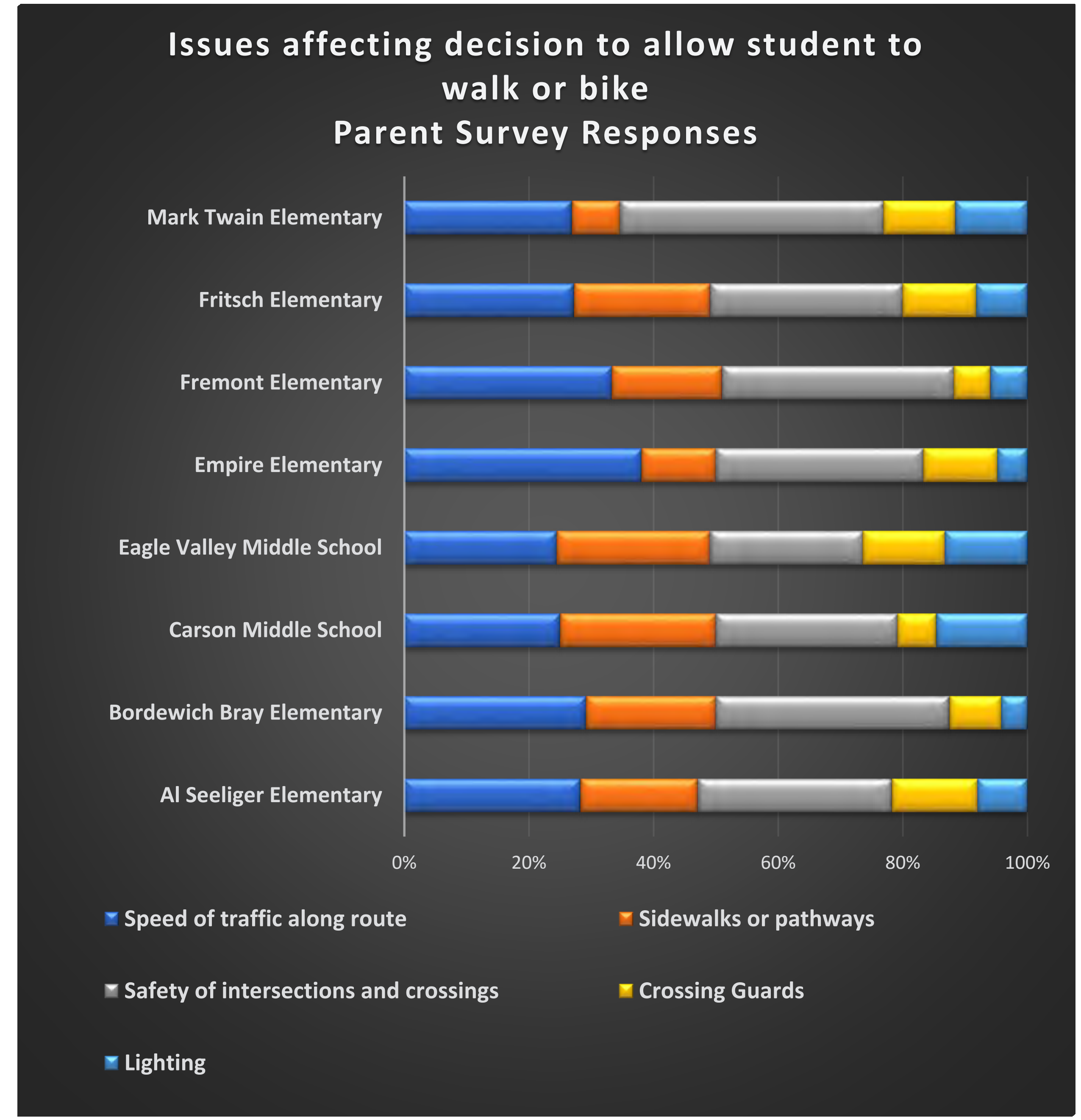


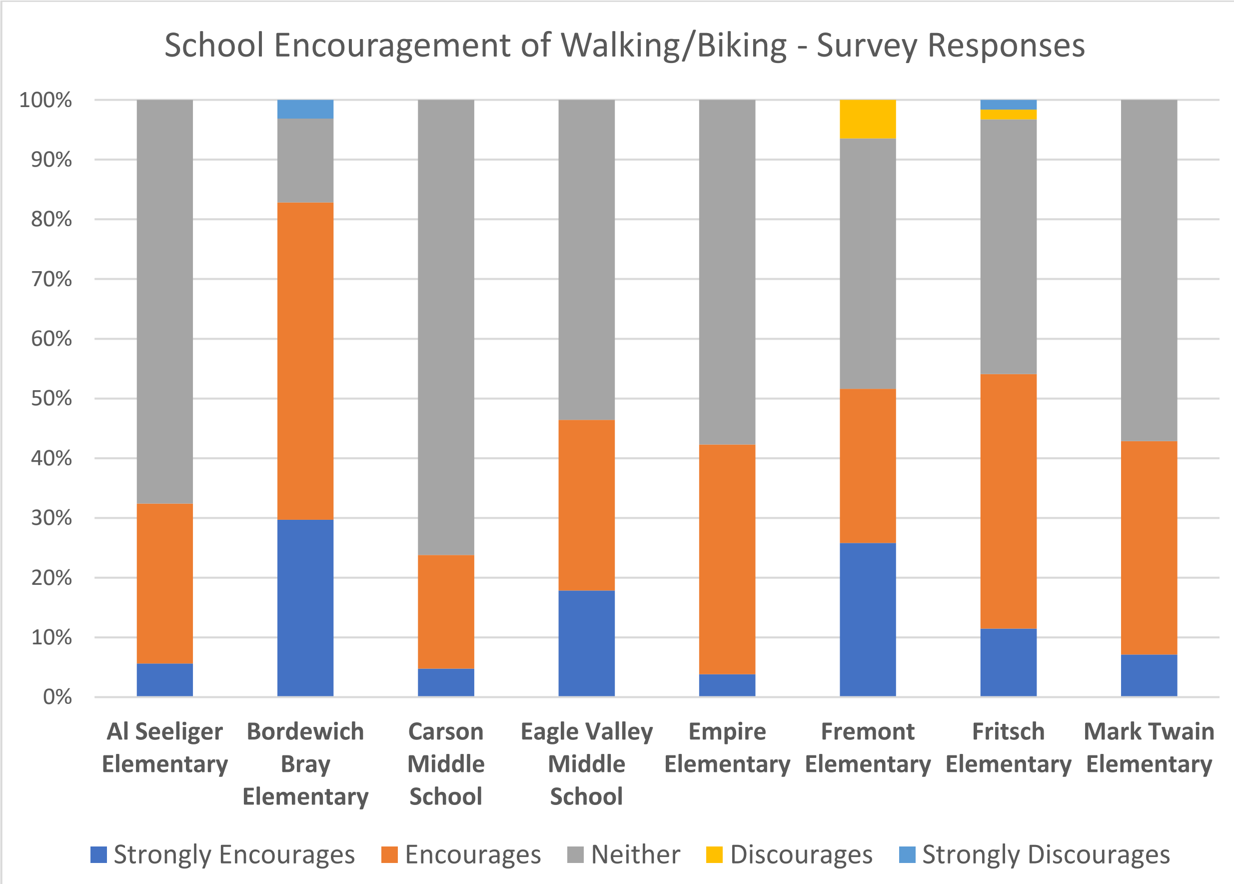
Child asked permission to walk/bike within the last year? - Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%
Yes
No

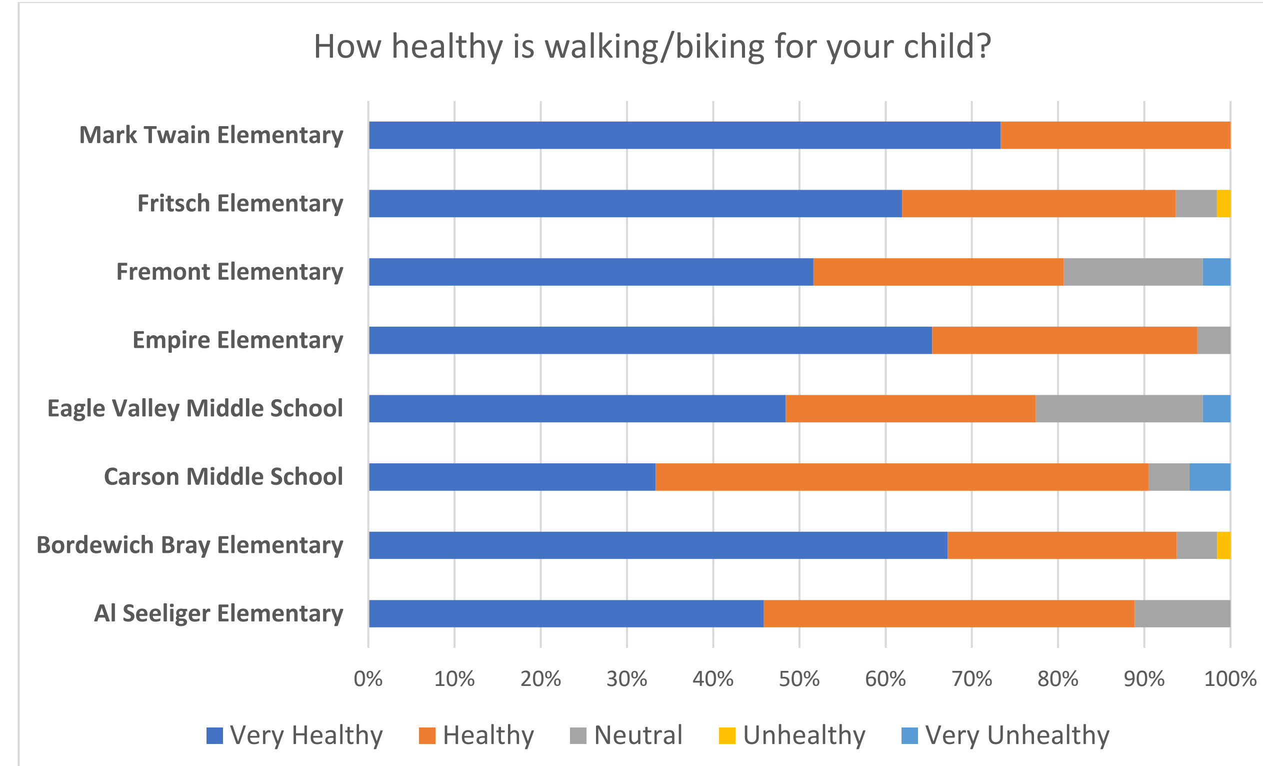


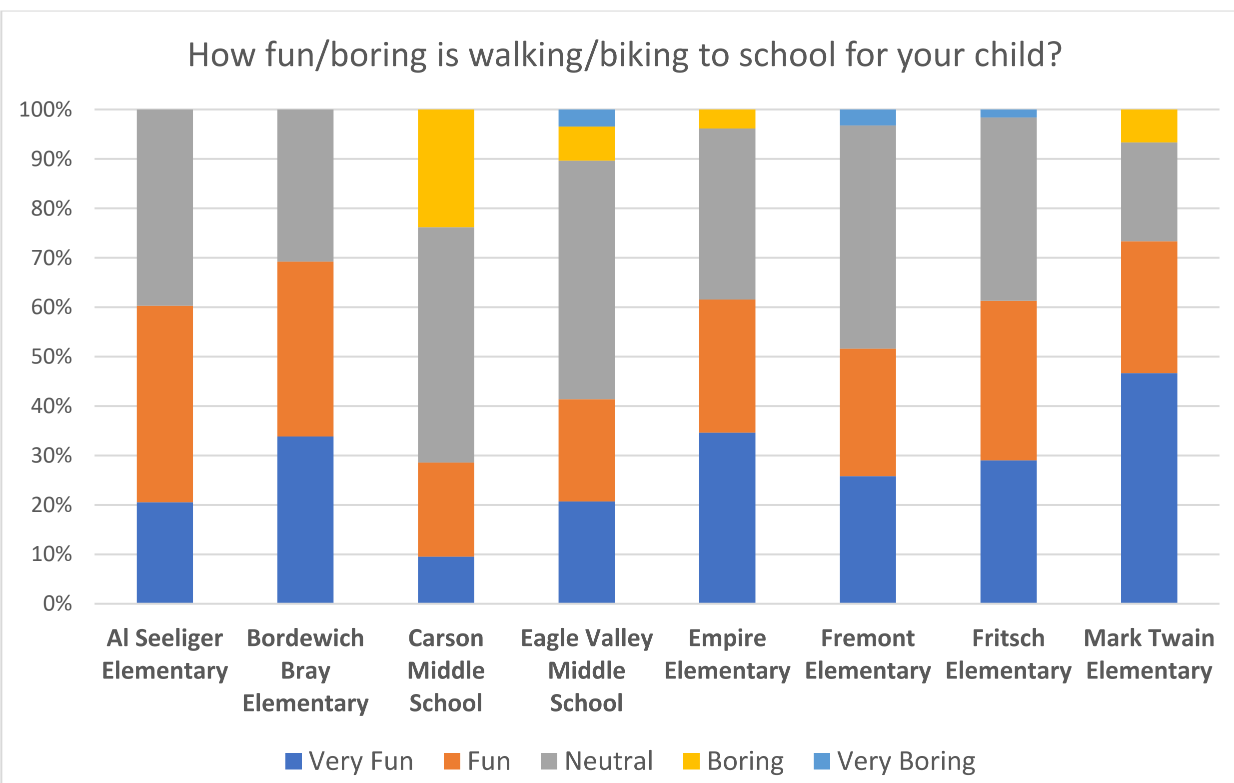
What grade would you feel comfortable letting your child walk/bike to school without an adult?
100 90 80 70 60 50 40 30 20 10 0
3
1
3
12
32
38
49
42
28
21
89
K
PK
1
2
3
4
5
6
7
8
I would not feel comfortable at any age


Issues affecting decision to walk/bike by school - Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Distance
Convenience of driving
Time
Child's before or after school activities
Speed of traffic along route
Amount of traffic along route
Sidewalks or pathways
Safety of intersections and crossings
Crossing Guards
Lighting
Weather or Climate

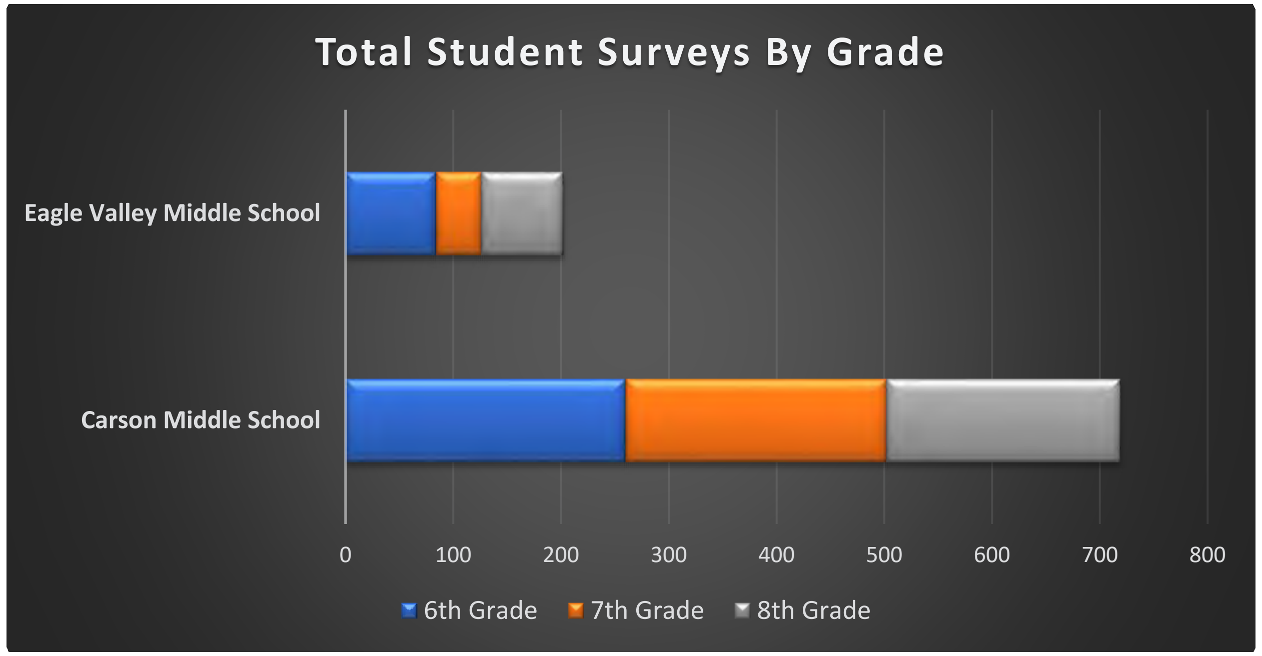

Issues affecting decision to allow student to walk or bike
Parent Survey Responses
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0%
20%
40%
60%
80%
100%
Speed of traffic along route
Sidewalks or pathways
Safety of intersections and crossings
Crossing Guards
Lighting

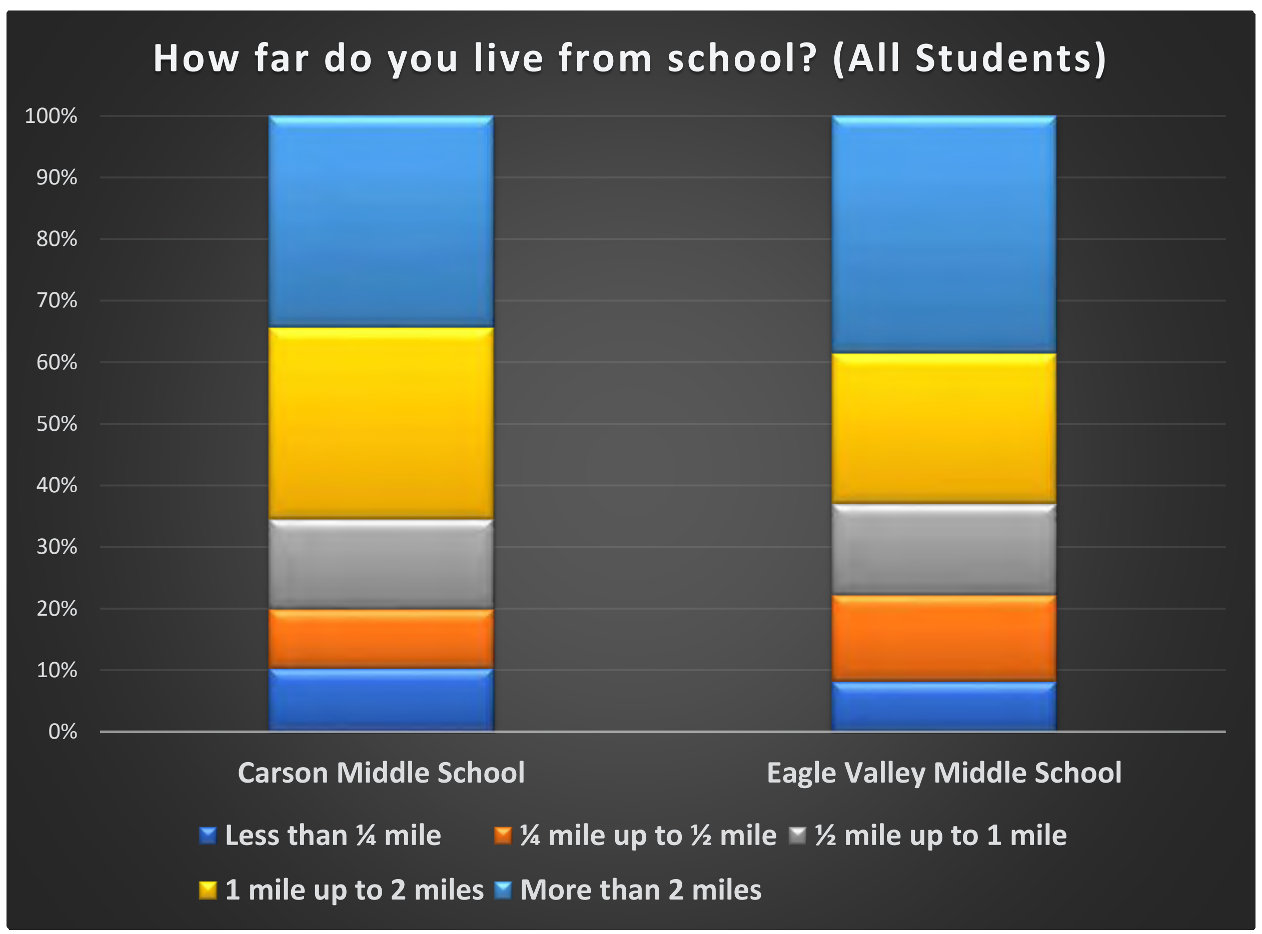

School Encouragement of Walking/Biking - Survey Responses
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Al Seeliger Elementary
Bordewich Bray Elementary
Carson Middle School
Eagle Valley Middle School
Empire Elementary
Fremont Elementary
Fritsch Elementary
Mark Twain Elementary
Strongly Encourages
Encourages
Neither
Discourages
Strongly Discourages

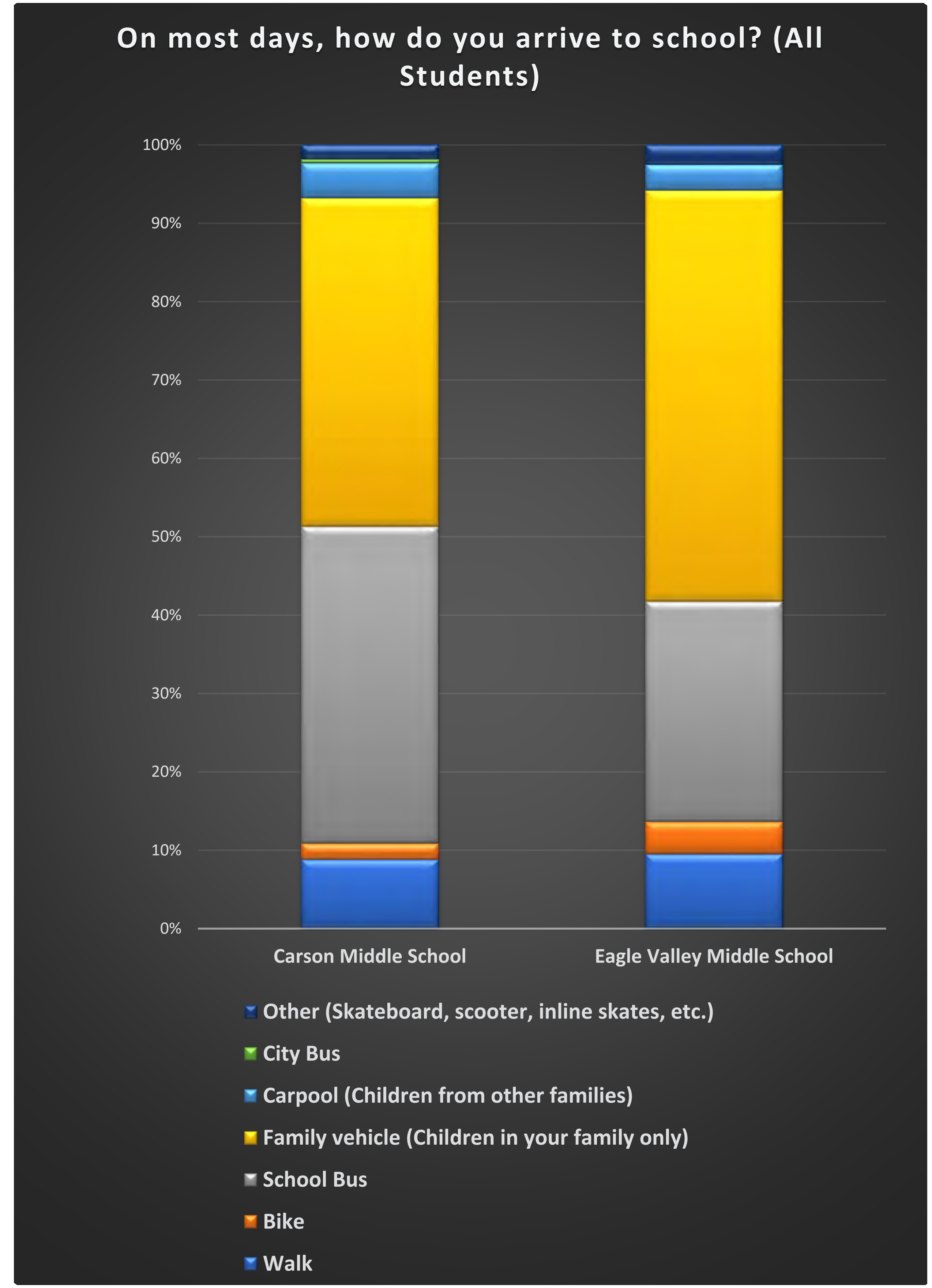

How healthy is walking/biking for your child?
Mark Twain Elementary
Fritsch Elementary
Fremont Elementary
Empire Elementary
Eagle Valley Middle School
Carson Middle School
Bordewich Bray Elementary
Al Seeliger Elementary
0%
10%
20%
30%
40%
50%
60%
70%
80%
90%
100%
Very Healthy
Healthy
Neutral
Unhealthy
Very Unhealthy

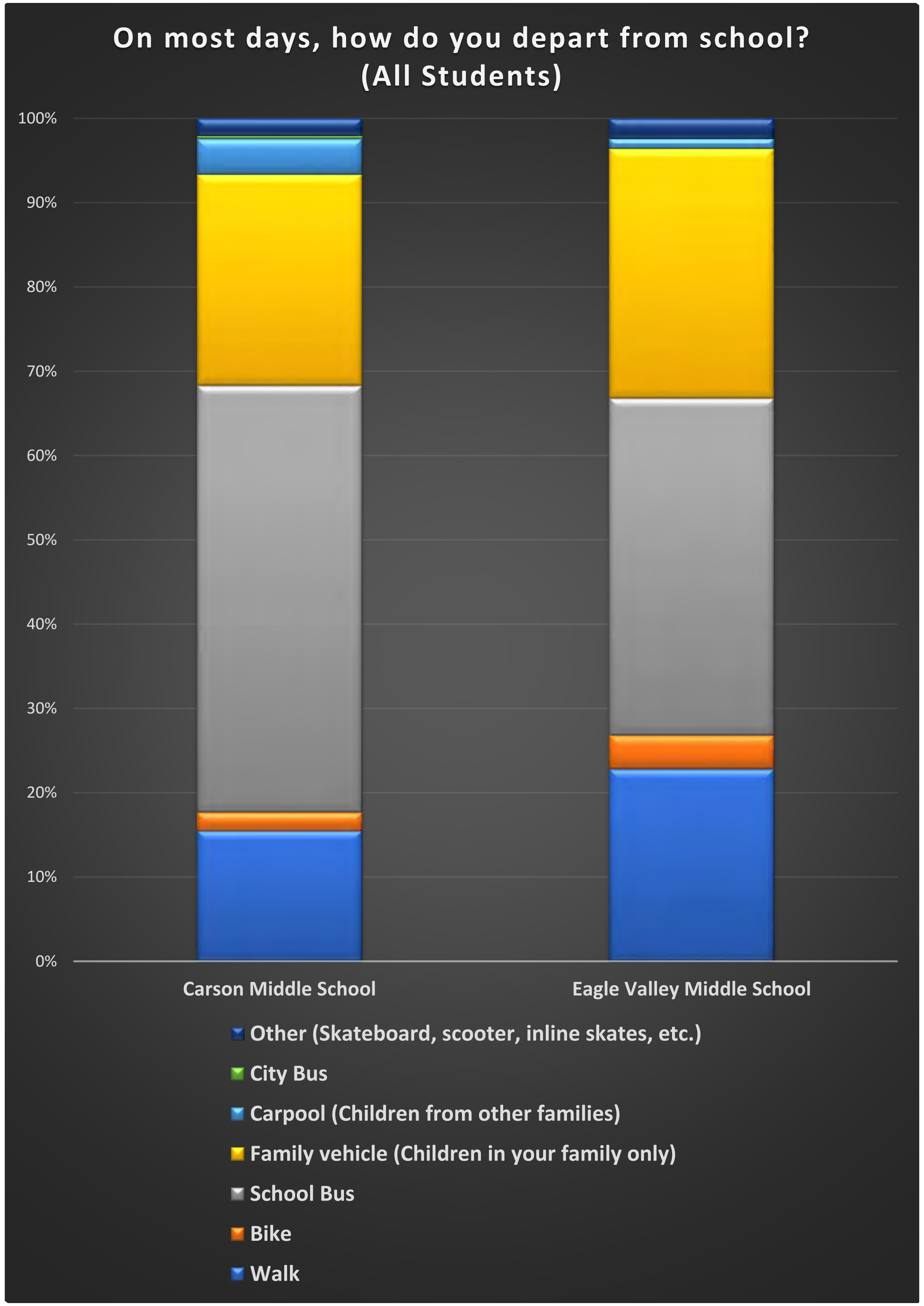

How fun/boring is walking/biking to school for your child?
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Al Seeliger Elementary
Bordewich Bray Elementary
Carson Middle School
Eagle Valley Middle School
Empire Elementary
Fremont Elementary
Fritsch Elementary
Mark Twain Elementary
Very Fun
Fun
Neutral
Boring
Very Boring

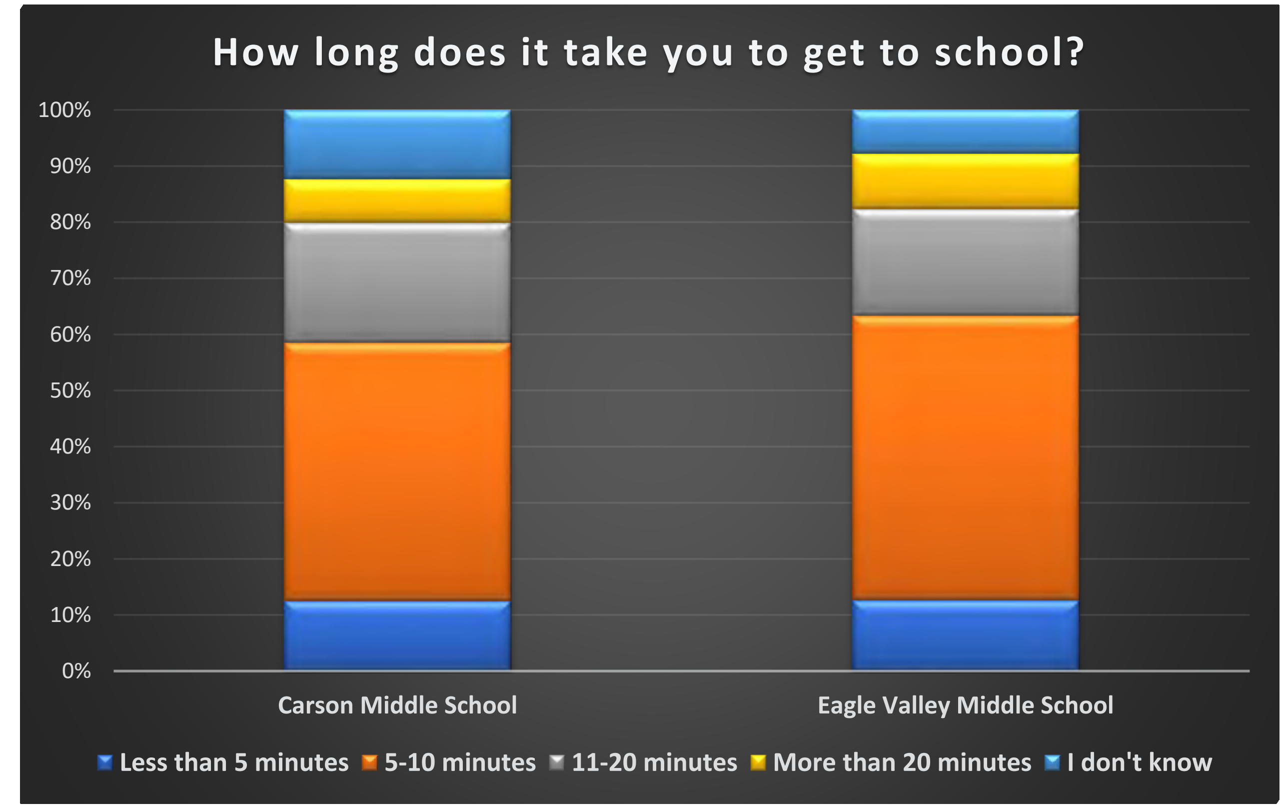
Carson City Safe Routes to School Master Plan – Middle School Student Survey Results

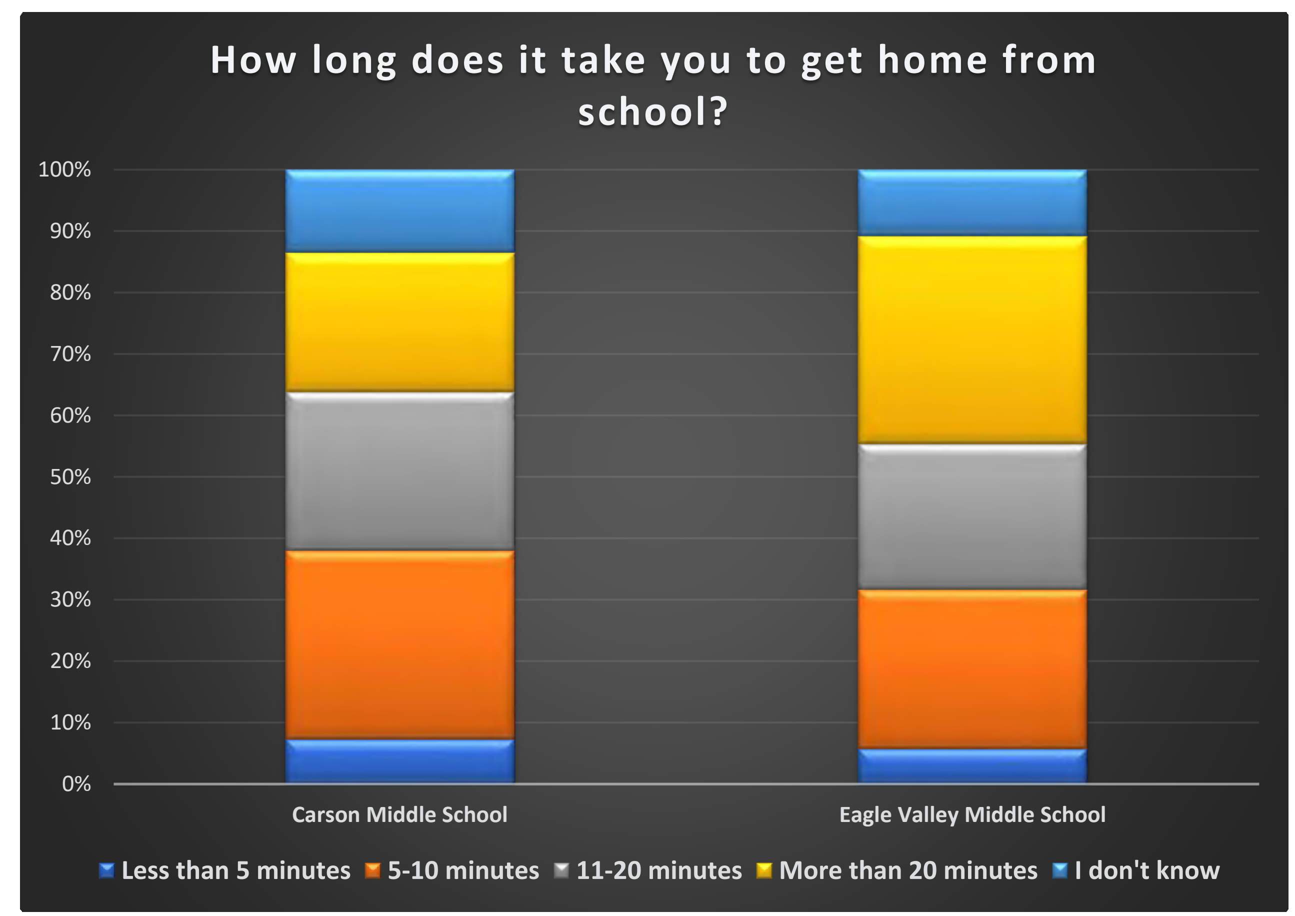


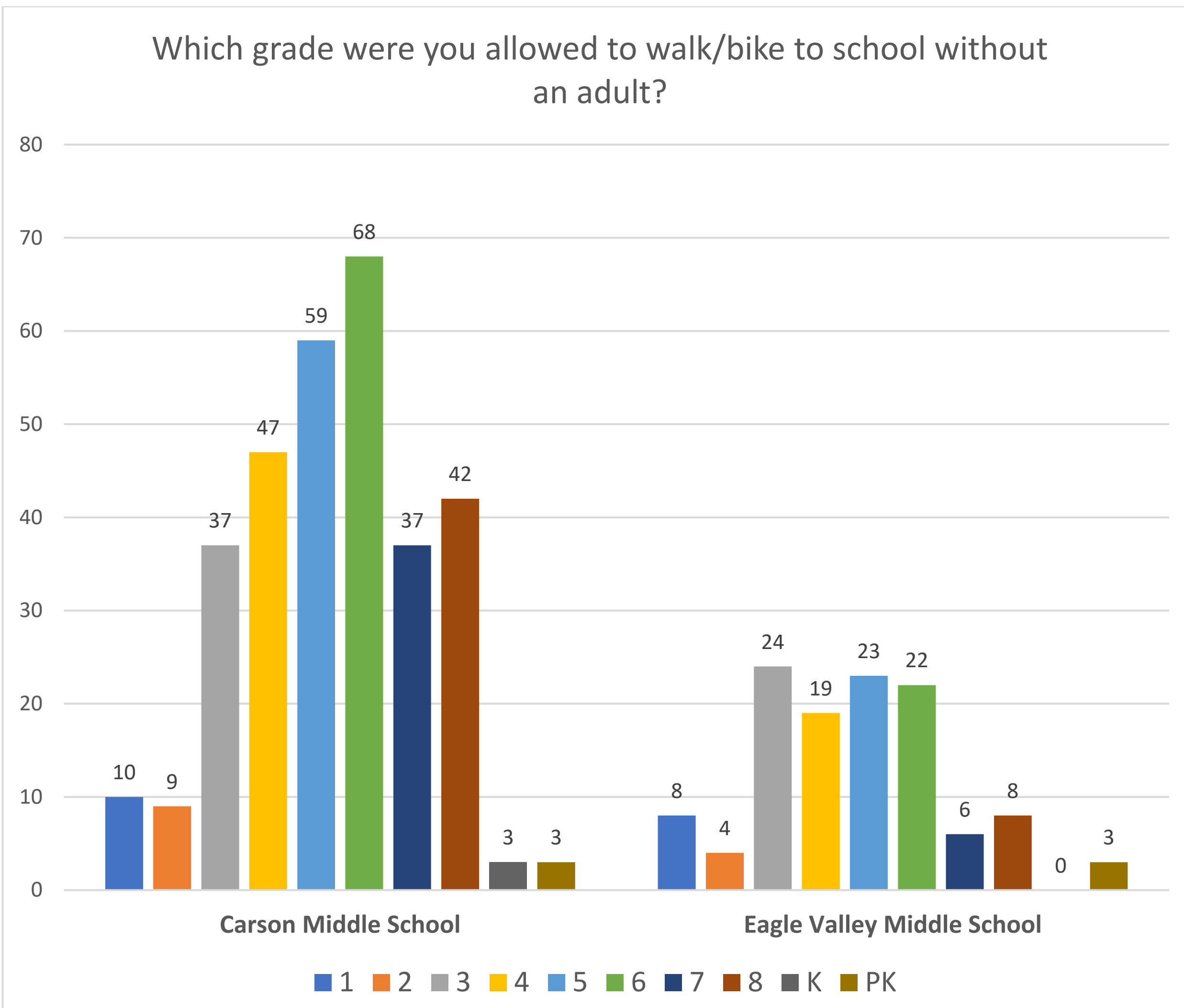


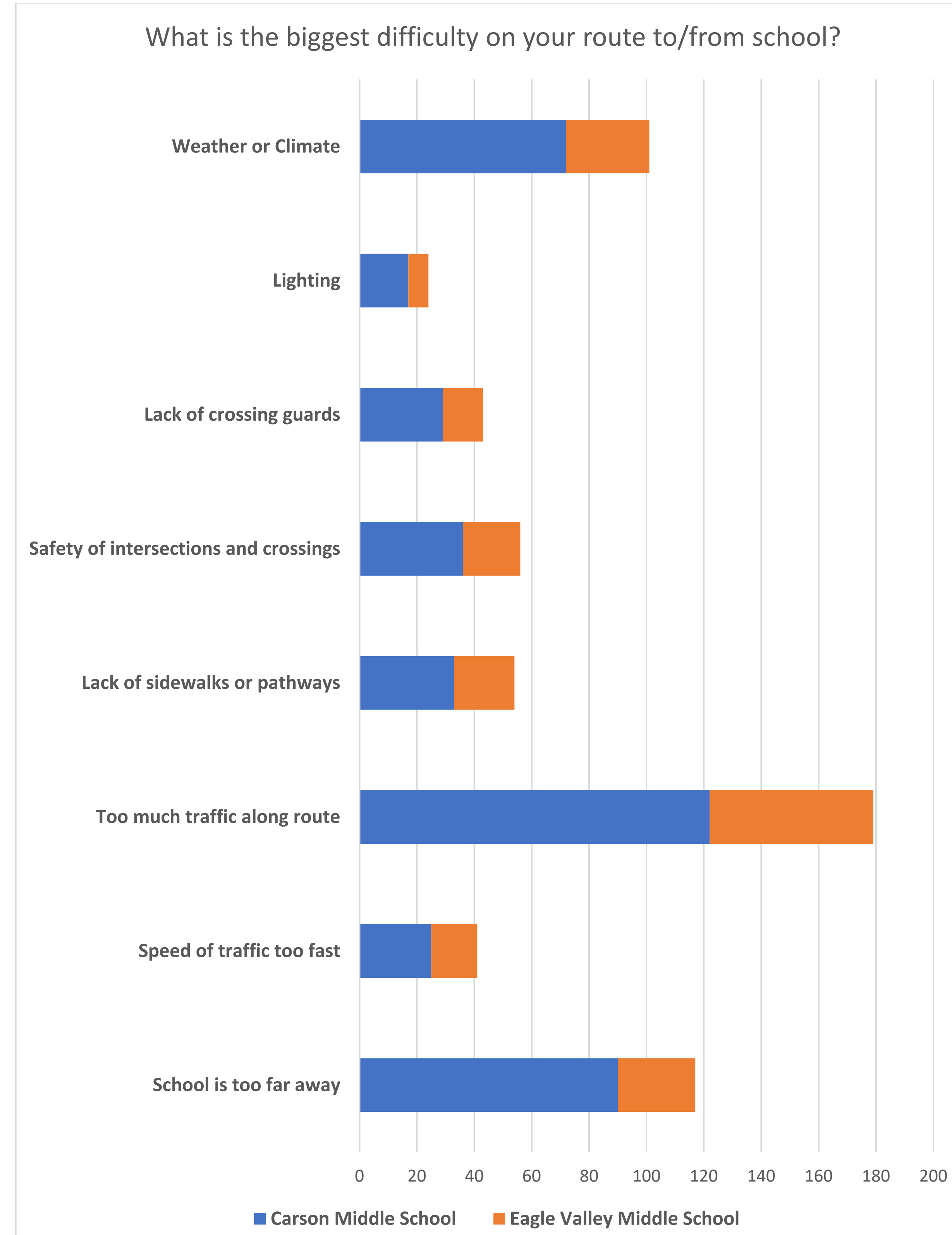


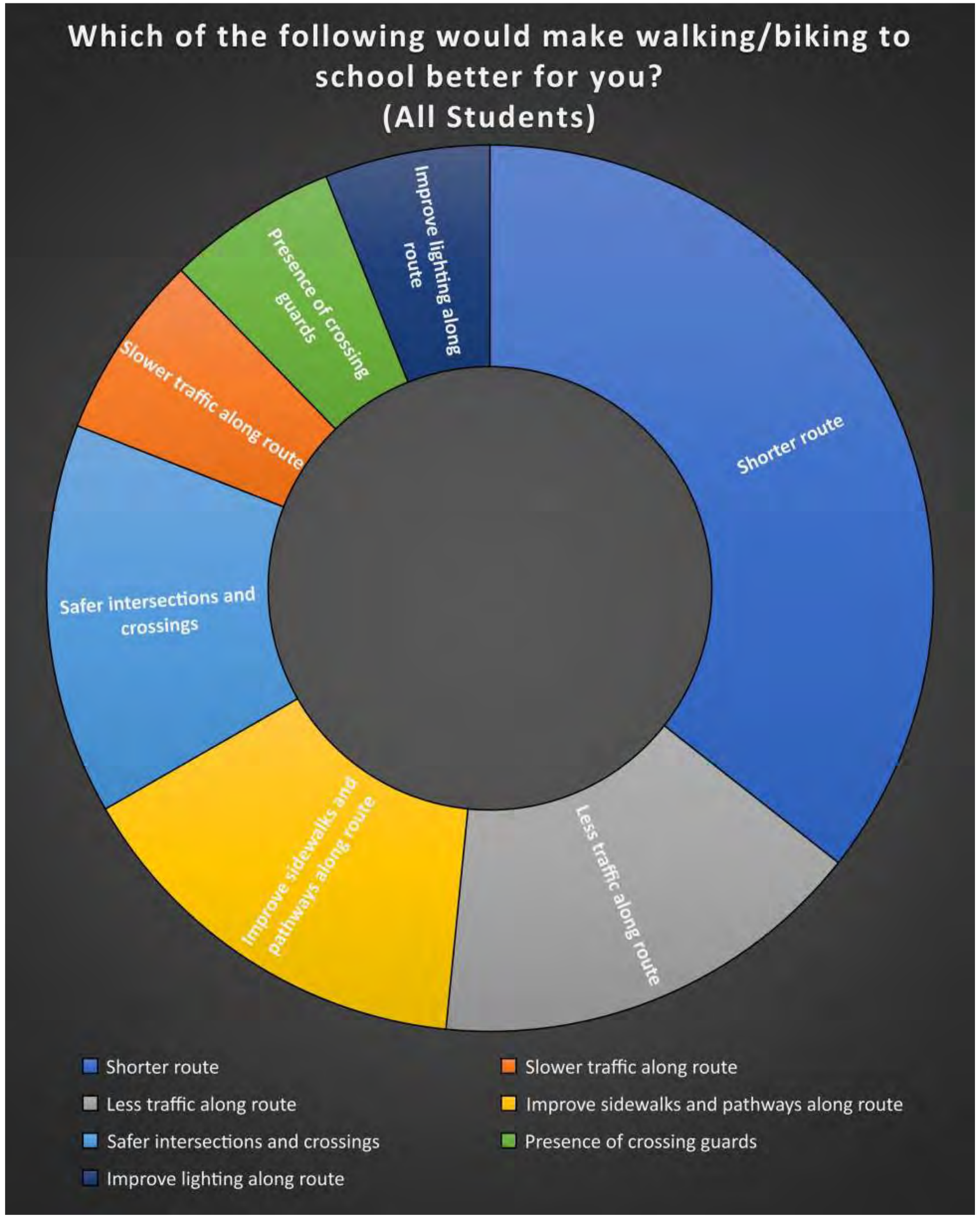

On most days, how do you depart from school?
(All Students)
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Carson Middle School
Eagle Valley Middle School
Other (Skateboard, scooter, inline skates, etc.)
City Bus
Carpool (Children from other families)
Family vehicle (Children in your family only)
School Bus
Bike
Walk

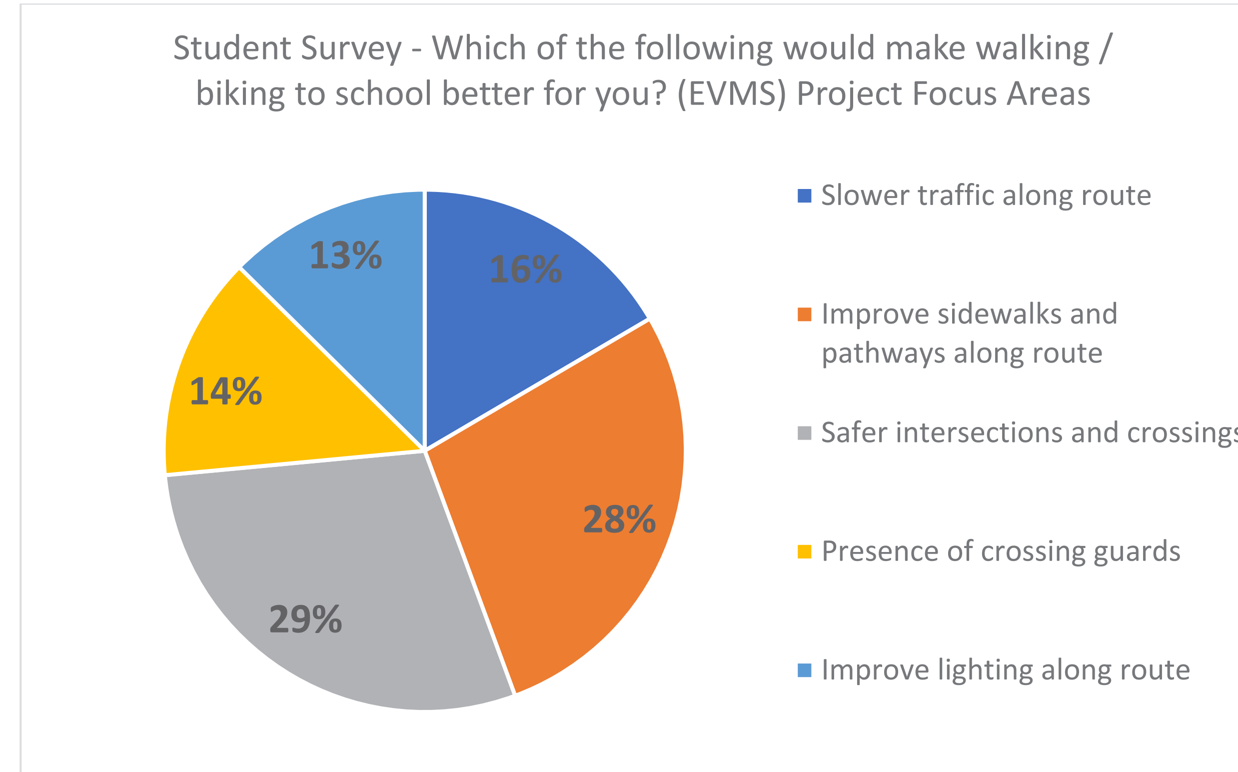

How long does it take you to get to school?
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Carson Middle School
Eagle Valley Middle School
Less than 5 minutes
5-10 minutes
11-20 minutes
More than 20 minutes
I don't know

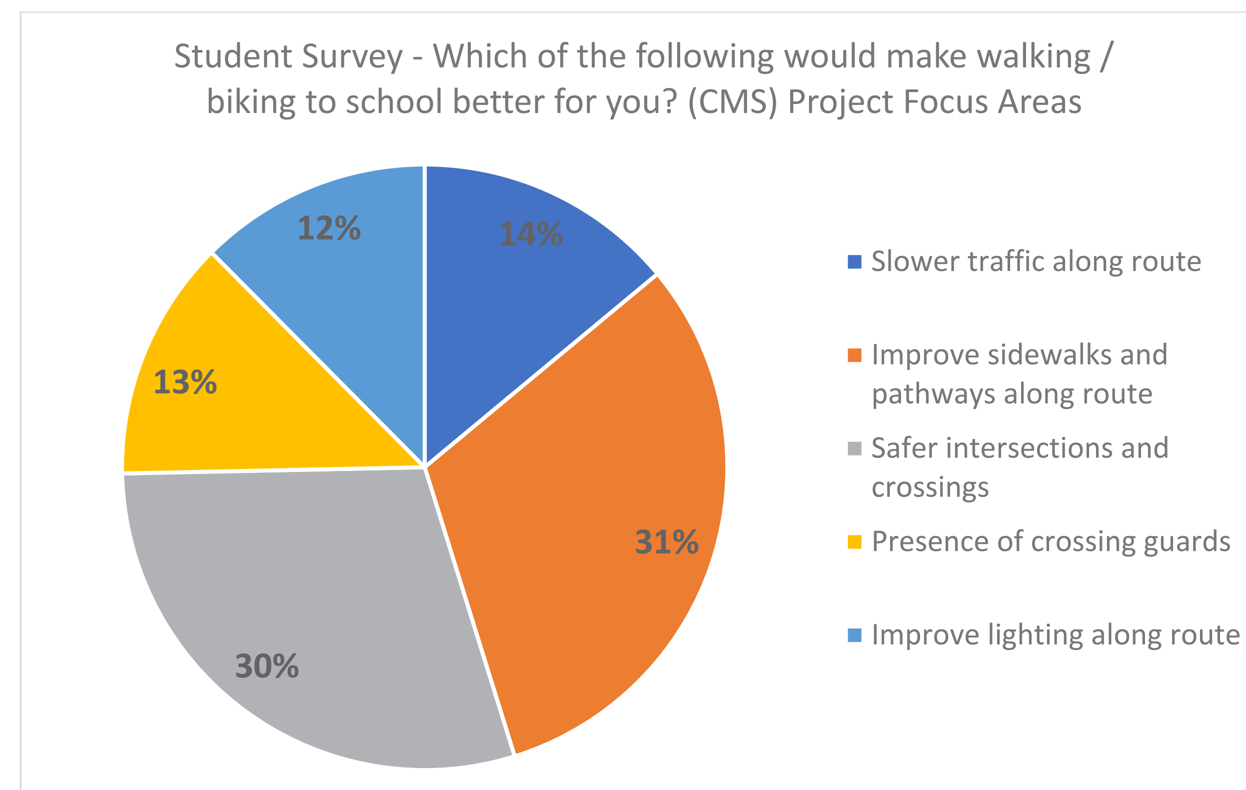

How long does it take you to get home from school?
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Carson Middle School
Eagle Valley Middle School
Less than 5 minutes
5-10 minutes
11-20 minutes
More than 20 minutes
I don't know

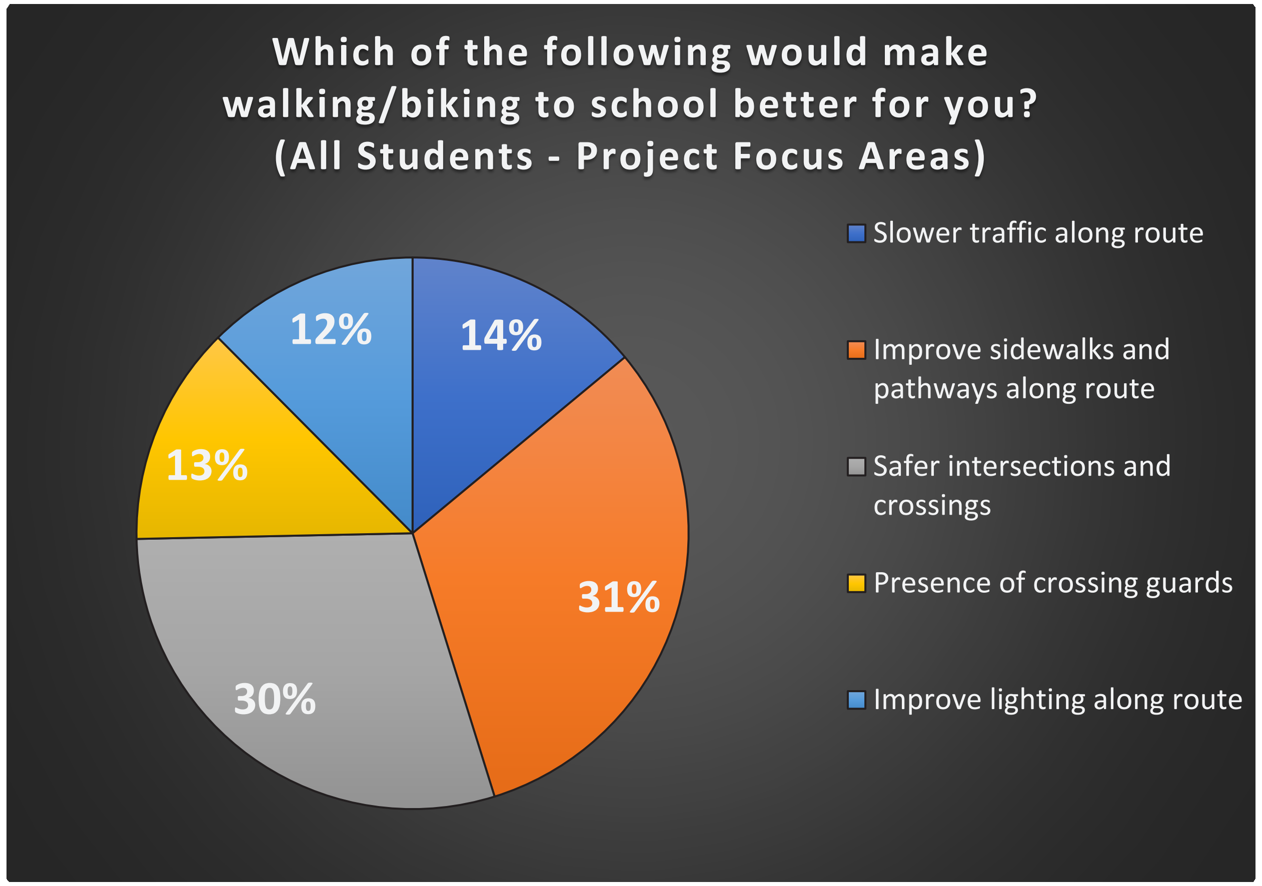

Which grade were you allowed to walk/bike to school without an adult?
80
70
60
50
40
30
20
10
0
10
9
37
47
59
68
37
42
3
3
8
4
24
19
23
22
6
8
0
3
Carson Middle School
Eagle Valley Middle School
1
2
3
4
5
6
7
8
K
PK


What is the biggest difficulty on your route to/from school?
Weather or Climate
Lighting
Lack of crossing guards
Safety of intersections and crossings
Lack of sidewalks or pathways
Too much traffic along route
Speed of traffic too fast
School is too far away
0
20
40
60
80
100
120
140
160
180
200
Carson Middle School
Eagle Valley Middle School


Which of the following would make walking/biking to school better for you? (All Students)
Shorter route
Less traffic along route
Improve sidewalks and pathways along route
Safer intersections and crossings
Slower traffic along route
Presence of crossing guards
Improve lighting along route
Shorter route
Slower traffic along route
Less traffic along route
Improve sidewalks and pathways along route
Safer intersections and crossings
Presence of crossing guards
Improve lighting along route

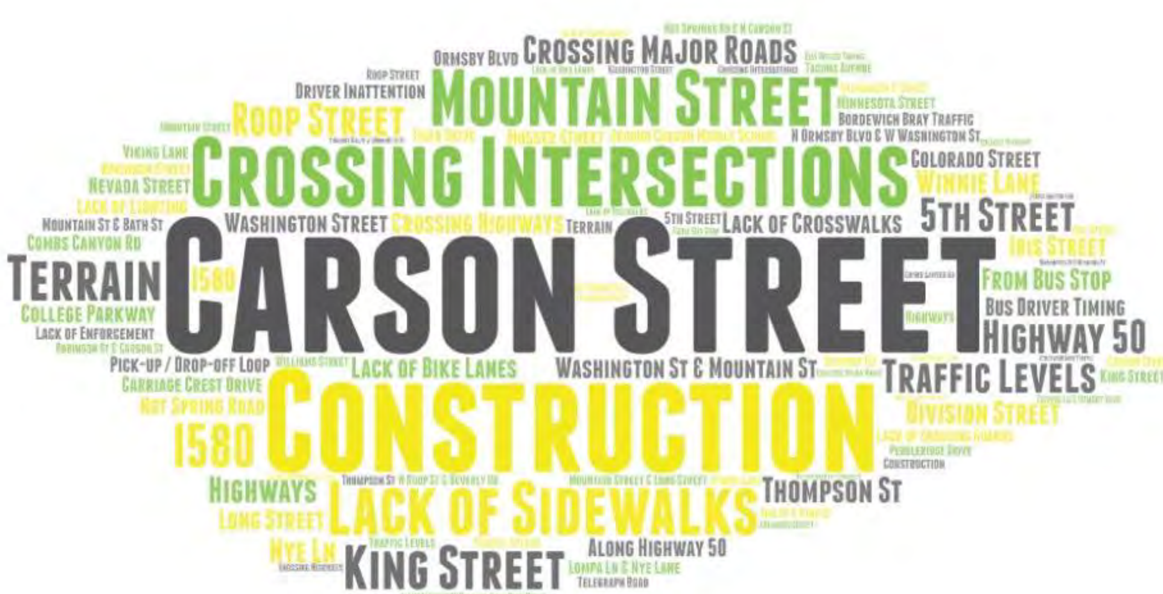

Student Survey - Which of the following would make walking / biking to school better for you? (EVMS) Project Focus Areas
16%
28%
29%
14%
13%
Slower traffic along route
Improve sidewalks and pathways along route
Safer intersections and crossings
Presence of crossing guards
Improve lighting along route


Student Survey - Which of the following would make walking / biking to school better for you? (CMS) Project Focus Areas
14%
31%
30%
13%
12%
Slower traffic along route
Improve sidewalks and pathways along route
Safer intersections and crossings
Presence of crossing guards
Improve lighting along route



Middle School Student Survey Responses Word Cloud

Question: Please identify specific locations (or issues) that pose walking/biking difficulty along your route.



Appendix B
Safe Routes to School Infrastructure Design Toolbox

HEADWAY TRANSPORTATION

Carson City, NV

Safe Routes to School Infrastructure

DESIGN TOOLBOX

Table of Contents

HEADWAY TRANSPORTATION

alta PLANNING + DESIGN

Section I

Context

Introduction

This Design Toolbox has been developed to complement Carson City's Safe Routes to School Master Plan and to assist the City in the selection and design of facilities. The designs featured in this Toolbox work to promote pedestrian and bicycle comfort, particularly among children. The chapter presents current engineering design resources and approaches to implement bicycle and pedestrian enhancements.

What, Why, Where, When and How?

Future roadway planning, engineering, design and construction will continue to strive for a balanced transportation system that includes a seamless, accessible bicycle and pedestrian network and encourages bicycle and pedestrian travel wherever possible.

There are many reasons to integrate bicycle and pedestrian facilities into typical roadway development policy. The goal of a transportation system is to better meet the needs of people - whether in vehicles, bicyclists or pedestrians - and to provide access to goods, services, and activities.

Supporting active modes gives users important transportation choices, whether it is to make trips entirely by walking or cycling, or to access public transit. Often in urban or suburban areas, walking and cycling are the fastest and most efficient ways to perform short trips.

Convenient non-motorized travel provides many benefits, including reduced traffic congestion, user savings, road and parking facility savings, economic development, and a healthier environment.

Compatible design does more than help those who already walk or bicycle. It encourages greater use of non-motorized transportation and makes the street safer for everyone.

The design recommendations in this document are for use on Carson City roadways. Projects must not only be planned for their physical aspects as facilities serving specific transportation objectives; they must also consider effects on the aesthetic, social, economic and environmental values, needs, constraints and opportunities in a larger community setting. This is commonly known as Context Sensitive Design, and should be employed when determining which standard is applicable in each scenario.

All walkway and bikeway design guidelines in this document meet or exceed the minimums set by the Americans with Disabilities Act.

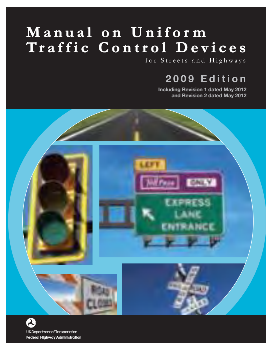
All traffic control devices, signs, pavement markings used and identified in this document must conform to the latest edition of the "Manual on Uniform Traffic Control Devices" (MUTCD).

Whenever possible and appropriate, the National Association of City Transportation Officials (NACTO)'s guidance is recommended where applicable.

Guidance Basis

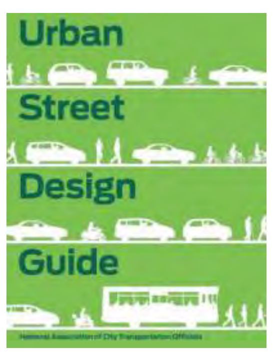
The sections that follow serve as an inventory of pedestrian and bicycle design treatments and provide guidelines for their development. These treatments and design guidelines are important because they represent the tools for creating a pedestrian- and bicycle-friendly, accessible community. The guidelines are not, however, a substitute for a more thorough evaluation by a professional engineer prior to implementation of facility improvements. The following guidelines are incorporated in this Design Guide.

National Guidance

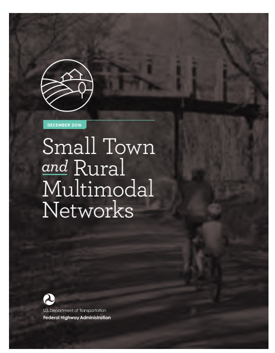


The Federal Highway Administration's ***Manual on Uniform Traffic Control Devices (MUTCD)*** *defines the standards used by road managers nationwide to install and maintain traffic control devices on all public streets, highways, bikeways, and private roads open to public traffic.*

Separated Bike Lane Planning and Design Guide (2015) *is the latest national guidance on the planning and design of separated bike lane facilities released by the Federal Highway Administration (FHWA). The resource documents best practices as demonstrated around the U.S., and offers ideas on future areas of research, evaluation and design flexibility.*

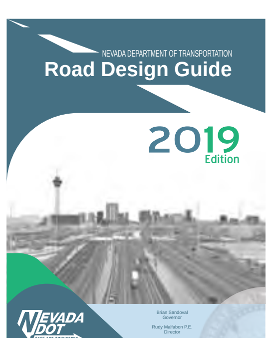


The National Association of City Transportation Officials' (NACTO) **Urban Bikeway Design Guide (2012)** *and* **Urban Street Design Guide (2013)** *are collections of nationally recognized street design standards, and offers guidance on the current state of the practice designs.*



The Federal Highway Administration's **Small Town and Rural Multimodal Networks Report (2016)** *offers resources and ideas to help small towns and rural communities support safe, accessible, comfortable, and active travel for people of all ages and abilities. It connects existing guidance to rural practice and includes examples of peer communities.*

Nevada Guidance



The Nevada Department of Transportations's **Road Design Guide (2019)** *establishes uniform design criteria for Nevada roadways to supplement AASHTO's "A Policy on Geometric Design of Highways and Streets."*

Design Needs of Pedestrians

The MUTCD recommends a normal walking speed of 3.5 ft per second when calculating the pedestrian clearance interval at traffic signals. The walking speed can drop to 3 ft per second for areas with older populations and persons with mobility impairments. While the type and degree of mobility impairment varies greatly across the population, the transportation system should accommodate these users to the greatest reasonable extent.

Types of Pedestrians

Pedestrians have a variety of characteristics and the transportation network should accommodate a variety of needs, abilities, and possible impairments.

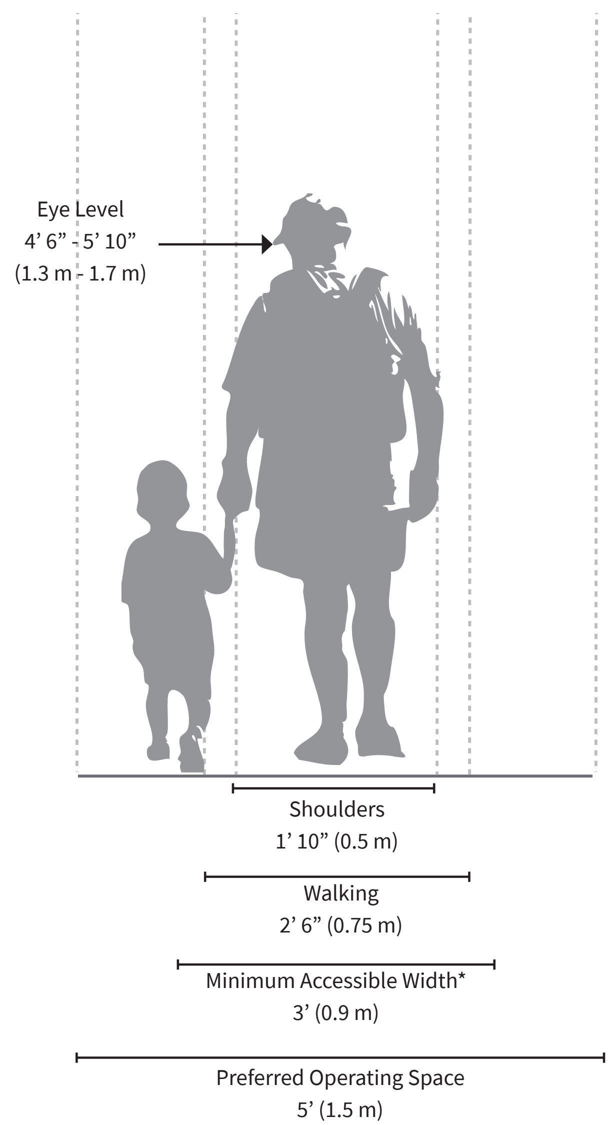
Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults. They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing.

Disabled Pedestrian Design Considerations

The table below summarizes common physical and cognitive impairments, how they affect personal mobility, and recommendations for improved pedestrian-friendly design.

Disabled Pedestrian Design Considerations

Impairment	Effect on Mobility	Design Solution
Physical Impairment Necessitating Wheelchair and Scooter Use	Difficulty propelling over uneven or soft surfaces.	Firm, stable surfaces and structures, including ramps or beveled edges.
	Cross-slopes cause wheelchairs to veer downhill or tip sideways.	Cross-slopes of less than two percent.
	Require wider path of travel.	Sufficient width and maneuvering space.
Physical Impairment Necessitating Walking Aid Use	Difficulty negotiating steep grades and cross slopes; decreased stability and tripping hazard.	Cross-slopes of less than two percent. Smooth, non-slippery travel surface.
	Slower walking speed and reduced endurance; reduced ability to react.	Longer pedestrian signal cycles, shorter crossing distances, median refuges, and street furniture.
Hearing Impairment	Less able to detect oncoming hazards at locations with limited sight lines (e.g. driveways, angled intersections, channelized right turn lanes) and complex intersections.	Longer pedestrian signal cycles, clear sight distances, highly visible pedestrian signals and markings.
Vision Impairment	Limited perception of path ahead and obstacles; reliance on memory; reliance on non-visual indicators (e.g. sound and texture).	Accessible text (larger print and raised text), accessible pedestrian signals (APS), guide strips and detectable warning surfaces, safety barriers, and lighting.
Cognitive Impairment	Varies greatly. Can affect ability to perceive, recognize, understand, interpret, and respond to information.	Signs with pictures, universal symbols, and colors, rather than text.



*At point of contact

Pedestrian Characteristics by Age

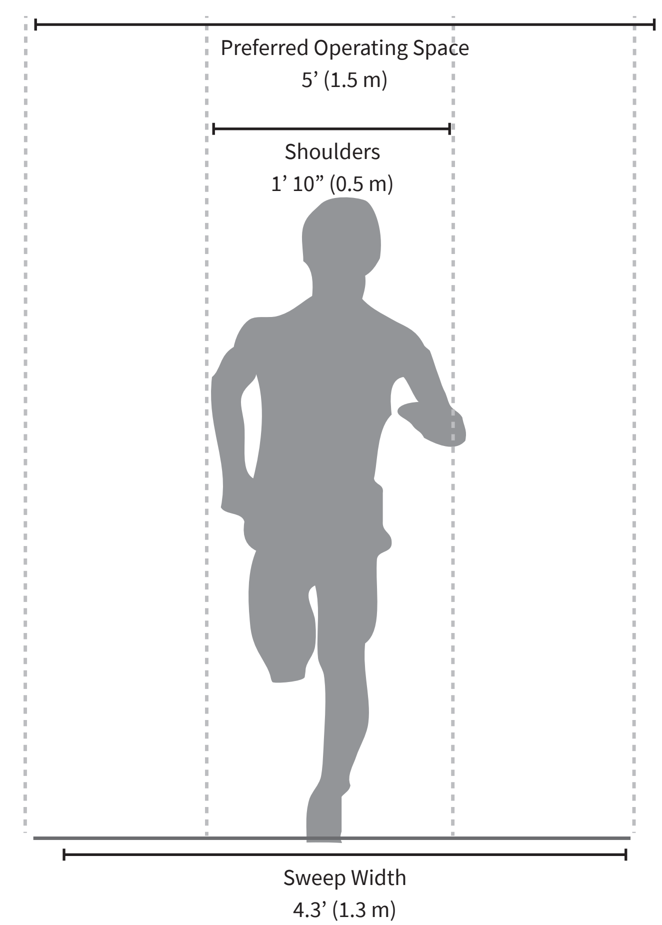
Age	Characteristics
0-4	Learning to walk
	Requires constant adult supervision
	Developing peripheral vision and depth perception
5-8	Increasing independence, but still requires supervision
	Poor depth perception
9-13	Susceptible to “darting out” in roadways
	Insufficient judgment
	Sense of invulnerability
14-18	Improved awareness of traffic environment
	Insufficient judgment
19-40	Active, aware of traffic environment
41-65	Slowing of reflexes
65+	Difficulty crossing street
	Vision loss
	Difficulty hearing vehicles approaching from behind

Source: AASHTO. Guide for the Planning, Design, and Operation of Pedestrian Facilities, Exhibit 2-1. 2004.

Design Needs of Runners

Running is an important recreation and fitness activity commonly performed on shared use paths. Many runners prefer softer surfaces (such as rubber, bare earth or crushed rock) to reduce impact. Runners can change their speed and direction frequently. If high volumes are expected, controlled interaction or separation of different types of users should be considered.

Runner Dimensions

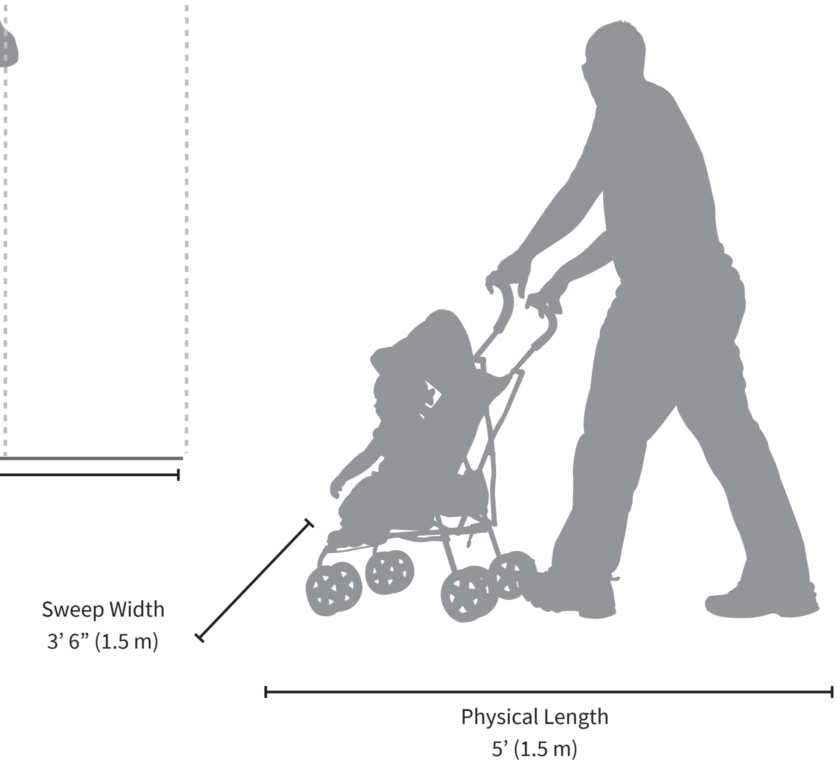


Design Needs of Strollers

Strollers are wheeled devices pushed by pedestrians to transport babies or small children. Stroller models vary greatly in their design and capacity. Some strollers are designed to accommodate a single child, others can carry 3 or more. Design needs of strollers depend on the wheel size, geometry and ability of the adult who is pushing the stroller.

Strollers commonly have small pivoting front wheels for easy maneuverability, but these wheels may limit their use on unpaved surfaces or rough pavement. Curb ramps are valuable to these users. Lateral overturning is one main safety concern for stroller users.

Stroller Dimensions



Design Needs of Wheelchair Users

As the American population ages, the age demographics in Carson City may also shift, and the number of people using mobility assistive devices (such as manual wheelchairs, powered wheelchairs) will increase.

Manual wheelchairs are self-propelled devices. Users propel themselves using push rims attached to the rear wheels. Braking is done through resisting wheel movement with the hands or arm. Alternatively, a second individual can control the wheelchair using handles attached to the back of the chair.

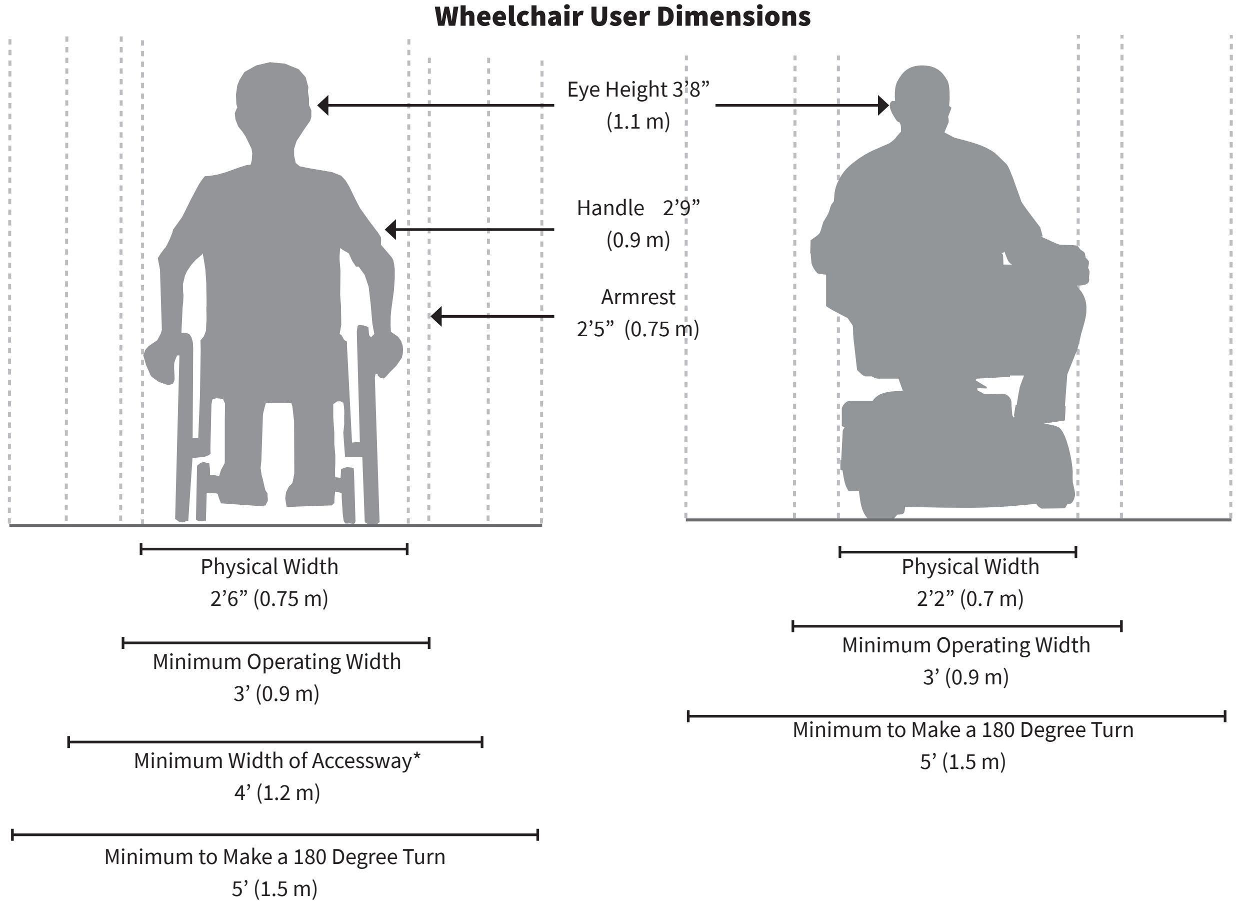
Power wheelchairs use battery power to move the wheelchair. The size and weight of power wheelchairs limit their ability to negotiate obstacles without a ramp. Various control units are available that enable users to control the wheelchair movement, based on their ability (e.g., joystick control, breath controlled, etc).

Maneuvering around a turn requires additional space for wheelchair devices. Providing adequate space for 180 degree turns at appropriate locations is an important element of accessible design.

Wheelchair User Design Considerations

Effect on Mobility	Design Solution
Difficulty propelling over uneven or soft surfaces.	Firm, stable surfaces and structures, including ramps or beveled edges.
Cross-slopes cause wheelchairs to veer downhill.	Cross-slopes of less than two percent.
Require wider path of travel.	Sufficient width and maneuvering space.

Wheelchair User Dimensions



**Provide 5' x 5' passing zone every 200' if travel way is at minimum width*

Design Needs of Bicyclists

The facility designer must have an understanding of how bicyclists operate and how their bicycle influences that operation. Bicyclists, by nature, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers.

By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk

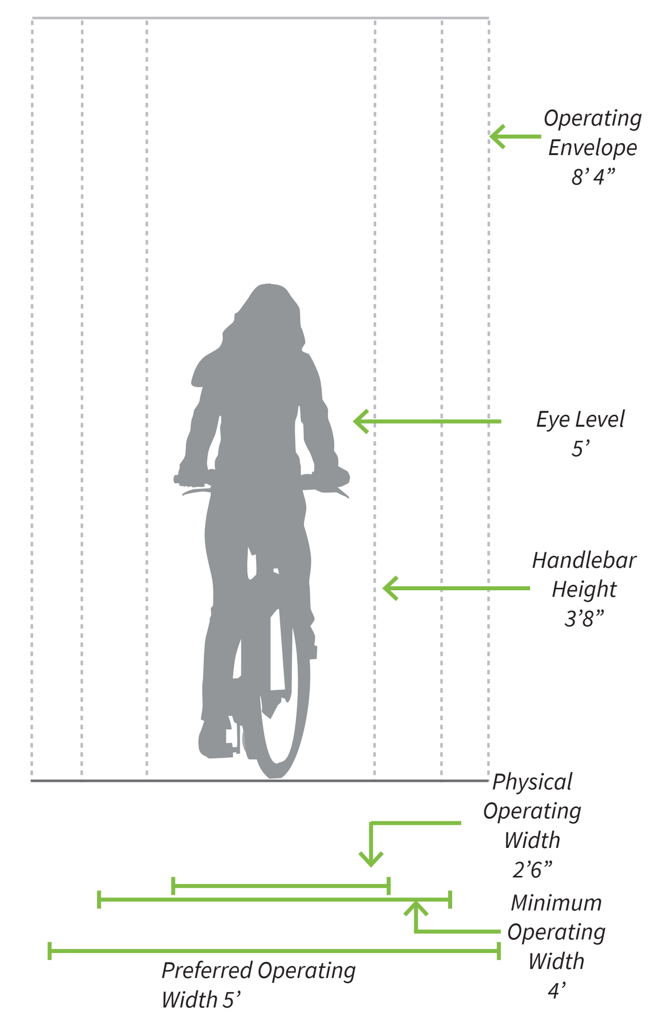
Bicycle as a Design Vehicle

Similar to motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

The Bicycle Rider figure illustrates the operating space and physical dimensions of a typical adult bicyclist, which are the basis for typical facility design. Bicyclists require clear space to operate within a facility. This is why the minimum operating width is greater than the physical dimensions of the bicyclist. Bicyclists prefer five feet or more operating width, although four feet may be minimally acceptable.

In addition to the design dimensions of a typical bicycle, there are many other commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories.

Bicycle Rider - Typical Dimensions



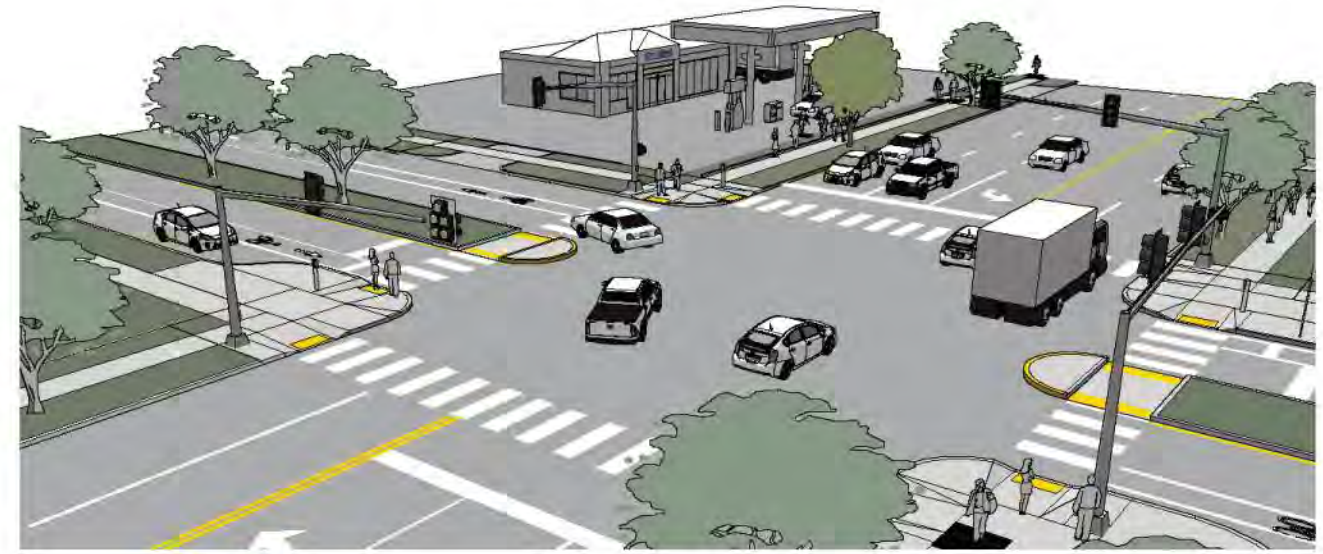
Bicycle as Design Vehicle - Design Speed Expectations

BICYCLE TYPE	FEATURE	TYPICAL SPEED
Upright Adult Bicyclist	Paved level surfacing	8-12 mph*
	Crossing Intersections	10 mph
	Downhill	30 mph
	Uphill	5 -12 mph
Recumbent Bicyclist	Paved level surfacing	18 mph

** Typical speed for causal riders per AASHTO 2013.*

Section 2

Pedestrian Toolbox



Marked Crosswalks

A marked crosswalk signals to motorists that they must yield to pedestrians and encourages pedestrians to cross at designated locations. Installing crosswalks alone will not necessarily enhance the comfort level of crossings. At mid-block locations, crosswalks can be marked where there is a demand for crossing and there are no nearby marked crosswalks.

Typical Use

All crosswalks should be marked at signalized intersections. At unsignalized intersections, crosswalks may be marked under the following conditions:

- At a complex intersection, to orient pedestrians in finding their way across.
- At an offset intersection, to show pedestrians the shortest route across traffic with the least exposure to vehicular traffic and traffic conflicts.
- At an intersection with visibility constraints, to position pedestrians where they can best be seen by oncoming traffic.
- At an intersection within a school zone on a walking route.

Design Features

- The crosswalk should be located to align as closely as possible with the through pedestrian zone of the sidewalk corridor.
- Users should not have to leave the crosswalk or reorient themselves from the crosswalk when accessing the curb ramp onto the sidewalk.
- See page 18 for design guidelines for curb ramps.
- High- visibility ladder, zebra, and continental crosswalk markings are preferable to standard parallel or dashed pavement markings.
- To reinforce yielding to pedestrians and reduce vehicle incursion into the crosswalk, include an advanced stop bar in advance of the crosswalk.

Marked crosswalks include standard parallel pavement markings as well as high-visibility ladder markings. Source: Google Streetview

Further Considerations

Pedestrians are sensitive to out-of-direction travel, and reasonable accommodations should be made to make crossings both convenient at locations with adequate visibility.

Continental crosswalk markings should be used at crossings with high pedestrian use or where vulnerable pedestrians are expected, including: school crossings, across arterial streets for pedestrian-only signals, at mid-block crosswalks, and at intersections where there is expected high pedestrian use and the crossing is not controlled by signals or stop signs. High-visibility crosswalks are not appropriate for all locations. Other crosswalk marking patterns are provided for in the MUTCD.

Some cities prohibit omitting or removing a marked crosswalk at intersections in order to require a three-stage pedestrian crossing. Intersections with three-stage crossings lead to arduous and increased crossing distances, pedestrian frustration, encourages jaywalking, and exhibits modal bias favoring motor vehicle level-of-service over other modes. There are circumstances when only three crosswalks are utilized and typically occur at or near interchanges and freeway ramps.

Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority. Thermoplastic markings offer increased durability than conventional paint.[1]

Approximate Cost

Depending on the type of material used, width of the crossing and width of the roadway, approximate installation costs are $500 for a regular striped crosswalk, $1,000 for a ladder crosswalk, and $8,000 for a patterned concrete crosswalk. In addition, the cost of a curb ramp is about $5,000-$10,000 per ramp.

Due to various number of crosswalk styles in use, signing standards, color and aesthetics, other factors will affect the final cost.

Maintenance of markings should also be considered.

1 The appropriate marking material(s) should be determined on a project basis.

Raised Pedestrian Crossings

A raised crosswalk or intersection can eliminate grade changes from the pedestrian path and give pedestrians greater prominence as they cross the street. Raised crosswalks also functions as speed tables, and encourage motorists to slow down. As such, they should be used only in cases where a special emphasis on pedestrians is desired.

Raised crosswalks are typically implemented on low-speed streets, bike boulevards and other areas of very high pedestrian activity. They are often paired with other treatments such as curb extensions for greater traffic calming effect.

Typical Use

Like a speed hump/table, raised crosswalks have a traffic slowing effect which may be unsuitable on high-speed streets, roadways with sharp curves, designated transit or freight routes, and in locations that would reduce access for emergency responders. Use detectable warnings at the curb edges to alert vision-impaired pedestrians that they are entering the roadway.

Approaches to the raised crosswalk may be designed to be similar to speed humps/tables.

Design Features

- Use detectable warnings at the curb edges to alert vision-impaired pedestrians that they are entering the roadway.
- Approaches to the raised crosswalk may be designed to be similar to speed humps.
- Drainage improvements may be required depending on the grade of the roadway.
- Special paving materials can be used to increase conspicuity of the crossing, and alert drivers to the presence of pedestrians.

Raised pedestrian crossings help reduce vehicle speeds and give pedestrians greater prominence as they cross the street.

Further Considerations

- The noise of vehicles traveling over raised crosswalks may be of concern to nearby residents and businesses.
- Refer to Americans with Disabilities Act (ADA) and California Building Code (CBC) for additional requirements.

Materials and Maintenance

Because the effectiveness of marked crossings depends entirely on their visibility, maintaining marked crossings should be a high priority. Ensure drainage used to channel stormwater past the raised intersection is kept free of debris, to prevent stormwater from backing up and pooling.

Approximate Cost

Raised crosswalks are approximately $2,000 to $15,000, depending on drainage conditions and material used.

Sidewalk Zones & Widths

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel separated from vehicle traffic. Providing adequate and accessible facilities can lead to increased numbers of people walking, improved accessibility, and the creation of social space.

Curbside Lane	Buffer Zone	Pedestrian Through Zone	Frontage Zone
The curbside lane can act as a flexible space to further buffer the sidewalk from moving traffic., and may be used for a bike lane. Curb extensions and bike corrals may occupy this space where appropriate. In the **edge zone** there should be a 6 inch wide curb.	The buffer zone, also called the furnishing or landscaping zone, buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, signs, and other street furniture are properly located.	The through zone is the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects. Wide through zones are needed in downtown areas or where pedestrian flows are high.	The frontage zone allows pedestrians a comfortable "shy" distance from the building fronts. It provides opportunities for window shopping, to place signs, planters, or chairs.

Street Classification	Parking Lane/ Enhancement Zone	Buffer Zone	Pedestrian Through Zone	Frontage Zone*
Local Streets	Varies	4 - 6 ft	6 ft	N/A
Downtown and Pedestrian Priority Areas	Varies	4 - 6 ft	12 ft	2.5 - 10 ft
Arterials and Collectors	Varies	4 - 6 ft	6 - 8 ft	2.5 - 5 ft

**Indicates ideal frontage zone space. Actual frontage zone is contingent upon the City's development code and required set backs*

Typical Uses

- Wider sidewalks should be installed near schools, at transit stops, in downtown areas, or anywhere high concentrations of pedestrians exist.
- At transit stops, an 8 ft by 5 ft clear space is required for accessible passenger boarding/ alighting at the front door location per ADA requirements.
- Sidewalks should be continuous on both sides of urban commercial streets, and should be required in areas of moderate residential density (1-4 dwelling units per acre).
- When retrofitting gaps in the sidewalk network, locations near transit stops, schools, parks, public buildings, and other areas with high concentrations of pedestrians should be the highest priority.

Materials and Maintenance

Sidewalks are typically constructed out of concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped boulevard. Less expensive walkways constructed of asphalt, crushed stone, or other stabilized surfaces may be appropriate. Ensure accessibility and properly maintain all surfaces regularly. Surfaces must be firm, stable, and slip resistant. Colored, patterned, or stamped concrete can add distinctive visual appeal.

Approximate Cost

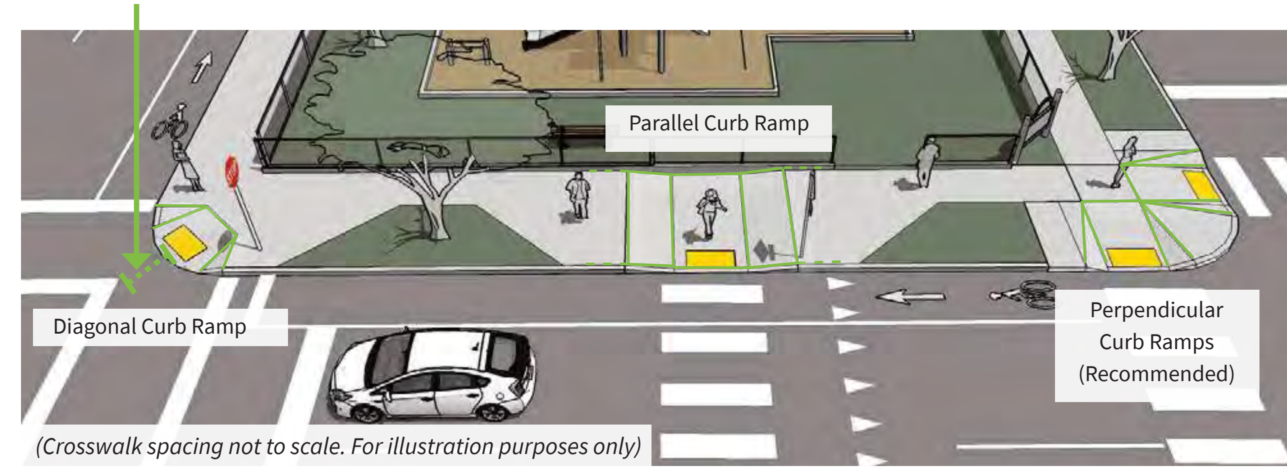
Cost of standard sidewalks range from about $25 per square foot for concrete sidewalk. This cost can increase with additional right-of-way acquisition or addition of landscaping, lighting or other aesthetic features. As an interim measure, an asphalt concrete path can be placed until such time that a standard sidewalk can be built. The cost of asphalt path can be less than half the cost of a standard sidewalk.

Curb Ramps

Curb ramps are the design elements that allow all users to make the transition from the street to the sidewalk. A sidewalk without a curb ramp can be useless to someone in a wheelchair, forcing them back to a driveway and out into the street for access. There are a number of factors to be considered in the design and placement of curb ramps.

Diagonal ramps shall include a clear space of at least 48" within the crosswalk for user maneuverability

Curb ramps shall be located so that they do not project into vehicular traffic lanes, parking spaces, or parking access aisles. Three configurations are illustrated below.



(Crosswalk spacing not to scale. For illustration purposes only)

Typical Use

- Curb ramps must be installed at all intersections and midblock locations where pedestrian crossings exist, as mandated by federal legislation (1973 Rehabilitation Act and ADA 1990). All newly constructed and altered roadway projects must include curb ramps. In addition, existing facilities must be upgraded to current standards when appropriate.
- The edge of an ADA compliant curb ramp shall be marked with a tactile warning device (also known as truncated domes) to alert people with visual impairments to changes in the pedestrian environment. Contrast between the raised tactile device and the surrounding infrastructure is important so that the change is readily evident to partially sighted pedestrians. These devices are most effective when adjacent to smooth pavement so the difference is easily detected.

Design Features

- The level landing at the top of a ramp shall be at least 4 feet long and at least the same width as the ramp itself. The slope of the ramp shall be compliant to current standards.
- If the ramp runs directly into a crosswalk, the landing at the bottom will be in the roadway.
- If the top landing is within the sidewalk or corner area where someone in a wheelchair may have to change direction, the landing must be a minimum of 4'-0" long (in the direction of the ramp run) and at least as wide as the ramp, although a width of 5'-0" is preferred.

Not recommended: diagonal curb ramp configuration. Source: Google Streetview

Recommended: Bulb-Out with bidirectional curb ramps for crossing in both directions. Source: Google Streetview

Further Considerations

Where feasible, separate directional curb ramps for each crosswalk at an intersection should be provided rather than having a single ramp at a corner for both crosswalks. Although diagonal curb ramps might save money, they orient pedestrians directly into the traffic zone, which can be challenging for wheelchair users and pedestrians with visual impairment. Diagonal curb ramp configurations are not recommended.

Curb return radii need to be considered when designing directional ramps. While curb ramps are needed for use on all types of streets, the highest priority locations are in downtown areas and on streets near transit stops, schools, parks, medical facilities, shopping areas.

Materials and Maintenance

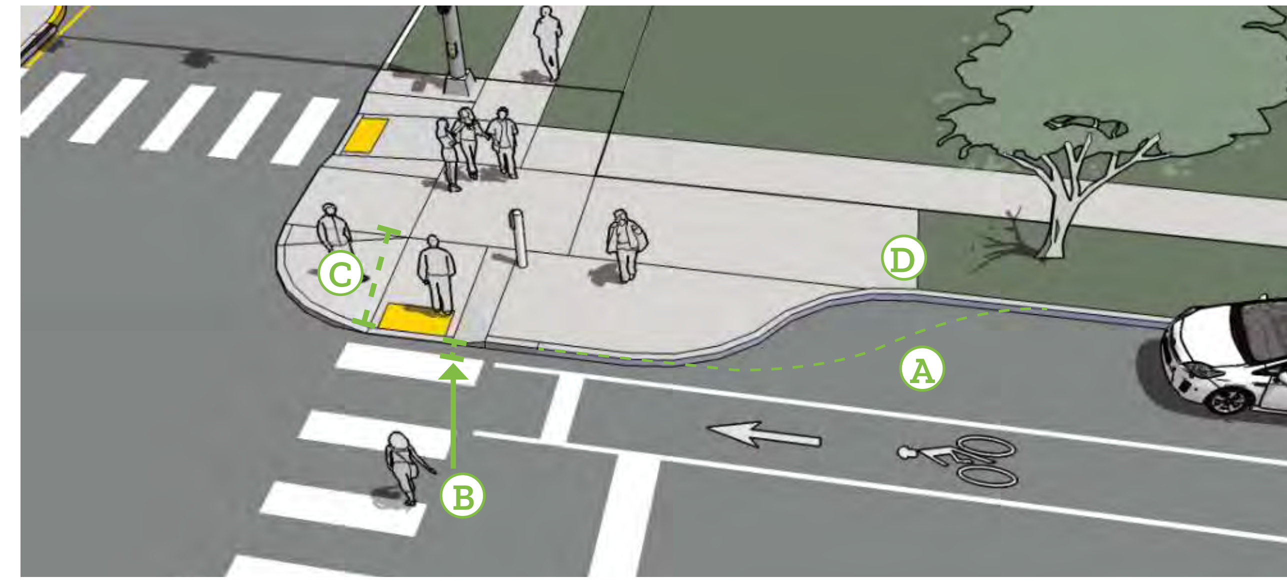
It is critical that the interface between a curb ramp and the street be maintained adequately. Asphalt street sections can develop potholes at the foot of the ramp, which can catch the front wheels of a wheelchair.

Approximate Cost

The cost is approximately $5,000-$10,000 per curb ramp depending on drainage and right-of-way.

Curb Extensions

Curb extensions minimize pedestrian exposure during crossing by shortening crossing distance and giving pedestrians a better chance to see and be seen before committing to crossing.



Typical Use

- Within parking lanes appropriate for any crosswalk where it is desirable to shorten the crossing distance and there is a parking lane adjacent to the curb.
- May be possible within non-travel areas on roadways with excess space.
- Particularly helpful at midblock crossing locations.
- Curb extensions should not impede bicycle travel in the absence of a bike lane.
- Curb extensions are often utilized as in-lane transit stops, allowing passengers to board and alight outside of the pedestrian through zone.

Materials and Maintenance

Planted curb extensions may be designed as a bioswale, a vegetated system for stormwater management. To maintain proper stormwater drainage, curb extensions can be constructed as refuge islands offset by a drainage channel or feature a covered trench drain.

Design Features

(A) For purposes of efficient street sweeping, the minimum radius for the reverse curves of the transition is 10 ft and the two radii should be balanced to be nearly equal.

(B) When a bike lane is present, the curb extensions should terminate one foot short of the parking lane to enhance bicyclist access.

(C) Reduces pedestrian crossing distance by 6-8 ft.

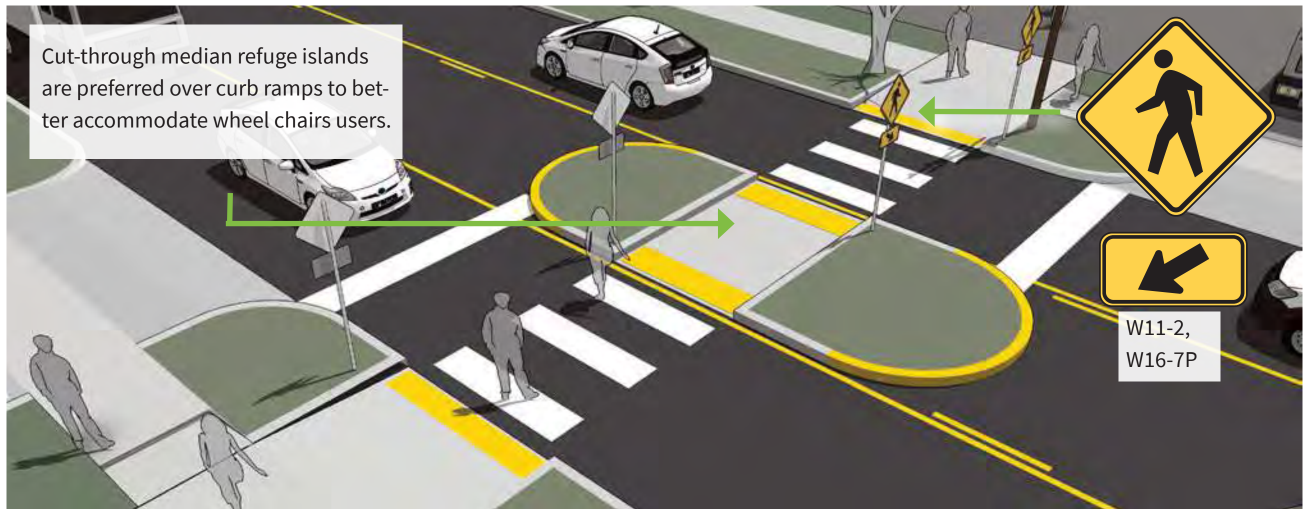
(D) Planted curb extensions may be designed as a bioswale for stormwater management.

Approximate Cost

The cost of a curb extension can range from $2,000 to $20,000 depending on the design and site condition, with the typical cost approximately $12,000. Green/vegetated curb extensions cost between $10,000 to $40,000.

Median Refuge Islands

Median refuge islands are located at the mid-point of a marked crossing and help improve pedestrian access by increasing pedestrian visibility and allowing pedestrians to cross one direction of traffic at a time. Refuge islands minimize pedestrian exposure at mid-block crossings by shortening the crossing distance and increasing the number of available gaps for crossing.



Typical Use

- Refuge islands an be applied on any roadway with a left turn center lane or median that is at least 6' wide. Islands are appropriate at signalized or unsignalized crosswalks.
- The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.
- The island should be at least 6' wide between travel lanes (to accommodate wheelchair users) and at least 20' long (40' minimum preferred).
- Provide double centerline marking, reflectors, and "KEEP RIGHT" signage (MUTCD R4-7a) in the island on streets with posted speeds above 25 mph.

Materials and Maintenance

Refuge islands may require frequent maintenance of road debris. Trees and plantings in a landscaped median must be maintained so as not to impair visibility, and should be no higher than 1 foot 6 inches.

Design Features

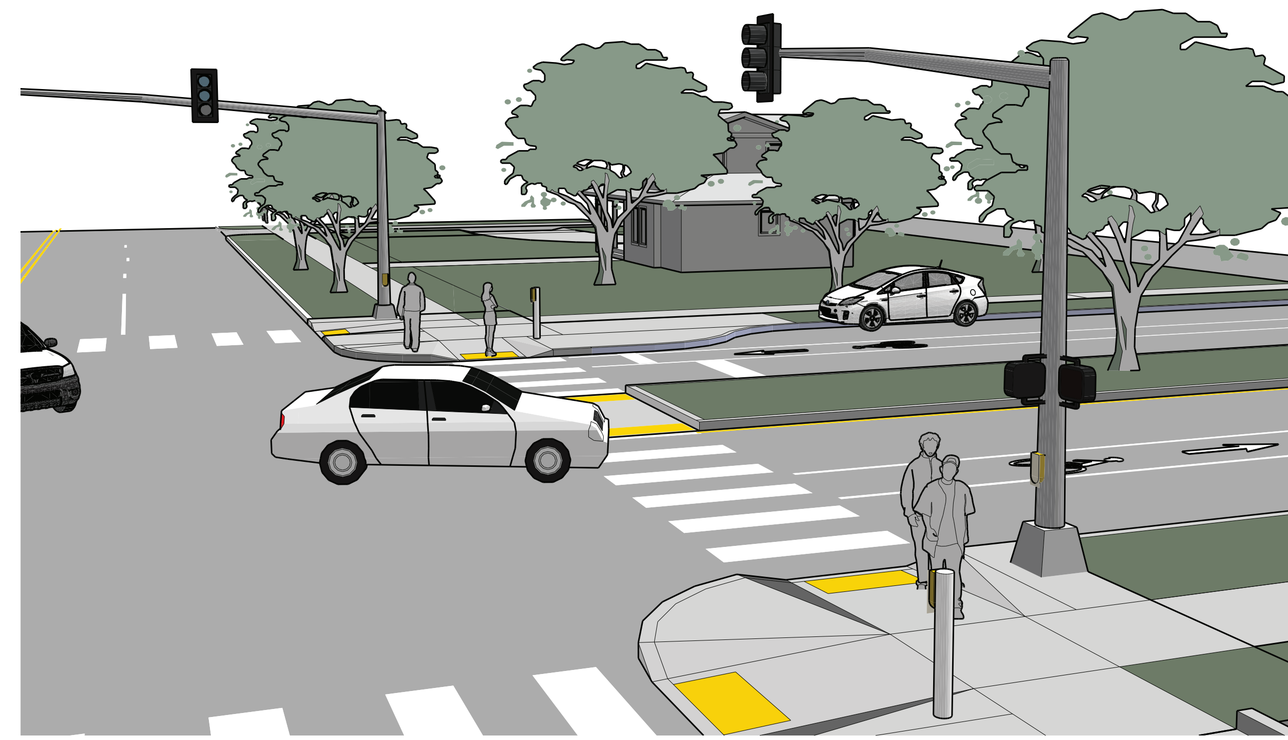
- Median refuge islands can be installed on roadways with existing medians or on multi-lane roadways where adequate space exists
- Median Refuge Islands should always be paired with crosswalks, and should include advance pedestrian warning signage when installed at uncontrolled crossings.
- On multi-lane roadways, consider configuration with active warning beacons for improved yielding compliance.

Approximate Cost

The approximate cost to install a median refuge island ranges from $500 to $1,100 per foot, or about $3,500 to $4,000, depending on the design, site conditions, landscaping, and whether the median can be added as a part of a larger street reconstruction project or utility upgrade.

Pedestrian Signalization Improvements

Pedestrian signal heads indicate to pedestrians when to cross at a signalized crosswalk. All traffic signals should be equipped with pedestrian signal indications except where pedestrian crossing is prohibited by signage. Pedestrian signals should be used at traffic signals wherever warranted, according to the MUTCD.



Typical Use

- Countdown pedestrian signals are particularly valuable for pedestrians, as they indicate whether a pedestrian has time to cross the street before the signal phase ends. Countdown signals should be used at all new and rehabilitated signalized intersections.
- Adequate pedestrian crossing time is a critical element of the walking environment at signalized intersections. The length of a signal phase with parallel pedestrian movements should provide sufficient time for a pedestrian to safely cross the adjacent street.
- There are several types of signal timing for pedestrian signals, including concurrent, exclusive, "Leading pedestrian interval" (LPI), and all-red interval. In general, shorter cycle lengths and extended walk intervals provide better service to pedestrians and encourage better signal compliance. For optimal pedestrian service, fixed-time signal operation usually works best.
- Leading Pedestrian Intervals (LPI) are used to reduce right turn and permissive left turn vehicle and pedestrian conflicts. The through pedestrian interval is initiated first, in advance of the concurrent through/right/permissive left turn interval. The LPI minimizes vehicle-pedestrian conflicts because it gives pedestrians a 3-10 second head start into the intersection, thereby making them more visible, and reducing crossing exposure time. Accessible Pedestrian Signals (APS) are recommended with an LPI.
- Automated pedestrian phases are preferred to passive or active detection, particularly in areas of high pedestrian activity.

A Pedestrian Island in large intersections helps shorten crossing distances. Source: Google Streetview

Design Features

- The MUTCD recommends that traffic signal timing assumes a pedestrian walking speed of 3.5 ft per second.[1]
- At crossings where older pedestrians or pedestrians with disabilities are expected, crossing speeds as low as 3 ft per second should be assumed. Special pedestrian phases can be used to provide greater visibility or more crossing time for pedestrians at certain intersections.
- Pedestrian pushbuttons may be installed at locations where pedestrians are expected intermittently. Otherwise, pedestrian signals should be automated with traffic signals. When used, pushbuttons should be well signed and within reach and operable from a flat surface for pedestrians in wheelchairs and with visual disabilities. They should be conveniently placed in the area where pedestrians wait to cross. Section 4E.09 within the MUTCD provides detailed guidance for the placement of pushbuttons to ensure accessibility.

Further Considerations

- When pushbuttons are used, they should be located so that someone in a wheelchair can reach the button from a level area of the sidewalk without deviating significantly from the natural line of travel into the crosswalk. Pushbuttons should be marked (for example, with arrows) so that it is clear which signal is affected.
- In areas with very heavy pedestrian traffic, consider an all-pedestrian signal phase to give pedestrians free passage in the intersection when all motor vehicle traffic movements are stopped.
- An exclusive pedestrian signal phase called a “Pedestrian Scramble” can be provided to reduce vehicle turning conflicts.

Materials and Maintenance

It is important to perform ongoing maintenance of traffic control equipment. Consider semi-annual inspections of controller and signal equipment, intersection hardware, and detectors.

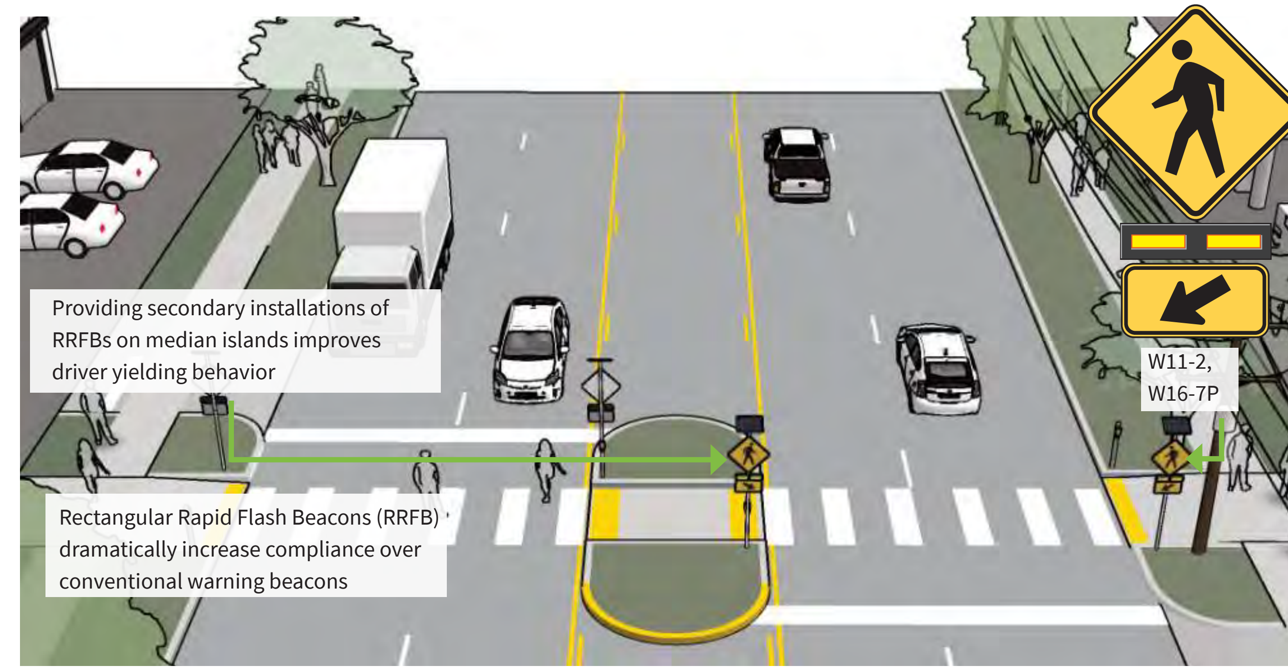
Approximate Cost

Adjusting signal timing is relatively inexpensive, as it requires only a few hours of staff time to accomplish. New signal equipment ranges from $20,000 to $140,000.

1 In Carson City, 3.5 ft per second is used for the Flashing Don't Walk (FDW) interval and 3.0 ft per second for the WALK interval.

Rectangular Rapid Flashing Beacons (RRFB)

Rectangular Rapid Flash Beacons (RRFB) are a type of active warning beacon used at unsignalized crossings. They are designed to increase motor vehicle yielding compliance on multi-lane or high-volume roadways. Guidance for marked/unsignalized crossings applies.



Typical Use

RRFBs are typically activated by pedestrians manually with a pushbutton, or can be actuated automatically with passive detection systems.

RRFBs shall not be used at crosswalks controlled by YIELD signs, STOP signs, or traffic control signals.

RRFBs shall initiate operation based on user actuation and shall cease operation at a predetermined time after the user actuation or, with passive detection, after the user clears the crosswalk.

Materials and Maintenance

RRFBs should be regularly maintained to ensure that all lights and detection hardware are functional.

Design Features

Guidance for marked/unsignalized crossings applies.

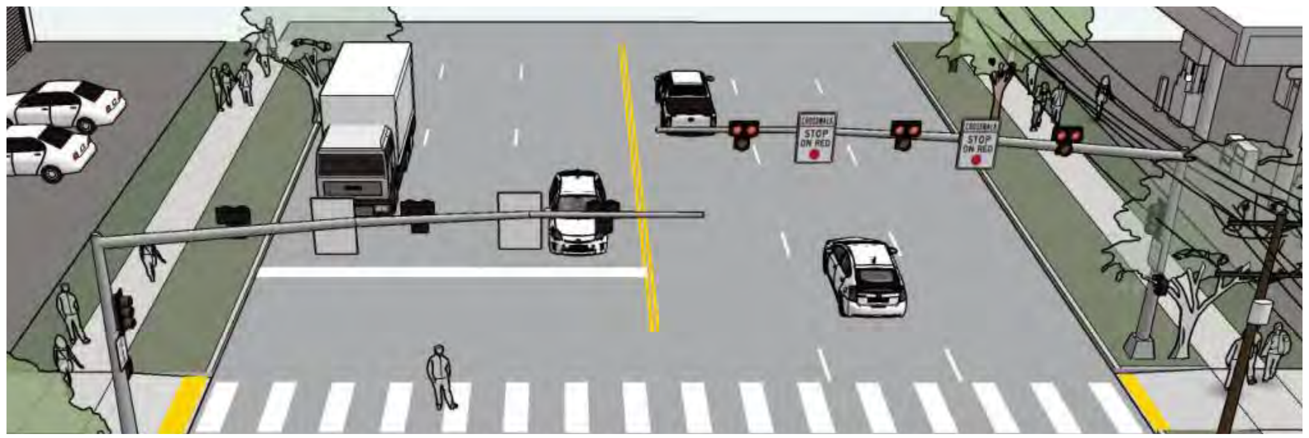
- A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent. A four-beacon arrangement raised compliance to 88%. Additional studies of long term installations show little to no decrease in yielding behavior over time.
- See FHWA Interim Approval 21 (IA-21) for more information on device application standards.

Approximate Cost

RRFBs range in price from $5,000 to $20,000 for a solar powered unit depending on the location, width of the road and other factors.

Pedestrian Hybrid Beacon (PHB)

Hybrid beacons or High-Intensity Activated Crosswalk (HAWK) beacons are used to improve unsignalized intersections or midblock crossings of major streets. It consists of a signal head with two red lenses over a single yellow lens on the major street, and a pedestrian signal head for the crosswalk. The signal is only activated when a pedestrian and/or bicyclist is present, resulting in minimal delay for motor vehicle traffic.



Typical Use

PHBs are only used at marked mid-block crossings or unsignalized intersections. They are typically activated with a pedestrian pushbutton at each end. If a median refuge island is used at the crossing, another pedestrian pushbutton can be located on the island to create a two-stage crossing.

Design Features

- PHBs may be installed without meeting traffic signal control warrants if roadway speed and volumes are excessive for comfortable pedestrian crossings.
- If installed within a signal system, signal engineers should evaluate the need for the PHB to be coordinated with other signals.
- The MUTCD recommends but does not require that PHBs be installed at least 100 feet from side streets that are controlled by stop or yield signs. Many agencies have implemented successful projects at otherwise uncontrolled intersections.
- Parking and other sight obstructions should be prohibited for at least 100 feet in advance and at least 20 feet beyond the marked crosswalk to provide adequate sight distance.

Further Considerations

- PHBs may also be actuated by infrared, microwave, or video detectors.
- Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity, and safety.
- The installation of PHBs should also include public education and enforcement campaigns to ensure proper use and compliance.

Materials and Maintenance

PHBs are subject to the same maintenance needs and requirements as standard traffic signals. Signing and striping need to be maintained to help users understand any unfamiliar traffic control.

Approximate Cost

PHBs are more expensive than other beacons, ranging in costs from $150,000 to $250,000, but are generally less expensive than full signals. PHBs may be side mounted in some contexts or solar powered to provide additional flexibility and costs closer to a RRFB installation.

THIS PAGE INTENTIONALLY LEFT BLANK

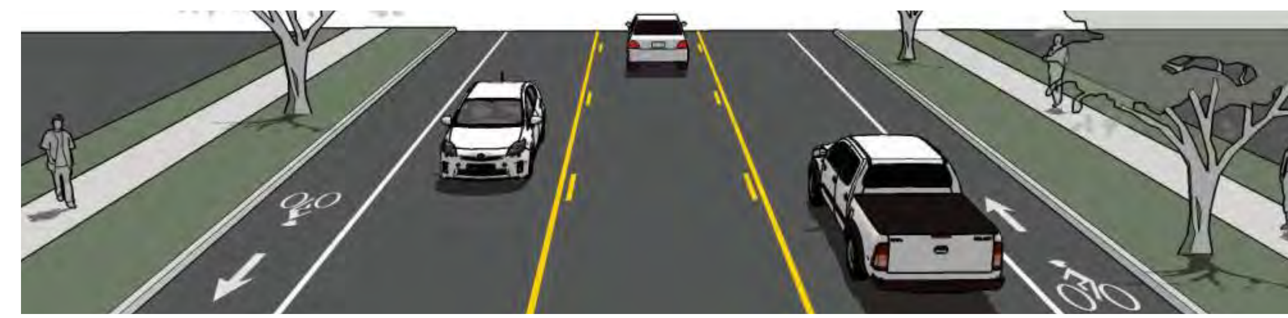
Section 3

Bicycle Toolbox

Lane Reconfigurations and Road Diets

Streets with excess roadway capacity or wider lanes often make excellent candidates for lane reconfigurations or road diet projects. The removal of a single travel lane will generally provide sufficient space for bike lanes on both sides of a street. Even if the width of the sidewalk does not increase, pedestrians benefit from the buffer that the new bike lanes create between the sidewalk and travel lanes. Although the actual roadway crossing distance has not been reduced, the addition of bike lanes reduces the number of vehicle travel lanes pedestrians must cross.

BEFORE
11-12' Travel | 11' Travel | 11' Travel | 11-12' Travel



AFTER
6' Bike | 10-12' Travel | 10-12' Turn | 10-12' Travel | 6' Bike

Typical Use

- Depending on a street's existing configuration, traffic operations, user needs, and comfort level, various lane reconfigurations may be appropriate.
- For instance, a four-lane street (with two travel lanes in each direction) could be modified to provide one travel lane in each direction, a center turn lane, and bike lanes.
- Prior to implementing this measure, a traffic analysis should identify potential impacts, including diversion to other parallel neighborhood streets. Road diets should also consider school, city bus, emergency service access, and other truck volumes.

Design Features

- Narrower lanes generally encourage slower vehicle speeds, higher comfort for people walking and biking.
- Vehicle lane width: Width depends on project. No narrowing may be needed if a lane is removed. Lanes along transit and freight routes may need a minimum of 11 feet to accommodate larger vehicles.
- Bicycle lane width: Standard bicycle lane width is 5-6 feet as measured from the face of the curb. A buffered bike lane requires an additional 2-3 feet.
- Number of Lanes: Generally, 3 lanes with a center turn lane can provide a capacity of 20,000 vehicles per day., with some examples carrying over 24,000 vehicles per day.

Before-and-after road reconfiguration on Duquesne Avenue in Culver City, CA. General Flow lanes were narrowed to make way for a bike lane while retaining parking.

Materials and Maintenance

Road configurations are often paired with the road repaving schedule to reduce costs. Use bicycle compatible drainage grates, and ensure they are flush with the pavement.

Approximate Cost

Adding striped shoulders can cost as little as $1,000 per mile if old paint does not need to be removed.

The cost for restriping a street to bike lanes or reducing the number of lanes to add on-street parking is approximately $11 per foot on street, depending on the number of lane lines to be removed.

The approximate cost for restriping a roadway as depicted can range from $10,000-$60,000 per mile.

Bike Boulevards

A Bike Boulevard is a low-speed, low-volume roadway that is designed to enhance comfort and convenience for people bicycling. It provides better conditions for bicycling while improving the neighborhood character and maintaining emergency vehicle access. Bike Boulevards are intended to serve as a low-stress bikeway network, providing direct, and convenient routes across Carson City. Key elements of Bike Boulevards are unique signage and pavement markings, traffic calming and diversion features to maintain low vehicle volumes, and convenient major street crossings.

Typical Use

- Parallel with, and in close proximity to major thoroughfares (1/4 mile or less) on low-volume, low-speed streets.
- Follow a desire line for bicycle travel that is ideally long and relatively continuous (2-5 miles).
- Avoid alignments with excessive zigzag or circuitous routing. The bikeway should have less than 10% out of direction travel compared to shortest path of primary corridor.
- Local streets with traffic volumes of fewer than 3,000 vehicles per day and posted speed limits of 25 miles per hour. Utilize traffic calming to maintain or establish low volumes and discourage vehicle cut through / speeding.

Design Features

- Signs and pavement markings are the minimum treatments necessary to designate a street as a bike boulevard.
- Implement volume control treatments based on the context of the bike boulevard, using engineering judgment. While motor vehicle volumes should not exceed 3,000 vehicles per day, ideal conditions are 1,500 vehicles per day or less.
- Intersection crossings should be designed to enhance comfort and minimize delay for bicyclists of diverse skills and abilities

A Painted Intersection, planters, and curb extensions to reinforce that the street is intended for local, slow-speed use instead of cut-through vehicle traffic.

An example of an large pavement marking to reinforce that the street is a Bike Boulevard.

Further Considerations

- Bike Boulevards are established on streets that improve connectivity to key destinations and provide a direct, low-stress route for bicyclists, with low motorized traffic volumes and speeds, designated and designed to give bicycle travel priority over other modes.
- Bike Boulevard retrofits to local streets are typically located on streets without existing signalized accommodation at crossings of collector and arterial roadways. Without treatments for bicyclists, these intersections can become major barriers along the Bike Boulevard.
- Traffic calming can deter motorists from driving on a street. Anticipate and monitor vehicle volumes on adjacent streets to determine whether traffic calming results in inappropriate volumes. Traffic calming can be implemented on a trial basis.

Materials and Maintenance

Bike Boulevards require few additional maintenance requirements to local roadways. Signage, signals, and other traffic calming elements should be inspected and maintained according to local standards.

Approximate Cost

Costs vary depending on the type of treatments proposed for the corridor. Simple treatments such as wayfinding signage and markings are most cost-effective, but more intensive treatments will have greater impact at lowering speeds and volumes, at higher cost. Costs can range from $5,000/mile on the simple end to $50,000/mile for significant horizontal deflection and diversion.

Shared Lane Markings

Shared Lane Marking (SLM) or “Sharrow” stencils are lane positioning stencils that can enhance shared roadways. The MUTCD approved pavement marking can serve a number of purposes, such as making motorists aware of the need to share the road with bicyclists, showing bicyclists the direction of travel, and, with proper placement, reminding bicyclists to bike further from parked cars to prevent collisions with drivers opening car doors.

Typical Use

- Shared Lane Markings are not appropriate on paved shoulders or in bike lanes, and should not be used on roadways that have a posted speed greater than 35 mph.
- Shared Lane Markings should be implemented in conjunction with BIKES MAY USE FULL LANE signs.

Design Features

(A) Placement in the center of the travel lane is preferred in constrained conditions.

- Markings should be placed immediately after intersections and spaced at 250 foot intervals thereafter.
- The MUTCD recommends centering the marking a minimum of 11 feet from the curb face with on-street parking and a minimum of 4 feet from the curb with no parking. Larger offsets are frequently desirable.

Sharrows also serve as positional guidance and raise bicycle awareness where there is not space to accommodate a full-width bike lane. Center lane markings may or may not be necessary depending on travel lane widths. Narrower two way residential streets (less than 22 ft between parked cars) have a natural traffic calming effect without center turn lanes.

Further Considerations

- Consider modifications to signal timing to induce a bicycle-friendly travel speed for all users.
- Though not always possible, placing the markings outside of vehicle tire tracks will increase the life of the markings and the long-term cost of the treatment.
- A green thermoplastic background can be applied to further increase the visibility of the shared lane marking.

Materials and Maintenance

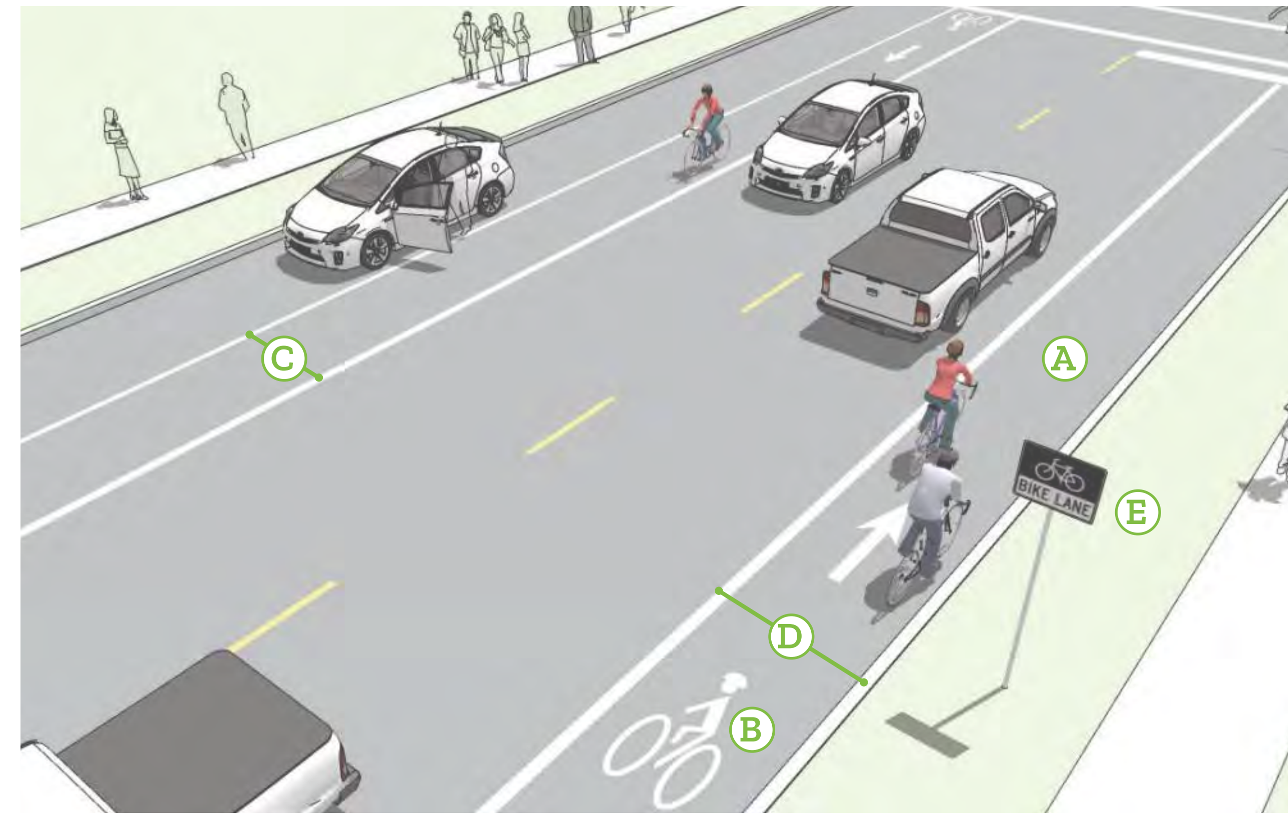
- Shared lane markings should be inspected annually and maintained accordingly, especially if located on roadways that feature high vehicle turning movements, or bus, or truck traffic. They can be placed in the center of the lane of travel to reduce wear from vehicles.

Approximate Cost

Sharrows typically cost $200 per each marking for a lane-mile cost of $4,200, assuming the MUTCD guidance of sharrow placement every 250 feet.

Bicycle Lanes

On-street bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signs. The bike lane is located directly adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.



Typical Use

- Bike lanes may be used on any street with adequate space, but are most effective on streets with moderate traffic volumes ≤ 6,000 ADT (≤ 3,000 preferred).
- Bike lanes are most appropriate on streets with lower to moderate speeds ≤ 25 mph.
- Appropriate for skilled adult riders on most streets.
- May be appropriate for children when configured as 6+ ft wide lanes on lower-speed, lower-volume streets with one lane in each direction.

Design Features

- (A) Mark inside line with 6" stripe. **(MUTCD 9C.04)** Mark 4" parking lane line or "Ts".
- (B) Include a bicycle lane marking **(MUTCD Figure 9C-3)** at the beginning of blocks and at regular intervals along the route. **(MUTCD 9C.04)**
- (C) 6 foot width preferred adjacent to on-street parking, (5 foot min.)
- (D) 5–6 foot preferred adjacent to curb and gutter (4 foot min.) or 4 feet more than the gutter pan width.
- (E) The R3-17 "Bike Lane" sign is optional, but recommended in most contexts.

Further Considerations

- On high speed streets (≥ 40 mph) the minimum bike lane should be 6 feet.
- It may be desirable to reduce the width of general purpose travel lanes in order to add or widen bicycle lanes.
- On multi-lane streets, the most appropriate bicycle facility to provide for user comfort may be buffered bicycle lanes or physically separated bicycle lanes.

Manhole Covers and Grates:

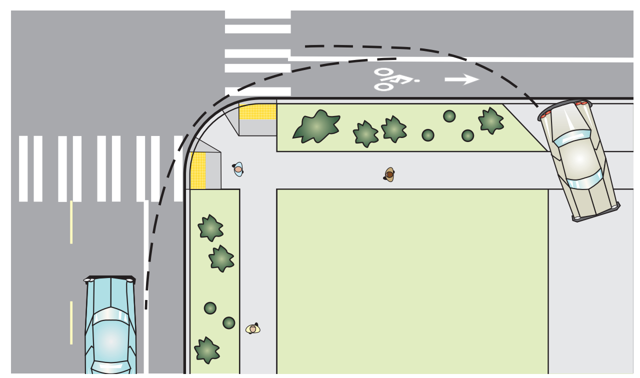
- Manhole surfaces should be manufactured with a shallow surface texture in the form of a tight, nonlinear pattern
- If manholes or other utility access boxes are to be located in bike lanes within 50 ft. of intersections or within 20 ft. of driveways or other bicycle access points, special manufactured permanent nonstick surfaces are required to ensure a controlled travel surface for cyclists breaking or turning.
- Manholes, drainage grates, or other obstacles should be set flush with the paved roadway. Roadway surface inconsistencies pose a threat to safe riding conditions for bicyclists. Construction of manholes, access panels or other drainage elements should be constructed with no variation in the surface. The maximum allowable tolerance in vertical roadway surface will be 1/4 of an inch.

Materials and Maintenance

Bike lane striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway.

Bike lanes should also be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

Bike lanes provided dedicated spaces for cyclists to ride on the street.



Place Bike Lane Symbols to Reduce Wear

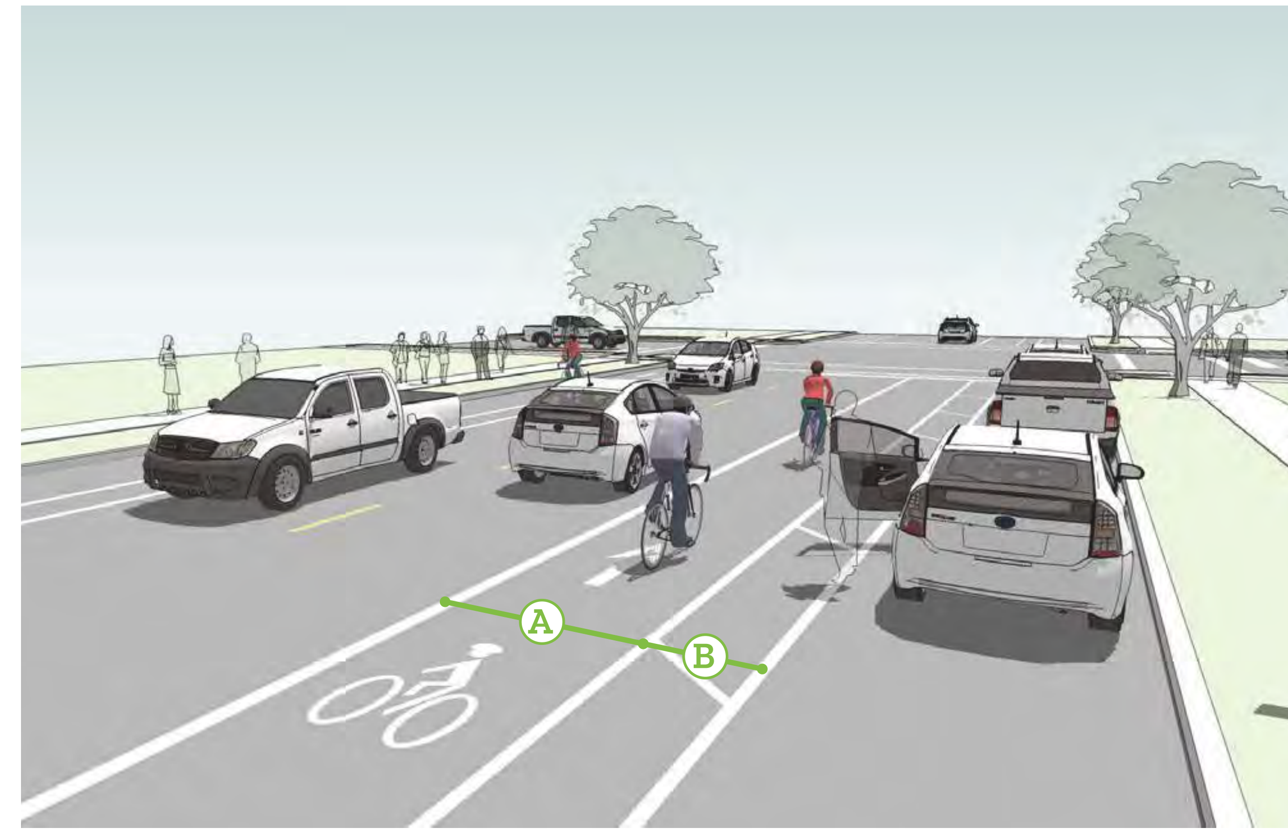
Bike lane word, symbol, and/or arrow markings **(MUTCD Figure 9C-3)** *shall be placed outside of the motor vehicle tread path in order to minimize wear from the motor vehicle path.* **(NACTO 2012)**

Approximate Cost

The cost for installing bicycle lanes varies and will depend on the implementation approach. Typical costs are $16,000 per mile for restriping using paint. More durable thermoplastic materials and the cost of repaving, or removing/replacing existing vehicle lane striping is not accounted for in this estimate. .

Buffered Bicycle Lanes

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane.



Typical Use

- Anywhere a conventional bike lane is being considered.
- While conventional bike lanes are most appropriate on streets with lower to moderate speeds (≤ 25 mph), buffered bike lanes are appropriate on streets with higher speeds (+25 mph) and high volumes or high truck volumes (up to 6,000 ADT).
- On streets with extra lanes or lane width.
- Appropriate for skilled adult riders on most streets.

Design Features

- (A) The minimum bicycle travel area (not including buffer) is 5 feet wide.
- (B) Buffers should be at least 2 feet wide. If buffer area is 4 feet or wider, white chevron or diagonal markings should be used.
- For clarity at driveways or minor street crossings, consider a dotted line.
- There is no standard for whether the buffer is configured on the parking side, the travel side, or a combination of both.

Buffered bike lanes should consider both vehicular traffic and parked cars.

The use of additional pavement markings delineates space between vehicles and cyclists.

Further Considerations

- Color may be used within the lane to discourage motorists from entering the buffered lane.
- A study of buffered bicycle lanes found that, in order to make the facilities successful, there needs to also be driver education, improved signage and proper pavement markings.[1]
- On multi-lane streets with high vehicles speeds, the most appropriate bicycle facility to provide for user comfort may be physically separated bike lanes.
- NCHRP Report #766 recommends, when space is limited, installing a buffer space between the parking lane and bicycle lane where on-street parking is permitted rather than between the bicycle lane and vehicle travel lane.[2]

Materials and Maintenance

Bike lane striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway.

Bike lanes should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

Approximate Cost

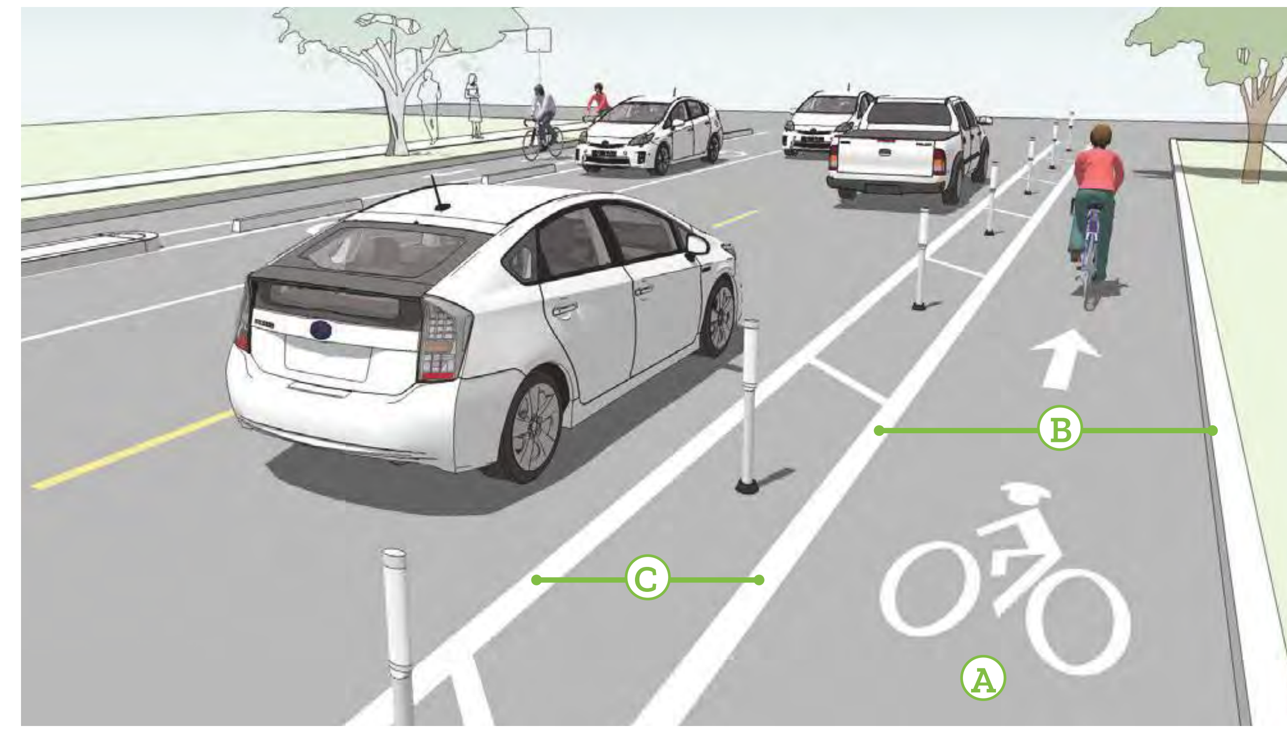
The cost for installing buffered bicycle lanes will depend on the implementation approach. Typical costs are $16,000 per mile for paint based restriping. More durable thermoplastic materials and the cost of repaving, or removing/replacing existing vehicle lane striping is not accounted for in this estimate.

1 Monsere, C.; McNeil, N.; and Dill, J., "Evaluation of Innovative Bicycle Facilities: SW Broadway Cycle Track and SW Stark/ Oak Street Buffered Bike Lanes. Final Report" (2011).Urban Studies and Planning Faculty Publications and Presentations.

2 National Cooperative Highway Research Program. Report #766: Recommended Bicycle Lane Widths for Various Roadway Characteristics.

One-Way Separated Bikeway

One-way separated bikeways, also known as protected bikeways or cycle tracks, are on-street bikeway facilities that are separated from vehicle traffic. Physical separation is provided by a barrier between the bikeway and the vehicular travel lane. These barriers can include flexible posts, bollards, parking, planter strips, extruded curbs, or on-street parking. Separated bikeways using these barrier elements typically share the same elevation as adjacent travel lanes, but the bikeway could also be raised above street level, either below or equivalent to sidewalk level.



Typical Use

- Along streets on which conventional bicycle lanes would cause many bicyclists to feel stress because of factors such as multiple lanes, high bicycle volumes, high motor traffic volumes (9,000-30,000 ADT), higher traffic speeds (25+ mph), high incidence of double parking, higher truck traffic (10% of total ADT) and high parking turnover.
- Along streets for which conflicts at intersections can be effectively mitigated using parking lane setbacks, bicycle markings through the intersection, and other signalized intersection treatments.

Design Features

(A) Pavement markings, symbols and/or arrow markings must be placed at the beginning of the separated bikeway and at intervals along the facility based on engineering judgment to define the bike direction. **(MUTCD 9C.04)**

(B) 7 foot width preferred in areas with high bicycle volumes or uphill sections to facilitate safe passing behavior (5 ft minimum).

(C) When placed adjacent to parking, the parking buffer should be 3 ft wide to allow for passenger loading and to prevent door collisions.

- When placed adjacent to a travel lane, one-way raised cycle tracks may be configured with a mountable curb to allow entry and exit from the bicycle lane for passing other bicyclists or to access vehicular turn lanes.

Parked cars serve as a barrier between bicyclists and the vehicle lane. Barriers could also include flexible posts, bollards, planters, or other design elements. Source: Bike East Bay

Further Considerations

- If the buffer area is 4 feet or wider, white chevron or diagonal markings should be used. Curbs may be used as a channeling device. Grade-separation provides an enhanced level of separation in addition to buffers and other barrier types.
- Where possible, physical barriers such as removable curbs should be oriented towards the inside edge of the buffer to provide as much extra width as possible for bicycle use.
- A retrofit separated bikeway has a relatively low implementation cost compared to road reconstruction by making use of existing pavement and drainage and using a parking lane as a barrier.
- Gutters, drainage outlets and utility covers should be designed and configured as not to impact bicycle travel.
- For clarity at major or minor street crossings, consider a dotted line for the buffer boundary where cars are expected to cross.
- Special consideration should be given at transit stops to manage bicycle and pedestrian interactions.

Materials and Maintenance

Bikeway striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway. Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.

Bikeways should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

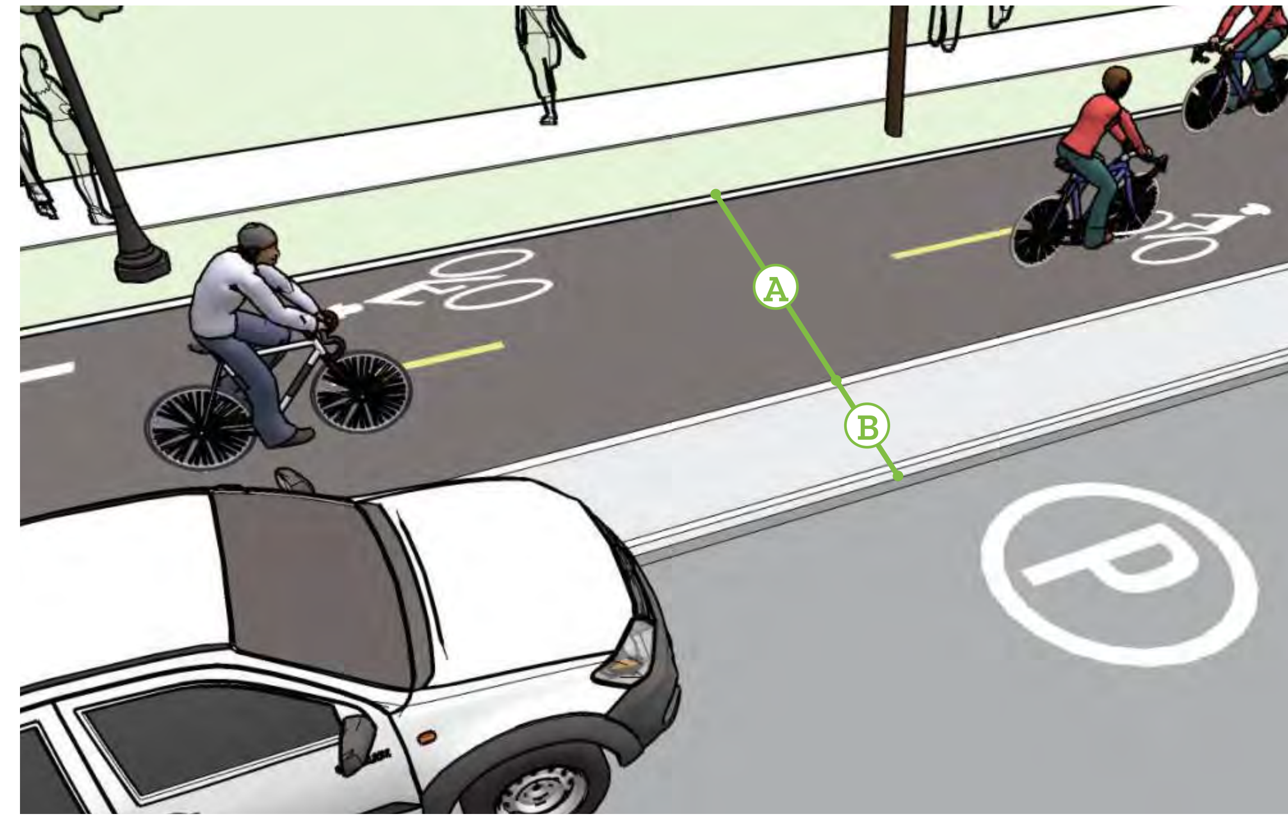
Access points along the facility should be provided for street sweeper vehicles to enter/exit the separated bikeway,

Approximate Cost

Separated bikeway construction costs can vary drastically depending on the type of separation used, the amount of new curb and gutter, stormwater mitigation, and crossing treatments. On the lower end of the scale, construction of a striped parking protected bikeway without delineators or other vertical elements can cost as little as $16,000 per mile.

Two-Way Separated Bikeway

Two-Way Separated Bikeways are bicycle facilities that allow bicycle movement in both directions on one side of the road. Two-way separated bikeways share some of the same design characteristics as one-way separated bikeways, but often require additional considerations at driveway and side-street crossings, and intersections with other bikeways.



Typical Use

- Works best on the left side of one-way streets.
- Streets with high motor vehicle volumes and/or speeds
- Streets with high bicycle volumes.
- Streets with a high incidence of wrong-way bicycle riding.
- Streets with few conflicts such as driveways or cross-streets on one side of the street.
- Streets that connect to shared use paths.

Design Features

- (A) 12 foot operating width preferred (10 ft minimum) width for two-way facility.
- In constrained locations an 8 foot minimum operating width may be considered.
- (B) Adjacent to on-street parking a 3 foot minimum width channelized buffer or island shall be provided to accommodate opening doors. **(NACTO, 2012**
- Additional signalization and signs may be necessary to manage conflicts.

Two-Way Separated Bikeway

A two-way facility can accommodate cyclists in two directions of travel.

Further Considerations

- A two-way separated bikeway on one way street should be located on the left side.
- A two-way separated bikeway may be configured at street level or as a raised separated bikeway with vertical separation from the adjacent travel lane.
- Two-way separated bikeways should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles.

Materials and Maintenance

Bikeway striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway. Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.

Bikeways should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

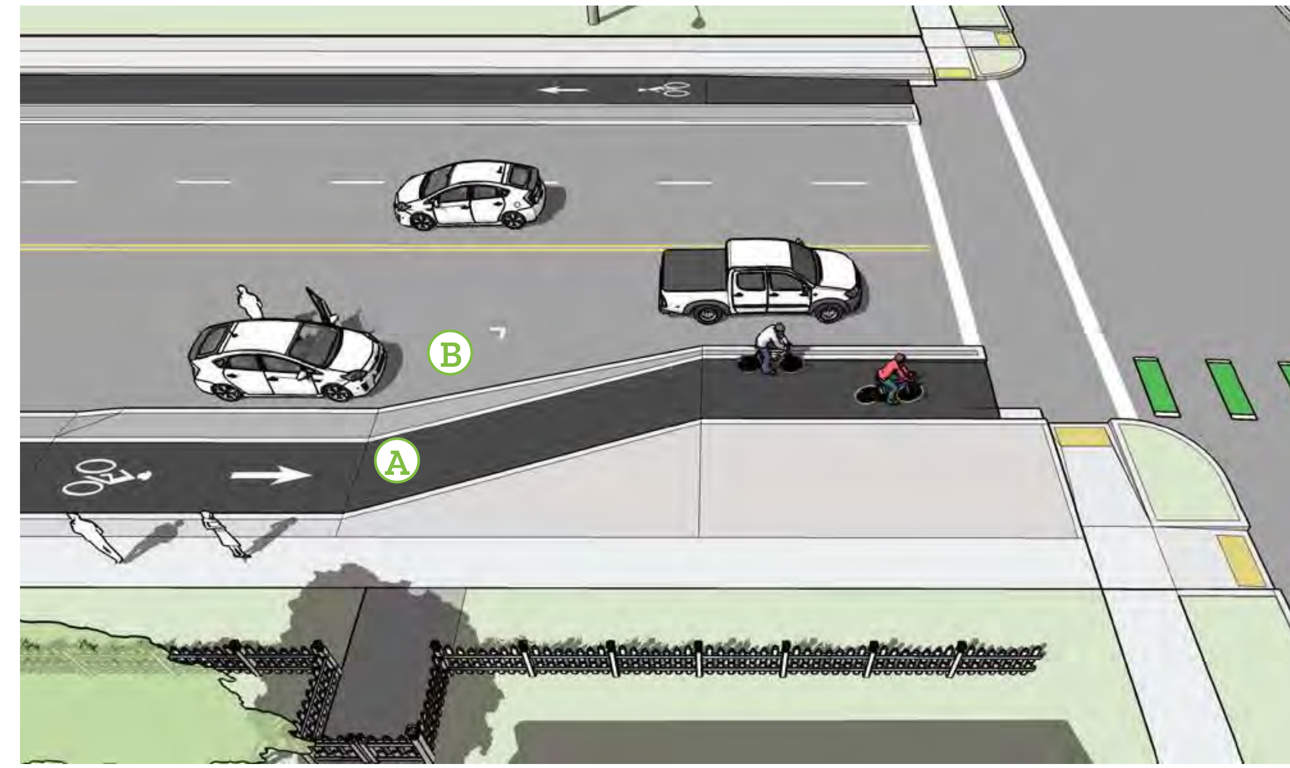
Access points along the facility should be provided for street sweeper vehicles to enter/exit the separated bikeway.

Approximate Cost

Separated bikeway construction costs can vary drastically depending on the type of separation used, the amount of new curb and gutter, stormwater mitigation, and crossing treatments. On the lower end of the scale, construction of a striped parking protected bikeway with delineators or other vertical elements can cost as little as $15,000-$30,000 per mile.

Bend-In

To increase the visibility of bicyclists for turning motorists, a “bend-in” intersection approach laterally shifts the separated bikeway immediately adjacent to the turning lane.



Typical Use

- Bikeways separated by a visually intensive buffer or on-street parking.
- Where it is desirable to create a curb extension at intersections to reduce pedestrian crossing distance.
- Where space is not available to bend-out the bikeway prior to the intersection.

Design Features

(A) At least 20 ft prior to an intersection, provide between 20 – 40 ft of length to shift the bikeway closer to motor vehicle traffic.

(B) Where the separated bikeway uses parked cars within the buffer zone, parking must be prohibited at the start of the transition.

- Place a “Turning Vehicles Yield to Bikes” sign (modified MUTCD R10-15) prior to the intersection.
- Optional - Provide a narrow buffer with vertical delineators between the travel and lane and bikeway to increase comfort for bicycle riders and slow driver turning speed.

Clear sight lines at intersections and driveways for people on bikes and people driving are an important aspect of this design.

The approach to an adjacent crossing intersection in Vancouver, BC.

Further Considerations

- The design creates an opportunity for a curb extension, to reduce pedestrian crossing distance. This curb extension can also create public space which can be used bike parking corrals, bikeshare stations, parklets, public art exhibits, and/or stormwater features such as bioswales.
- Can be paired with intersection crossing markings such as green colored pavement to raise awareness of conflict points.

Materials and Maintenance

Bikeway striping and markings will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway. Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.

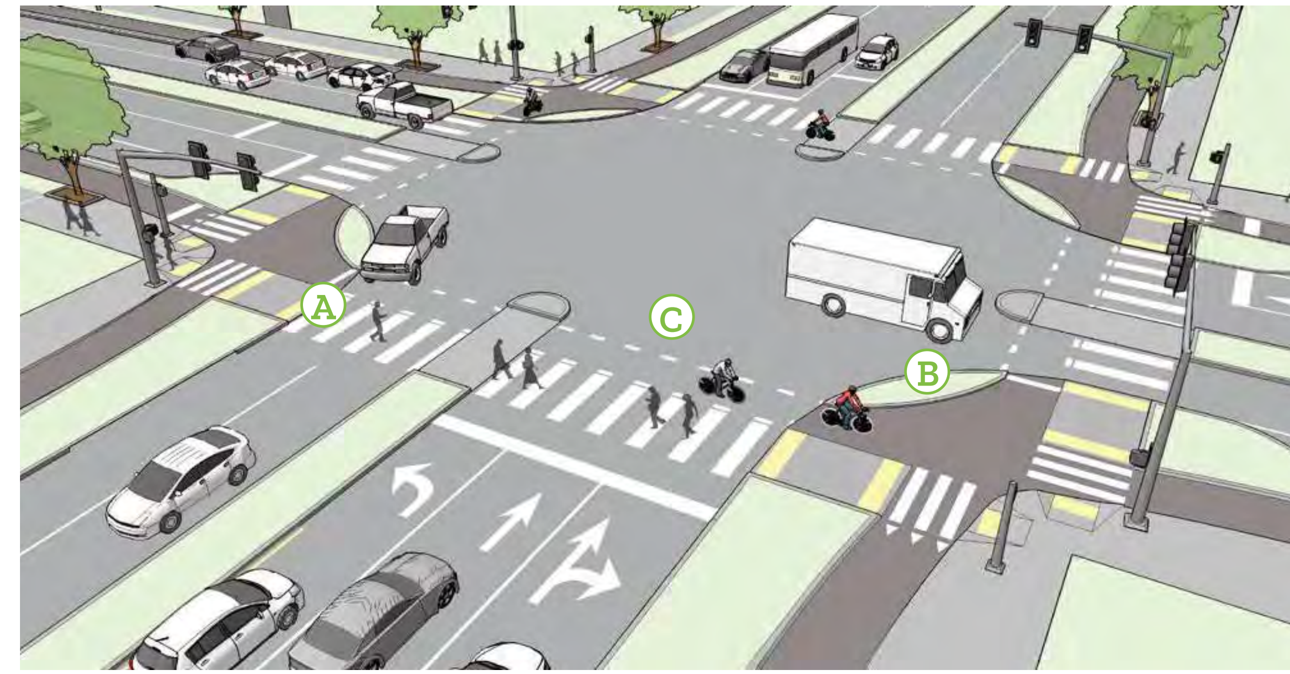
Bikeway should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

Approximate Cost

The costs of the lateral shift or protected intersection elements vary depending on materials used and degree of implementation desired. Inexpensive materials can used, such as paint, concrete planters, and bollards.

Protected Intersection

A protected intersection, or "Bend Out" uses a collection of intersection design elements to maximize user comfort within the intersection and promote a high rate of motorists yielding to people bicycling. The design maintains a physical separation within the intersection to define the turning paths of motor vehicles, slow vehicle turning speed, and offer a comfortable place for people bicycling to wait at a red signal.



Typical Use

- Streets with separated bikeways protected by wide buffer or on-street parking.
- Where two separated bikeways intersect and two-stage left-turn movements can be provided for bicycle riders.
- Helps reduce conflicts between right-turning motorists and bicycle riders by reducing turning speeds and providing a forward stop bar for bicycles.
- Where it is desirable to create a curb extension at intersections to reduce pedestrian crossing distance.

Design Features

(A) Setback bicycle crossing of 19.5 feet allows for one passenger car to queue while yielding. Smaller setback distance is possible in slow-speed, space constrained conditions.

(B) Corner island with a 15-20 foot corner radius slows motor vehicle speeds. Larger radius designs may be possible when paired with a deeper setback or a protected signal phase, or small mountable aprons. Two-stage turning boxes are provided for queuing bicyclists adjacent to corner islands.

(C) Use intersection crossing markings.

Protected intersections feature a corner safety island and intersection crossing markings.

Protected intersections incorporate queuing areas for two-stage left turns.

Further Considerations

- Pedestrian crosswalks may need to be further set back from intersections in order to make room for two-stage turning queue boxes.
- Wayfinding and directional signage should be provided to help bicycle riders navigate through the intersection.
- Colored pavement may be used within the corner refuge area to clarify use by people bicycling and discourage use by people walking or driving.
- Intersection approaches with high volumes of right turning vehicles should provide a dedicated right turn only lane paired with a protected signal phase. Protected signal phasing may allow different design dimensions than are described here.

Materials and Maintenance

- Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.
- Bikeways should be maintained so that there are no pot holes, cracks, uneven surfaces or debris.
- Bikeways protected by concrete islands or other permanent physical separation, can be swept by street sweeper vehicles with narrow widths.

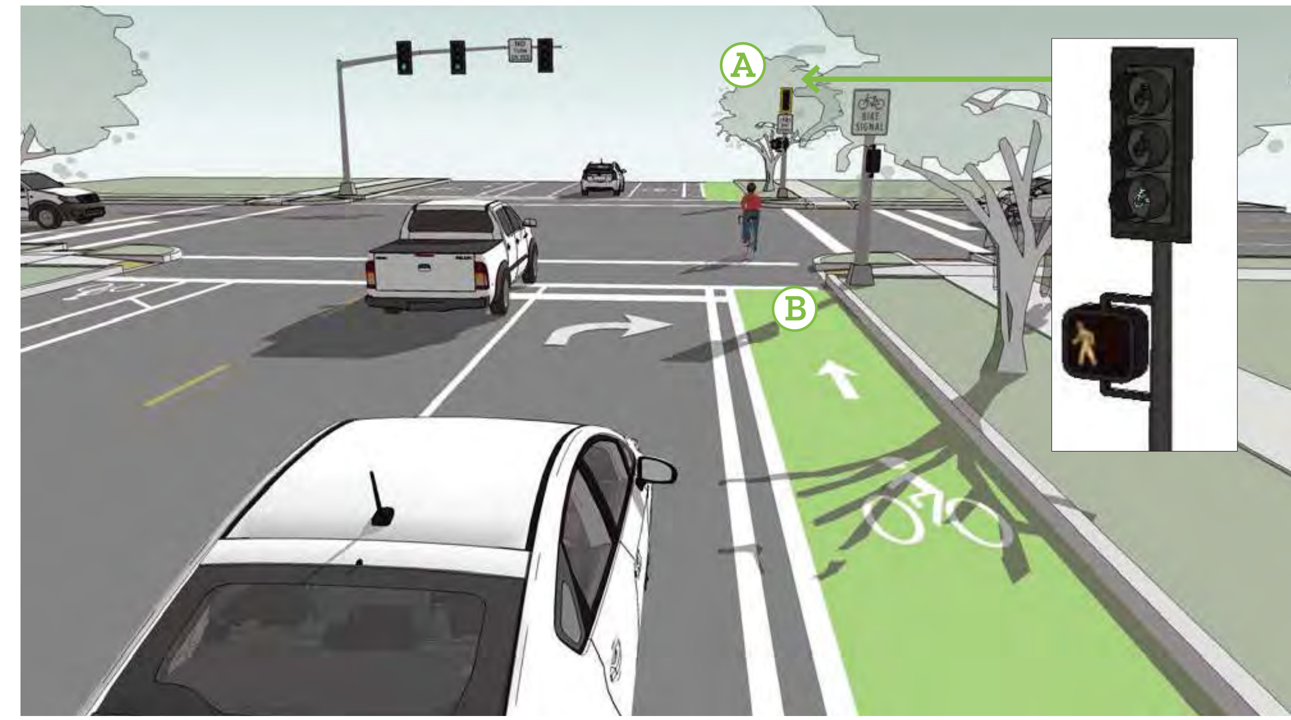
Approximate Cost

The cost of protected intersection elements vary depending on materials used and degree of implementation desired.

- Complete reconstruction costs comparable to a full intersection.
- Retrofit implementation may be possible at lower costs if existing curbs and drainage are maintained. Inexpensive materials can used, such as paint, concrete planters, and bollards.

Separated Bicycle Signal Phase

Separated bicycle lane crossings of signalized intersections can be accomplished through the use of a bicycle signal phase which reduces conflicts with motor vehicles by separating bicycle movements from any conflicting motor vehicle movements. Bicycle signals are traditional three lens signal heads with green, yellow and red bicycle stenciled lenses.



Typical Use

- Two-way protected bikeways where contraflow bicycle movement or increased conflict points warrant protected operation.
- Bicyclists moving on a green or yellow signal indication in a bicycle signal shall not be in conflict with any simultaneous motor vehicle movement at the signalized location
- Right (or left) turns on red should be prohibited in locations where such operation would conflict with a green bicycle signal indication.

Design Features

(A) An additional "Bicycle Signal" sign should be installed below the bicycle signal head.

(B) Designs for bicycles at signalized crossings should allow bicyclists to trigger signals via pushbutton, loop detectors, or other passive detection, to navigate the crossing.

- On bikeways, signal timing and actuation shall be reviewed and adjusted to consider the needs of bicyclists. **(MUTCD 9D.02)**

A bicycle signal head at a signalized crossing creates a protected phase for cyclists to safely navigate an intersection.

A bicycle detection system triggers a change in the traffic signal when a bicycle is detected.

Further Considerations

- A bicycle signal should be considered for use only when the volume/collision or volume/geometric warrants have been met.
- The Federal Highway Administration (FHWA) has approved bicycle signals for use, if they comply with requirements from Interim Approval 16 (I.A. 16). Bicycle Signals are not approved for use in conjunction with Pedestrian Hybrid Beacons.
- Bicyclists typically need more time to travel through an intersection than motor vehicles. Green light times should be determined using the bicycle crossing time for standing bicycles.
- Bicycle detection and actuation systems include user-activated buttons mounted on a pole, loop detectors that trigger a change in the traffic signal when a bicycle is detected and video detection cameras, that use digital image processing to detect a change in the image at a location.

Materials and Maintenance

Bicycle signal detection equipment should be inspected and maintained regularly, especially if detection relies on manual actuation. Pushbuttons and loop detectors will tend to have higher maintenance needs than other passive detection equipment.

Approximate Cost

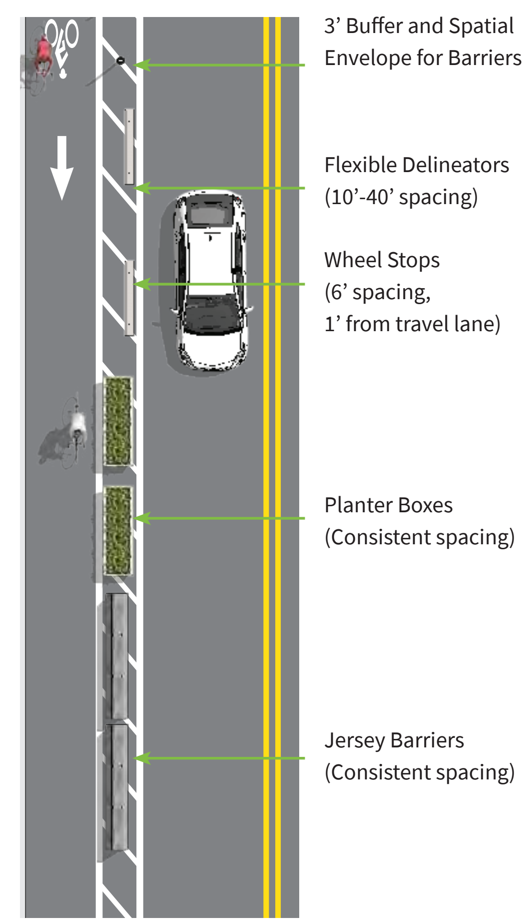
Bicycle signal heads have an average cost of $12,800.

Video detection camera system costs range from $15,000 to $25,000 per intersection.

Separated Bikeway Barriers

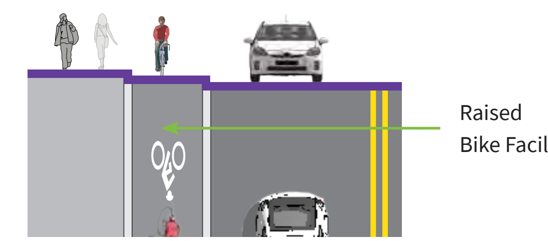
Separated bikeways may use a variety of vertical elements to physically separate the bikeway from adjacent travel lanes. Barriers may be robust constructed elements such as curbs, or may be more interim in nature, such as flexible delineator posts.

Barrier Separation

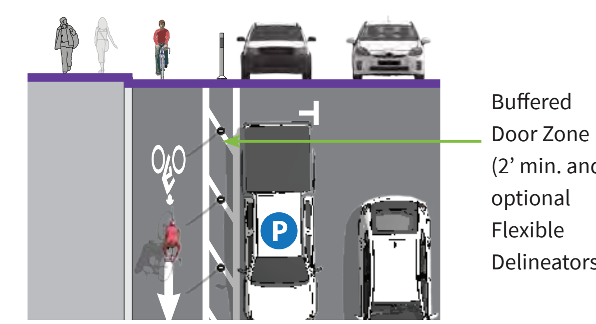


Media Separation

Grade Separation



Parking Separation



Typical Use

Appropriate barriers for retrofit projects:

- Parked Cars
- Flexible delineators
- Bollards
- Planters
- Parking stops

Appropriate barriers for reconstruction projects:

- Curb separation
- Medians
- Landscaped medians
- Raised protected bike lane with vertical or mountable curb
- Pedestrian Refuge Islands

Raised separated bikeways are bicycle facilities that are vertically separated from motor vehicle traffic.

Design Features

- Maximize effective operating space by placing curbs or delineator posts as far from the through bikeway space as practicable.
- Allow for adequate shy distance of 1 to 2 feet from vertical elements to maximize useful space.
- When next to parking allow for 3 feet of space in the buffer space to allow for opening doors and passenger unloading.
- The presences of landscaping in medians, planters and safety islands increases comfort for users and enhances the streetscape environment.

Further Considerations

- With new roadway construction, a raised separated bikeway can be less expensive to construct than a wide or buffered bicycle lane because of shallower trenching and sub base requirements.
- Parking should be prohibited within 30 feet of the intersection to improve visibility.

Materials and Maintenance

Separated bikeways protected by concrete islands or other permanent physical separation, can be swept by smaller street sweeper vehicles.

Access points along the facility should be provided for street sweeper vehicles to enter/exit the separated bikeway.

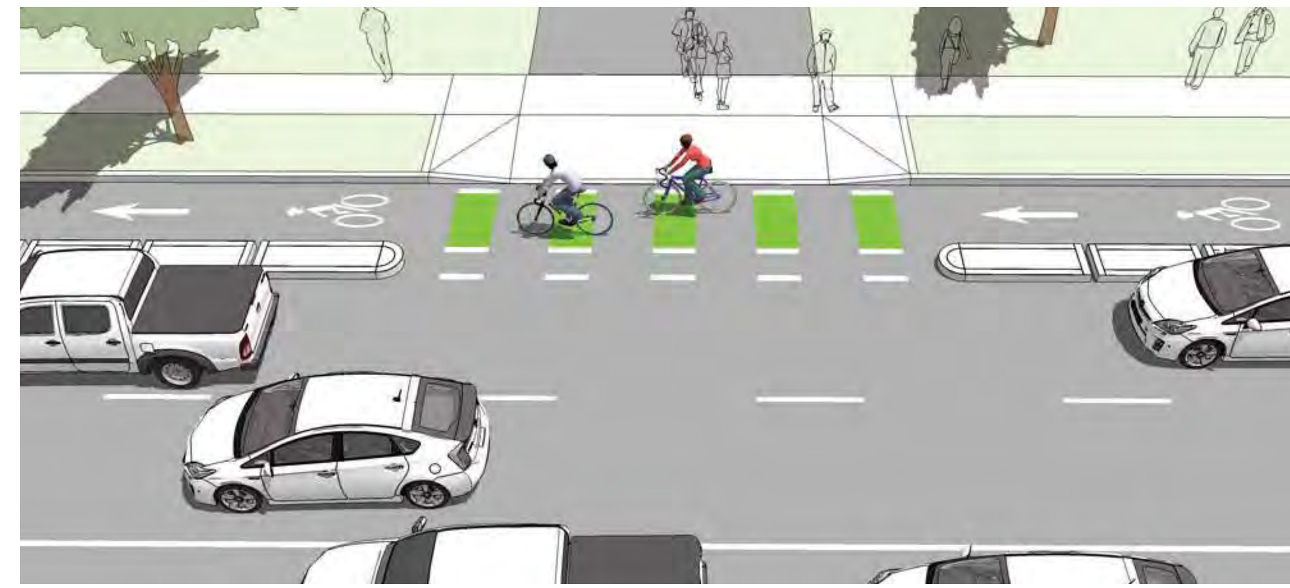
Approximate Cost

Separated bikeway barrier material costs can vary greatly, depending on the type of material, the scale, and whether it is part of a broader construction project.

Separated Bikeways at Driveways (and Minor Streets)

The added separation provided by separated bikeways creates additional considerations at intersections and driveways when compared to conventional bicycle lanes. Special design guidelines are necessary to preserve sightlines and denote potential conflict areas between modes, especially when motorists turning into or out of driveways may not be expecting bicycle travel opposite to the main flow of traffic.

At driveways and crossings of minor streets, bicyclists should not be expected to stop if the major street traffic does not stop.

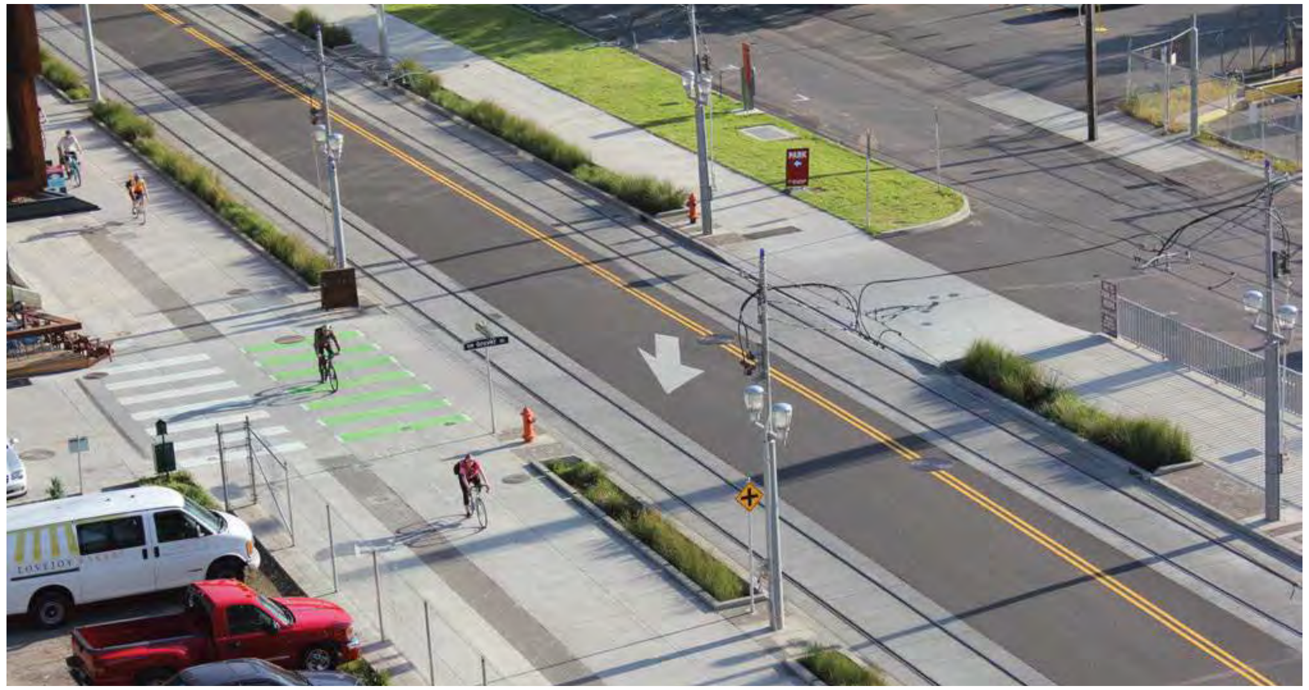


Typical Use

- Along streets with separated bikeway where there are intersections and driveways.
- Higher frequency driveways or crossings may require additional treatment such as conflict markings and signs.

Design Features

- Remove parking to allow for the appropriate clear sight distance before driveways or intersections to improve visibility. The desirable no-parking area is at least 30 feet from each side of the crossing.
- Use colored pavement markings and/or shared line markings through conflict areas at intersections.
- If a raised bikeway is used, the height of the lane should be maintained through the crossing, requiring automobiles to cross over.
- Motor vehicle traffic crossing the bikeway should be constrained or channelized to make turns at sharp angles to reduce travel speed prior to the crossing.
- Driveway crossings may be configured as raised crossings to slow turning cars and assert physical priority of travelling bicyclists.
- Motor vehicle stop bar on cross-streets and driveways is setback from the intersection to ensure that drivers slow down and scan for pedestrians and bicyclists before turning.



Intersection crossing markings can be used at high volume driveway and minor street crossings, as illustrated above.

Further Considerations

- Removing obstructions and providing clear sight distance at crossings increases visibility of bicyclists.
- Treatments designed to constrain and slow turning motor vehicle traffic will slow drivers to bicycle-compatible travel speeds prior to crossing the separated bikeway.

Materials and Maintenance

Green conflict striping and markings, will require higher maintenance where vehicles frequently traverse over them at driveways and minor intersection. Green conflict striping (if used) will also generally require higher maintenance due to vehicle wear.

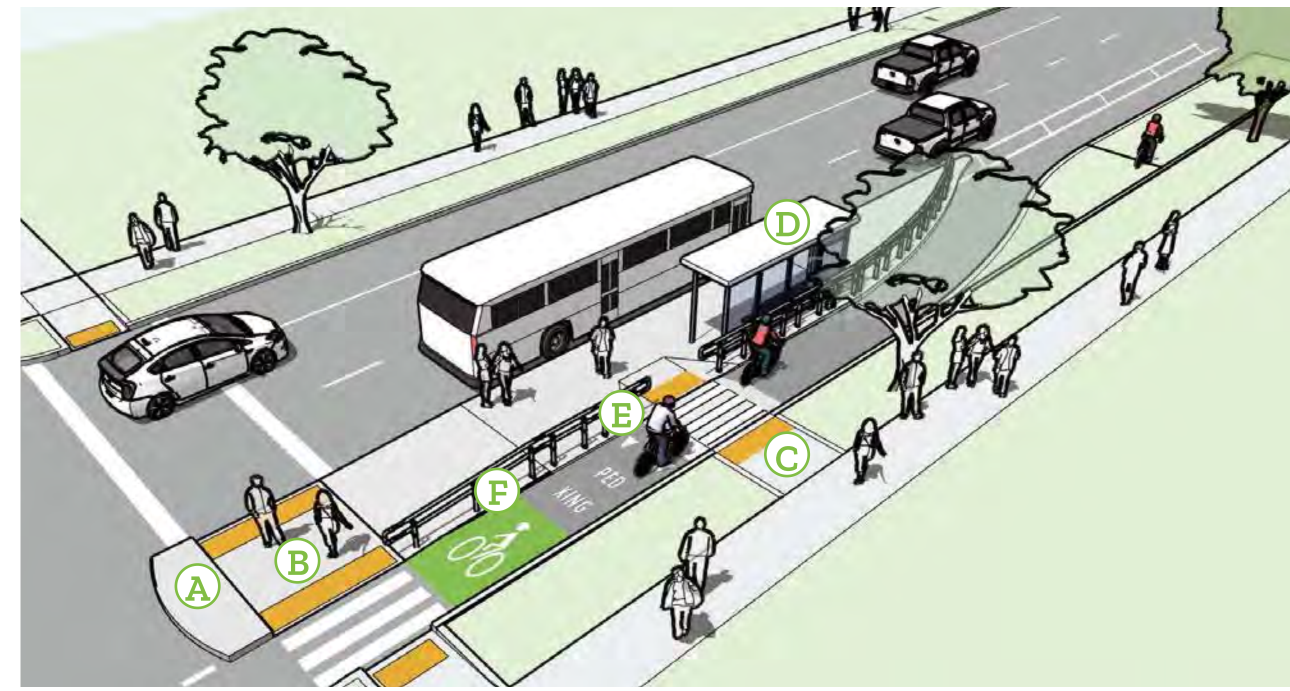
Approximate Cost

The cost for installing high visibility colored crossing markings will depend on the materials selected and implementation approach. Typical costs range from $1.20/sq. ft. installed for paint to $14/sq. ft. installed for thermoplastic. Colored pavement is more expensive than standard asphalt installation, costing 30-50% more than non-colored asphalt.

Separated Bikeways at Transit Side Boarding Islands

A transit side boarding island is a channelized lane for bicyclists designed to provide a path for bicyclists to pass stopped transit vehicles, and clarify interactions between pedestrians, bicyclists, and passengers, boarding and alighting.

This is particularly helpful on corridors with high volumes of transit vehicles and bicyclists, where "leapfrogging" may occur, and on separated bikeway corridors where maintaining physical separation is important to maintain user comfort.



Typical Use

- Routes where bike lanes or separated bikeways and transit operations overlap.
- Provides an in-lane stop for buses, reducing delay at stops.
- Median refuge also provides a shorter crossing for pedestrians at intersections

Design Features

(A) Pedestrian median refuge island (optional) shortens the crossing distance at intersections.

(B) Pedestrian ramp into crosswalks should be ADA compliant with detectable warning surfaces.

(C) Direct pedestrians to crossing locations to minimize conflicts between modes.

(D) High volume stops should have room for appropriately sized shelters and transit amenities.

(E) Pavement markings and signage should clarify expectations among users. The bikeway could also ramp up to sidewalk level at this crossing to reduce bicycle speeds and enhance ADA access to the stop.

(F) Pavement markings on the bikeway should define the bicycle path of travel to minimize intrusion by pedestrians, except at designated crossings.

A transit side boarding island clarifies user spaces and minimizes conflict between bicyclists. pedestrians, transit passengers, buses, and vehicles.

Further Considerations

- Transit island should be wide enough to accommodate mobility devices. An 8'x 5' accessible clear space is required at the front door per ADA requirements.
- Transit platforms should feature pedestrian scale lighting.
- Side boarding island will require detectable warning surfaces along full length of platform if greater than 6" high.

Materials and Maintenance

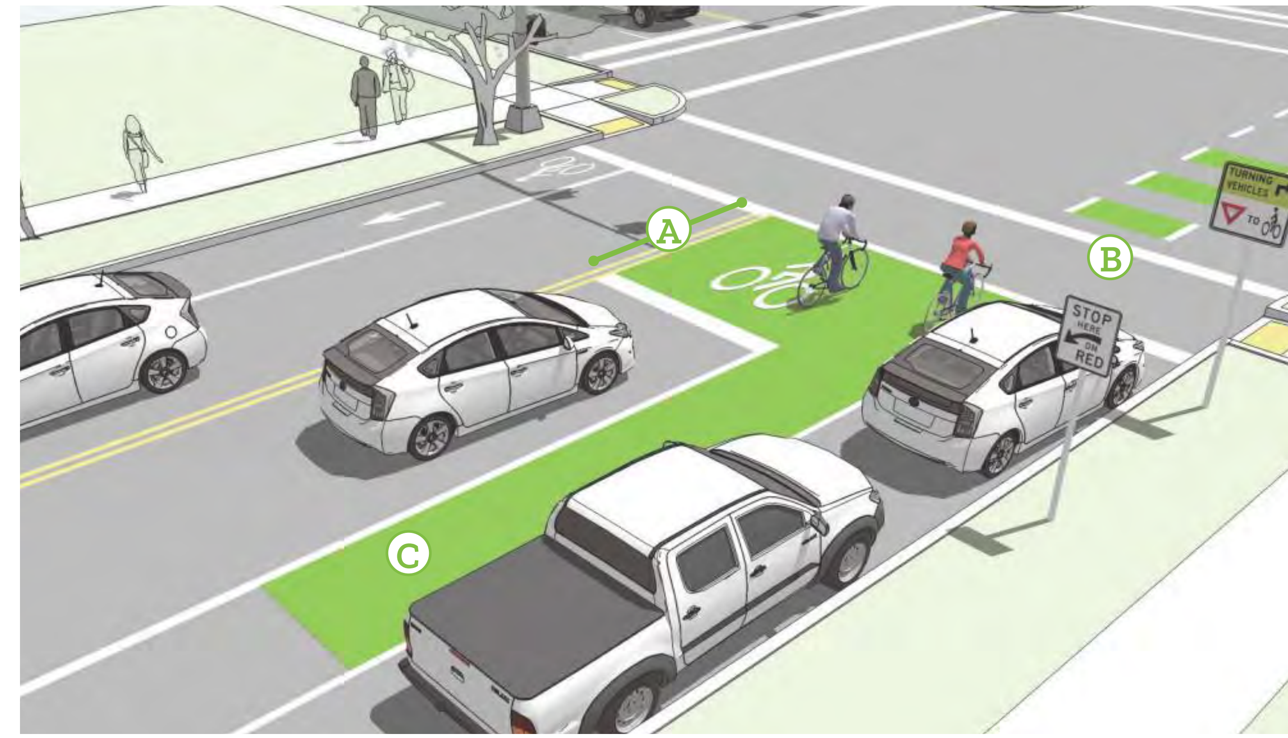
Similar to median refuge islands, side boarding islands may require frequent maintenance of road debris. If at street grade, the bikeway can be swept by street sweeper vehicles with narrow widths.

Approximate Cost

The approximate cost of a side boarding island is similar to median refuge islands ranging from $500 to $1,100 per foot, or about $3,500 to $4,000, depending on the design, and site conditions. This cost is exclusive of transit shelters and amenities, landscaping, and lighting.

Bicycle Box

A bicycle box is an experimental treatment, designed to provide bicyclists with a safe and visible space to get in front of queuing traffic during the red signal phase. Motor vehicles must queue behind the white stop line at the rear of the bike box. On a green signal, all bicyclists can quickly clear the intersection. This treatment received Interim Approval from the FHWA in 2016.



Typical Use

- At potential areas of conflict between bicyclists and turning vehicles, such as a right or left turn locations.
- At signalized intersections with high bicycle volumes.
- At signalized intersections with high vehicle volumes.
- Not to be used on downhill approaches to minimize the right hook threat potential during the extended green signal phase.

Design Features

- (A) 14 foot minimum depth from back of crosswalk to motor vehicle stop bar. **(NACTO, 2012)**
- (B) A "No Turn on Red" **(MUTCD R10-11)** sign shall be installed overhead to prevent vehicles from entering the Bike Box. A "Stop Here on Red" **(MUTCD R10-6)** sign should be post mounted at the stop line to reinforce observance of the stop line.
- (C) A 50 foot ingress lane should be used to provide access to the box.
- Use of green colored pavement is recommended.

A bike box allows for cyclists to wait in front of queuing traffic, providing high visibility and a head start over motor vehicle traffic.

Further Considerations

- This treatment positions bicycles together and on a green signal, all bicyclists can quickly clear the intersection, minimizing conflict and delay to transit or other traffic.
- Pedestrian also benefit from bike boxes, as they experience reduced vehicle encroachment into the crosswalk.
- Bike boxes require permission from the FHWA to implement, and jurisdictions must receive approval prior to implementation. A State may request Interim Approval for all jurisdictions in that State.[1]
- Bike boxes should not be used to accommodate bicyclist turns at intersections that have substantial parallel green time as bicyclists cannot safely occupy the box when arriving on green.

Materials and Maintenance

Bike boxes are subject to high vehicle wear, especially turning passenger vehicles, buses, and heavy trucks. As a result, bike boxes with green coloring will require more frequent replacement over time. The life of the green coloring will depend on vehicle volumes and turning movements, but thermoplastic is generally a more durable material than paint.

Approximate Cost

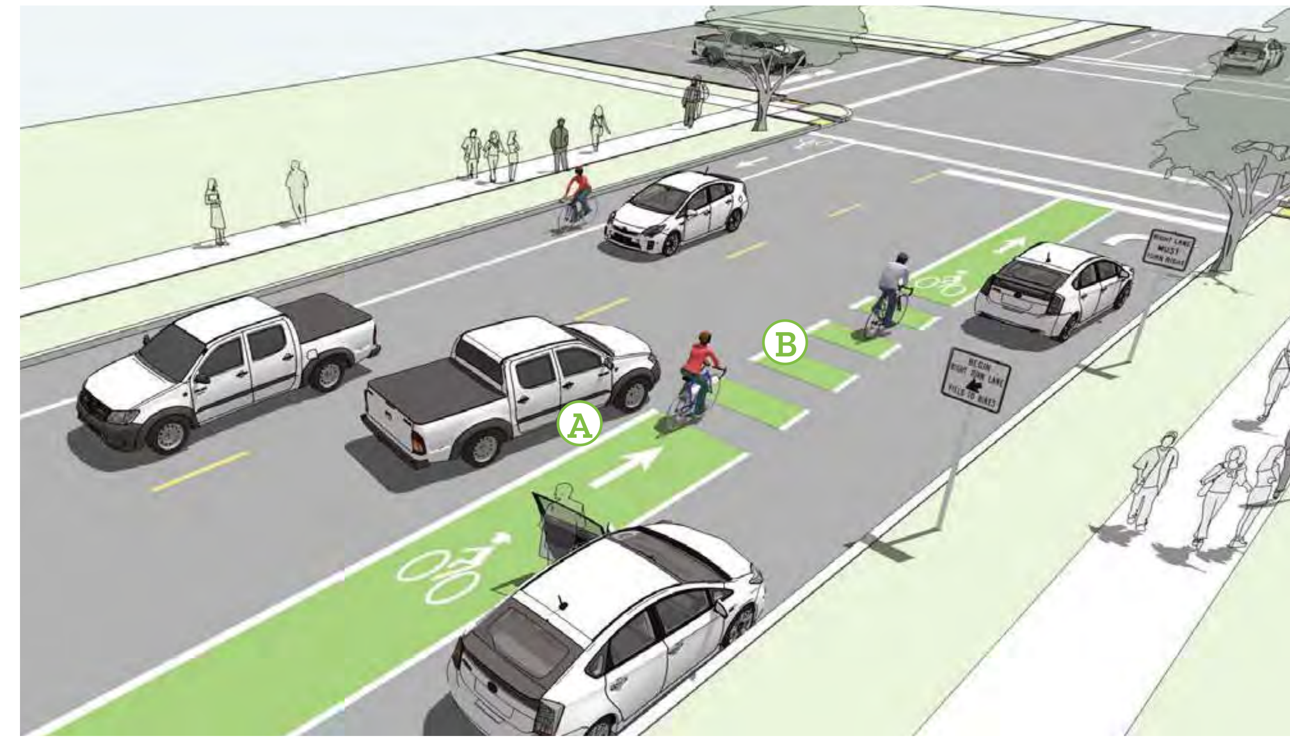
Costs will vary due to the type of paint or thermoplastic used and the size of the bike box, as well as whether the treatment is added at the same time as other road treatments.

Typical costs range from $1.20/sq. ft. installed for paint to $14/sq. ft. installed for thermoplastic.

1 *FHWA. Interim Approval for Optional Use of an Intersection Bicycle Box (IA-18). 2016.*

Colored Pavement Treatment

Colored pavement within a bicycle lane may be used to increase the visibility of the bicycle facility, raise awareness of the potential to encounter bicyclists, and reinforce priority of bicyclists in conflict areas.



Typical Use

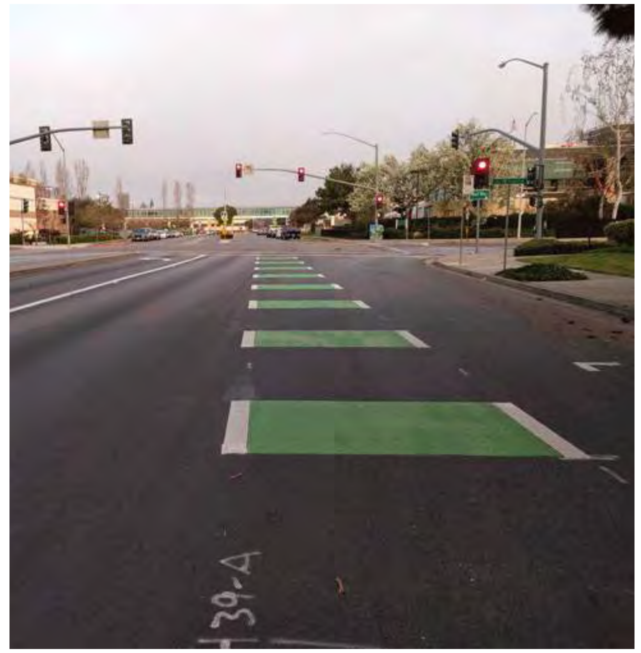
- Within a weaving or conflict area to identify the potential for bicyclist and motorist interactions and assert bicyclist priority.
- Across intersections, driveways and Stop or Yield-controlled cross-streets.
- At bike boxes and two-stage turn boxes

Design Features

(A) Typical white bike lane striping (solid or dotted 6" stripe) is used to outline the green colored pavement.

(B) In weaving or turning conflict areas, preferred striping is dashed, to match the bicycle lane line extensions.

- The colored surface should be skid resistant and retro-reflective **(MUTCD 9C.02.02).**
- In exclusive use areas, such as bike boxes, color application should be solid green.



Green colored conflict striping indicates the path of travel of people on bicycles, and alerts people intending to turn across the bike lane to yield when bicyclists are present.

Further Considerations

- Green colored pavement shall be used in compliance with FHWA Interim Approval (FHWA IA-14.10).[1]
- While other colors have been used (red, blue, yellow), green is the recommended color in the US.
- The application of green colored pavement within bicycle lanes is an emerging practice. The guidance recommended here is based on best practices in cities around the county.

Materials and Maintenance

As intended, paint or thermoplastic are placed in locations that are trafficked by vehicles, and are subject to high vehicle wear. Colored pavement treatments will experience higher rates of wear at locations with higher turning vehicles, buses, and heavy trucks. At these locations, green coloring will require more frequent replacement over time.

The life of the green coloring will depend on vehicle volumes and turning movements, but thermoplastic is a more durable material than paint.

Approximate Cost

The cost for installing colored pavement markings will depend on the materials selected and implementation approach. Typical costs range from $1.20/sq. ft installed for paint to $14/sq. ft installed for thermoplastic. Colored pavement is more expensive than standard asphalt installation, costing 30-50 percent more than non-colored asphalt.

1 FHWA. Interim Approval for Optional Use of Green Colored Pavement for Bike Lanes (IA-14). 2011.

Short-Term Bicycle Parking

People need a safe, convenient place to secure their bicycle when they reach their destination. This may be short-term parking of 2 hours or less, or long-term parking for employees, students, residents, and commuters.

Information on short- and long-term bike parking has been informed by the Association of Pedestrian and Bicycle Professionals (APBP) Bicycle Parking Guide, which is updated frequently and is available online at www.apbp.org.

Application

Bike Racks

- Bike racks provide short-term bicycle parking and are meant to accommodate visitors, customers, and others expected to depart within two hours. It should be an approved standard rack, appropriate location and placement.

Bike Corrals

- On-street bike corrals (also known as on-street bicycle parking) consist of bicycle racks grouped together in a common area within the street traditionally used for automobile parking.
- Bicycle corrals are reserved exclusively for bicycle parking and provide a relatively inexpensive solution to providing high-volume bicycle parking. Bicycle corrals can be implemented by converting one or two on-street motor vehicle parking spaces into on-street bicycle parking.
- Each motor vehicle parking space can be replaced with approximately 6-10 bicycle parking spaces.

Design Features

Bike Racks

- When placed on sidewalks, 2 feet minimum from the curb face to avoid 'dooring.'
- 4 feet between racks to provide maneuvering room.
- Locate close to destinations; 50 feet maximum distance from main building entrance.
- Minimum clear distance of 6 feet should be provided between the bicycle rack and the property line.
- While bike racks could be installed perpendicular or parallel to the curb, it is important to ensure there is sufficient room for pedestrian traffic, even when a bike is locked to the rack.

Bike Corrals

- Bicyclists should have an entrance width from the roadway of 5-6 feet.
- Can be used with parallel or angled parking.
- Parking stalls adjacent to curb extensions are good candidates for bicycle corrals since the concrete extension serves as delimitation on one side.

Further Considerations

- Where the placement of racks on sidewalks is not possible (due to narrow sidewalk width, sidewalk obstructions, street trees, etc.), bicycle parking can be provided in the street where on-street vehicle parking is allowed in the form of on-street bicycle corrals.
- Some types of bicycle racks may meet design criteria, but are discouraged except in limited situations. This includes undulating "wave" racks, schoolyard racks, and spiral racks. These discouraged racks are illustrated on the following page.
- Bike racks should be made of thick stainless steel to reduce the chance of thieves cutting through the racks to take bicycles. Square tubing can provide further protection from cutting, as well.
- If a bike rack is installed as surface mount, countersink bolts or expansion bolts should be used to keep the rack in place. Covering the bolts with putty or epoxy can provide additional protection.

References

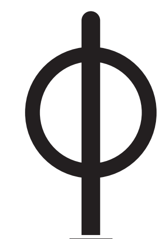
- AASHTO. Guide for the Development of Bicycle Facilities. 2012.
- APBP. Bicycle Parking Guide 2015.

Inverted-U racks provide two points of contact.

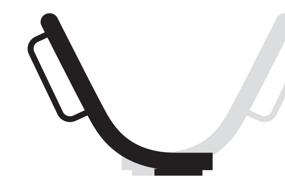
Racks with square tubing, good spacing, and a concrete base likewise offer two points of contact.

Types of Bike Racks to Use

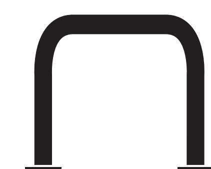
These racks provide two points of contact with the bicycle, accommodate varying styles of bike, allow for the frame of a bicycle and at least one wheel to be secured by most U-locks, and are intuitive to use.



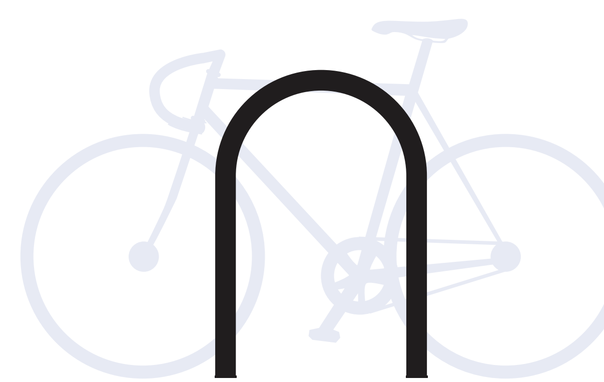
POST & RING



WHEELWELL SECURE



INVERTED-U



Communities may consider purchasing branded U-racks for installation on sidewalks.

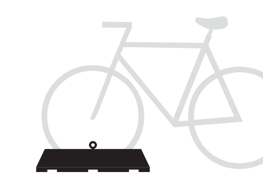
Types of Bike Racks to Avoid

These racks do not provide support at two places on the bike, can damage the wheel, do not provide an opportunity for the user to lock the frame of their bicycle easily, and are not intuitive to use. Because of performance concerns, the APBP Essentials of Bike Parking Report recommends selecting other racks instead of these.

WAVE

SPIRAL

COMB



WHEELWELL

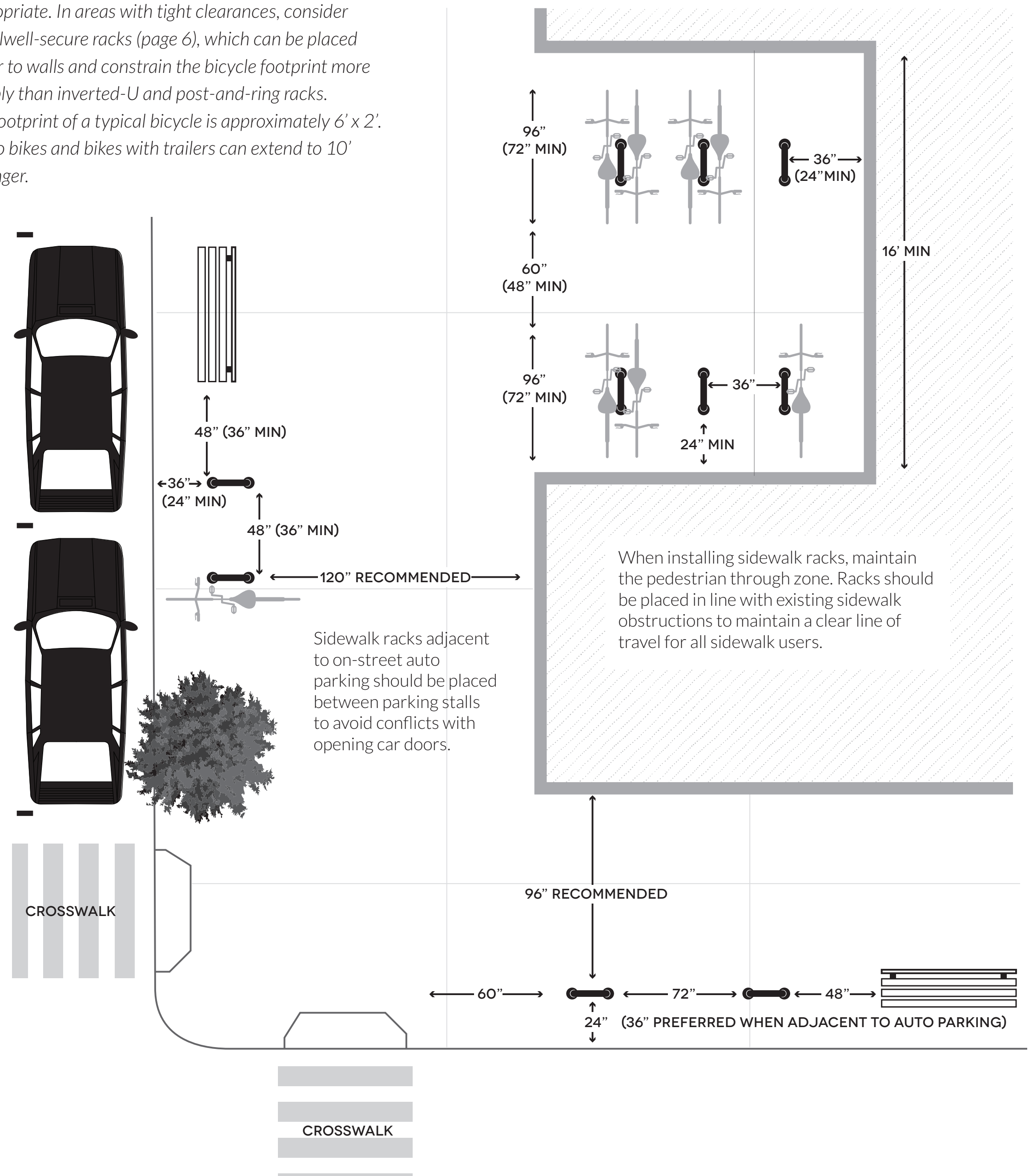
COATHANGER

BOLLARD

Graphics courtesy of Association of Pedestrian and Bicycle Professionals Essentials of Bike Parking report (2015).

Space Requirements

The following minimum spacing requirements apply to some common installations of fixtures like inverted-U or post-and-ring racks that park one bicycle roughly centered on each side of the rack. Recommended clearances are given first, with minimums in parentheses where appropriate. In areas with tight clearances, consider wheelwell-secure racks (page 6), which can be placed closer to walls and constrain the bicycle footprint more reliably than inverted-U and post-and-ring racks. The footprint of a typical bicycle is approximately 6' x 2'. Cargo bikes and bikes with trailers can extend to 10' or longer.



Long-Term Bicycle Parking

Users of long-term parking generally place high value on security and weather protection. Long-term parking is designed to meet the needs of employees, residents, public transit users, and others with similar needs.

Information on short and long term bike parking has been obtained from the APBP Bicycle Parking Guide, which is updated frequently and is available online at www.apbp.org.

Application

- At transit stops, bike lockers or a sheltered secure enclosure may be appropriate long term solutions.
- On public or private property where secure, long-term bike parking is desired.
- Near routine destinations, such as workplaces, universities, hospitals, etc.

Design Features

Bike Lockers

- Minimum dimensions: width (opening) 2.5 feet; height 4 feet; depth 6 feet.
- 4 foot side clearance and 6 foot end clearance. 7 foot minimum distance between facing lockers.

Secure Parking Area

- Closed-circuit television monitoring or on-site staff with secure access for users.
- Double high racks & cargo bike spaces.
- Bike repair station with bench and bike tube and maintenance item vending machine.
- Bike lock "hitching post" – allows people to leave bike locks.

Further Considerations

- As the APBP Bike Parking Guide notes, increasing density of bike racks in a long-term facility without careful attention to user needs can exclude users with less-common types of bicycles which may be essential due to age, ability, or bicycle type.
- To accommodate trailers and long bikes, a portion of the racks should be on the ground and should have an additional 36" of in-line clearance.

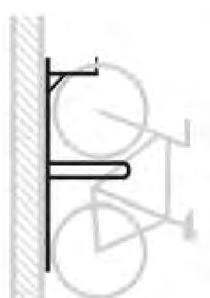
References

- AASHTO. Guide for the Development of Bicycle Facilities. 2012.
- APBP. Bicycle Parking Guide 2015.

High Density Bike Racks

Racks may be used that increase bike parking density, like the ones below. While these types of racks provide more spaces, racks that require lifting should not be used exclusively. People with heavier bikes (i.e. cargo bikes) or people with disabilities or people who are simply small in stature may be unable to lift their bikes easily.

STAGGERED WHEELWELL-SECURE



VERTICAL

TWO-TIER

Bike Parking Rooms

Long term bike parking may be available in dedicated rooms in residential and commercial buildings. Bicycle parking can be accommodated in 15 square feet per space or less.

Bike lockers

Secured parking areas

Where should parking be located?

Well-located bike parking will be:

- Visible to the public.
- Near primary entrances/exits, as close to the entrance as the first motor vehicle parking spot not designated for people with disabilities when possible.
- Easily accessed without dismounting a bike.
- Clear of obstructions which might limit the circulation of users and their bikes.
- In areas that are well-lit.
- Installed on a hard, stable surface that is unaffected by weather.

How much parking should be provided?

APBP's Essentials of Bicycle Parking Recommendations

The Association of Pedestrian and Bicycle Professionals' (APBP) has published recommendations for bicycle parking locations and quantities. These guidelines and recommendations are based on industry best practices as well as APBP's Essentials of Bicycle Parking Recommendations, but can be adjusted to meet the context and needs of each community.

Recommendations for Bicycle Parking Locations and Quantities

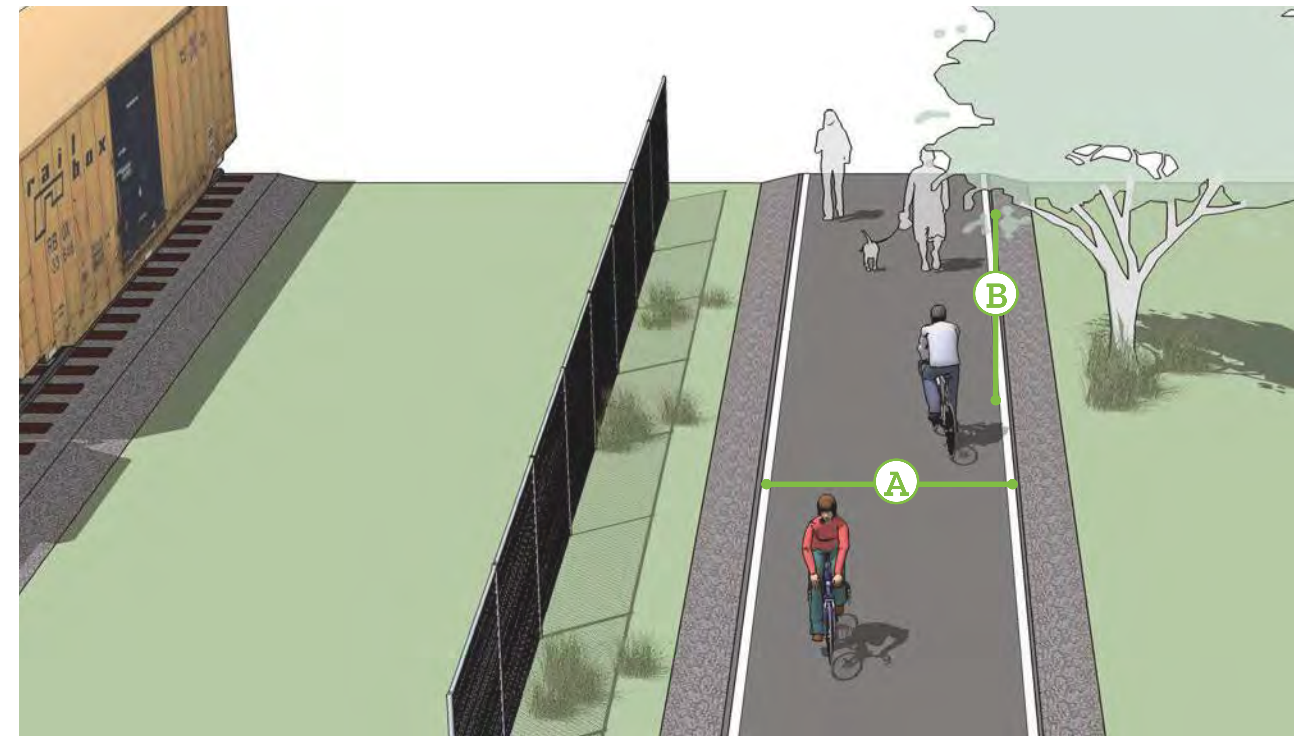
Land Use or Location	Physical Location	Quantity (Minimum)
Parks	Adjacent to restrooms, picnic areas, fields, and other attractions	8 bicycle parking spaces per acre
Schools	Near office and main entrance with good visibility	8 bicycle parking spaces per 40 students
Public Facilities (e.g., libraries, community centers)	Near main entrance with good visibility	8 bicycle parking spaces per location
Commercial, Retail, and Industrial Developments (over 10,000 square feet)	Near main entrance with good visibility	1 bicycle parking space per 15 employees or 8 bicycles per 10,000 square feet
Shopping Centers (over 10,000 square feet)	Near main entrance with good visibility	8 bicycle parking spaces per 10,000 square feet
Transit Stations	Near platform, security or ticket booth	1 bicycle parking space or locker per 30 automobile parking spaces
Multi-Family Residential	Near main entrance with good visibility	1 short-term bicycle parking space per 10 residential units and 1 long-term bicycle parking space per 2 residential units

Section 4

Mixed Use Toolbox

Shared Use Path

Shared use paths are off-street facilities that can provide a desirable transportation and recreation connection for users of all skill levels who prefer separation from traffic. They often provide low-stress connections to local and regional attractions that may be difficult, or not be possible on the street network.



Typical Use

- In abandoned rail corridors (commonly referred to as Rails-to-Trails or Rail-Trails.
- In active rail corridors, trails can be built adjacent to active railroads (referred to as Rails-with-Trails).
- In utility corridors, such as power line and sewer corridors.
- In waterway corridors, such as along canals, drainage ditches, rivers, and creeks.
- Along roadways.

Design Features

(A) 8 ft is the minimum width (with 2' ft shoulders) allowed for a two-way bicycle path and is only recommended for low traffic situations.

- 10 ft is recommended in most situations and will be adequate for moderate to heavy use.
- 12 ft is recommended for heavy use situations with high concentrations of multiple users. A separate track (5' minimum) can be provided for pedestrian use.

Lateral Clearance

- A 2 ft or greater shoulder on both sides of the path should be provided. An additional ft of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings.
- If bollards are used at intersections and access points, they should be colored brightly and/or supplemented with reflective materials to be visible at night.

Overhead Clearance

(B) Clearance to overhead obstructions should be 8 ft minimum, with 10 ft recommended.

Striping

- When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines.
- Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings.

Further Considerations

- The provision of a shared use path adjacent to a road is not a substitute for the provision of on-road accommodation such as paved shoulders or bike lanes, but may be considered in some locations in addition to on-road bicycle facilities.
- To reduce potential conflicts in some situations, it may be better to place one-way sidepaths on both sides of the street.
- The design of the trail should conform to Crime Prevention Through Environmental Design (CPTED) principles. CPTED is a framework that encourages intuitive visual cues to guide path users, increase the visibility of the corridor and adjacent landmarks and properties, careful design that indicates active use and upkeep, and manages conflicting uses, and regular maintenance to prevent improper or illegal uses.

Shared Use Paths offer pedestrians and bicyclists space to be active away from vehicle traffic. Source: Peter Stetson.

Materials and Maintenance

Shared use paths must be regularly maintained so that they are free of potholes, cracks, root lift, and debris. Signage and lighting should also be regularly maintained to ensure shared use path users feel comfortable, especially where visibility is limited.

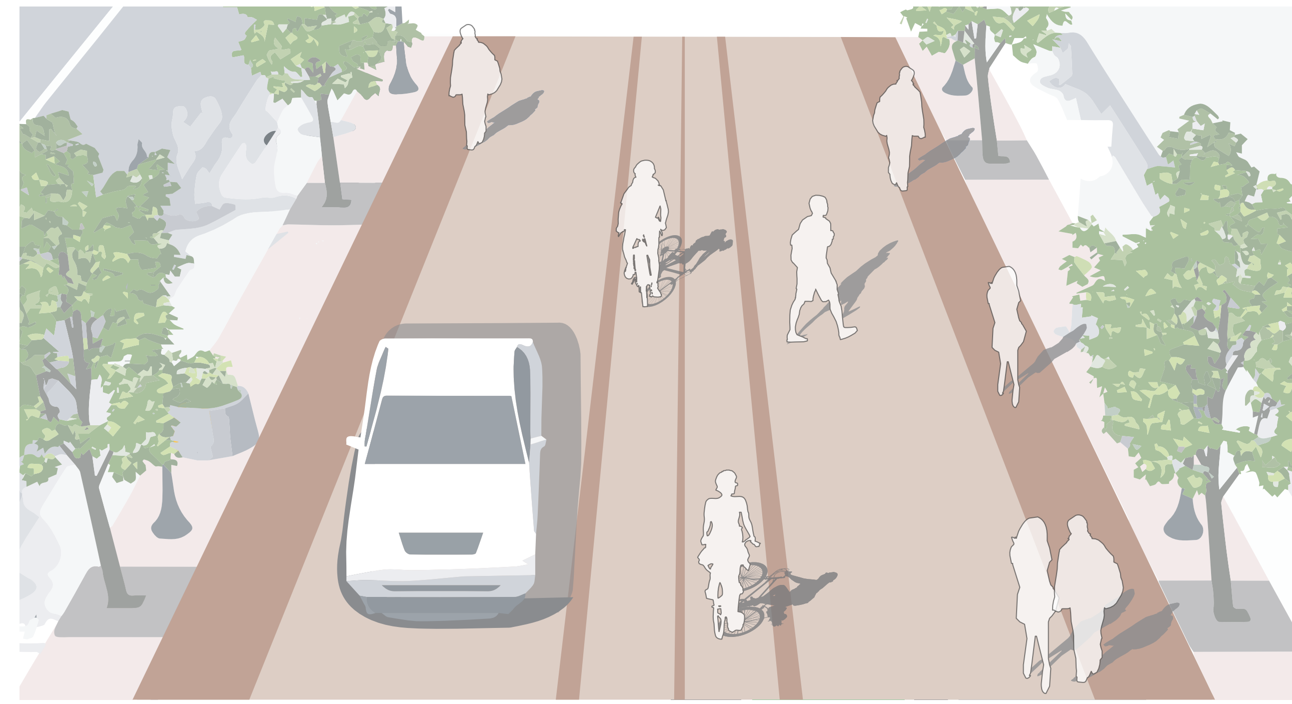
Adjacent landscaping should be regularly pruned, to allow adequate sightlines, daylight, and pedestrian-scale lighting, and so as not to obstruct the path of travel of trail users.

Approximate Cost

The cost of a shared use path can vary, but typical costs are between $65,000 per mile to $4 million per mile. These costs vary with materials, such as asphalt, concrete, boardwalk and other paving materials, lighting, and ROW acquisition.

Shared Street

A shared street is a street with no designated space for bicyclists, pedestrians or vehicles. Pedestrian and bicycle travel is prioritized, speeds are limited by the speed of pedestrians and bicyclists, and pavement materials, landscaping and amenities communicate that this is not a standard road. Vehicle volumes should be very low with only local vehicles (no through travel) using the street.



Typical Use

- Utilized in areas with high pedestrian activity that need to maintain limited access for vehicles and loading / unloading delivery trucks at designated hours.
- In commercial areas, a shared street environment should be considered in places where pedestrian activity is high and vehicle volumes are either low or discouraged.
- In residential areas, a shared street should be considered in places where sidewalks are limited, pedestrian activity and use of streets as public space is high, and vehicle volumes are low.

Design Features

- Vehicle use should be limited to destinations along the shared street (residences, parking garages, maintenance and emergency access vehicles).
- Vehicle speeds should be no more than 15 mph.
- The entrance to the shared street should be designed so that the shared street is clearly recognizable (through signage, surface material, amenities and landscaping).
- Landscaping should include canopy trees for shade and to enhance the bicycle and pedestrian environment, but should not restrict visibility.
- Amenities such as benches, cafe seating, and moveable landscaping elements should be included to communicate the prioritization of pedestrians and bicyclists, but should not restrict visibility.
- A clear width (void of vertical objects) should be provided to ensure emergency vehicle access.

Shared streets in active commercial areas become destinations themselves.

In residential areas, shared streets expand public space and create new places for people to play.

Additional References and Guidelines

FHWA, Achieving Multimodal Networks: Applying Design Flexibility & Reducing Conflicts, "Shared Streets". 2016.

Examples:

- Jack London Square, Oakland, CA
- Wall Street, Asheville, NC
- Bell Street Park, Seattle, WA
- Old Firehouse Alley, Fort Collins, CO
- Calle Guanajuato, Ashland, OR
- Winthrop Street, Cambridge, MA
- First Street North, Jacksonville Beach, FL

Materials and Maintenance

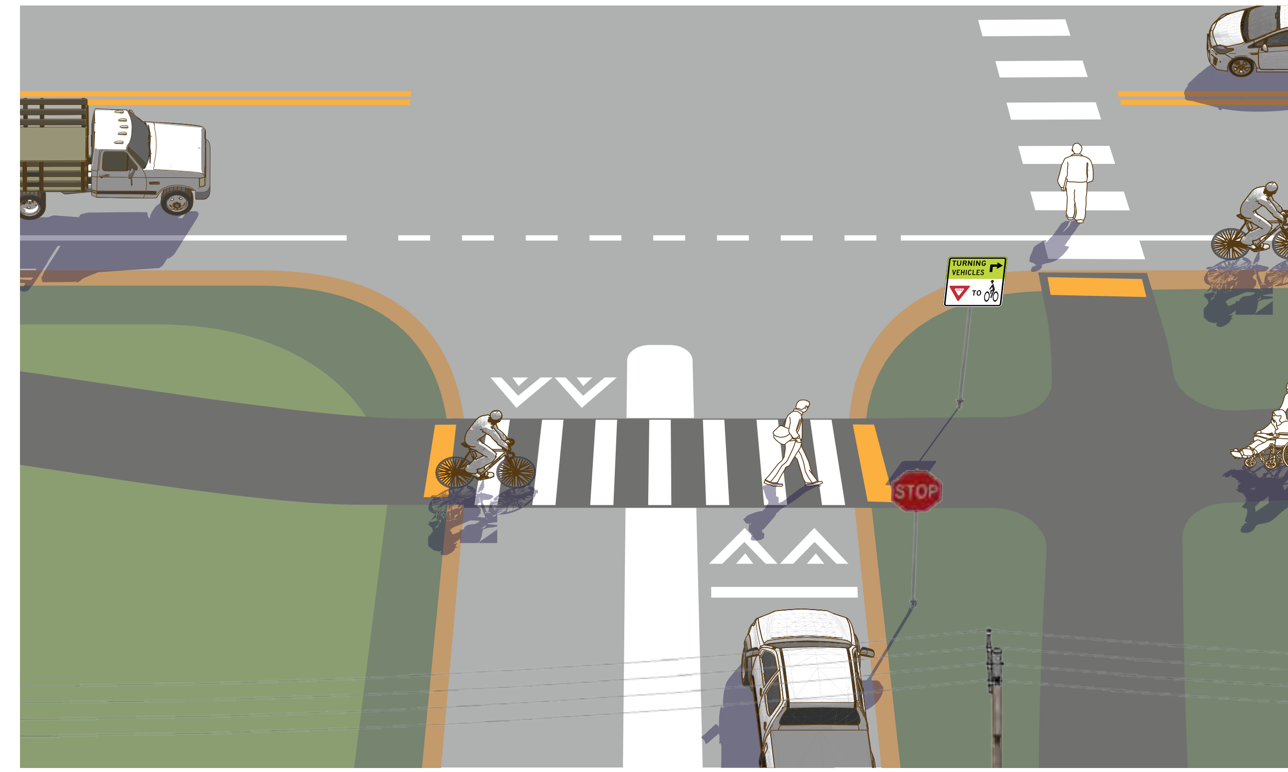
Pavement materials should be similar to that of a pedestrian pathway or plaza using concrete, colored concrete, paving stones or similar materials. Pavement materials and depths should be designed to accommodate vehicular travel, but should clearly signal to all roadway users that pedestrians have priority.

Approximate Cost

The cost of a shared street can vary depending on materials (such as asphalt, concrete, and other paving materials), lighting, landscaping, and ROW acquisition.

Sidepath Design

A sidepath is a bidirectional shared use path located immediately adjacent and parallel to a roadway. Sidepaths can offer a high-quality experience for users of all ages and abilities.



Typical Use

Sidepaths should be considered where one or more of the following conditions exist:

- The adjacent roadway has relatively high volume and/or high-speed motor vehicle traffic that might discourage many people bicycling from riding on the roadway to achieve the targeted low stress. Sidepaths do not preclude the installation or maintenance of existing bike lanes.
- Along corridors with few intersections with minor streets and driveways.
- To provide continuity between existing segments of shared use paths.
- For use near schools, neighborhoods, and mixed use commercial areas, where increased separation from motor vehicles is desired, and there are few roadway and driveway crossings.

Design Features

- Sidepaths shall be designed to meet transportation standards as defined by AASHTO, PROWAG, and MUTCD.
- Materials: Asphalt is the standard paving material for sidepaths.
- Minimum Width: Minimum width of a sidepath is 10'. Where user volumes are high, additional width, as well as parallel facilities such as bike lanes and sidewalk can provide needed space.
- Roadway Separation: The preferred minimum roadway separation width is 6.5 - 16.5' **(Schepers, 2011).** Absolute minimum separation width of 5' **(AASHTO Bike Guide 2012, p. 5-11).**
- Roadway Separation: Separation from roadway traffic is an essential design feature of sidepaths. Separation should increase as volumes and speed of adjacent roadway increase **(AASHTO Bike Guide 2012, p. 5-11).**

A sidepath provides a continuous path of travel along roadway corridors with few driveways or intersections. Depending on the anticipated volumes and context, the sidepath can be constructed in lieu of sidewalk and/or bike lanes. Oftentimes, anticipated volumes, mix of skills, or other factors such as route continuity will also be considered in the decision to also include bike lanes and sidewalks.

- Horizontal Clearance: A lateral clearance to landscaping, street furnishings and signs is required. MUTCD identifies minimum clearance. Signs and other street furniture should be placed outside of the minimum path width.
- Vertical Clearance: Standard clearance to overhead obstructions is 10'.
- Cross Slope and Running Slope: As sidepaths are typically located within public rights of way, their designs are governed by ADA guidelines.

Further Considerations

- Sight Lines: It is important to keep approaches to intersections and major driveways clear of obstructions due to parked vehicles, shrubs, and signs on public or private property.
- Corner radii at driveways and minor streets should be minimized to facilitate vehicle turning speeds of 10-15 mph.

Materials and Maintenance

Like shared use paths, Sidepaths must be regularly maintained so that they are free of potholes, cracks, root lift, and debris. Signage and lighting should also be regularly maintained to ensure sidepath users feel comfortable, especially in areas where visibility is limited.

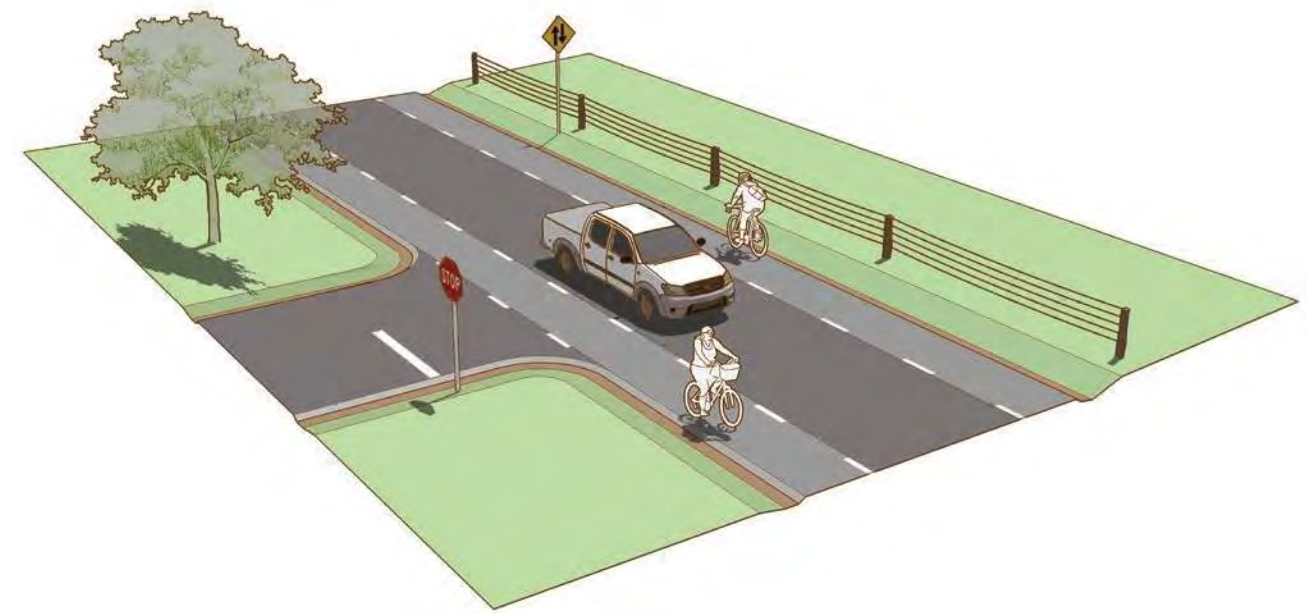
Adjacent landscaping should be regularly pruned, to allow adequate sightlines along the path and at minor street crossings and driveways, allow for daylight, and pedestrian-scale lighting, and so as not to obstruct the path of travel of trail users.

Approximate Cost

The cost of a sidepath can vary, but typical costs are similar to shared use paths between $90,000 per mile to $4 million per mile. These costs vary with materials, such as asphalt, concrete, boardwalk, and other paving materials, and ROW acquisition.

Advisory Shoulder

Roads with advisory shoulders accommodate low to moderate volumes of two-way motor vehicle traffic and provide a prioritized space for bicyclists with little or no widening of the paved roadway surface. An approved Request to Experiment is required to implement Advisory Shoulders, called "dashed bicycle lanes" in the FHWA experimentation process.



Typical Use

- Most appropriate on streets with low to moderate volumes and moderate speeds of motor vehicles.
- Roadways in built-up areas with constrained connections, bicycle and pedestrian demand, and limited available paved roadway space.
- Advisory shoulder designs work best on road segments without frequent stop or signal controlled intersections.

Design Features

- The preferred width of the advisory shoulder space is 6 ft. Absolute minimum width is 4 ft when no curb and gutter is present.
- Consider using contrasting paving materials between the advisory shoulder and center travel lane to differentiate the advisory shoulder from the center two-way travel lane in order to minimize unnecessary encroachment and reduce regular straddling of the advisory shoulder striping.
- Preferred two-way center travel lane width is 13.5–16 ft although may function with widths of 10–18 ft. **(Small and Rural Multimodal Networks Report, Table 2-2)**
- A broken lane line used to delineate the advisory shoulder should consist of 3 ft line segments and 6 ft gaps.
- Use signs to warn road users of the special characteristics of the street.

Advisory shoulders create usable shoulders for bicyclists on a roadway that is otherwise too narrow to accommodate one. The shoulder is delineated by pavement marking and optional pavement color. Motorists may only enter the shoulder when no bicyclists are present and must overtake these users with caution due to potential oncoming traffic.

Further Considerations

- Unlike a conventional shoulder, an advisory shoulder is a part of the traveled way, and it is expected that vehicles will regularly encounter meeting or passing situations where driving in the advisory shoulder is necessary and safe
- Advisory shoulders may function as an interim measure where plans include shoulder widening in the future.
- Where additional edge definition is desired, stripe a normal solid white edge line in addition to the broken advisory shoulder line.
- In general, do not mark a center line on the roadway. Short sections may be marked with center line pavement markings to separate opposing traffic flows at specific locations, such as around curves, over hills, on approaches to at-grade crossings, and at bridges.
- Strive to maintain the visual definition of the advisory shoulder through all driveways and street crossings, and provide a conventional shoulder at controlled intersections.
- Advisory shoulders as described here are not intended for use by pedestrians. When advisory shoulders are intended for use by pedestrians, they must meet accessibility guidelines.

Materials and Maintenance

Shoulder striping will require higher maintenance where vehicles frequently traverse over them at intersections, driveways, parking lanes, and along curved or constrained segments of roadway.

Advisory shoulders should also be maintained so that there are no pot holes, cracks, uneven surfaces or debris.

Approximate Cost

The cost for installing advisory shoulders will depend on the implementation approach. Typical costs are $6,000 per mile when used on a street with no markings.

Appendix C

Project Prioritization Memorandum

MEMORANDUM

617 W 7th Street, Suite 1103
Los Angeles, CA 90017
(213) 489-7443
altalosangeles@altaplanning.com

To: Cole Peiffer, Senior Planner, Headway Transportation

From: Sam Corbett, Principal, Alta Planning + Design

Date: August 7, 2020

Re: Carson City SRTS Prioritization of Final Recommendations

Prioritization Strategy

To guide implementation of the proposed SRTS improvements, a prioritization framework was developed to evaluate the relative priority of proposed bicycle and pedestrian projects. This enables the City to identify priority projects and phase the implementation of projects over a period of time. The prioritization focused on three categories of projects:

- **Tier 1. Quick Win Projects:** These projects can be implemented rapidly across the community at minimal expense. These projects can be implemented quickly as they are fairly inexpensive and will not need to compete with larger projects for scarce resources. It is expected that the Quick Win projects will be the first course of action the City will take in implementing the SRTS improvements.
- **Tier 2. SRTS Core Projects (Constrained List):** Recommendations in this category represent projects which are in close proximity to study schools, do not require lane reductions or significant parking removal, and could realistically be implemented within the next five to ten years with the existing funding and political conditions. These Tier 2 projects focus heavily on sidewalk gap closures, making key connections to schools, bicycle facilities which do not impact parking or capacity, and intersection crossing improvements. These projects were individually prioritized to further guide the City with implementation.
- **Tier 3. Aspirational Projects (Unconstrained List):** This category includes projects which are transformational in nature and require significant effort through engineering, funding, or building political consensus. These projects may be further away from study schools and may result in a greater benefit to the larger community as compared to SRTS Core Projects, which are tailored towards school-aged children. These projects are deemed "unconstrained" due to their unknown timeframe for completion. Tier 3 Projects were not individually prioritized as they will be implemented in the medium to long term based on available opportunities.

Tier 1. Quick Win Projects

Projects involving minimal capital and infrastructure improvements, such as changes to signage or red curb striping, were identified as **Quick Win Projects** and have been excluded from project prioritization (see Table 1). It is expected that the City will implement these projects as soon as possible to gain immediate benefits for students walking, biking, and riding buses to school.

Table 1. Quick Win Projects

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-1	Seeliger Paths	Footpaths to Seeliger Elementary School from: Cortez Street, Schell Avenue, and off Shady Oak Drive	Repave paths and extend pavement to school grounds	$15,000
Q-2	Appion Way	150 ft East & West of Muldoon Street	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$2,000
Q-3	Bath Street	At FrES Parent Drop-Off Loop Exit	Extend existing red curb by 20 feet to the east	$400
Q-4	Bonanza Drive	W. Sutro Terrace to Manzanita Terrace	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$4,000
Q-5	Carriage Crest Drive	At MTES Parent Drop-Off Exit	Relocate existing "No Left-Out" signage to more visible location	$750
Q-6	Cochise Street	150 ft North & South of Overland / Cochise Street Intersection	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$2,000
Q-7	Combs Canyon Road	Lakeview Road to Meadowood Road	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$4,000
Q-8	Combs Canyon Road	Harvard Drive to Dartmouth Drive	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$6,000
Q-9	De Ann Drive / Lompa Lane	150 ft on all sides of De Ann Drive / Lompa Lane Intersection	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$4,000
Q-10	Deer Run Road	150 feet on either side of Deer Run Road / BLM Access (located 2,150 feet south of Brunswick Canyon Road)	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$2,000
Q-11	EVMS Drop Off Loop	Parking Area in Drop Off Loop	Restrict parking to staff & deliveries only in front of school (reroute traffic around parking lot immediately in front of school)	$5,000
Q-12	FES Drop Off Loop	At existing temporary "Single Lane Pick-Up" Sign	Install permanent sign	$500
Q-13	Firebox Road	At Saliman Road	Install in-road message sign stating No Left-Out	$1,500
Q-14	Firebox Road	At Saliman Road	Update existing red curb along Firebox Road to be more visible	$3,000
Q-15	Gentry Lane	200 ft South of Heidi Circle	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$2,000
Q-16	Goni Road	Jefferson Drive to Franklin Road	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$4,000
Q-17	Hidden Meadows Drive	Eagle Valley MS Bus Entrance	Install marked crosswalk	$2,500

Project Number	Street	Extent (Or Cross Street)	Description	Cost
Q-18	Kelvin Road	200 ft East and West of Kelvin Road / Salk Road intersection	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$2,000
Q-19	Prospect Drive	Timberline Drive to Lotus Circle	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$2,000
Q-20	Rabe Way	400 ft West of Coffey Drive & 150 ft East of Parker Drive	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$3,000
Q-21	S. Sutro Terrace	Bryce Drive to Emerson Drive	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$5,000
Q-22	Saliman Road	At Cardinal Way	Install RRFB at existing crosswalk south of Cardinal Way	$95,000
Q-23	Salk Road	150 ft North & South of Avery Road	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$2,000
Q-24	Siskiyou Drive	Stanton Drive	Install marked crosswalk	$2,500
Q-25	Telegraph Street	3 Intersections: Telegraph Street & Mountain Street Telegraph Street & Division Street Telegraph Street & Richmond Avenue	Install marked crosswalk	$30,000
Q-26	Timberline Drive	Prospect Drive to 100 ft East of Westwood Drive	Utilize temporary signage to increase awareness of bus stop locations (ENG-4)	$4,000

Tier 2. SRTS Core Projects

The **SRTS Core Projects** involving more significant capital and infrastructure improvements were evaluated using prioritization criteria summarized in Table 2. These criteria included findings from the community survey, ability to address key safety issues, connections to schools and other community facilities, demographic data, cost efficiency and feasibility, and consistency with the City's planned capital improvements. For each criterion, Tier 2 projects received an individual score and a composite score was developed based on the sum of all eight factors evaluated. Total scores falling within the top third are considered **"Near Term"**; total scores falling in the middle third are considered **"Medium Term"**; and scores falling in the lower third are considered **"Long Term"** projects.

Table 2. Project Prioritization Criteria

Category	Rationale	*Description	Range of Points	Maximum Points Possible
Survey	School administrators, parents, students, and community members noted specific locations needing improvements in the community survey. Addressing this feedback is a priority of the Plan.	Improvement is at a location specifically identified by 6 or more survey participants *(10 points)* Improvement is at a location specifically identified by 3 to 5 survey participants *(8 points)* Improvement is at a location specifically identified by 1 to 2 survey participants *(6 points)*	Tiered: *10, 8, 6, 0*	**10**

Category	Rationale	*Description	Range of Points	Maximum Points Possible
		Improvement is not at a location identified by survey participants *(0 points)*		
Addresses Known Safety Issue	Improving safety is a core goal of this Plan. Community members shared that vehicle speeds, intersections, and sidewalks/pathways are the most important improvements needed.	Project reduces vehicle speeds *(3 points)* Project improves an intersection *(3 points)* Project improves existing or recommends new sidewalks/pathways *(3 points)* Project does not reduce vehicle speeds, improve an intersection, and/or improve existing or recommends new sidewalks/pathways *(0 points)*	Cumulative: *9, 6, 3, or 0*	**9**
Equity	Lower-income households are disproportionately represented in severe and fatal injuries. This criterion considers median household income to prioritize disadvantaged areas, using thresholds for Medicaid eligibility, median household income in Carson City, and median household income in Nevada.	Project is located in a block group with a median household income of $34,638 or less *(6 points)* Project is located in a block group with a median household income between $34,638.01 and $52,034 *(4 points)* Project is located in a block group with a median household income between $52,034.01 and $57,598 *(2 points)* Project is located in a block group with a median household income $57,598.01 and above *(0 points)*	Tiered: *6, 4, 2, 0*	**6**
Proximity to School(s) in Study	Improving access to schools in this study is a primary purpose of this Plan.	Project is located within 1/8-mile (660 ft) of a school in the study *(16 points)* Project is located within ¼-mile (1,320 ft) of a school in the study *(12 points)* Project is located within ½-mile (2,640 ft) of a school in the study *(4 points)* Project is located more than ½-mile (2,640 ft) of a school in the study *(0 points)*	Tiered: *16, 12, 4, 0*	**16**
Proximity to Community Facilities	Projects in areas of high demand provide benefit to a greater number of people. This criterion uses data about pedestrian and bicycle activity generators to prioritize areas of higher demand.	Project is located within ¼-mile of more than 10 community facilities (park, hospital, senior center, library, school not in the study, and/or other community facility) *(6 points)* Project is located within ¼-mile of 5 to 10 community facilities (park, hospital, senior center, library, school not in the study, and/or other community facility) *(4 points)* Project is located within ¼-mile of 1 to 4 community facilities (park, hospital, senior center, library, school not in the study, and/or other community facility) *(2 points)* Project is not located within ¼-mile of a park, hospital, senior center, library, school not in the study, and/or other community facility *(0 points)*	Tiered: *6, 4, 2, 0*	**6**

Category	Rationale	*Description	Range of Points	Maximum Points Possible
Demand	Projects in areas of high demand provide benefit to a greater number of people. This criterion uses data about pedestrian and bicycle activity generators to prioritize areas of higher demand.	Population density within ¼-mile of the project is more than 7,000 people per square mile *(4 points)* Population density within ¼-mile of the project is between 4,000 and 6,999 people per square mile *(2 points)* Population density within ¼-mile of the project is less than 4,000 people per square mile *(0 points)*	Tiered: *4, 2, 0*	**4**
Cost Efficiency / Feasibility	Lower cost projects can generally be implemented more rapidly and allow limited resources to be distributed more widely. Implementation is a strong focus of this Plan, and this criterion prioritizes lower-cost and less complex projects.	**For non-point improvements:** Estimated Total Project Cost: • <$50,000 *(4 points)* • $50,001 – $200,000 *(3 points)* • $200,001 – $500,000 *(2 points)* • >$500,000 *(0 points)* **PLUS** Estimated Cost Per Mile: • <$100,000 *(4 points)* • $100,001 – 500,000 *(3 points)* • $500,000 – $1 million *(2 points)* • >$1 million *(0 points)* **For point improvements (Crossing Safety projects):** Estimated Total Project Cost: • <$50,000 *(8 points)* • $50,001 – $200,000 *(6 points)* • $200,001 – $500,000 *(4 points)* • >$500,000 *(0 points)*	**For non-point improvements:** Cumulative: *8, 7, 6, 5, 4, 3, 2, 0* **For point improvements:** Tiered: *8, 6, 4, 0*	**8**
In CIP	This Plan aims to support the City's Capital Improvement Program (CIP), and prioritizes recommendations that are consistent with or complement projects within the CIP.	Project is within the CIP *(8 points)* Project partially overlaps with the CIP *(4 points)* *Project is not in the CIP, and does not complement other projects in the CIP (0 points)*	Tiered: *8, 4, 0*	**8**
*Note: For projects that span a larger geography than point recommendations (i.e., bikeways), points were awarded if one part of the segment meets any of the listed criteria (e.g., proximity to schools, median household income, population density).				**67**

The results of the prioritization process are considered to be a starting point for assisting the City with implementation of Tier 2 projects. Some projects may be able to be implemented as part of routine roadway maintenance programs; in fact, projects received points if they overlap with the City's Capital Improvement Program (CIP). As funding sources become available and the CIP is updated, it is expected that the City will take advantage of all available opportunities to implement proposed projects as quickly as possible. Should opportunities arise to complete Tier 2 medium or long term projects, or projects from other tiers of SRTS projects (Tiers 1 and 3), it is recommended that they should be taken as well. For example, if a new development is required to provide a public benefit along these corridors, the proposed bikeways/walkways on these prioritized lists should be considered as an option. If the City plans to repave a corridor that has a recommended bikeway or sidewalk, the City should consider including the proposed improvements as the street is repaved.

Near Term Projects

Near Term Projects, listed in Table 3, reflect the proposed improvements that scored the highest through the prioritization process. Therefore, it is recommended that the City prioritize Near Term Projects by seeking funding for and dedicating resources to planning, designing, and constructing these projects in the immediate years. Since many of these projects are of a larger-scale and are transformational in nature, they will require community engagement and dedicated funding sources. Developing timelines for outreach and identification of funding sources should be a high priority and immediate next step for the City. The Near Term Projects that are less infrastructure-intensive and lower in cost should be considered for immediate implementation in the coming fiscal years.

Table 3. Tier 2, Near Term Projects

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
C-7	W. King Street	Thames Lane to Curry Street	**A**. Construct multi-use path from Thames Lane to Canyon Park Court **B.** Add physical buffer for bike lane at CMS & BBES C. Close sidewalk gaps between Curry Street and Ormsby Boulevard **D.** Install intersection crossing enhancements at Tacoma Avenue, Richmond Avenue, Mountain Street, Thompson Street, Minnesota Street, Division Street	$1,180,000	47
WZ-33	Telegraph Street	Richmond Avenue to Mountain Street	Construct sidewalk on south side of roadway to eliminate sidewalk gaps and enhance existing sidewalks, as possible	$480,000	47
CS-4	Monte Rosa Drive	Stanton Avenue to Gordonia Avenue	Add intersection crossing enhancements to Stanton Drive & Gordonia Avenue intersections, including striping to prohibit parking close to existing crosswalks	$20,000	45
WZ-28	Saliman Road	Fairview Drive to Koontz Lane	**A.** Intersection crossing enhancements at Sonoma Street **B.** RRFB at Damon Road crosswalk **C.** Sidewalk east side Colorado Street to Fairview Drive **D.** Enhance existing sidewalk as possible"	$687,000	43
WZ-29	Saliman Road	E. 5th Street to Fairview Drive	Enhance existing sidewalk as possible	$410,000	43
WZ-21	Mountain Street	Nye Lane to King Street	**A**. Close sidewalk gaps & enhance existing sidewalk where possible **B**. Add intersection crossing enhancements at Winnie Lane, Bath Street, Long Street, Washington Street, Telegraph Street, Musser Street	$2,831,000	42
CS-1	Carriage Crest Drive	Slide Mountain Drive to Mountain Park Drive	**A.** Add intersection crossing enhancements at Mountain Park Drive and Slide Mountain Drive intersections **B.** Add center median 70' south of Slide Mountain Drive to Parent Drop-Off Loop entrance **C.** Consider parking restrictions or removal on Carriage Crest Drive during school pick-up and drop-off periods	$330,000	39
WZ-16	Gordonia Avenue	Monte Rosa Drive to La Loma Drive	**A.** Widen existing sidewalks on the north side of the roadway **B.** Add center median from Monte Rosa Drive to La Loma Drive	$321,000	39
WZ-32	Stanton Drive	Monte Rosa Drive to Fairview Drive	Widen existing sidewalk on south side and create center median	$161,000	39
WZ-11	Division Street	Bath Street to W. 5th Street	**A.** Add Intersection crossing enhancements at minor side streets **B**. Enhance & upgrade existing crosswalks throughout the corridor including Musser Street, Telegraph Street, and Long Street **C.** Close sidewalk gaps with widen sidewalks as possible	$1,850,000	38

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
WZ-34	Thompson Street	King Street to 550 ft. S. of San Marcus Drive	**A.** Close sidewalk gaps on east side (King Street to 5th Street) **B.** Close sidewalk gaps on west side (5th Street to San Marcus Drive) **C.** Create intersection crossing enhancements at existing W. 2nd St, W. 3rd St, and W. 4th St crosswalks	$380,000	38
C-6	Sonoma Street	Carson Street to Saliman Road	**A.** Construct Bike Lanes **B.** Add intersection crossing enhancement at Silver Sage Drive	$53,000	36
CS-3	Fairview Drive	Desatoya Drive to Walker Drive	**A.** Install RRFB at Desatoya Drive **B.** Install RRFB with pedestrian refuge island (painted or hardscape) between Walker Drive and Stanton Drive **C.** Construct Sidewalk on the west side of Fairview Drive from Walker Drive to Edmonds Drive **D.** Enhanced existing sidewalk on east side from Lepire Drive to multi-use path **E.** Enhance existing sidewalk on west side from Desatoya Drive to multi-use path south of Butti Way	$274,000	36
WZ-35	W. 5th Street	Richmond Avenue to Carson Street	**A.** Close sidewalk gaps and enhance existing sidewalk where possible **B.** Add intersection crossing enhancements at Thompson Street & Division Street	$2,470,000	36
WZ-10	Desatoya Avenue	Airport Road to Fairview Drive	Widen sidewalks on south side of roadway	$175,000	35
C-4	E. 5th Street	Fairview Drive to Mexican Ditch Trail	**A.** Construct bike lanes from Fairview Drive to Carson River Road **B.** Construct buffered bike lane from Carson River Road to Mexican Ditch Trail **C.** Add marked crosswalk with pedestrian refuge (painted or hardscape) at Parkhill Drive **D.** Construct pedestrian refuge at Regent Court (painted or hardscape) **E.** Relocate existing crosswalk at Carson River Road & Hells Bells Road approximately 15 feet to the east, add pedestrian refuge Island (painted or hardscape) and RRFB	$101,000	34

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
WZ-3	Bath Street	Mountain Street to Carson Street	**A**. Close Sidewalk Gap between Curry Street & Mountain Street **B**. Add Intersection crossing enhancement (paint or hardscape) at existing mid-block crosswalk and Division street crosswalks **C**. Add missing & repair damaged ADA Ramps **D**. Repair and enhance existing sidewalks as possible	$616,000	34
WZ-36	Winnie Lane	Carson Street to Mountain Street	Enhance existing sidewalks as possible	$257,000	34

Medium Term Projects

Table 4 presents **Medium Term Projects** which scored in the middle of Tier 2 projects and are recommended for implementation after the Near Term Projects have been completed. As appropriate, these projects may be combined with Near Term Projects to strengthen the walking and cycling network, address gap closures, and to complement other projects.

Table 4. Tier 2, Medium Term Projects

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
C-8	Winnie Lane	Mountain Street to Ormsby Blvd	**A.** Enhance existing sidewalks where possible **B.** Add bike lanes from Mountain Street to Ormsby Boulevard **C.** Add wayfinding signage at Victoria Avenue directing bicyclists towards the multi-use path on north side **D.** Enhance crosswalks at Ormsby Boulevard, Mountain Street, and Victoria Avenue **E.** Enhance street lighting at Mountain Street and Winnie Lane **F.** Remove overgrown vegetation to improve visibility	$160,000	33
C-1	Airport Road	Butti Way to E. 5th Street	**A.** Construct bike lane from Butti Way to Highway 50 **B.** Add intersection crossing enhancements at Airport Road / Douglas Drive and Airport Road / Menlo Drive	$186,500	31

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
WZ-12	Division Street	5th Street to southern terminus of Division Street	Close sidewalk gaps	$222,500	31
WZ-6	Carson Street	Bath Street to 420 ft. N. of Bath Street	Construct sidewalk	$87,500	30
WZ-20	Long Street	Curry Street to Sierra Circle & Fall Street to Stewart Street	**A.** Close sidewalk gaps (Curry Street to Sierra Circle & Fall Street to Stewart Street) **B.** Crosswalks and Intersection Enhancements at Division Street, Curry Street, and Marian Avenue	$853,000	30
B-3	Winnie Lane	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to Roop Street	$75,000	29
WZ-26	Roop Street	Winnie Lane to E. 5th Street	**A.** Close sidewalk gaps (Telegraph Street to E. 5th Street) **B.** Enhance existing sidewalks as possible	$860,000	29
C-3	E. 5th Street	Saliman Road to Carson Street	**A.** Enhance existing sidewalks **B.** Widen existing bike lane to 5'	$655,000	27
WZ-27	S. Iris Street	4th Street to King Street	Construct sidewalk	$500,000	27
WZ-19	Lepire Drive	Snake Mountain Multi-Use Path to Cassidy Court	Construct sidewalk from Snake mountain multi-use path to the existing sidewalk on the north side of Lepire Drive	$143,000	26
WZ-23	Musser Street	Richmond Avenue to Winters Drive	Construct sidewalk	$72,500	26

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
C-2	Carmine Street	Airport Road to Lompa Lane	**A.** Traffic Circle at Dori Way & Carmine Street **B**. Close sidewalk gaps between Airport Road & Dori Way **C**. Intersection crossing enhancements at Dori Way, Lompa Lane, and Airport Road	$952,000	25
B-1	Colorado Street	Carson Street to Roop Street	Construct buffered bike lanes from Carson Street to existing bike lanes	$10,000	23
CS-2	Carson Street	Nye Lane	**A.** Construct RRFB **B.** Add Crosswalk on south intersection leg **C.** Add Pedestrian Refuge Island (painted or hardscape)	$220,000	23
WZ-1	Airport Road	Nye Lane to Highway 50	**A.** Close sidewalk gaps **B.** Enhance existing sidewalk as possible	$1,550,000	23
WZ-13	S. Edmonds Drive	Fairview Drive to Colorado Street Bridge	Construct multi-use path on west/north side to connect to existing path	$220,000	22

Long Term Projects

Table 5 presents the projects scoring in the lowest third of the prioritization process for Tier 2 projects, referred to as **Long Term Projects**. Many of the projects in this category did not receive any public comments through the community survey, are not proximate to multiple community facilities, and do not overlap with projects in the City's CIP. However, these projects help to complete a full active transportation network, increasing access to schools for our youth. Should the City have the opportunity to implement projects from any of the three Tier 2 levels, it is recommended as all projects have been developed to close network gaps and improve walking, biking, and connecting to the bus for Carson City students and residents.

Table 5. Tier 2, Long Term Projects

Project Number	Street	Extent (Or Cross Street)	Description	Cost	Priority Score
C-5	Nye Lane	Lompa Lane to Highway 50	Construct bike lanes & close sidewalk gaps	$5,404,000	21
WZ-17	Hillview Drive	Kingsley Lane to Clearview Drive	Construct paved shoulder or multi-use path to connect with existing multi-use path on Saliman Road at Kingsley Lane	$230,000	21
WZ-25	Robinson Street	Richmond Avenue to Mountain Street	Construct sidewalk	$390,000	21
WZ-37	Winnie Lane	Ash Canyon Road to Ormsby Boulevard	Extend multi-use path on north side to Ash Canyon Road	$200,000	21
WZ-8	Colorado Street	Colorado Terminus to Edmonds Drive	**A.** Construct multi-use bridge over I-580 from Colorado Street terminus to Edmonds Drive **B.** Marked Crosswalk with RRFB at Colorado Street & Edmonds Drive intersection (Due to funding constraints, the City may select one pedestrian bridge project to pursue, either **WZ-15** or **WZ-8**)	$4,855,000	20
B-2	E. 5th Street	Saliman Road to I-580	Construct multi-use path or separated facility with connection to existing multi-use path on either side of I-580	$940,000	19
WZ-5	Camille Drive	Sunland Drive	Install staircase and ramp for multi-use connectivity	$200,000	18
WZ-14	N. Edmonds Drive	320 ft N. of Reeves to 100 ft N. Brown Street	Construct sidewalk on west side of roadway	$200,000	18
WZ-24	Reavis Lane	Create Pedestrian Connection to Multi-Use Path	Construct multi-use bridge between existing multi-use trail and sidewalk on southside of Reavis Lane	$140,000	18
CS-5	Roop Street/Silver Sage Drive	Fairview Drive to Sonoma Avenue	Add intersection crossing enhancements at minor side-street approaches south of Fairview Drive	$310,000	17
WZ-4	Brown Street	420 ft. N. of Reeves Street to 170 ft. S. of Reeves Street	Construct sidewalk	$207,500	17
WZ-22	Musser Street	Harbin Avenue to Anderson Street	**A.** Close sidewalk gaps **B.** Enhance sidewalk where possible	$270,000	17
WZ-30	Sherman Lane	Lompa Lane to Chanel Lane	Construct sidewalk	$2,000,000	17
WZ-7	Clearview Drive	Oak Street to I-580	Construct paved shoulder for bikes/pedestrians/bus stop accessibility	$255,000	16
WZ-9	Colorado Street	Birch Street to 125 ft W. of Utah Street	Construct sidewalk	$235,000	15
WZ-18	Koontz Lane	Center Drive to I-580	Construct paved shoulder for bikes/pedestrians/bus stop accessibility	$629,000	15
WZ-31	Stampede Drive	Gregg Street East to Existing Sidewalk	Construct sidewalk on south side corner to existing sidewalk	$133,000	14
WZ-15	Edmonds Sports Complex	Between Edmonds Sports Complex and Appion Way / Hillview Drive intersection	**A.** Construct multi-use bridge over I-580 from the southeastern corner of Appion Way / Hillview Drive intersection to the Edmonds Sports Complex (Due to funding constraints, the City may select one pedestrian bridge project to pursue, either **WZ-15** or **WZ-8**)	$6,000,000	12
CS-6	Silver Sage Drive	Sonoma Avenue to Koontz Lane	**A**. Add Crosswalk at Pioche St **B.** Add intersection crossing enhancements at Koontz Lane intersection and minor side-street approaches between Koontz Lane & Sonoma Avenue	$810,000	11
WZ-2	Baker Drive	Koontz Lane to 175 ft. S. of Kerinne Circle	Construct sidewalk	$292,500	9

Tier 3: Aspirational Projects (Unconstrained List)

Table 6 details the City's **Tier 3 Aspirational Projects**. These projects are transformational, and will remain on the City's "unconstrained" plan until the Tier 1 and 2 projects have been implemented. Should resources and community demand present opportunities to implement these projects, the City will work to do so.

Table 6. Tier 3: Aspirational Projects (Unconstrained List)

Project Number	Street	Extent (Or Cross Street)	Description	Cost
A-1	Airport Road	Nye Lane to Highway 50	**A.** Construct buffered bike lanes or similar multi-modal improvement **B.** Protected intersection at Airport Road / Highway 50 or similar multi-modal improvement	$1,450,000
A-2	Ash Canyon / Ormsby Boulevard	Longview Way to Washington Street	Construct multi-use path from Longview Way to Washington Street or similar multi-modal improvement	$650,000
A-3	Carmine Street	Airport Road to Lompa Lane	Construct bike boulevard or similar multi-modal improvement	$130,000
A-4	Carriage Crest Drive	Northridge Drive to Sunland Ave	Construct bike boulevard or similar multi-modal improvement	$37,000
A-5	Division Street	Bath Street to W. 5th Street	Construct bike boulevard or similar multi-modal improvement	$1,795,000
A-6	Fairview Drive	Nye Lane to Butti Way	Construct protected cycle track with protected intersection at Highway 50 or similar multi-modal improvement	$1,000,000
A-7	Fairview Drive	Edmonds Drive to Saliman Road	Construct protected cycle track / multi-use path or similar multi-modal improvement	$500,000
A-8	Little Lane	Saliman Road to Roop Street	Construct buffered bike lanes or similar multi-modal improvement	$12,000
A-9	Long Street	Mountain Street to Russell Way	**A**. Buffered bike lane from Mountain Street to Saliman Road or similar multi-modal improvement **B.** Bike lane from Saliman Road to Russell Way or similar multi-modal improvement	$435,000
A-10	Mountain Street	Nye Lane to King Street	Construct buffered bike lanes or similar multi-modal improvement	$2,891,000
A-11	Northgate Lane	Arrowhead Drive to Nye Lane	Construct protected cycle track or similar multi-modal improvement	$320,000
A-12	Ormsby Boulevard	Oak Ridge Drive to Winnie Lane	Construct bike lanes or similar multi-modal improvement	$3,000

Appendix D
Vehicle Speed Data

Appendix D: School Zone Vehicle Speed Data

The following maps and tables represent vehicle speed data collected by Carson City Public Works within school zones across Carson City, NV. Data was collected using pneumatic hose counters and speed feedback sign data.

Pneumatic Hose Counter Data

Data was collected by pneumatic hose counters at the following locations:

1. Carriage Crest Drive - Mark Twain Elementary School
2. Ormsby Boulevard - Carson Middle School
3. Saliman Road - Fremont Elementary School
4. Saliman Road - Seeliger Elementary School

The collected data was analyzed by hour to identify vehicle speeds and volumes during school zones. It is important to note vehicle speeds were collected in both directions and captured vehicle speeds within the school zone as well as at the beginning and end of the zone. This strategy helps identify the difference in vehicle speeds as they travel through the school zone.

Speed Feedback Sign Data

Speed feedback signs alert drivers to the speed of their vehicle. As vehicles travel past the speed feedback sign, the vehicle speed is recorded. Downloading this data helps provide insights into the speed of vehicles as they are entering a school zone. Data recorded between fall 2019 and February 2020 by speed feedback signs at the following school zone locations was downloaded by Carson City Public Works and is included in this Appendix:

1. W. King Street - Bordewich-Bray Elementary School
2. W. King Street - Carson Middle School
3. Gordonia Avenue - Empire Elementary School
4. Fairview Drive - Empire Elementary School & Eagle Valley Middle School
5. Saliman Road - Fremont Elementary School & Seeliger Elementary School
6. Bath Street - Fritsch Elementary School

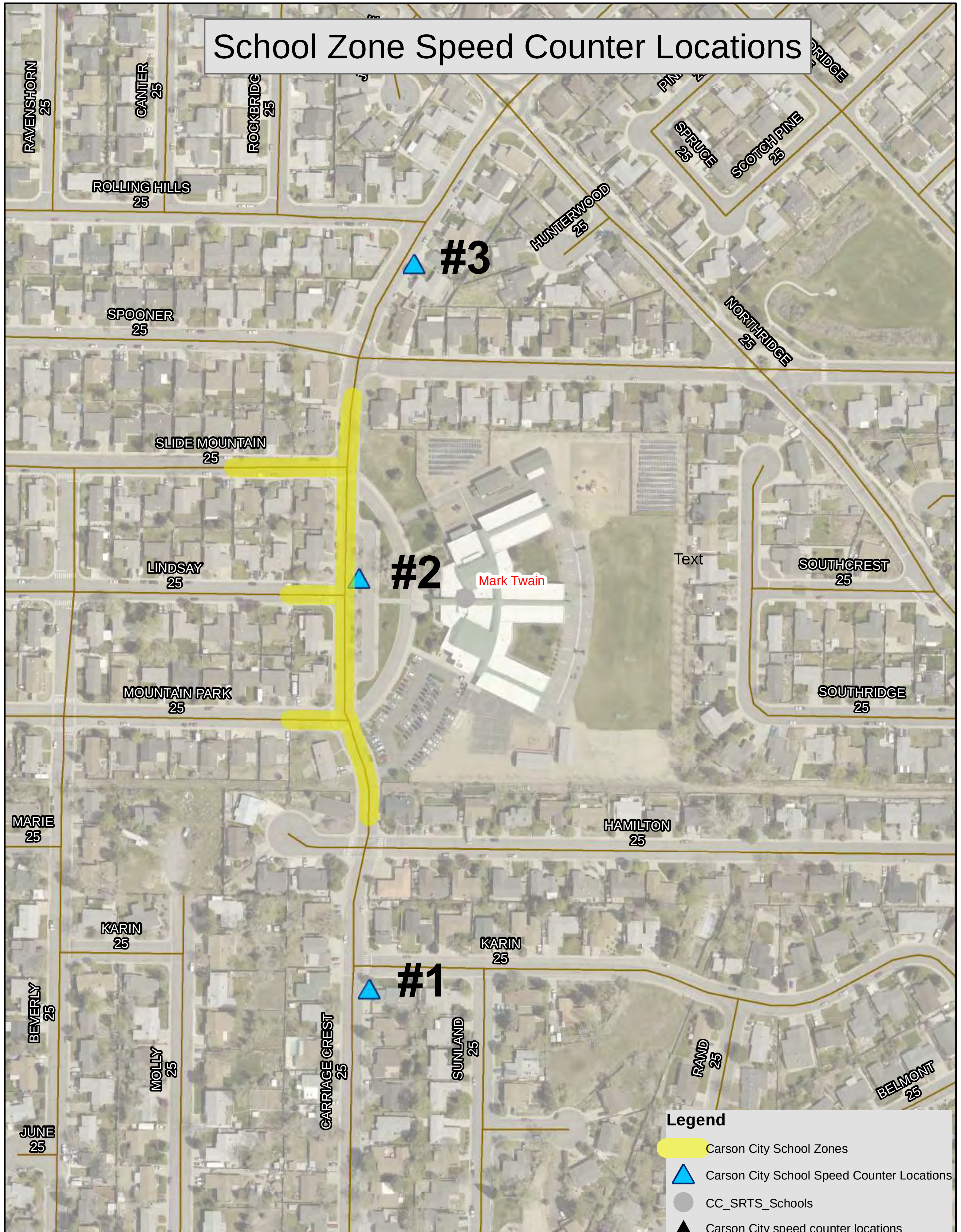


Table 1. Carriage Crest Drive - 85th Percentile Speeds

Carriage Crest Drive - Mark Twain Elementary School Zone (85th Percentile Speed)										
Time Period		Northbound				Southbound				
		Location 1	Location 2	Location 3	Average	Location 1	Location 2	Location 3	Average
Monday	AM	24.2	20.6	25.2	23.3	20.1	19.0	23.3	20.8
	Lunch	23.3	27.1	27.6	26.0	19.0	23.3	26.9	23.1
	PM	23.6	22.9	24.7	23.7	20.6	22.8	24.4	22.6
	Daily	23.8	28.2	26.5	26.2	19.7	26.3	27.5	24.5
Tuesday	AM	24.0	21.1	24.2	23.1	19.0	19.0	23.9	20.6
	Lunch	21.5	24.0	26.3	23.9	18.9	23.4	25.8	22.7
	PM	22.1	26.0	28.4	25.5	19.4	23.1	24.5	22.3
	Daily	23.8	28.3	26.6	26.2	19.7	26.5	27.1	24.4
Wednesday	AM	24.3	23.5	24.1	24.0	19.5	18.9	25.4	21.3
	Lunch	21.8	26.9	27.5	25.4	17.3	23.9	27.7	23.0
	PM	22.8	26.2	28.5	25.8	19.7	25.8	26.6	24.0
	Daily	23.8	28.7	27.7	26.7	19.9	27.8	28.1	25.3
Thursday	AM	23.9	20.2	24.2	22.8	19.7	18.6	23.7	20.7
	Lunch	24.3	23.4	28.0	25.2	19.7	21.9	27.6	23.1
	PM	23.9	25.5	28.8	26.1	19.3	25.0	26.2	23.5
	Daily	23.8	27.8	26.0	25.9	19.9	26.1	27.2	24.4
Friday	AM	23.3	22.6	24.4	23.4	19.4	18.9	24.1	20.8
	Lunch	23.5	26.9	27.1	25.8	18.9	25.1	24.5	22.8
	PM	22.3	26.1	26.0	24.8	19.1	24.6	24.2	22.6
	Daily	23.3	28.4	26.4	26.0	19.6	27.2	27.4	24.7

Table 2. Carriage Crest Drive - Average 85th Percentile Speeds by Time Period

Carriage Crest Drive - Daily 85th Percentile Speeds									
Date	Day of the Week	Northbound				Southbound			
		24 hours	AM	Lunch	PM	24 hours	AM	Lunch	PM
11/18/2019	Monday	26.2	23.3	26.0	23.7	24.5	20.8	23.1	22.6
11/12/19 - 11/19/19	Tuesday	26.2	23.1	23.9	25.5	24.4	20.6	22.7	22.3
11/13/2019	Wednesday	26.7	24.0	25.4	25.8	25.3	22.7	23.0	24.0
11/14/2019	Thursday	25.9	22.8	25.2	26.1	24.4	22.3	23.1	23.5
11/15/2019	Friday	26.0	23.4	23.5	22.3	24.7	20.8	22.8	22.6
Average		26.2	23.3	24.8	24.7	24.7	21.5	22.9	23.0

Table 3. Carriage Crest - 85th Percentile Speeds by Location & Time Period

Carriage Crest Drive - 85th Percentile Speeds By Time Period								
Time Period	Northbound				Southbound			
	Location 1	Location 2	Location 3	Average	Location 1	Location 2	Location 3	Average
AM	23.94	21.60	24.42	23.32	19.54	18.88	24.08	20.83
Lunch	22.88	25.66	27.30	25.28	18.76	23.52	26.50	22.93
PM	22.94	25.34	27.28	25.19	19.62	24.26	25.18	23.02
Daily	23.70	28.28	26.64	26.21	19.76	26.78	27.46	24.67

Table 4. Carriage Crest Drive - Traffic Volumes By Location & Time Period

Carriage Crest Drive - Mark Twain Elementary School (Volumes)									
Time Period		Northbound				Southbound			
		Location 1	Location 2	Location 3	Average	Location 1	Location 2	Location 3	Average
Monday	AM	43	32	68	48	23	129	100	84
	Lunch	15	37	45	32	9	40	26	25
	PM	9	27	55	30	26	58	35	40
	Daily	205	511	516	411	252	717	511	493
Tuesday	AM	45	29	79	51	27	151	94	91
	Lunch	6	25	25	19	13	38	25	25
	PM	20	43	34	32	10	44	26	27
	Daily	203	520	487	403	242	753	498	498
Wednesday	AM	34	33	36	34	20	101	34	52
	Lunch	1	20	23	15	4	19	15	13
	PM	24	39	30	31	14	27	24	22
	Daily	367	212	391	323	405	381	391	392
Thursday	AM	45	42	69	52	22	146	88	85
	Lunch	19	33	23	25	18	32	16	22
	PM	17	33	26	25	8	43	32	28
	Daily	149	499	475	374	159	730	477	455
Friday	AM	42	39	84	55	28	160	101	96
	Lunch	11	28	28	22	12	29	15	19
	PM	18	33	30	27	8	42	30	27
	Daily	206	570	548	441	245	814	524	528

Table 5. Carriage Crest Drive - Average Traffic Volumes by Time Period

Carriage Crest Drive Mark Twain School Zone (Volumes, Average of all days)								
Time Period	Northbound				Southbound			
	Location 1	Location 2	Location 3	Average	Location 1	Location 2	Location 3	Average
AM	42	35	67	48	24	137	83	82
Lunch	10	29	29	23	11	32	19	21
PM	18	35	35	29	13	43	29	28
Daily	226	462	483	391	261	679	480	473

Table 1. 85th Percentile Speeds (Ormsby Blvd, at Carson Middle School)

Ormsby Blvd – Carson Middle School (85th Percentile Speeds)			
Time Period		Northbound	Southbound
Monday	AM	37.8	35.8
	Lunch	38.7	38.5
	PM	35.2	37.9
	Daily	37.7	38.8
Tuesday	AM	40.3	39.3
	Lunch	36.7	34.4
	PM	36.9	36.4
	Daily	36.8	38.5
Wednesday	AM	38.4	37.8
	Lunch	36.8	38.1
	PM	35.5	36.2
	Daily	37.4	38.6
Thursday	AM	37.8	37.9
	Lunch	36.6	36.3
	PM	37.5	38.2
	Daily	37.1	38.6
Friday	AM	33.0	42.1
	Lunch	37.9	37.9
	PM	37.2	38.2
	Daily	37.7	38.7

Table 2. 85th Percentile Speeds by Time Period (Ormsby Blvd, at Carson Middle School)

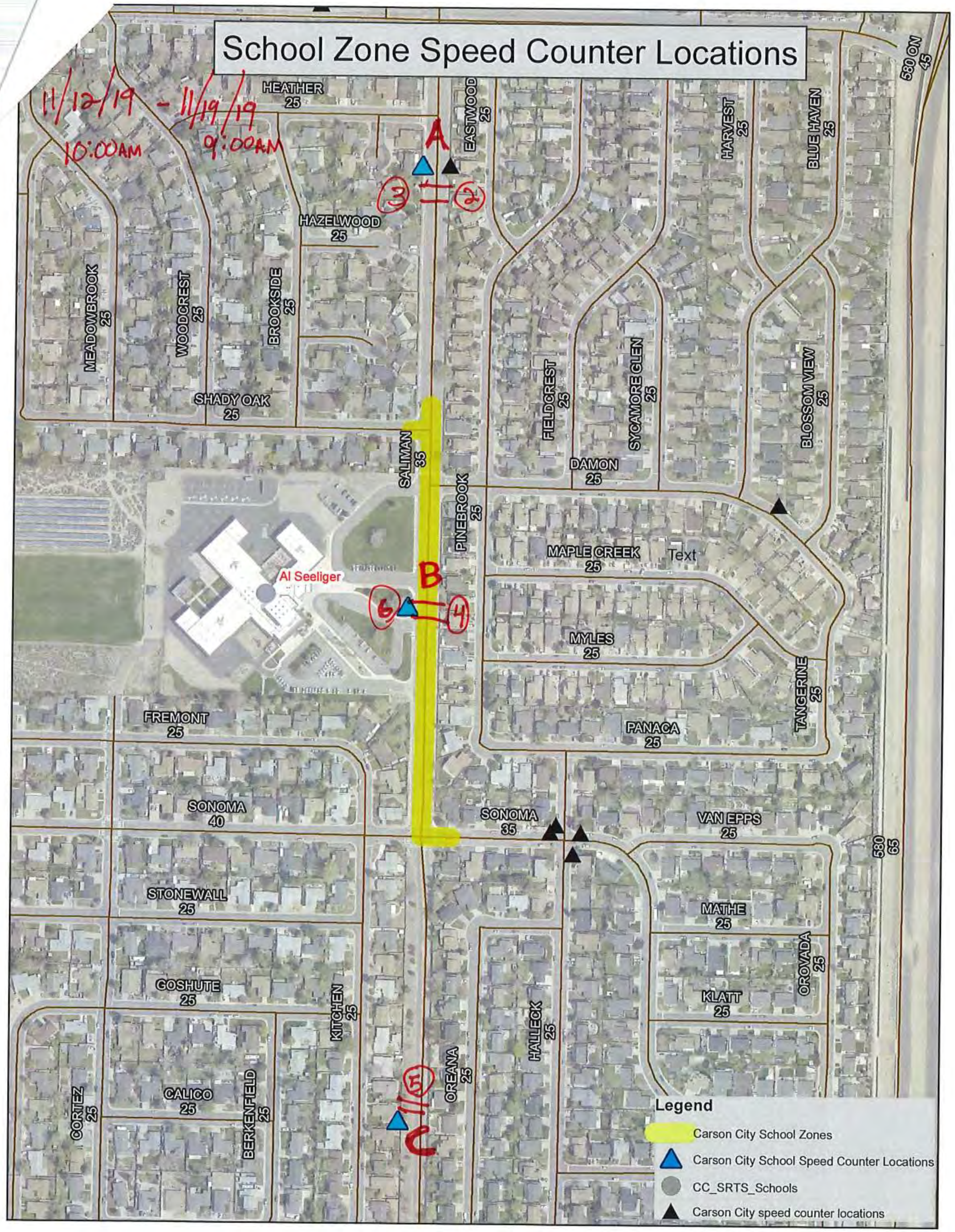
Ormsby Blvd - Carson Middle School (85th Percentile Speeds)		
Time Period	Northbound	Southbound
AM	37.5	38.6
Lunch	37.3	37.0
PM	36.5	37.4
Daily	37.3	38.6

Table 3. Total Peak Hour & Daily Volumes (Ormsby Blvd, at Carson Middle School)

Ormsby Blvd - Peak Hour & Daily Volumes (Carson Middle)			
Time Period		Northbound	Southbound
Monday	AM	12	8
	Lunch	41	33
	PM	68	63
	Daily	677	579
Tuesday	AM	16	15
	Lunch	34	39
	PM	43	55
	Daily	752	681
Wednesday	AM	14	11
	Lunch	31	35
	PM	39	44
	Daily	716	630
Thursday	AM	11	16
	Lunch	44	41
	PM	40	46
	Daily	729	681
Friday	AM	6	15
	Lunch	32	44
	PM	36	45
	Daily	699	631

Table 4. Average Peak Hour & Daily Volumes (Ormsby Blvd, at Carson Middle School)

Ormsby Blvd – Average Peak Hour & Daily Volumes (Carson Middle)		
Time Period	Northbound	Southbound
AM	12	13
Lunch	36	38
PM	45	51
Daily	715	640


School Zone Speed Counter Locations
11/12/19 - 11/19/19
10:00AM 9:00AM
A
B
C
3
2
6
4
5
HEATHER 25
EASTWOOD 25
HARVEST 25
BLUE HAVEN 25
580 ON 45
HAZELWOOD 25
MEADOWBROOK 25
WOODCREST 25
BROOKSIDE 25
FIELDCREST 25
SYCAMORE GLEN 25
BLOSSOM VIEW 25
SHADY OAK 25
SALIMAN 35
PINEBROOK 25
DAMON 25
MAPLE CREEK 25
Text
Al Seeliger
MYLES 25
TANGERINE 25
FREMONT 25
PANACA 25
SONOMA 40
SONOMA 35
VAN EPPS 25
580 65
STONEWALL 25
MATHE 25
OROVADA 25
GOSHUTE 25
KITCHEN 25
HALLECK 25
KLATT 25
OREANA 25
CALICO 25
CORTEZ 25
BERKENFIELD 25
Legend
Carson City School Zones
Carson City School Speed Counter Locations
CC_SRTS_Schools
Carson City speed counter locations


School Zone Speed Counter Locations
11/19/19 - 11/26/19
10:00 AM 12:00 PM
A
B
C
5
1
6
4
3
2
DEPOT 25
ROUND HOUSE 25
LITTLE 25
CORONET 25
FIRE BOX 25
JEWELL 25
SPARTAN 25
Fremont
Text
FLEETWOOD 25
SALIMAN 35
CARDINAL 25
RAILROAD 25
CANVASBACK 25
MALLARD 25
QUAIL RUN 25
TEAL 25
CABOOSE 25
PULLMAN 25
DRAKE 25
BOBWHITE 25
Legend
Carson City School Zones
Carson City School Speed Counter Locations
CC_SRTS_Schools
Carson City speed counter locations

Table 1. 85th Percentile Speeds (Al Seeliger School Zone)

Saliman Road - Al Seeliger School Zone (85th Percentile Speed)									
Time Period		Northbound				Southbound			
		Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
Monday	AM	33.6	27.8	38.5	33.3	32.6	27.8	36.4	32.3
	Lunch	34.8	33.7	39.5	36.0	34.5	33.7	38.4	35.5
	PM	33.8	30.5	37.8	34.0	34.1	30.5	35.8	33.5
	Daily	34.8	33.7	39.3	35.9	34.3	33.7	37.6	35.2
Tuesday	AM	33.8	27.7	38.2	33.2	32.6	27.7	37.0	32.4
	Lunch	36.2	32.8	38.5	35.8	34.3	32.8	35.6	34.2
	PM	33.3	29.4	38.3	33.7	33.9	29.4	36.3	33.2
	Daily	34.6	33.3	38.9	35.6	34.1	33.3	36.6	34.7
Wednesday	AM	33.4	26.4	39.1	33.0	32.4	26.4	36.2	31.7
	Lunch	34.6	33.4	38.2	35.4	34.6	33.4	37.4	35.1
	PM	33.0	29.4	38.0	33.5	33.1	29.4	34.4	32.3
	Daily	34.8	33.4	39.2	35.8	34.2	33.4	36.6	34.7
Thursday	AM	33.1	28.0	38.0	33.0	32.1	28.0	36.1	32.1
	Lunch	34.7	33.1	38.5	35.4	34.6	33.1	37.7	35.1
	PM	33.1	29.5	36.7	33.1	33.9	29.5	35.5	33.0
	Daily	34.7	33.5	39.3	35.8	34.2	33.5	37.2	35.0
Friday	AM	33.1	27.8	38.7	33.2	31.8	27.8	36.6	32.1
	Lunch	34.7	33.0	39.2	35.6	35.0	33.0	37.2	35.1
	PM	33.6	29.3	38.4	33.8	33.4	29.3	36.8	33.2
	Daily	35.1	34.2	39.5	36.3	34.6	34.2	37.5	35.4
	Missing data replaced with Southbound data for location B.								

Table 2. 85th Percentile Speeds (Fremont School Zone)

Saliman Road - Fremont School Zone (85th Percentile Speed)									
Time Period		Northbound				Southbound			
		Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
Monday	AM	34.0	37.0	34.5	35.2	32.1	38.0	30.2	33.4
	Lunch	37.2	38.4	39.1	38.2	35.1	40.6	39.4	38.4
	PM	36.0	37.5	38.9	37.5	34.0	39.3	38.5	37.3
	Daily	38.2	39.1	40.0	39.1	34.8	39.9	39.0	37.9
Tuesday	AM	35.3	36.7	38.3	36.8	29.9	36.5	38.2	34.9
	Lunch	37.5	38.8	39.6	38.6	34.7	39.7	38.8	37.7
	PM	36.8	37.4	39.1	37.8	33.1	37.5	37.3	36.0
	Daily	37.8	39.1	39.5	38.8	34.6	39.9	38.4	37.6
Wednesday	AM	34.6	36.2	37.4	36.1	31.5	38.4	37.3	35.7
	Lunch	36.4	38.7	39.2	38.1	34.5	39.9	38.2	37.5
	PM	34.7	36.3	37.4	36.1	33.0	38.4	37.0	36.1
	Daily	37.4	38.8	39.2	38.5	34.5	39.8	38.2	37.5
Thursday	AM	34.3	36.1	38.0	36.1	31.8	37.6	38.0	35.8
	Lunch	36.7	38.7	39.7	38.4	34.4	39.4	39.1	37.6
	PM	34.8	36.3	39.0	36.7	33.8	38.6	38.2	36.9
	Daily	37.8	38.9	39.5	38.7	34.8	39.8	38.7	37.8
Friday	AM	34.8	35.7	38.6	36.4	31.8	38.3	38.1	36.1
	Lunch	37.7	38.9	39.7	38.8	34.7	39.2	38.3	37.4
	PM	34.9	36.1	38.7	36.6	33.6	37.7	37.5	36.3
	Daily	37.9	39.1	39.7	38.9	35.0	39.8	38.6	37.8

Table 3. Average 85th Percentile Speeds by Time Period (Al Seeliger School Zone)

Saliman Road - Al Seeliger School Zone (85th Percentile Speed, Avg. of all days)								
Time Period	Northbound				Southbound			
	Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
AM	33.40	27.54	38.50	33.15	32.30	27.54	36.46	32.10
Lunch	35.00	33.20	38.78	35.66	34.60	33.20	37.26	35.02
PM	33.36	29.62	37.84	33.61	33.68	29.62	35.76	33.02
Daily	34.80	33.62	39.24	35.89	34.28	33.62	37.10	35.00
	Missing data replaced with Southbound data for location B.							

Table 4. 85th Percentile Speeds by Time Period (Fremont School Zone)

Saliman Road - Fremont School Zone (85th Percentile Speed, Avg. of all days)								
Time Period	Northbound				Southbound			
	Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
AM	34.60	36.34	37.36	36.10	31.42	37.76	36.36	35.18
Lunch	37.10	38.70	39.46	38.42	34.68	39.76	38.76	37.73
PM	35.44	36.72	38.62	36.93	33.50	38.30	37.70	36.50
Daily	37.82	39.00	39.58	38.80	34.74	39.84	38.58	37.72

Table 5. Total Volumes by Location (Al Seeliger School Zone)

Saliman Road - Al Seeliger School Zone (Volumes)									
Time Period		Northbound				Southbound			
		Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
Monday	AM	258	95	97	150	95	95	164	118
	Lunch	132	88	87	102	143	88	150	127
	PM	177	114	114	135	215	114	228	186
	Daily	2239	1941	1132	1771	2293	1941	1223	1819
Tuesday	AM	249	95	82	142	158	95	143	132
	Lunch	144	80	76	100	120	80	140	113
	PM	175	120	89	128	200	120	232	184
	Daily	1874	1781	904	1520	2028	1781	976	1595
Wednesday	AM	248	91	81	140	144	91	161	132
	Lunch	112	82	45	80	131	82	152	122
	PM	147	103	97	116	166	103	210	160
	Daily	2218	1960	1067	1748	2319	1960	1143	1807
Thursday	AM	263	91	105	153	121	91	155	122
	Lunch	140	74	58	91	124	74	136	111
	PM	189	126	106	140	186	126	219	177
	Daily	2268	2055	1107	1810	2338	2055	1236	1876
Friday	AM	261	81	98	147	137	81	167	128
	Lunch	122	84	63	90	126	84	149	120
	PM	196	127	90	138	201	127	246	191
	Daily	2358	2216	2276	2283	2476	2216	1388	2027
	Missing data replaced with Southbound data for location B.								

Table 6. Total Volumes by Location (Fremont School Zone)

Saliman Road - Fremont School Zone (Volumes)									
Time Period		Northbound				Southbound			
		Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
Monday	AM	207	46	72	108	178	283	135	199
	Lunch	279	235	238	251	230	241	205	225
	PM	287	262	227	259	287	303	203	264
	Daily	3800	3041	3178	3340	3389	2608	3493	3163
Tuesday	AM	300	285	260	282	232	179	38	150
	Lunch	256	229	223	236	217	253	226	232
	PM	303	274	250	276	299	334	222	285
	Daily	4125	3488	3650	3754	3569	2755	3619	3314
Wednesday	AM	294	271	240	268	241	336	95	224
	Lunch	239	204	191	211	220	229	134	194
	PM	316	274	243	278	275	279	106	220
	Daily	3860	3260	3439	3520	3531	1885	3543	2986
Thursday	AM	312	278	276	289	230	326	75	210
	Lunch	223	224	209	219	217	252	210	226
	PM	315	267	239	274	259	302	198	253
	Daily	4052	3509	3633	3731	3869	2821	3612	3434
Friday	AM	276	265	250	264	227	325	98	217
	Lunch	280	260	249	263	231	237	219	229
	PM	330	275	253	286	335	364	253	317
	Daily	4156	3693	3844	3898	3983	3103	3854	3647

Table 7. Average Total Volume by Time Period (Al Seeliger School Zone)

Saliman Road - Al Seeliger School Zone (Volumes, Average of all days)								
Time Period	Northbound				Southbound			
	Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
AM	256	91	93	146	131	91	158	127
Lunch	130	82	66	92	129	82	145	119
PM	177	118	99	131	194	118	227	180
Daily	2191	1991	1297	1826	2291	1991	1193	1825
	Missing data replaced with Southbound data for location B.							

Table 8. Average Total Volume by Time Period (Fremont School Zone)

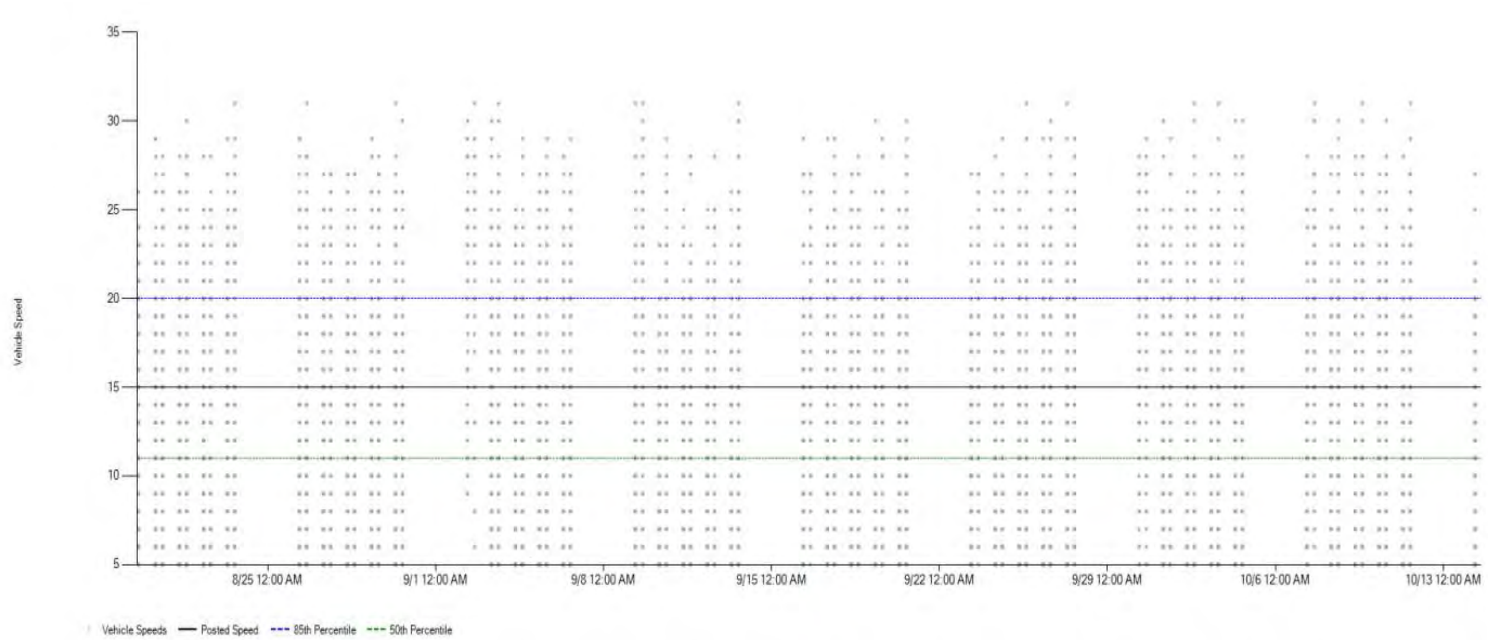
Saliman Road - Fremont School Zone (Volumes, Average of all days)								
Time Period	Northbound				Southbound			
	Location A	Location B	Location C	Total	Location A	Location B	Location C	Total
AM	278	229	220	242	222	290	88	200
Lunch	255	230	222	236	223	242	199	221
PM	310	270	242	274	291	316	196	268
Daily	3999	3398	3549	3649	3668	2634	3624	3309

Speed Feedback Sign Location	Average Speed (During School Zone Times)	85th Percentile Speed (During School Zone Times)
Bordewich-Bray (W. King Street)	11	20
Carson Middle School (W. King Street)	16	25
Empire Elementary (Gordonia Dr)	15	21
Empire Elementary - Fairview Drive (Southbound)	22	34
Empire Elementary - Fairview Drive (Northbound)	31	38
Fremont Elementary (Saliman Rd - Northbound)	23	34
Fremont Elementary (Saliman Rd - Southbound)	24	32
Fritsch Elementary (Bath St)	15	22
Seeliger Elementary (Saliman Rd)	17	25

Posted school zone speeds in Nevada are 15mph. Data analyzed above was captured from Carson City Public Works speed feedback signs at the locations described above during the 2019-2020 school year. The table above is a summary of the following data. For more information on the raw data, please contact Carson City Public Works.

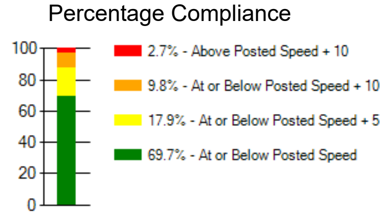
Vehicle Speed Report

Data File: Bordewich Eastbound Dec-12-19 15;22.csv
Date Range: 8/19/19 1:50 PM to 10/14/19 1:38 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:30:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	14971
Average daily volume:	365
Posted speed:	15
Average speed:	12.2
Percentiles:	
85th	20
50th	11

Percentage Compliance

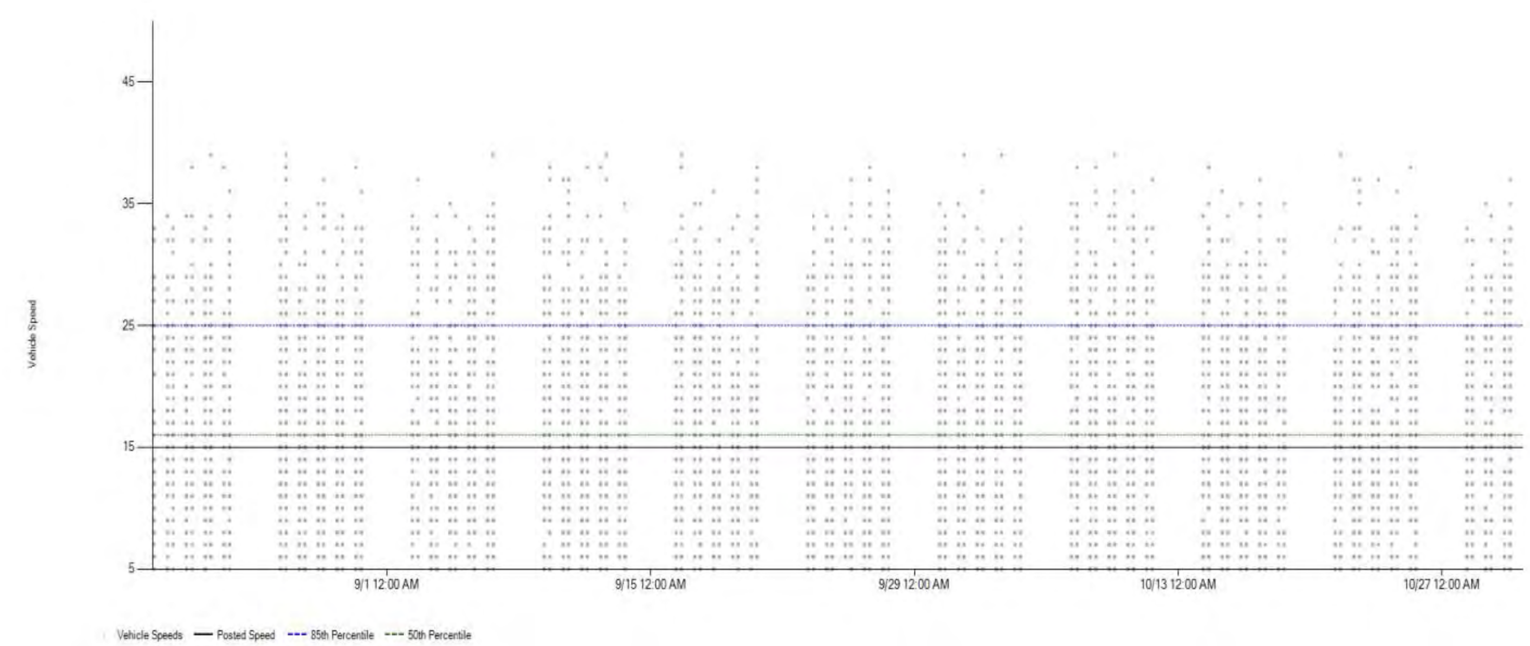


carmanah®

Report Date: 1/13/2020

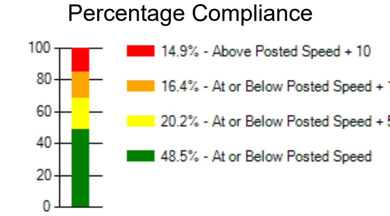
Vehicle Speed Report

Data File: King St Eastbound Dec-12-19 14;56.csv
Date Range: 8/19/19 1:20 PM to 10/31/19 7:21 AM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	8194
Average daily volume:	154
Posted speed:	15
Average speed:	16.8
Percentiles:	
85th	25
50th	16

Percentage Compliance

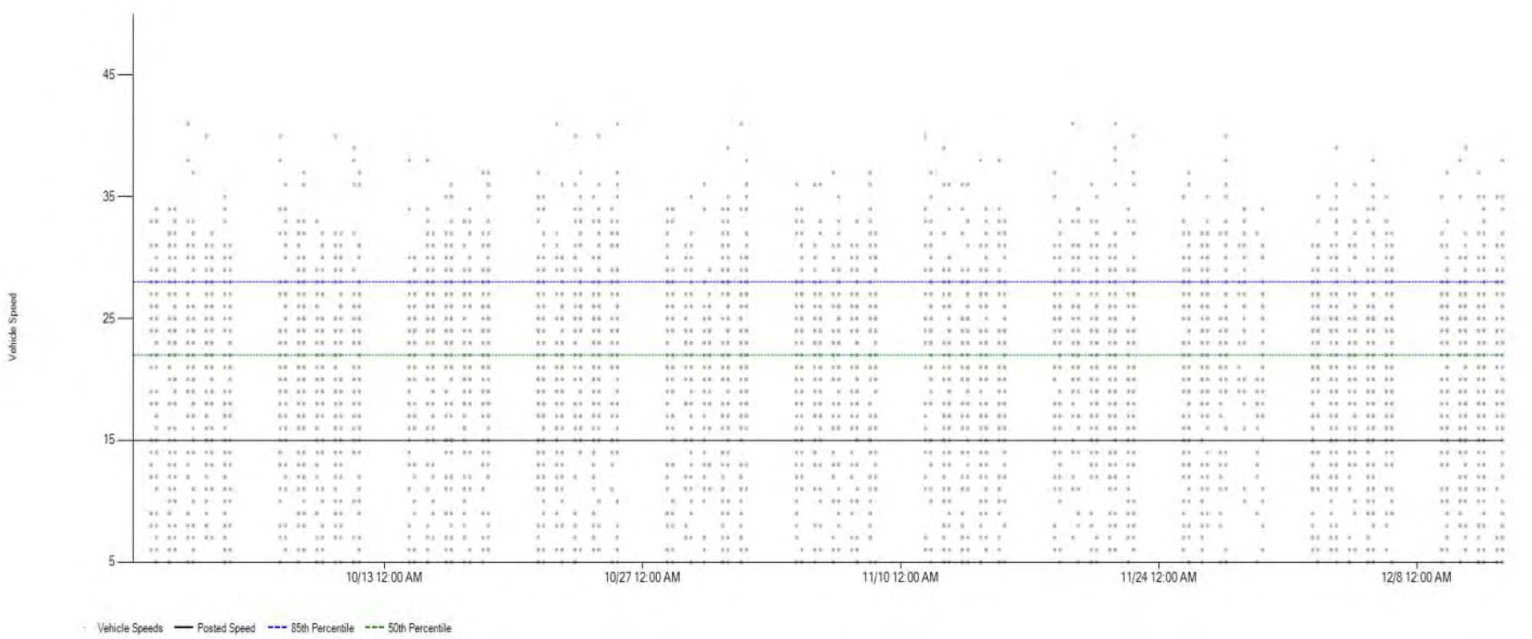


carmanah®

Report Date: 1/13/2020

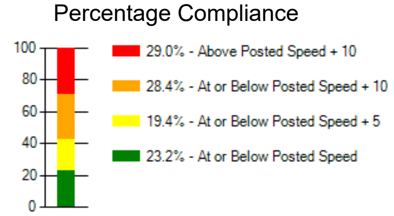
Vehicle Speed Report

Data File: Empire school Dec-12-19 15;06.csv
Date Range: 9/29/19 9:00 AM to 12/12/19 3:04 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	6242
Average daily volume:	115
Posted speed:	15
Average speed:	20.9
Percentiles:	
85th	28
50th	22

Percentage Compliance

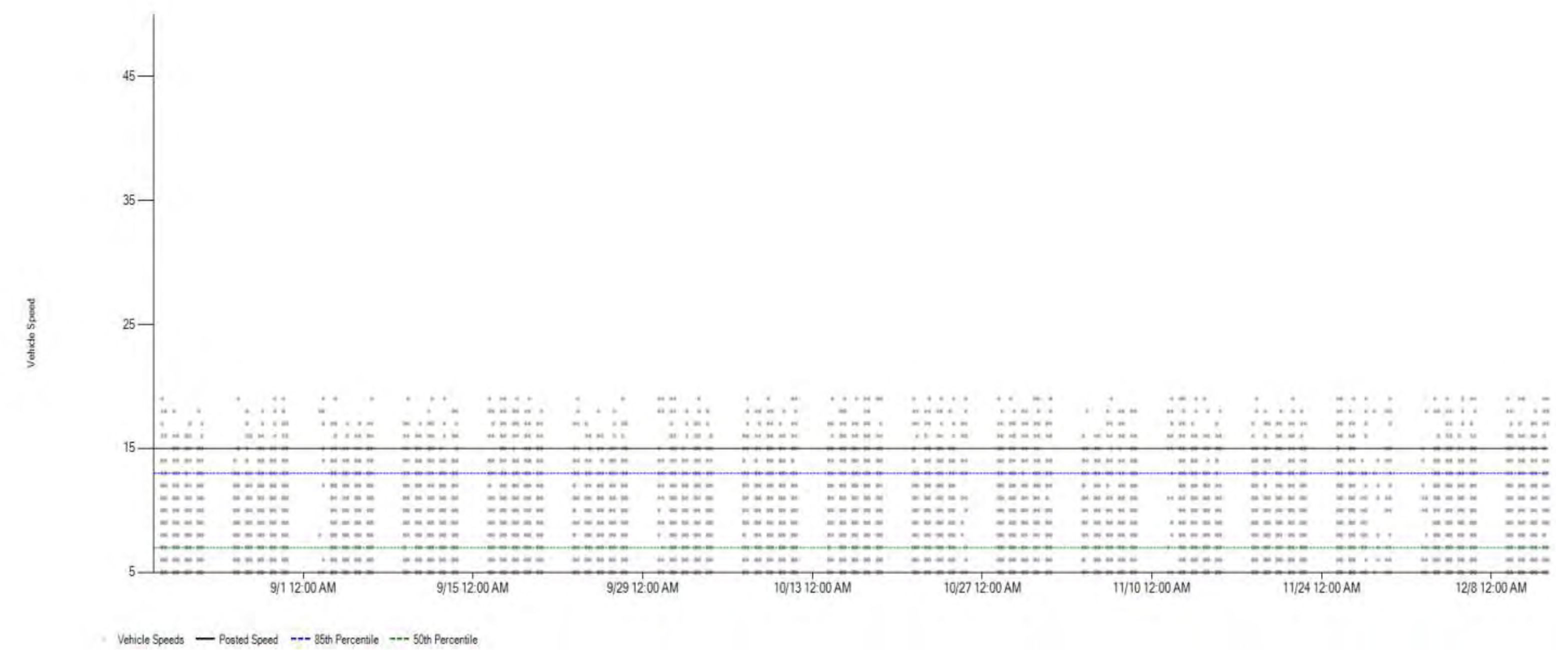


carmanah®

Report Date: 1/13/2020

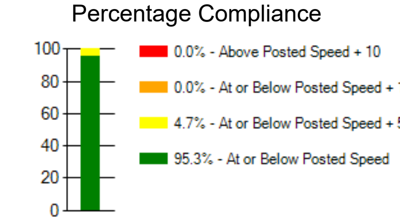
Vehicle Speed Report

Data File: Empire elementary sb Dec-12-19 14;53.csv
Date Range: 8/19/19 3:48 PM to 12/12/19 2:53 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	15317
Average daily volume:	184
Posted speed:	15
Average speed:	8.5
Percentiles:	
85th	13
50th	7

Percentage Compliance

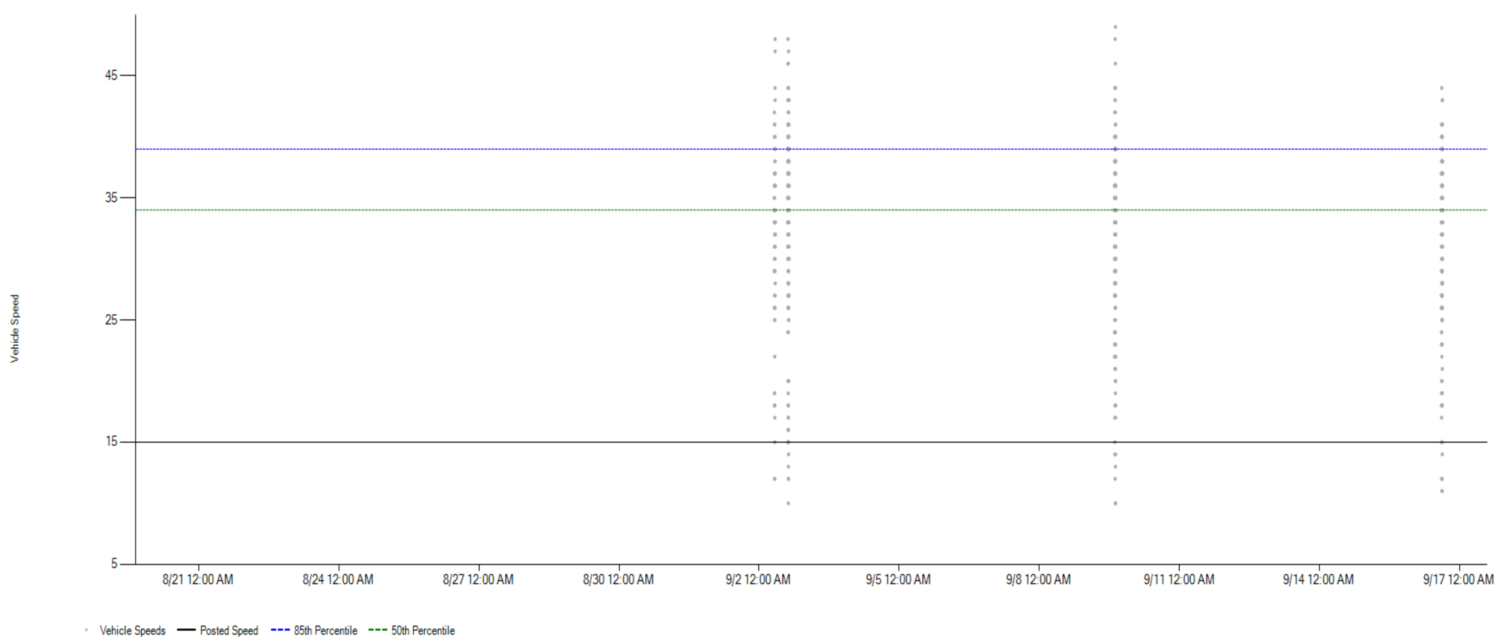


carmanah®

Report Date: 1/13/2020

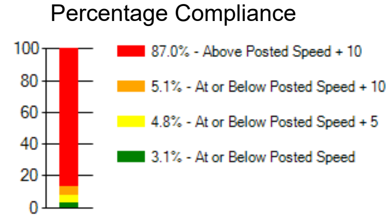
Vehicle Speed Report

Data File: Fairview Dr Northbound Dec-12-19 14;42.csv
Date Range: 8/19/19 3:38 PM to 9/17/19 2:13 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	831
Average daily volume:	277
Posted speed:	15
Average speed:	32.4
Percentiles:	
85th	39
50th	34

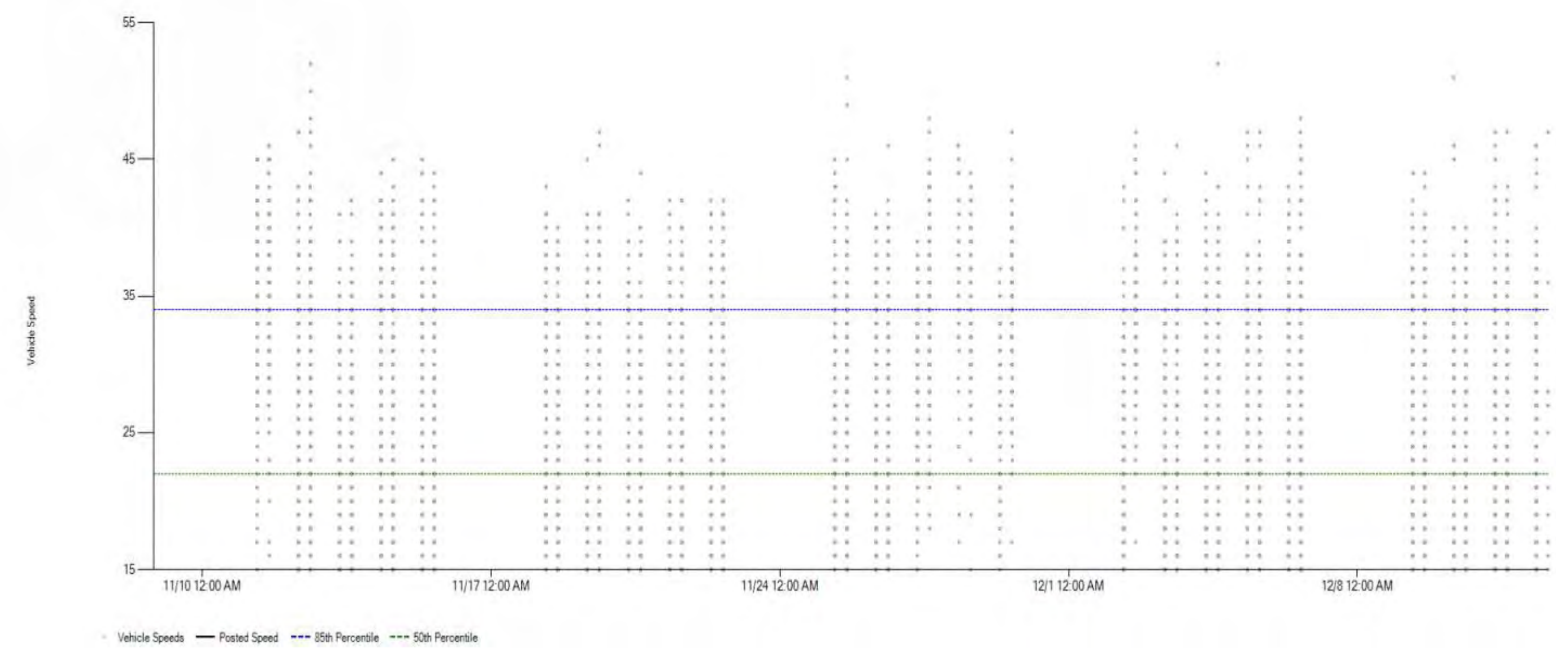
Percentage Compliance



Report Date: 1/13/2020

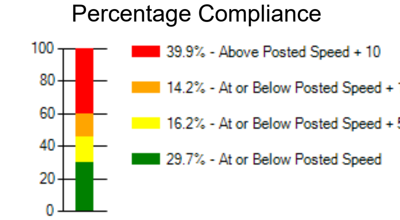
Vehicle Speed Report

Data File: Fairview Dr Southbound Dec-12-19 14;47.csv
Date Range: 11/8/19 8:00 PM to 12/12/19 2:46 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	10905
Average daily volume:	454
Posted speed:	15
Average speed:	22.3
Percentiles:	
85th	34
50th	22

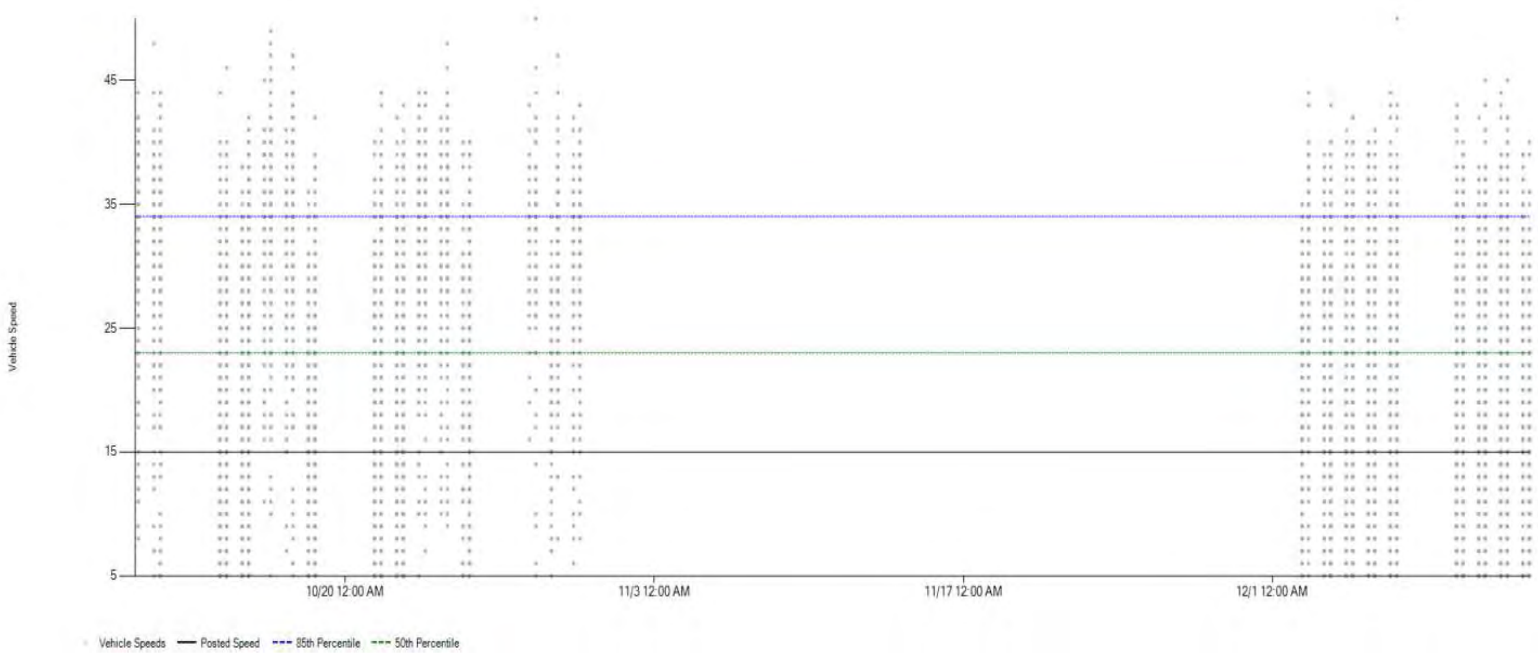
Percentage Compliance



Report Date: 1/13/2020

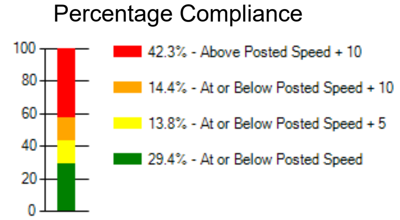
Vehicle Speed Report

Data File: S Fremont Northbound Dec-12-19 15;10.csv
Date Range: 10/10/19 12:00 PM to 12/12/19 3:10 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	10719
Average daily volume:	446
Posted speed:	15
Average speed:	22.4
Percentiles:	
85th	34
50th	23

Percentage Compliance

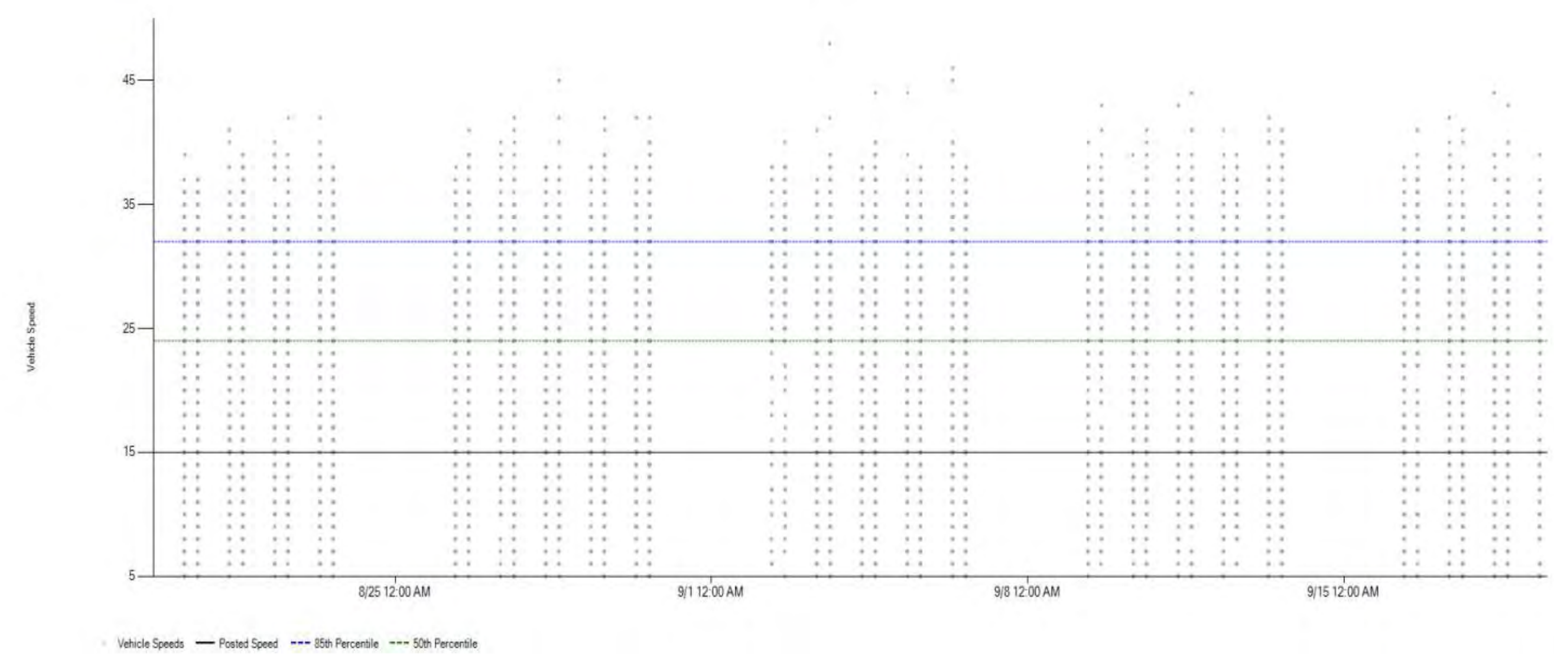


carmanah®

Report Date: 1/13/2020

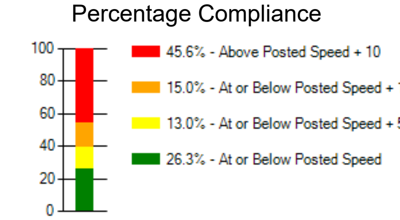
Vehicle Speed Report

Data File: Fremont Southbound Dec-12-19 14;49.csv
Date Range: 8/19/19 3:44 PM to 9/19/19 11:48 AM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	10535
Average daily volume:	458
Posted speed:	15
Average speed:	22.8
Percentiles:	
85th	32
50th	24

Percentage Compliance

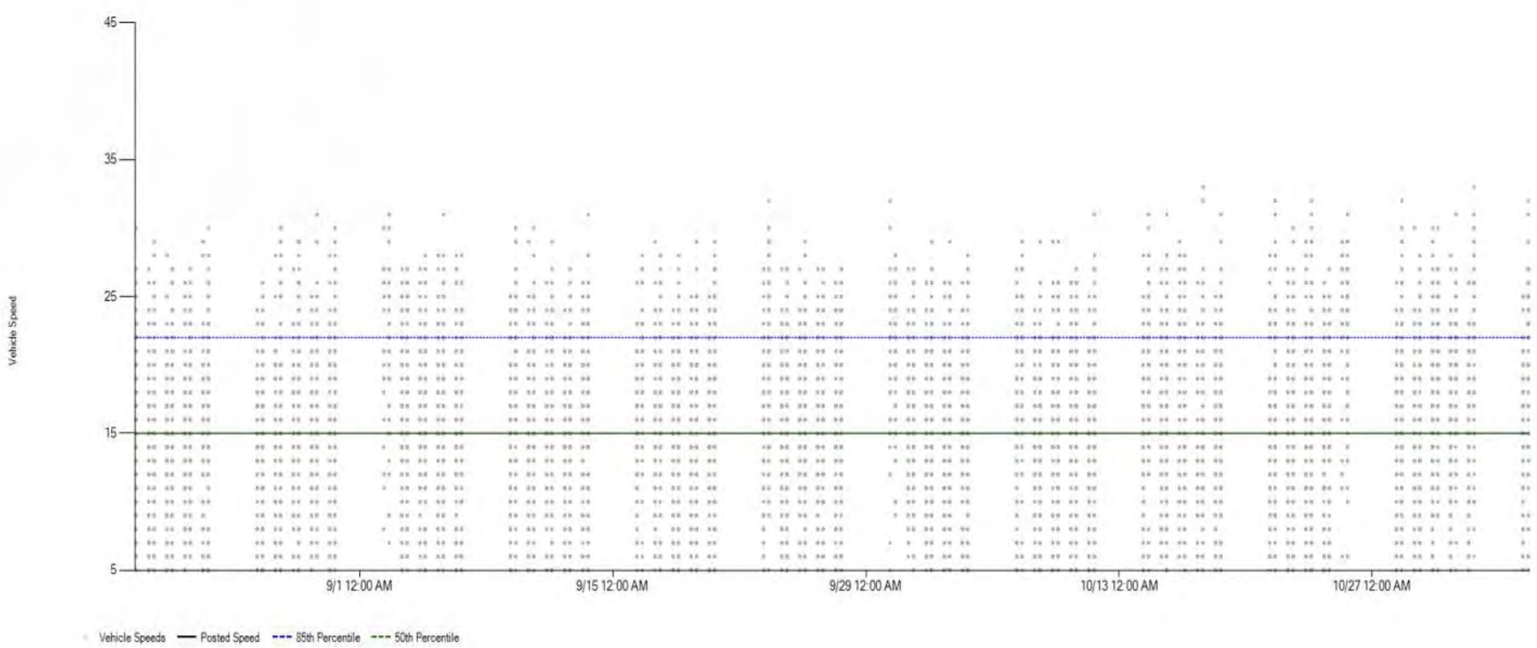


carmanah®

Report Date: 1/13/2020

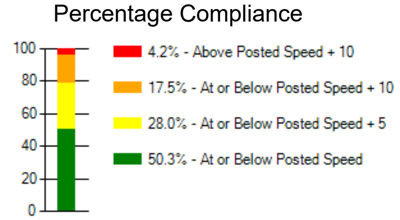
Vehicle Speed Report

Data File: Fritsch Northbound Dec-12-19 15;31.csv
Date Range: 8/19/19 2:14 PM to 11/4/19 4:04 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	11023
Average daily volume:	196
Posted speed:	15
Average speed:	15.4
Percentiles:	
85th	22
50th	15

Percentage Compliance

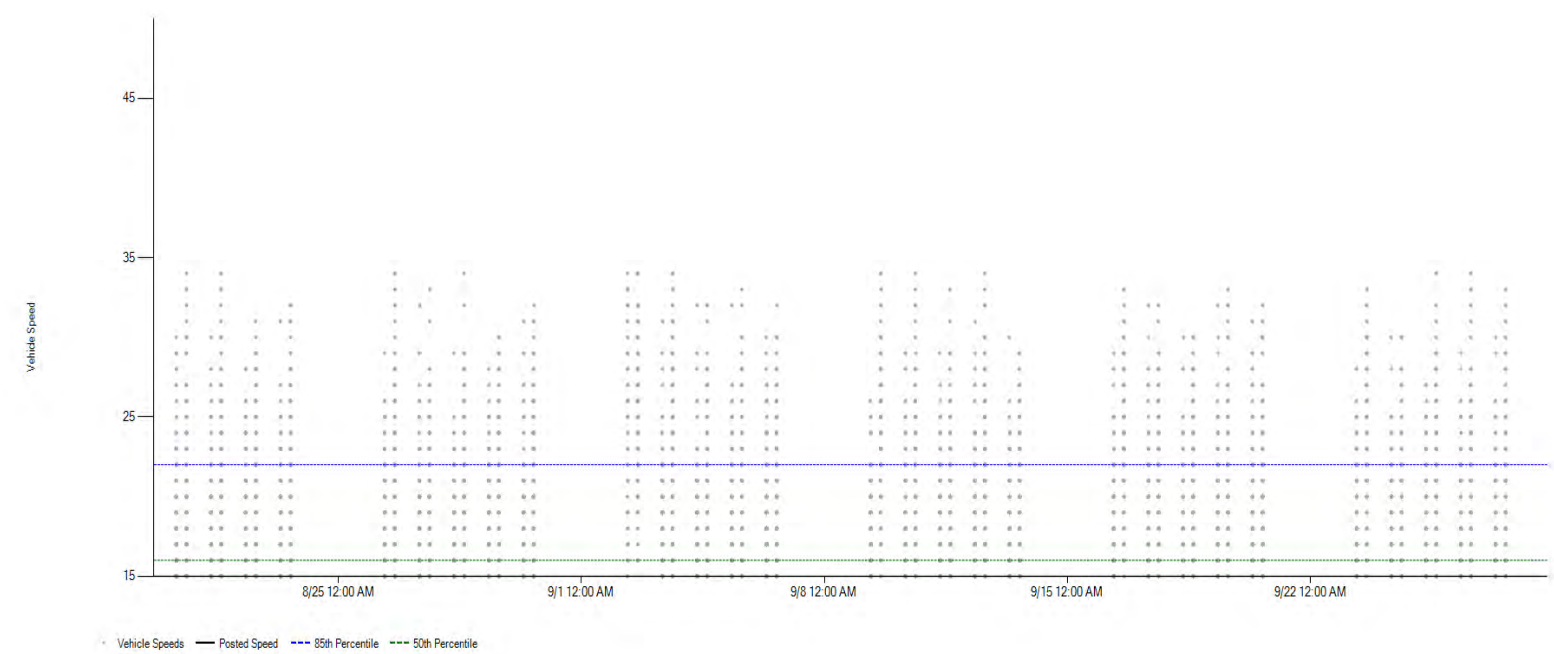


carmanah®

Report Date: 1/13/2020

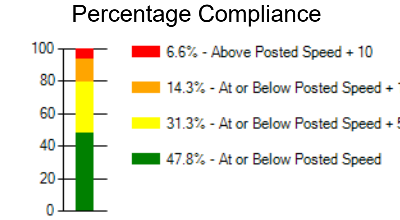
Vehicle Speed Report

Data File: S Seeliger Northbound Dec-12-19 15;21.csv
Date Range: 8/19/19 4:26 PM to 9/28/19 7:37 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	14672
Average daily volume:	505
Posted speed:	15
Average speed:	16.1
Percentiles:	
85th	22
50th	16

Percentage Compliance

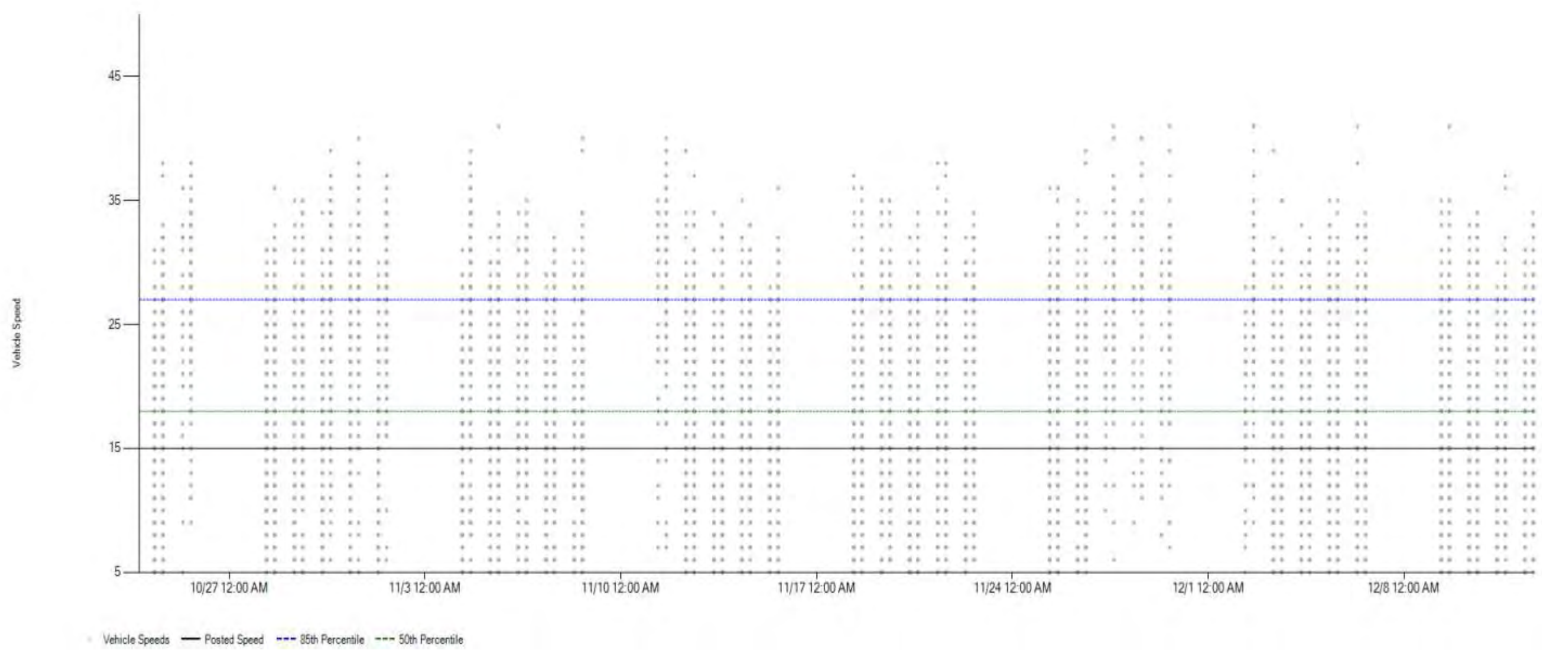


carmanah®

Report Date: 1/13/2020

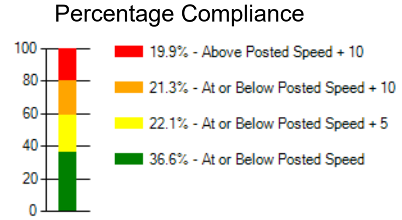
Vehicle Speed Report

Data File: N Seeliger Southbound Dec-12-19 15;11.csv
Date Range: 10/23/19 7:00 PM to 12/12/19 3:11 PM
Included days: Monday, Tuesday, Wednesday, Thursday, Friday
Included hours: 07:45:00 to 08:15:00, 14:45:00 to 15:15:00
Excluded speeds greater/less than: 3 std. deviations from average



Number of data points:	11955
Average daily volume:	332
Posted speed:	15
Average speed:	18.6
Percentiles:	
85th	27
50th	18

Percentage Compliance



carmanah®

Report Date: 1/13/2020

Appendix E
Crash History Maps

HEADWAY TRANSPORTATION

Appendix E: Crash History Maps

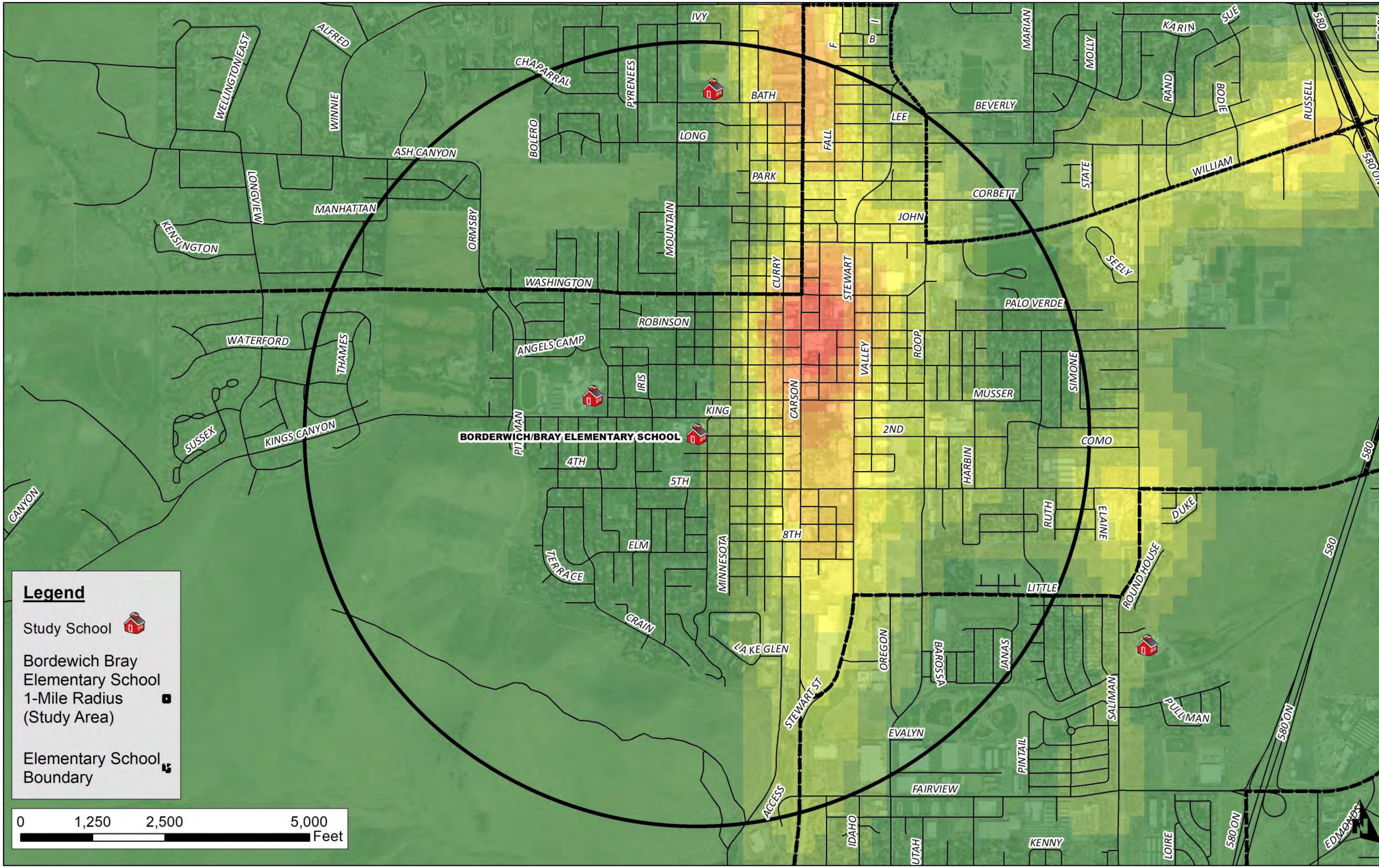
An extended Table 1, below, from page 2-2 represents Top Ten Pedestrian/ Bicyclist Crash Corridors during School Hours with the addition of contributing factors, severity and crash types. Analyzing contributing factors, severity and crash types points to mitigating engineering solutions to increase safety in school zones.

The following maps illustrate fatal and injurious hot spots and individual pedestrian and bicyclist crash locations with severity and crash type centered around elementary and middle schools in Carson City.

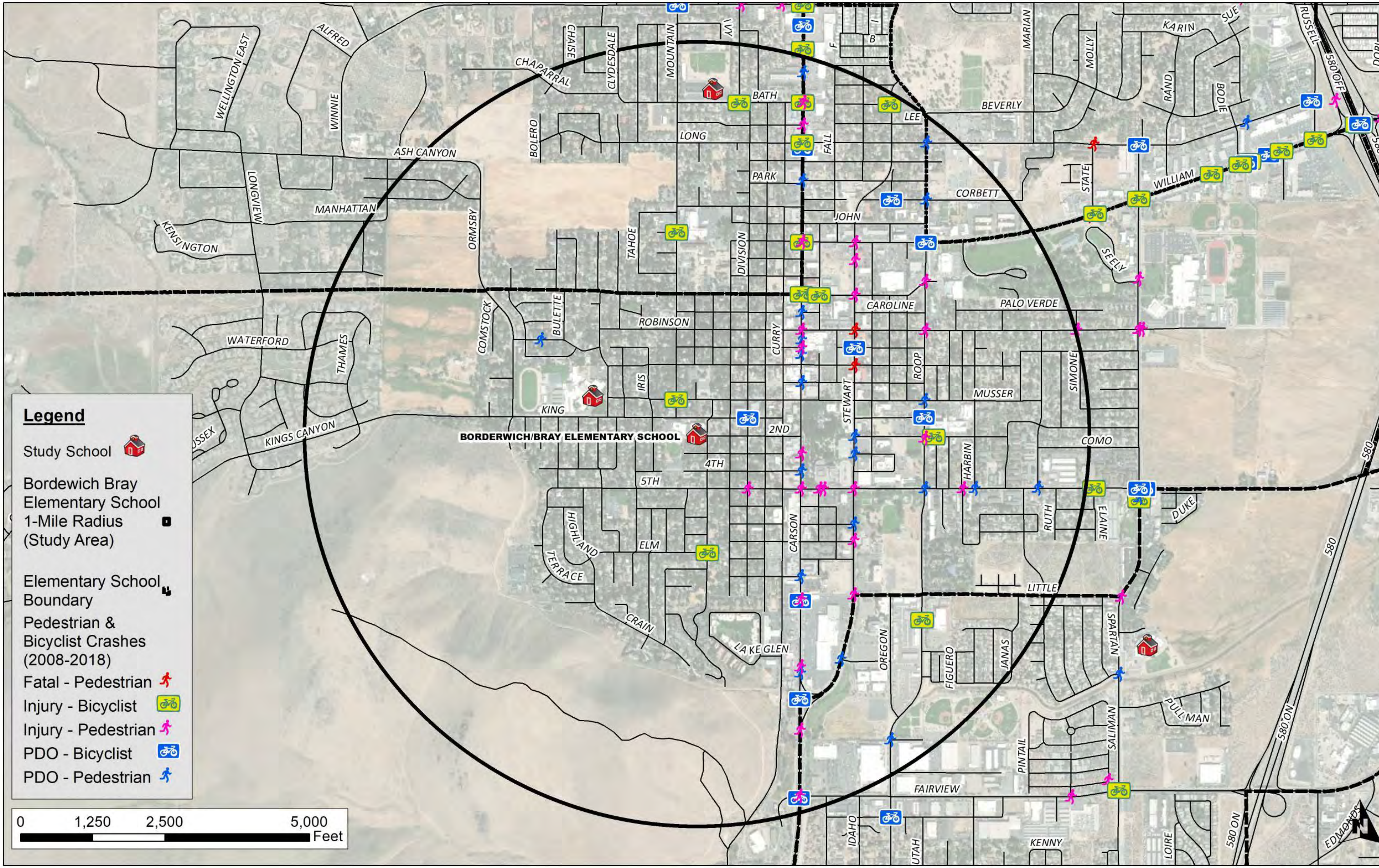
Corridor	Crashes	Contributing Factors	Severity	Crash Types
1. Carson Street	45	Speed, Inattention/ Distracted, Improper Driving, Fell Asleep, Drinking, Drugs, Impairment, Obstructed view	1 Fatality, Injuries, PDO *	Rear End, Angle, Side Swipe, Non- Collision, Pedestrian, Bicyclist
2. William Street/ US 50	25	Speed, Inattention/ Distracted, Improper Driving, Fell Asleep, Drinking, Drugs, Impairment, Obstructed view	2 Fatalities, Injuries, PDO	Rear End, Angle, Side Swipe, Non- Collision, Backing, Head-On, Bicyclist, Pedestrian
3. S. Roop Street	13	Fell, Asleep, Inattention/ Distracted, Drinking, Speed	Injuries, PDO	Rear End, Angle, Side Swipe, Head-On, Pedestrian, Bicyclist
4. S. Saliman Street	12	Inattention/ Distracted, Improper Driving, Fell Asleep, Drinking, Impairment, Obstructed view	Injuries, PDO	Rear End, Angle, Side Swipe, Head-On, Non-collision, Pedestrian, Bicyclist
5. S. Stewart Street	11	Fell asleep, Physical impairment, Inattention/ Distracted, Speed, Erratic, careless driving	2 Fatalities, Injuries, PDO	Rear End, Angle, Side Swipe, Head-On, Non-collision, Pedestrian, Bicyclist
6. W. 5th Street	10	Speed, Follow too closely, disregarded traffic signs, unsafe backing	Injuries, PDO	Rear End, Angle, Pedestrian
7. Fairview Drive	9	Speed, Inattention/ Distracted, Improper Driving, Fell Asleep, Drinking, Drugs, Impairment	Injuries, PDO	Rear End, Angle, Side Swipe, Non- Collision, Pedestrian, Bicyclist
8. E. College Parkway	6	Inattention/ Distracted, Improper Driving, Fell Asleep, Drinking, Illness, Speed, Follow too closely	Injuries, PDO	Rear End, Angle, Side Swipe, Non- Collision, Backing, Head-On, Pedestrian, Bicyclist
9. SR 529	5	Inattention/ Distracted, Speed, Improper Driving, Fell Asleep, Drinking, Physical impairment	Injuries, PDO	Rear End, Angle, Side Swipe, Non- Collision, Backing, Head-On, Rear to Rear, Pedestrian, Bicyclist
10. W. Robinson Street	5	Speed, Improper turn, unsafe backing, fail to yield right of way	Injuries, PDO	Rear End, Angle, Side Swipe, Pedestrian

* Property Damage Only (PDO)

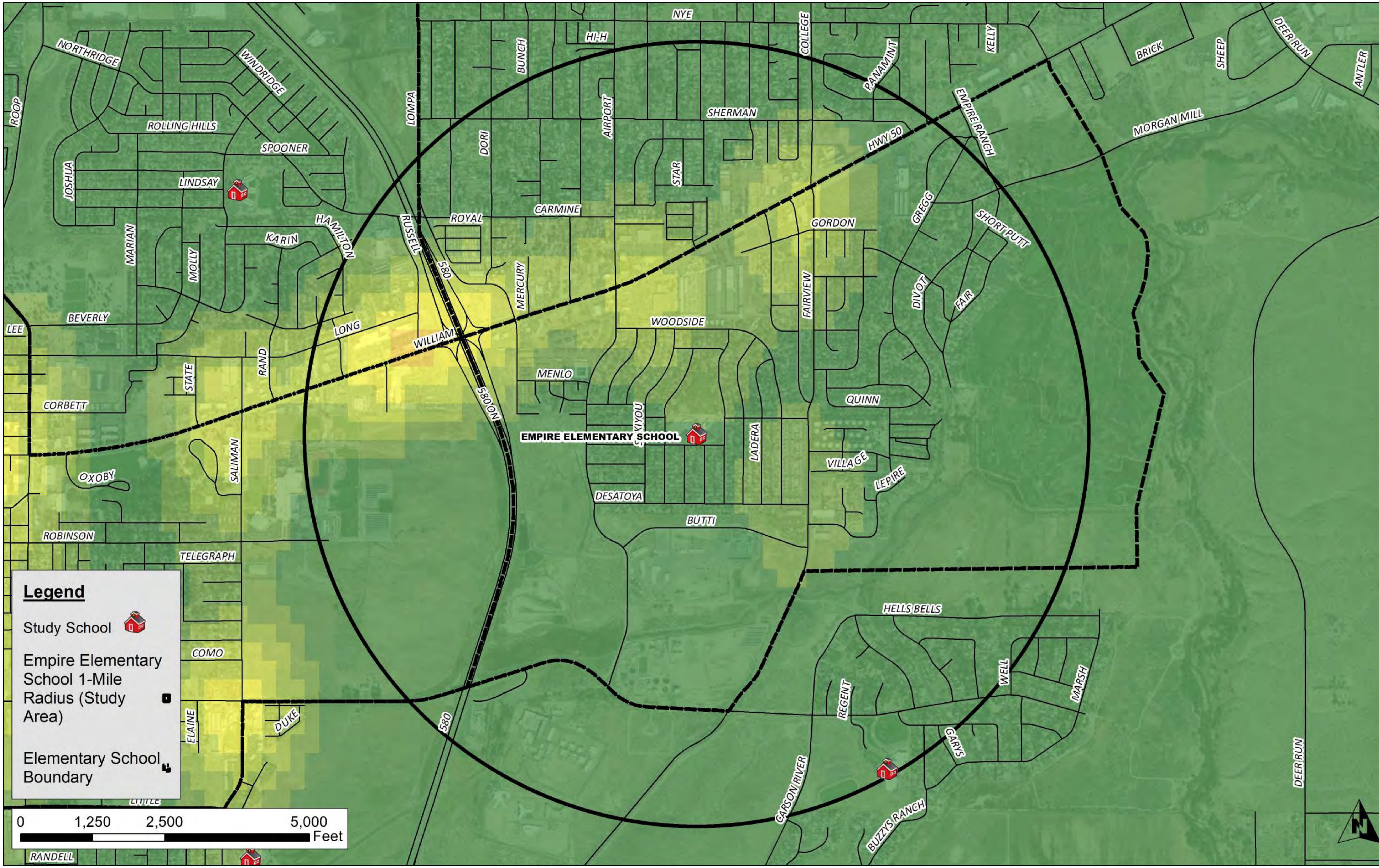
Bordewich-Bray Elementary School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)



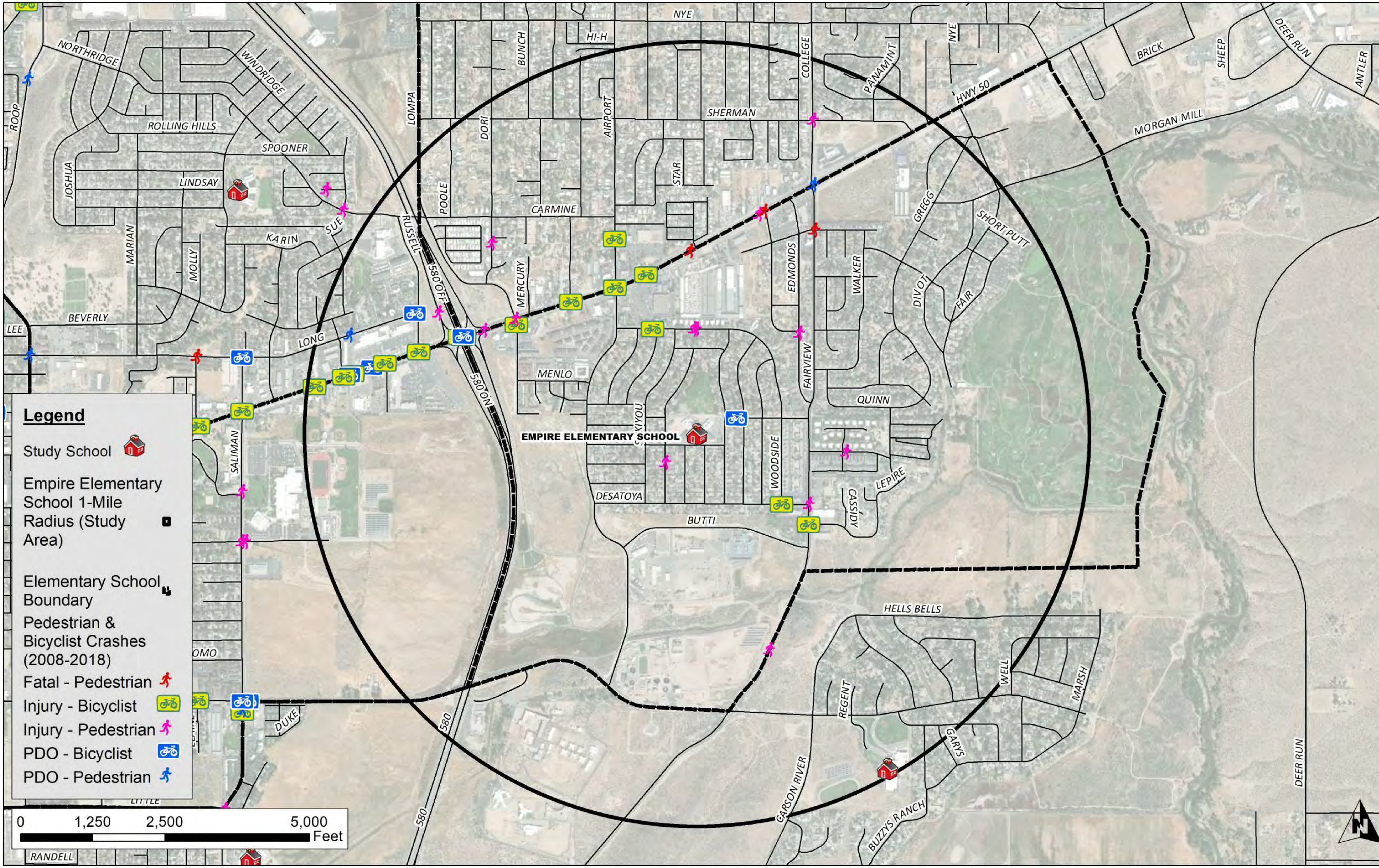
Bordewich-Bray Elementary School Bicycle & Pedestrian Crashes (2008-2018)



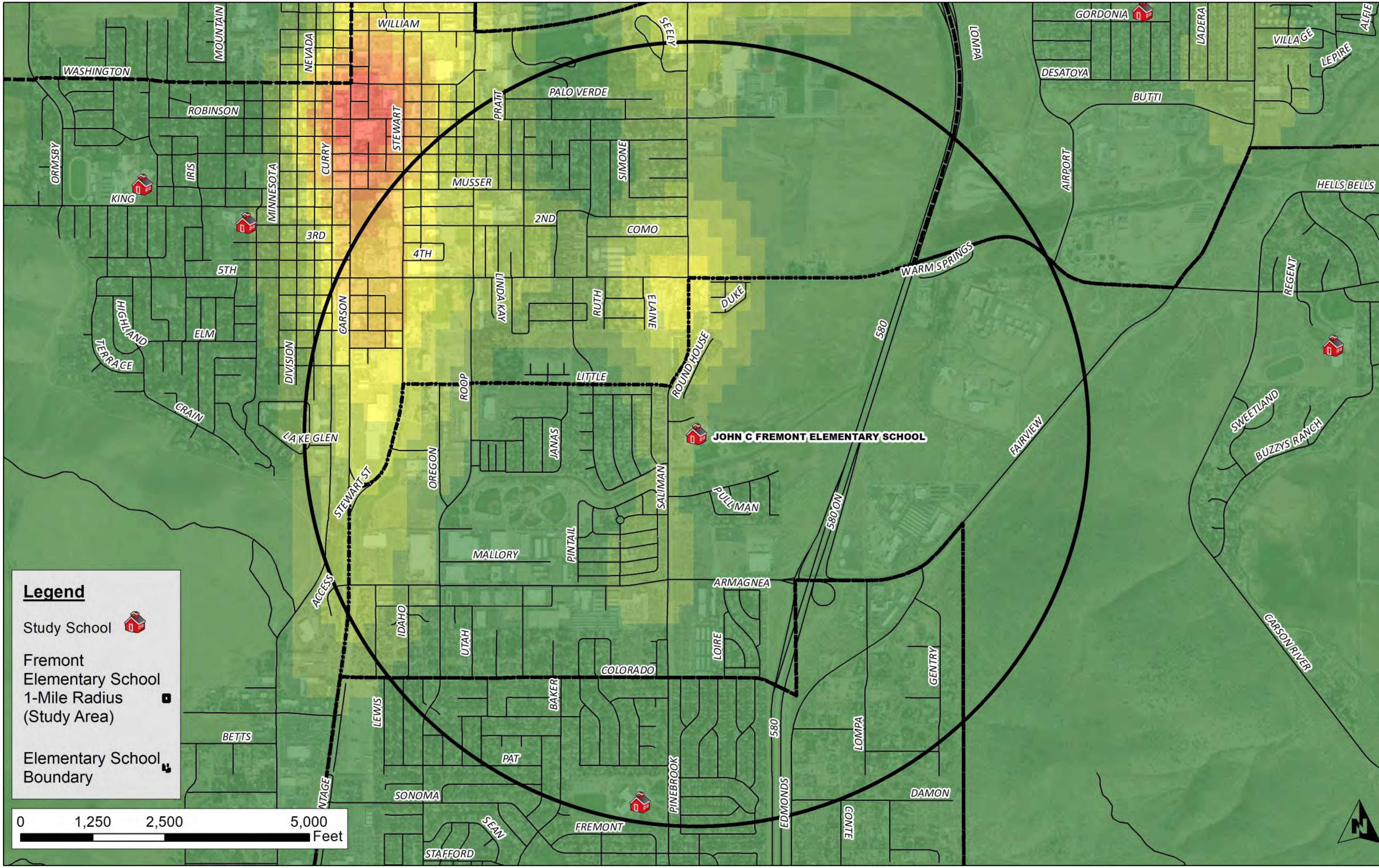
Empire Elementary School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)



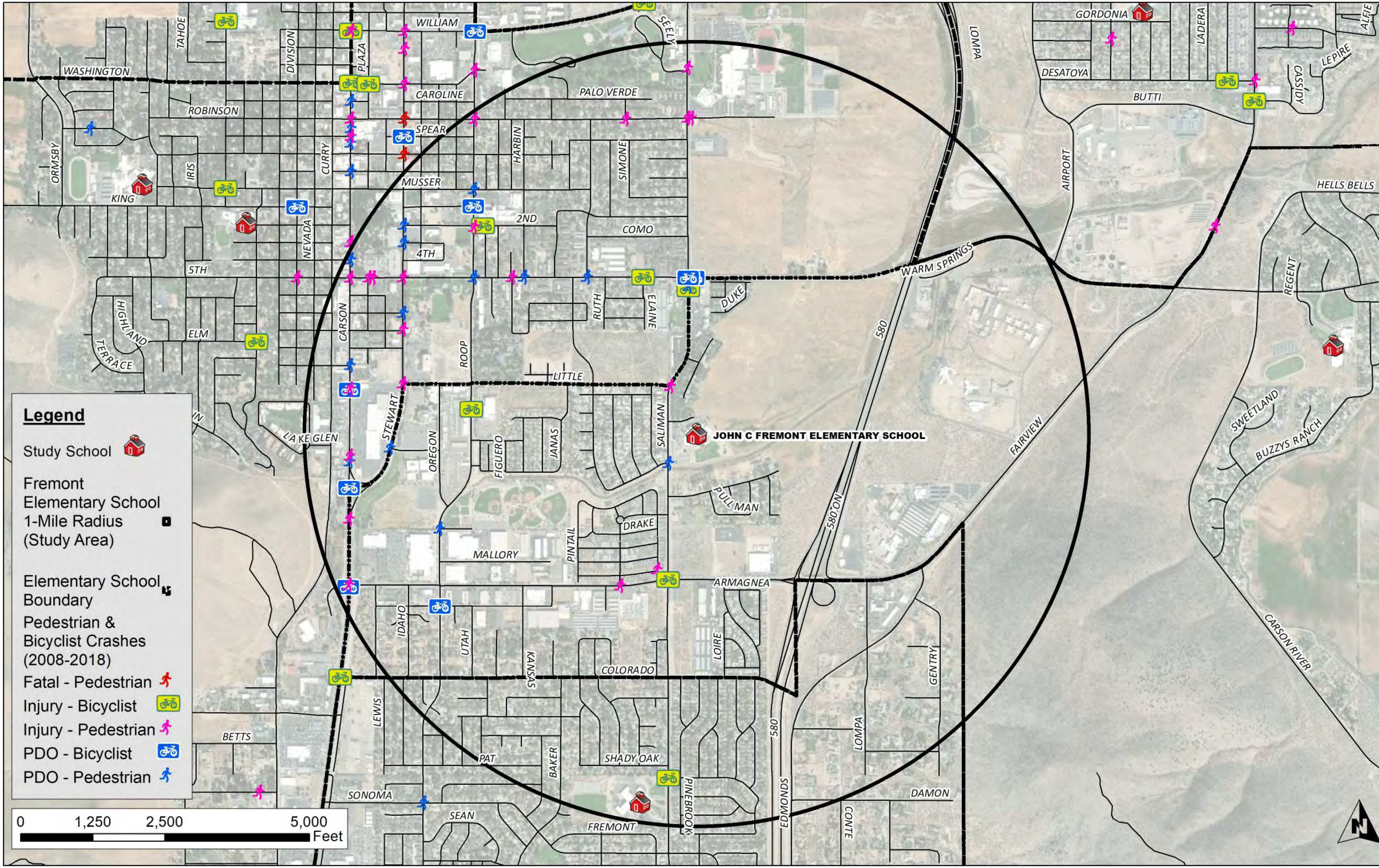
Empire Elementary School Bicycle & Pedestrian Crashes (2008-2018)



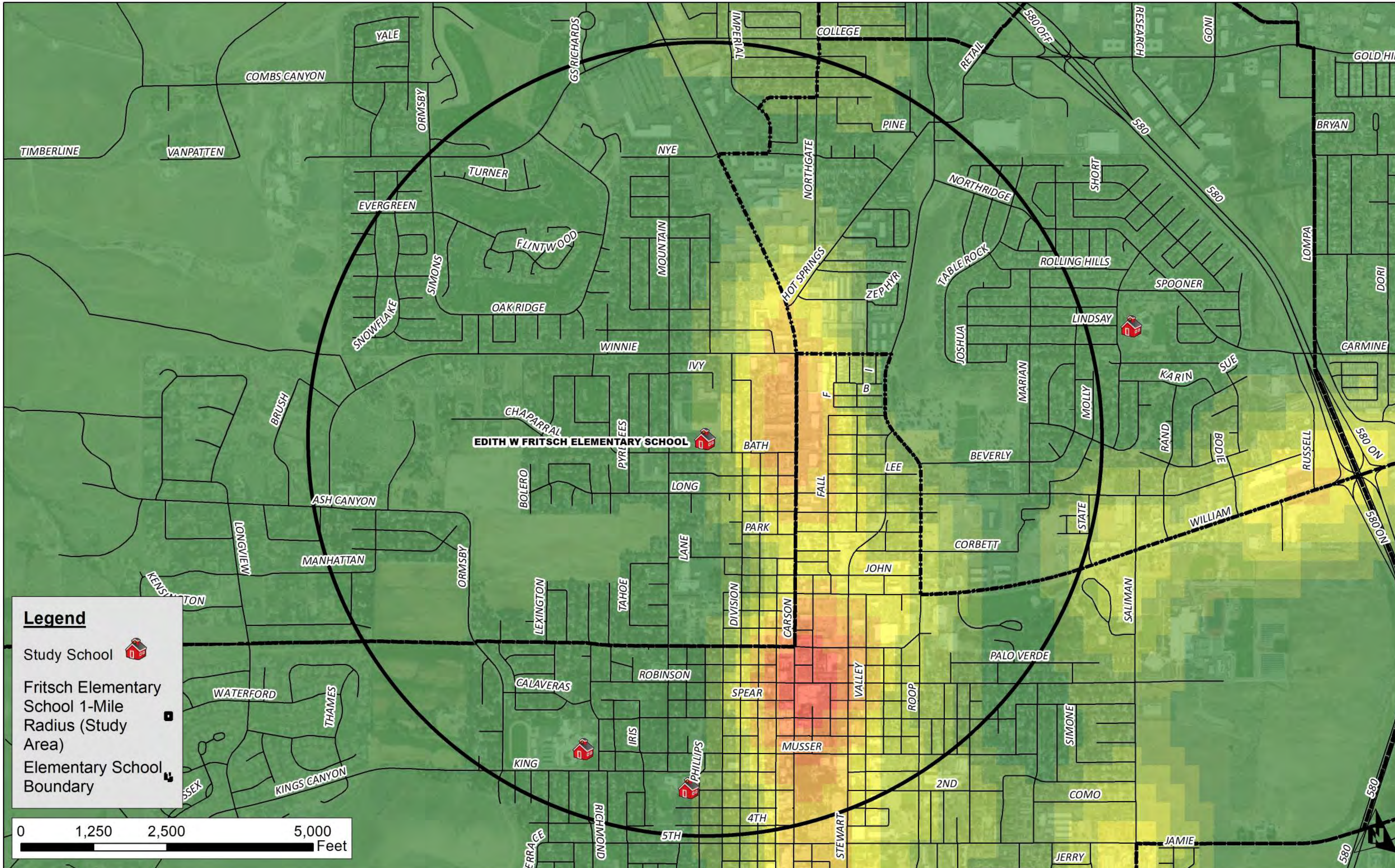
Fremont Elementary School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)



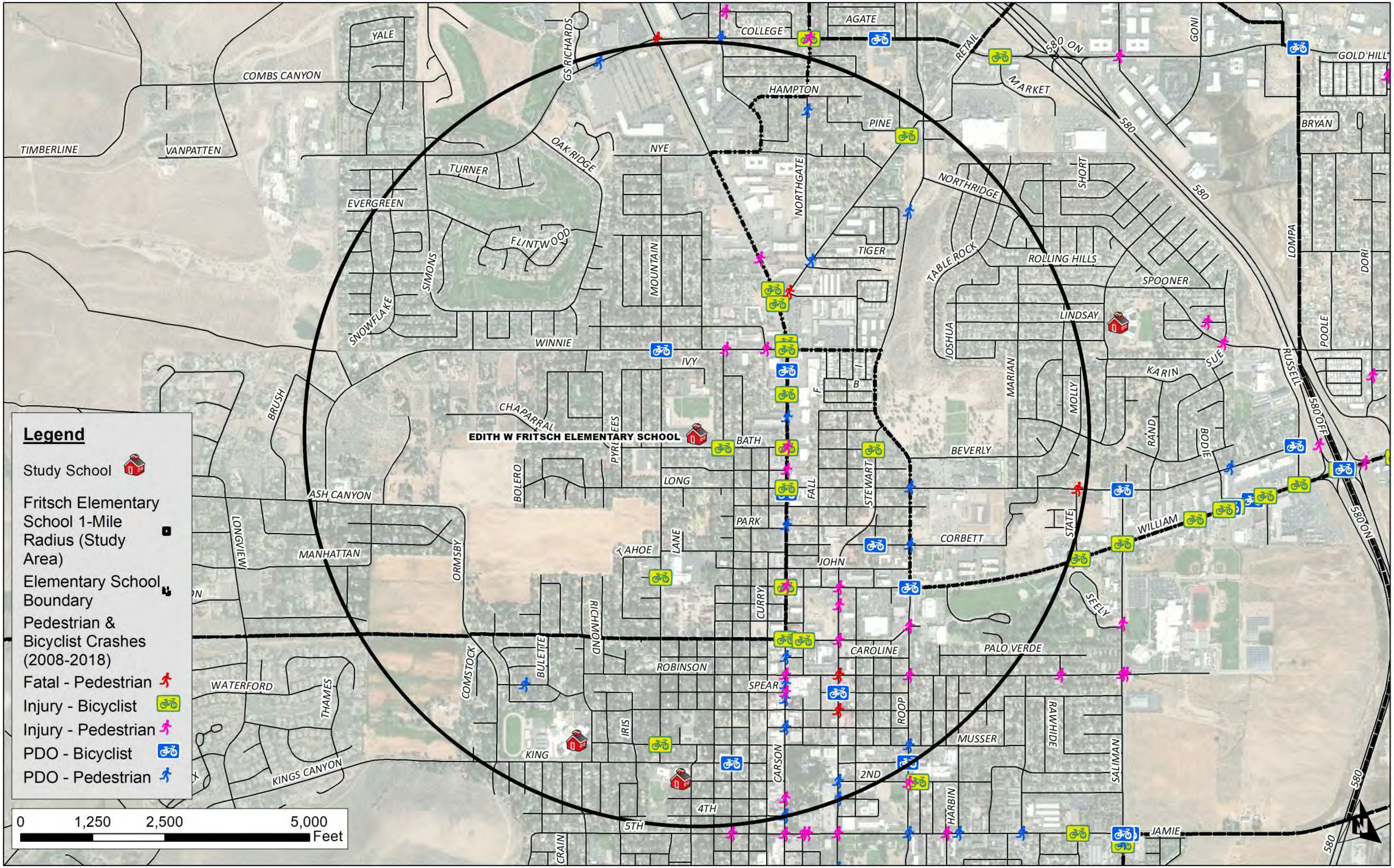
Fremont Elementary School Bicycle & Pedestrian Crashes (2008-2018)



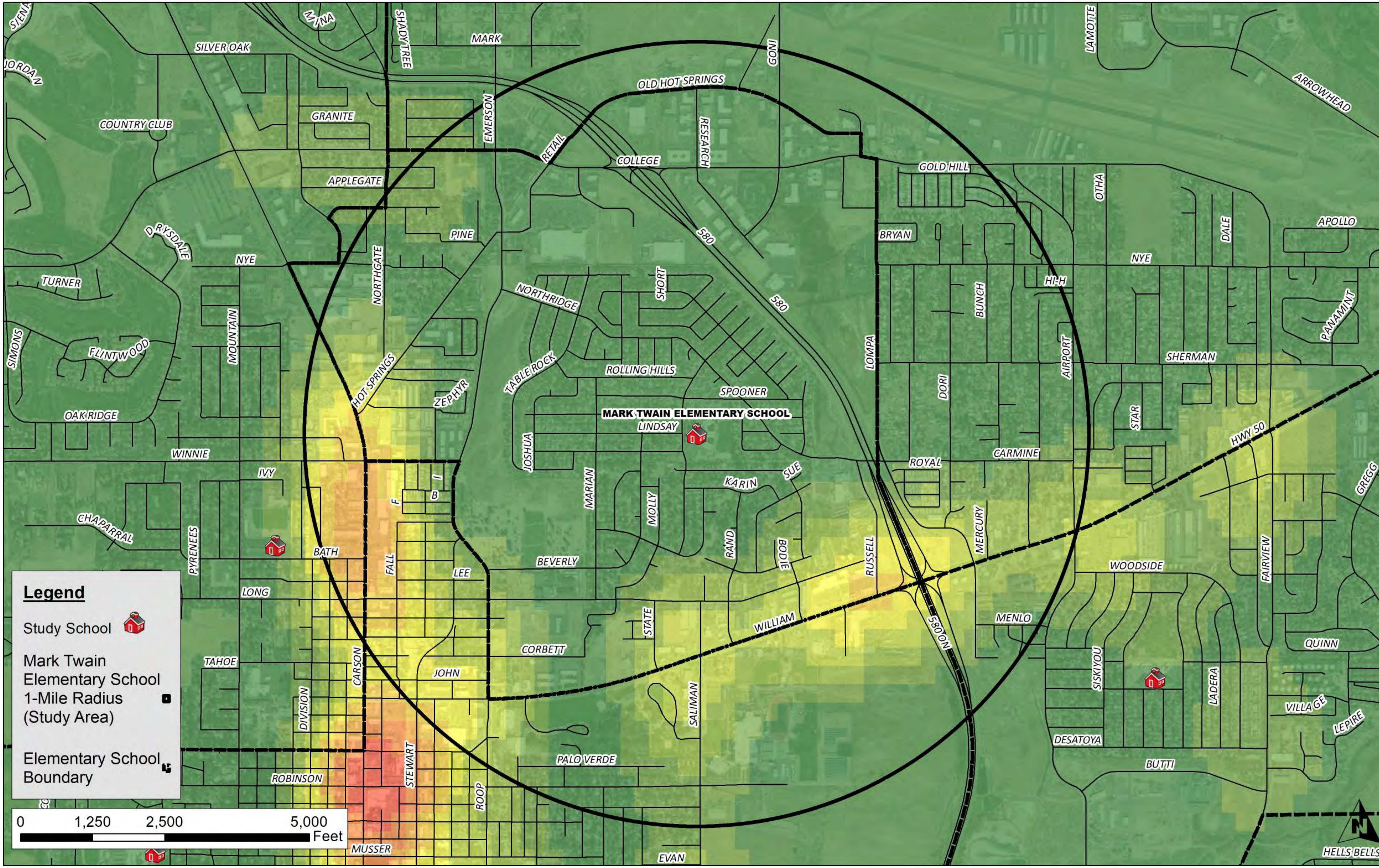
Fritsch Elementary School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)



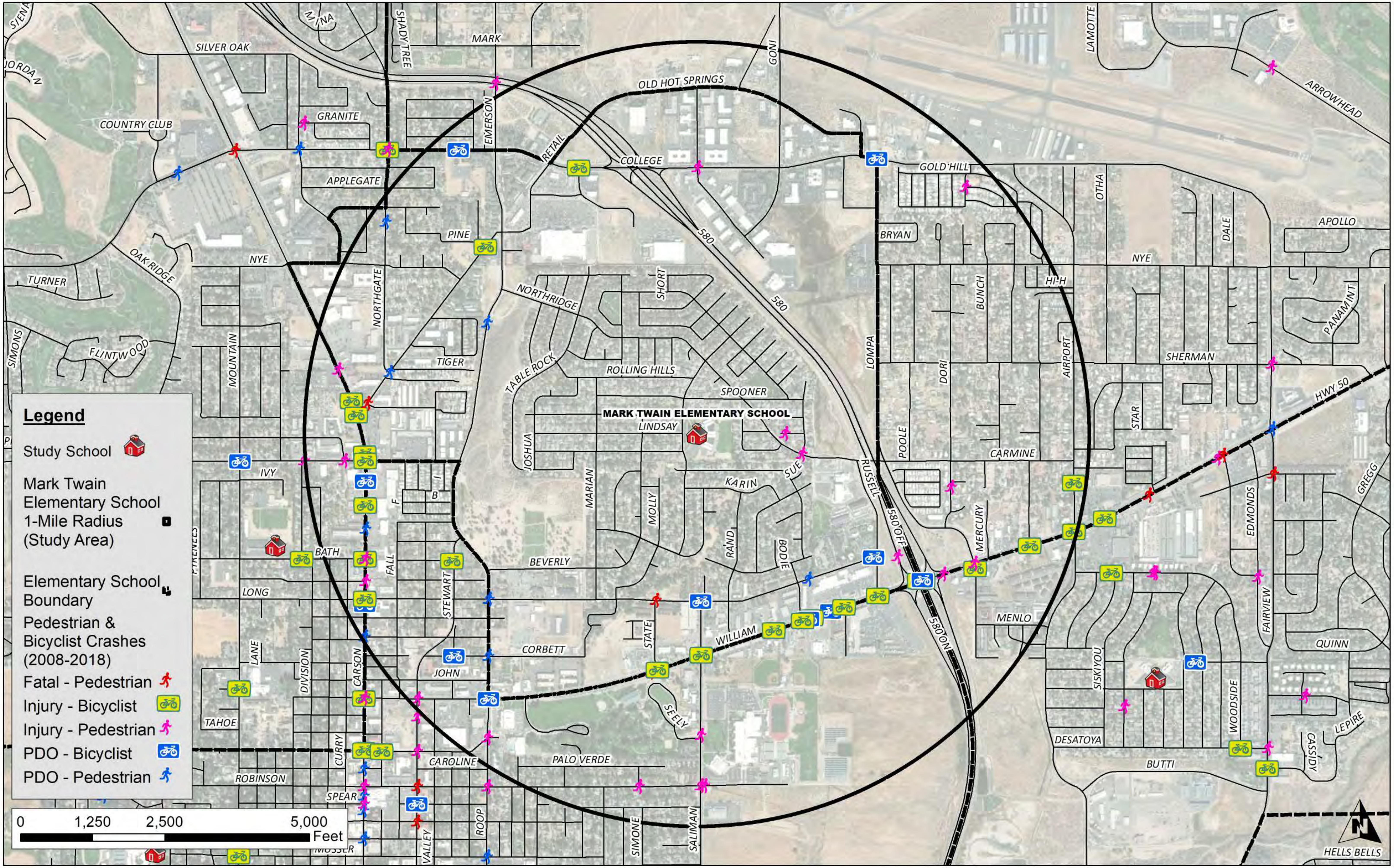
Fritsch Elementary School Bicycle & Pedestrian Crashes (2008-2018)



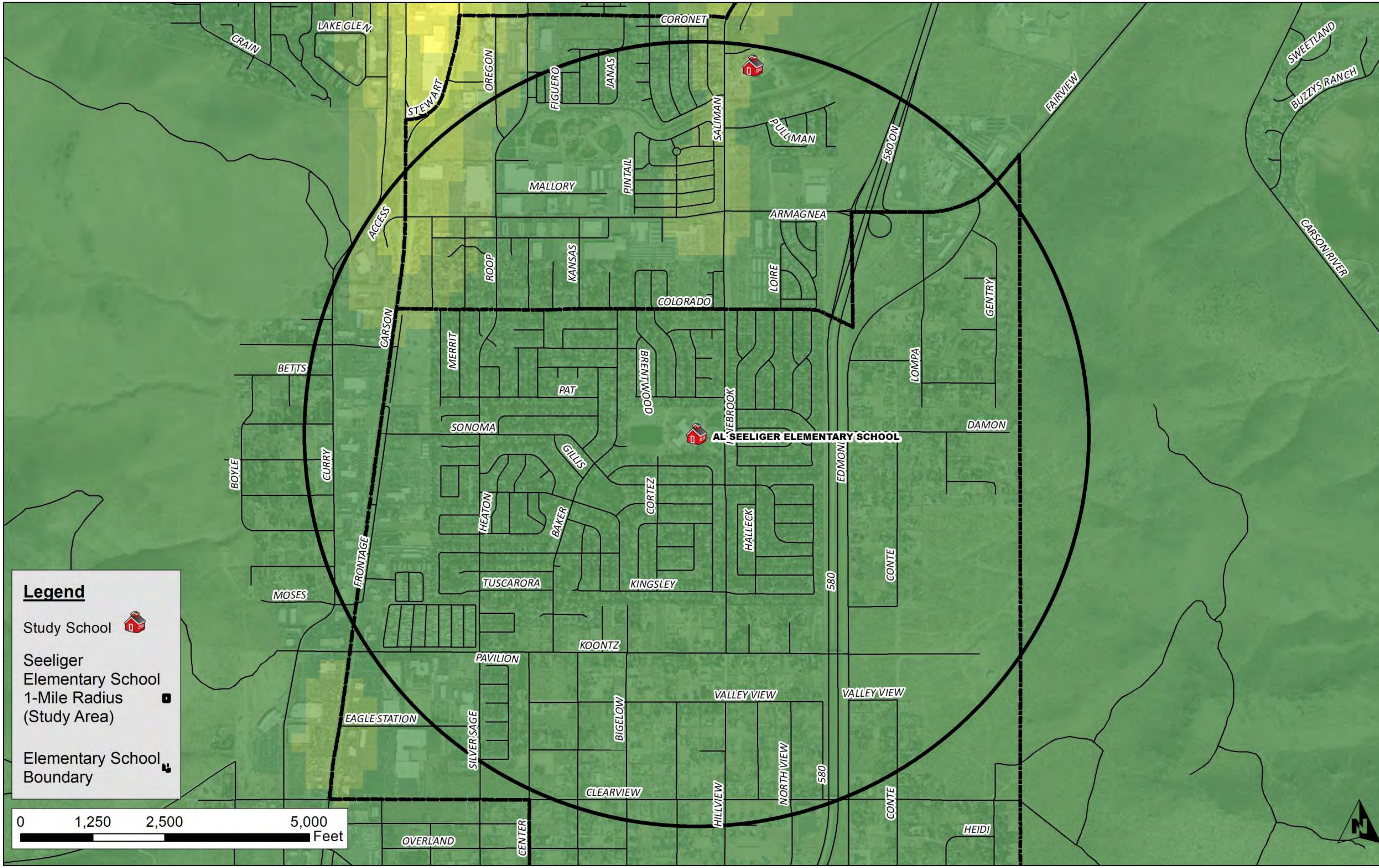
Mark Twain Elementary School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)



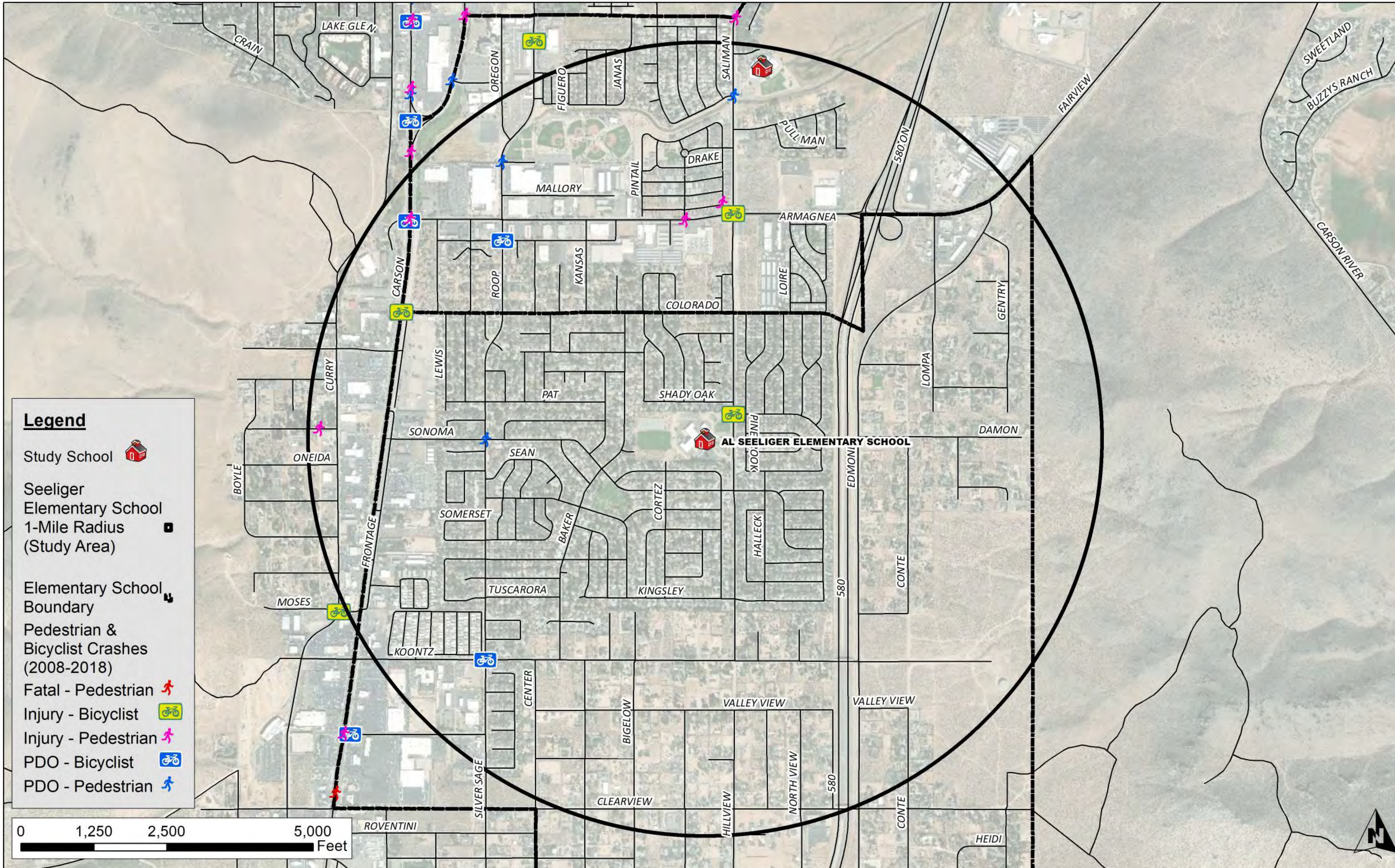
Mark Twain Elementary School Bicycle & Pedestrian Crashes (2008-2018)



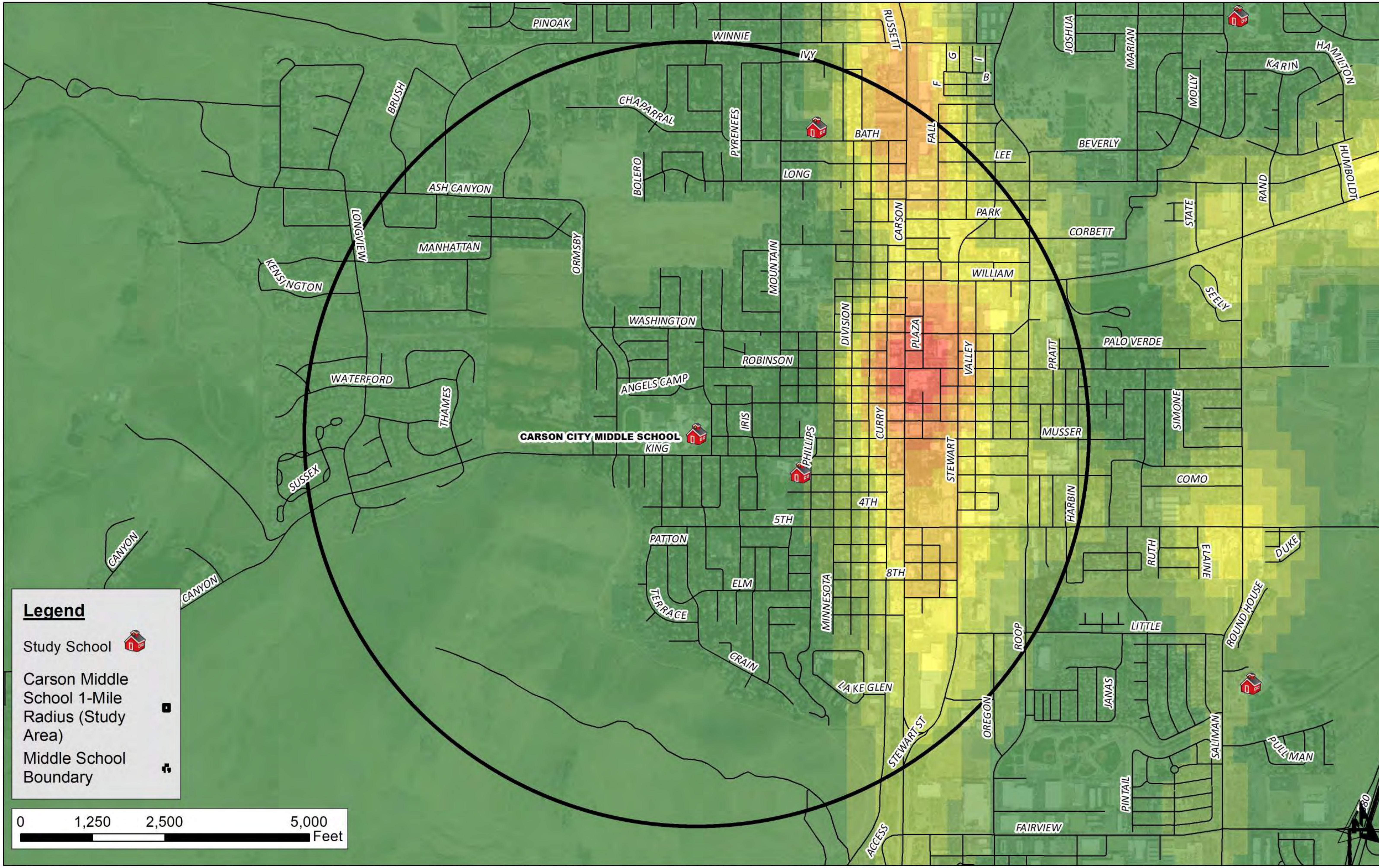
Al Seeliger Elementary School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)



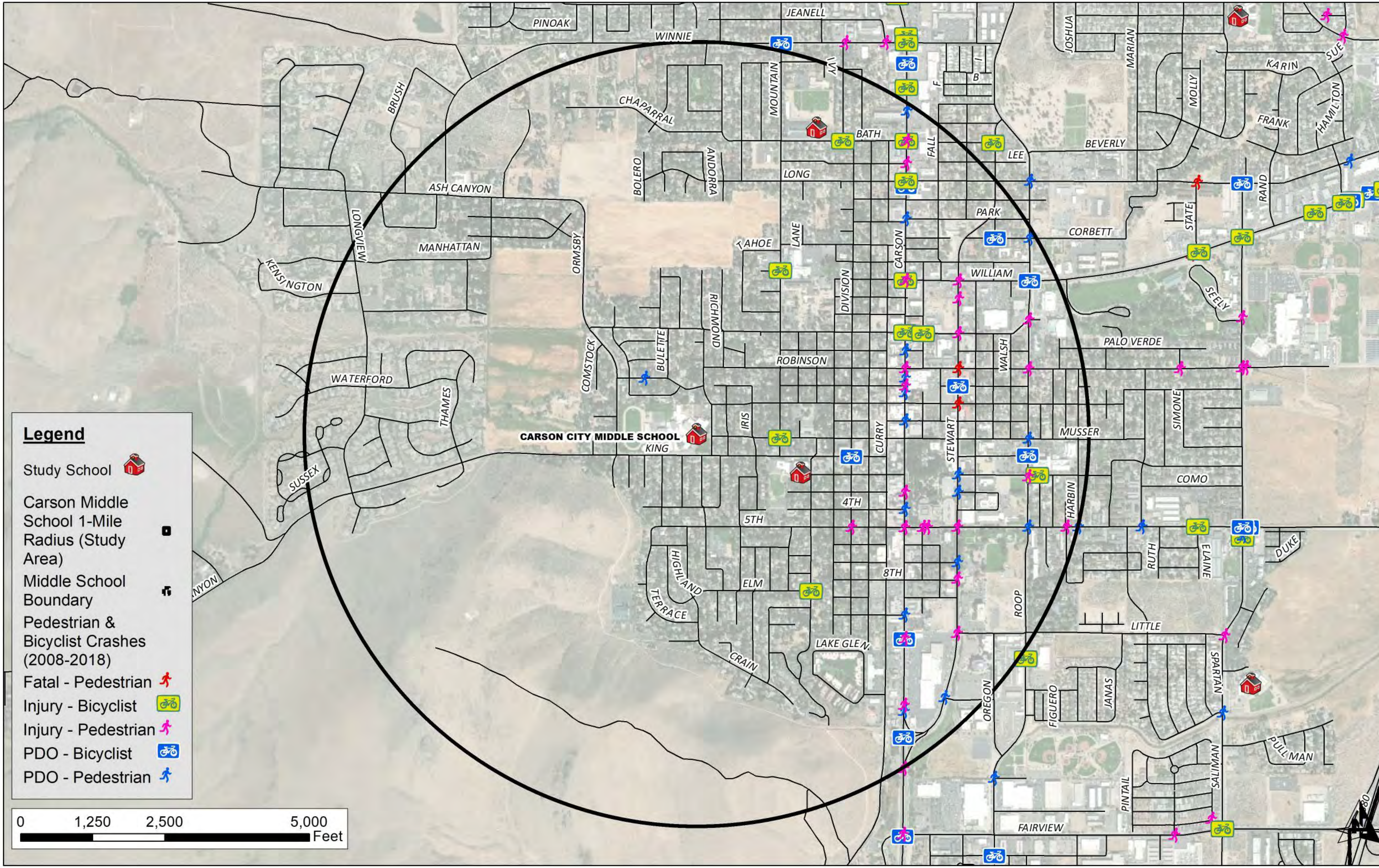
Al Seeliger Elementary School Bicycle & Pedestrian Crashes (2008-2018)



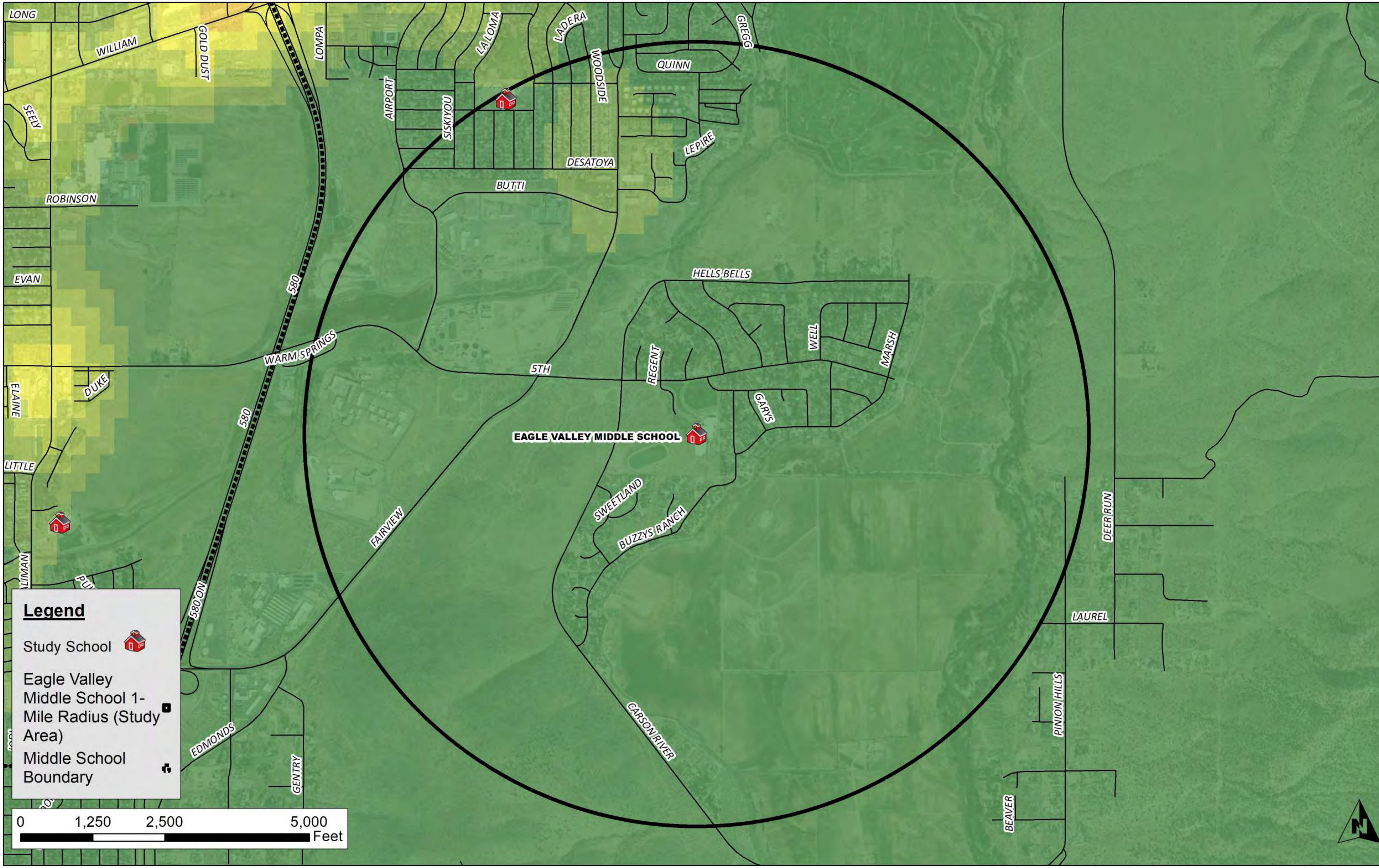
Carson Middle School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)



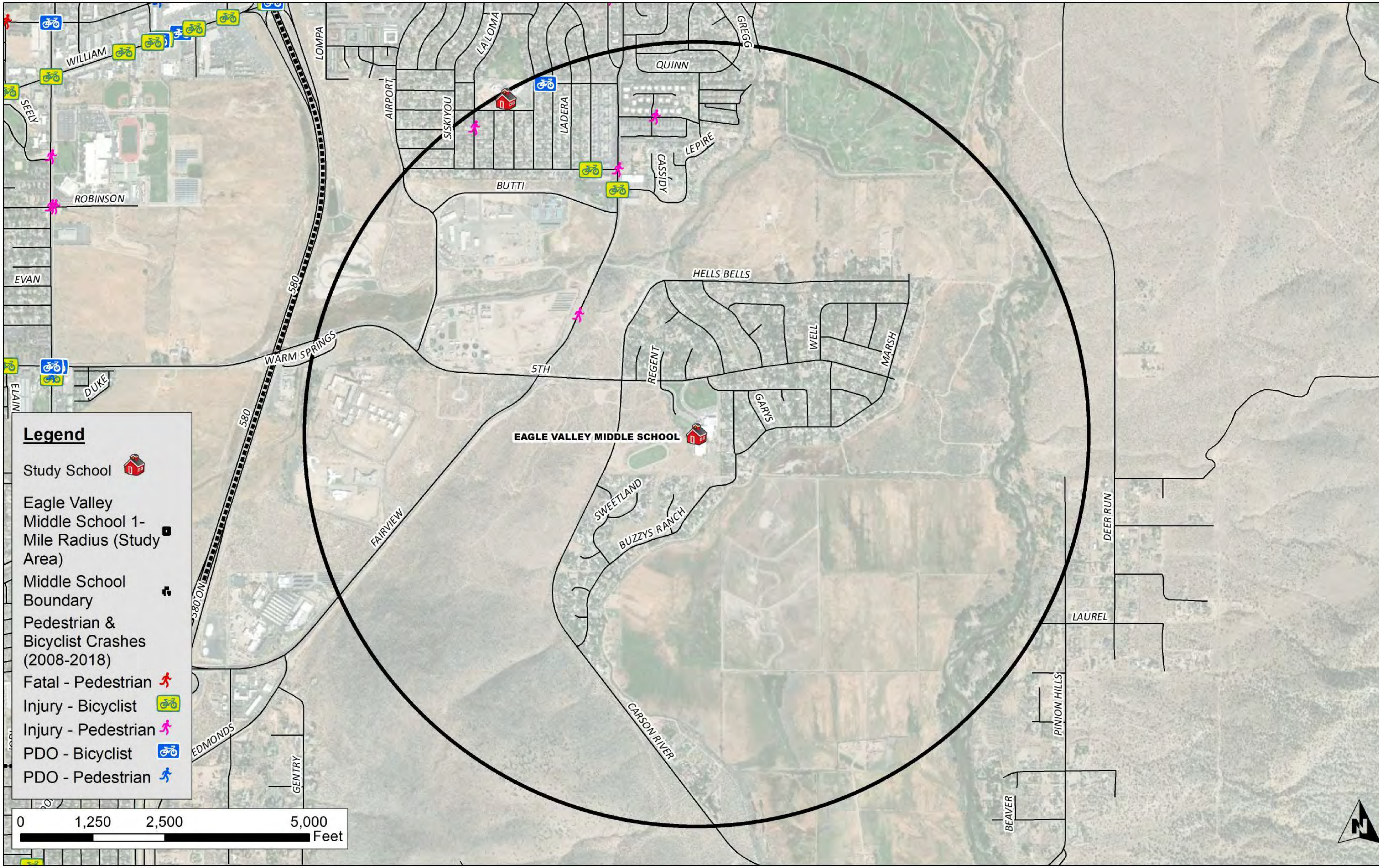
Carson Middle School Bicycle & Pedestrian Crashes (2008-2018)



Eagle Valley Middle School Bicycle & Pedestrian Fatal & Injury Crash Hot Spots (2008-2018)

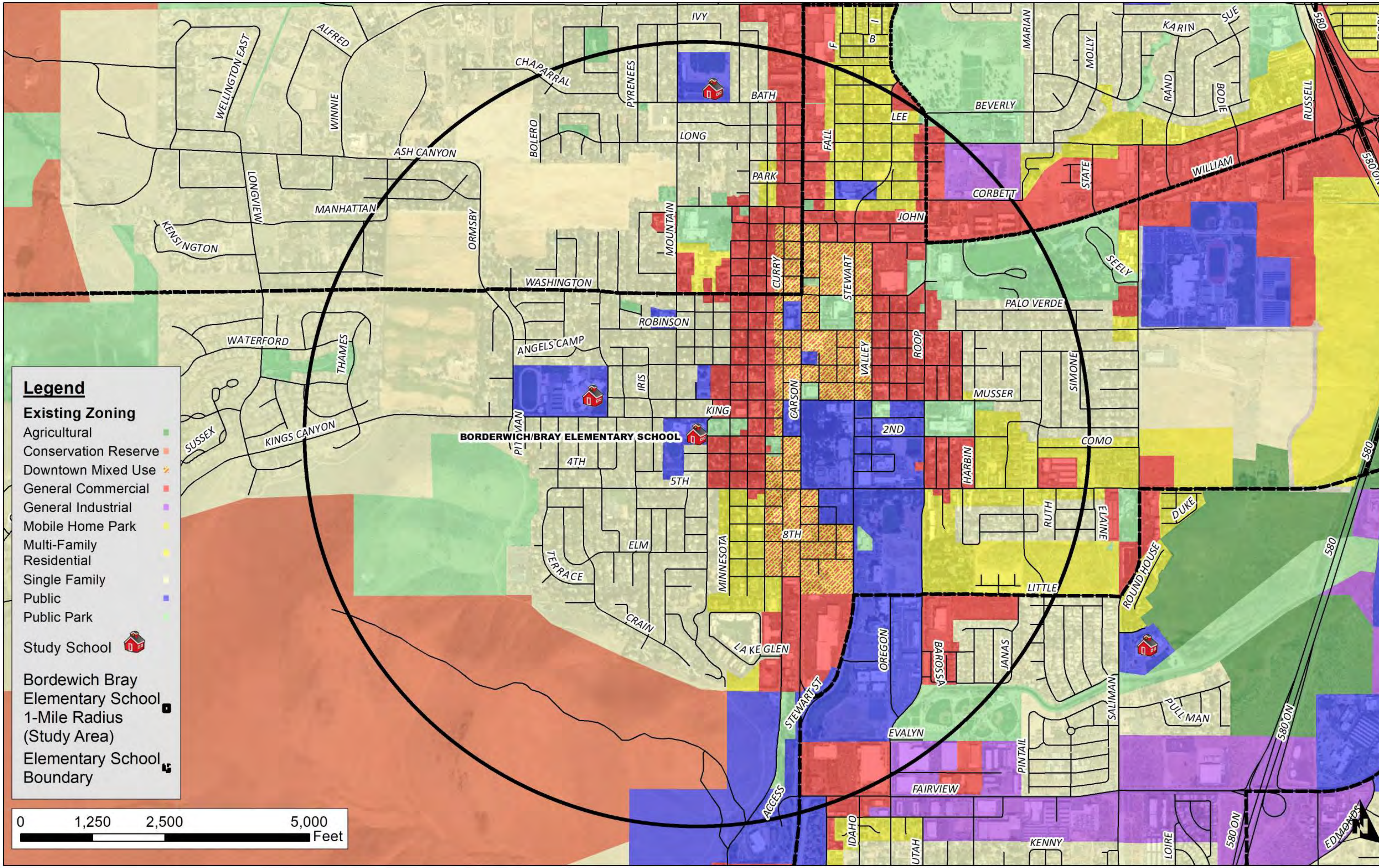


Eagle Valley Middle School Bicycle & Pedestrian Crashes (2008-2018)

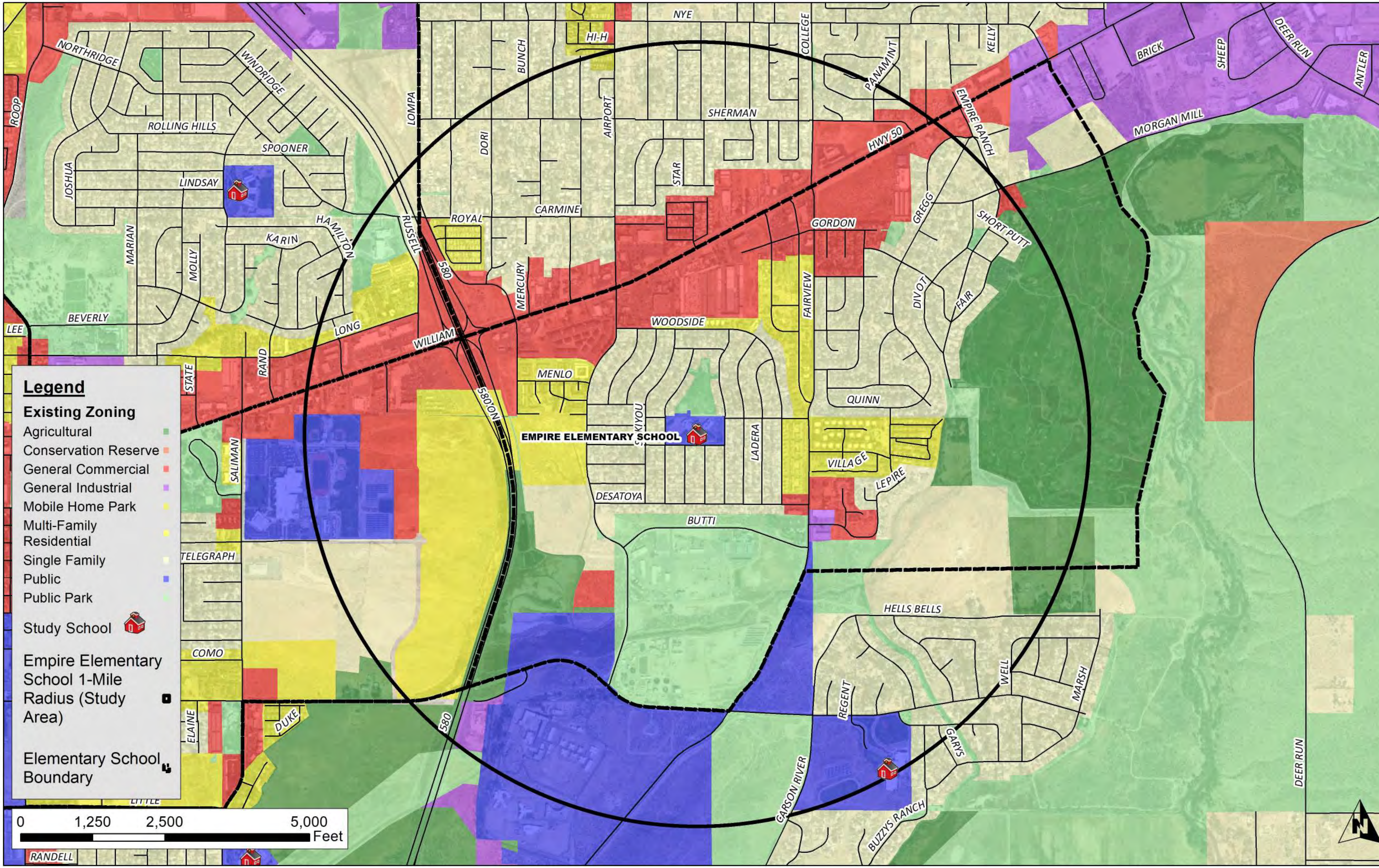


Appendix F
Zoning Maps

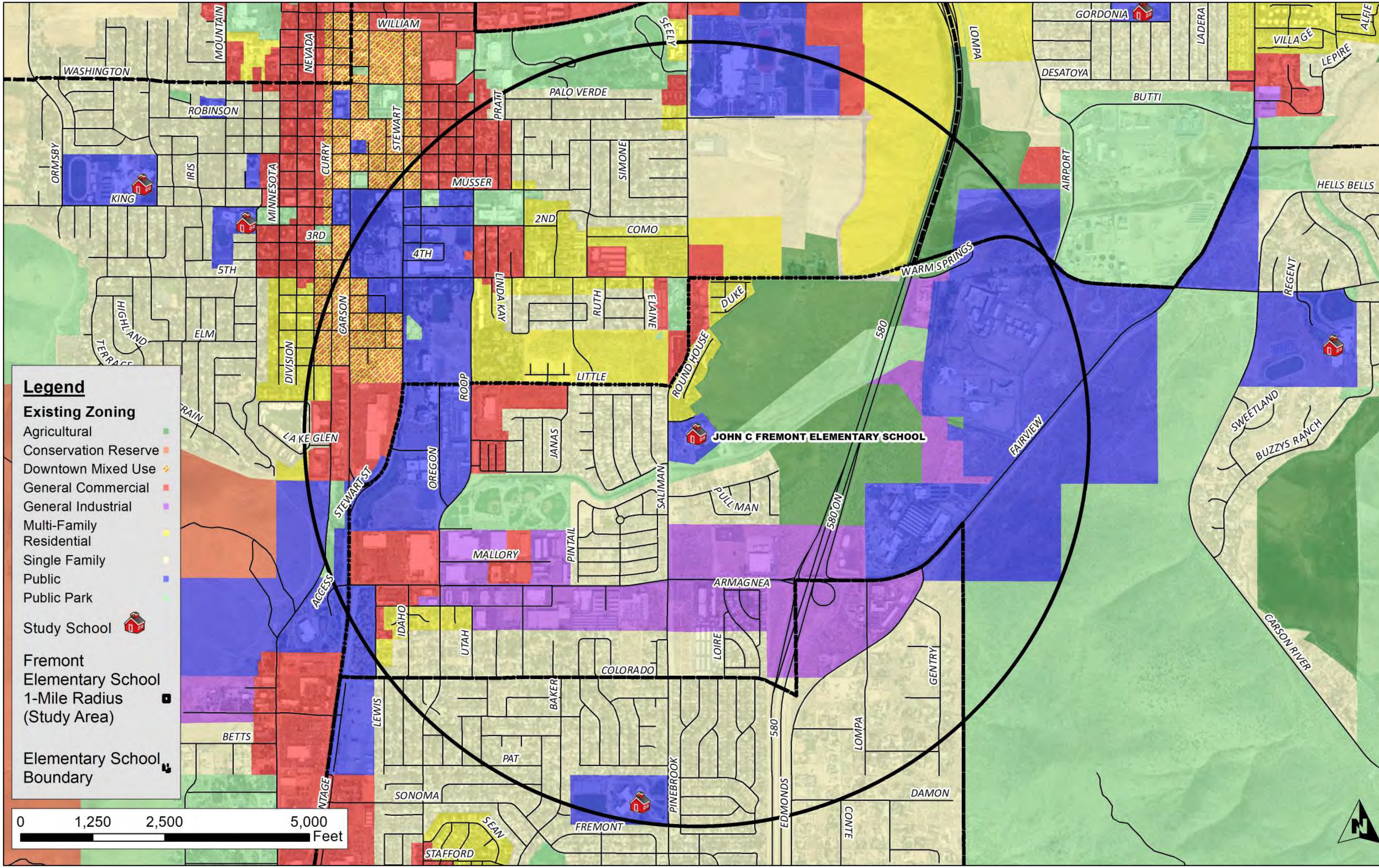
Bordewich-Bray Elementary School Existing Zoning



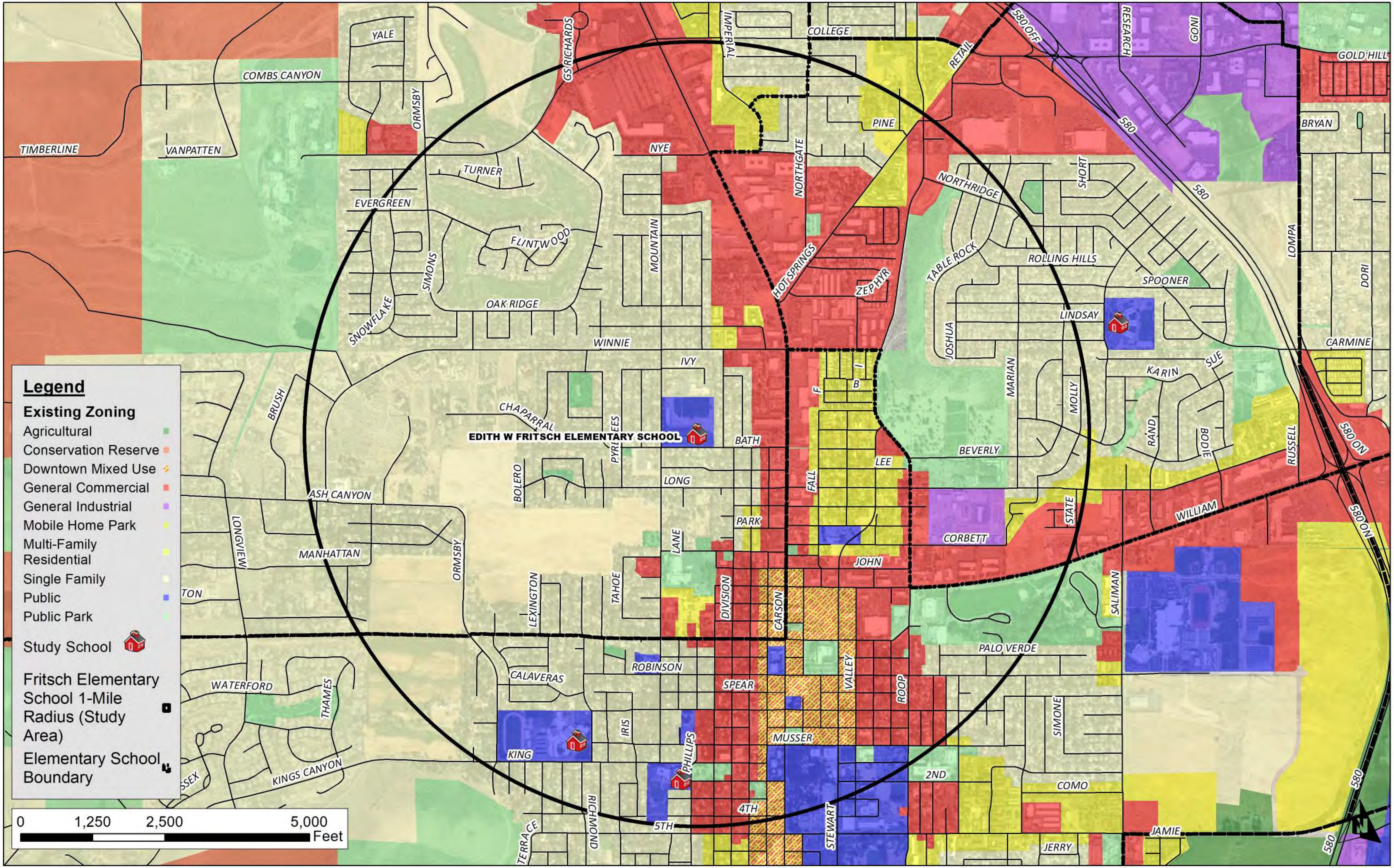
Empire Elementary School Existing Zoning



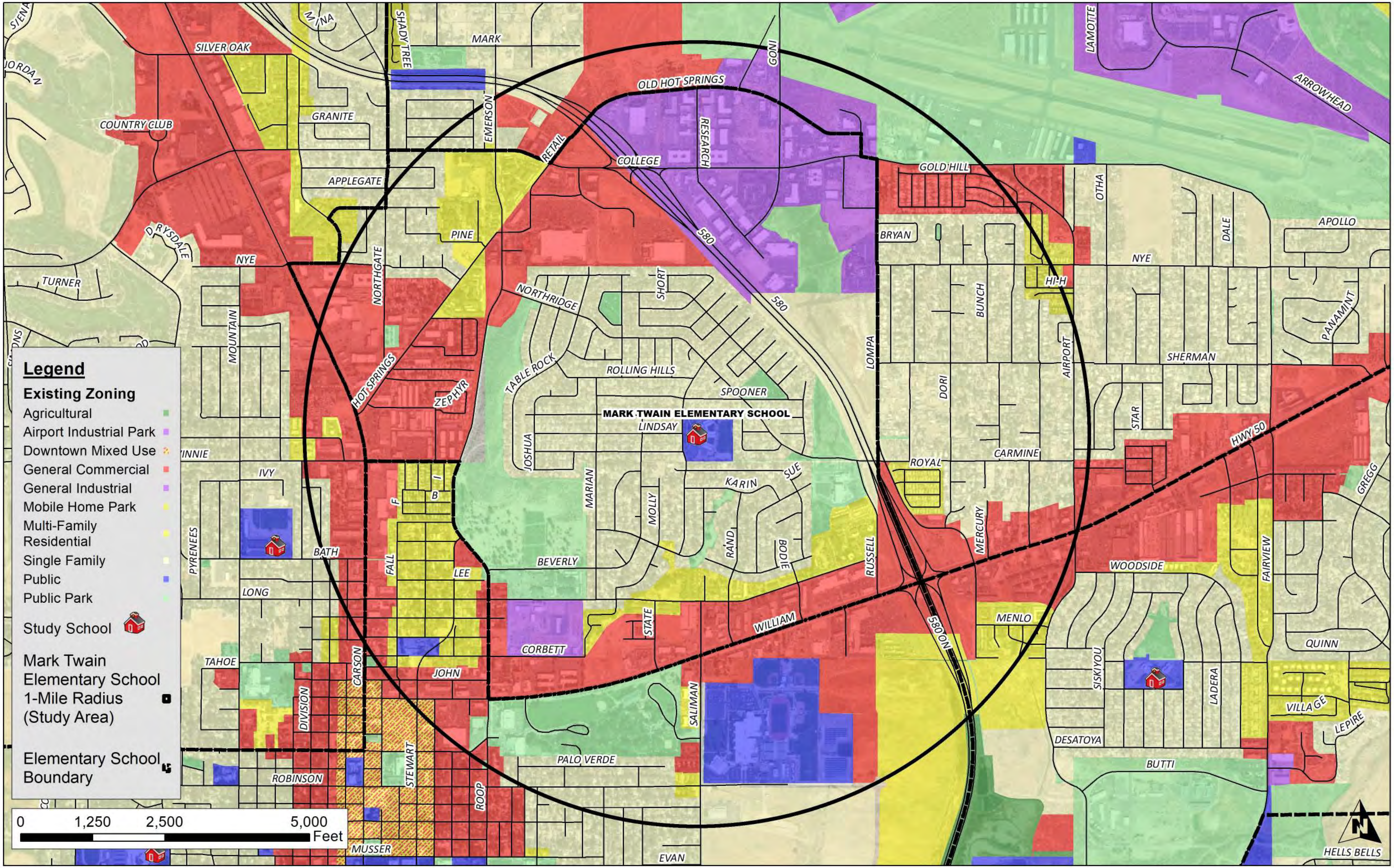
Fremont Elementary School Existing Zoning



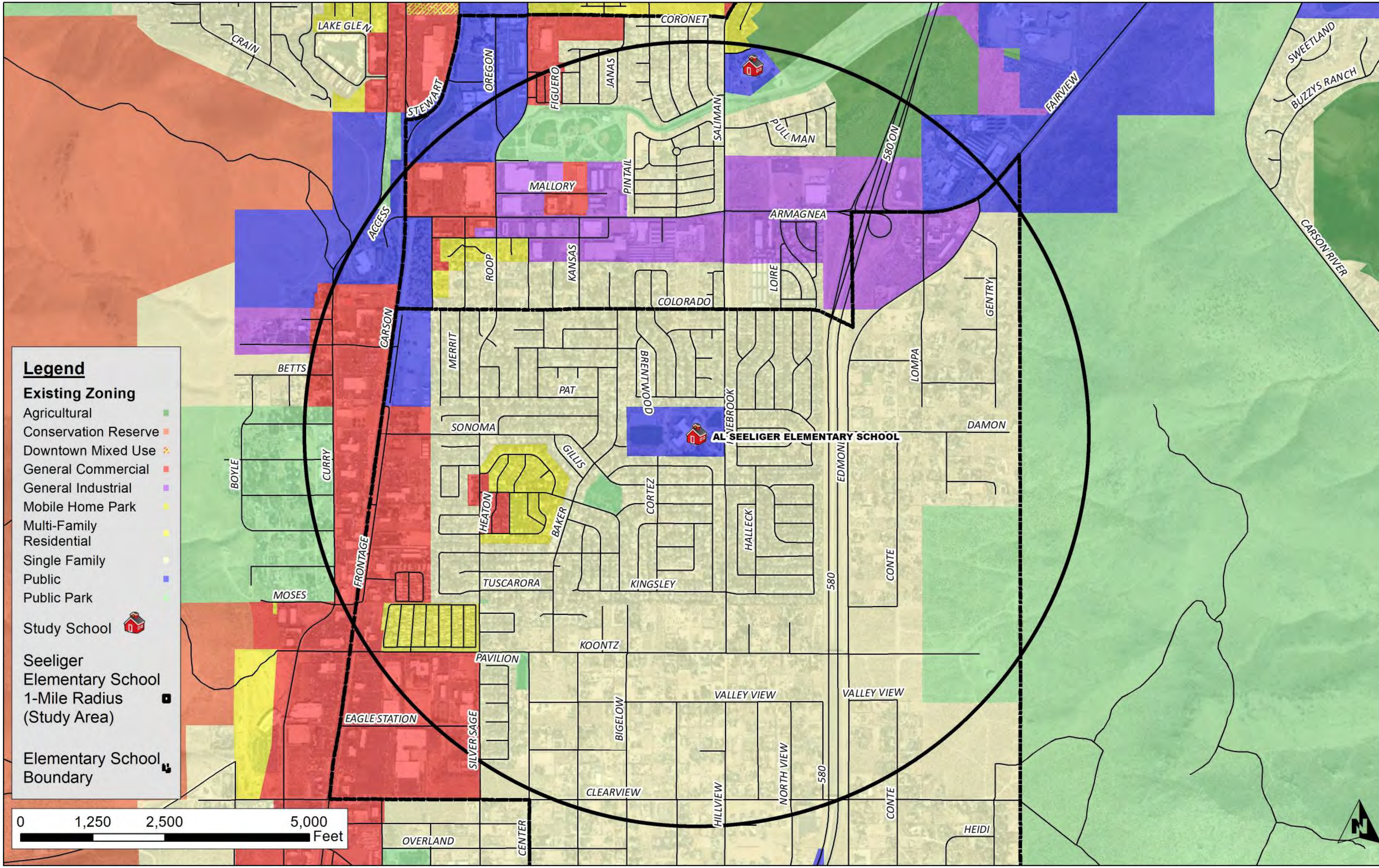
Fritsch Elementary School Existing Zoning



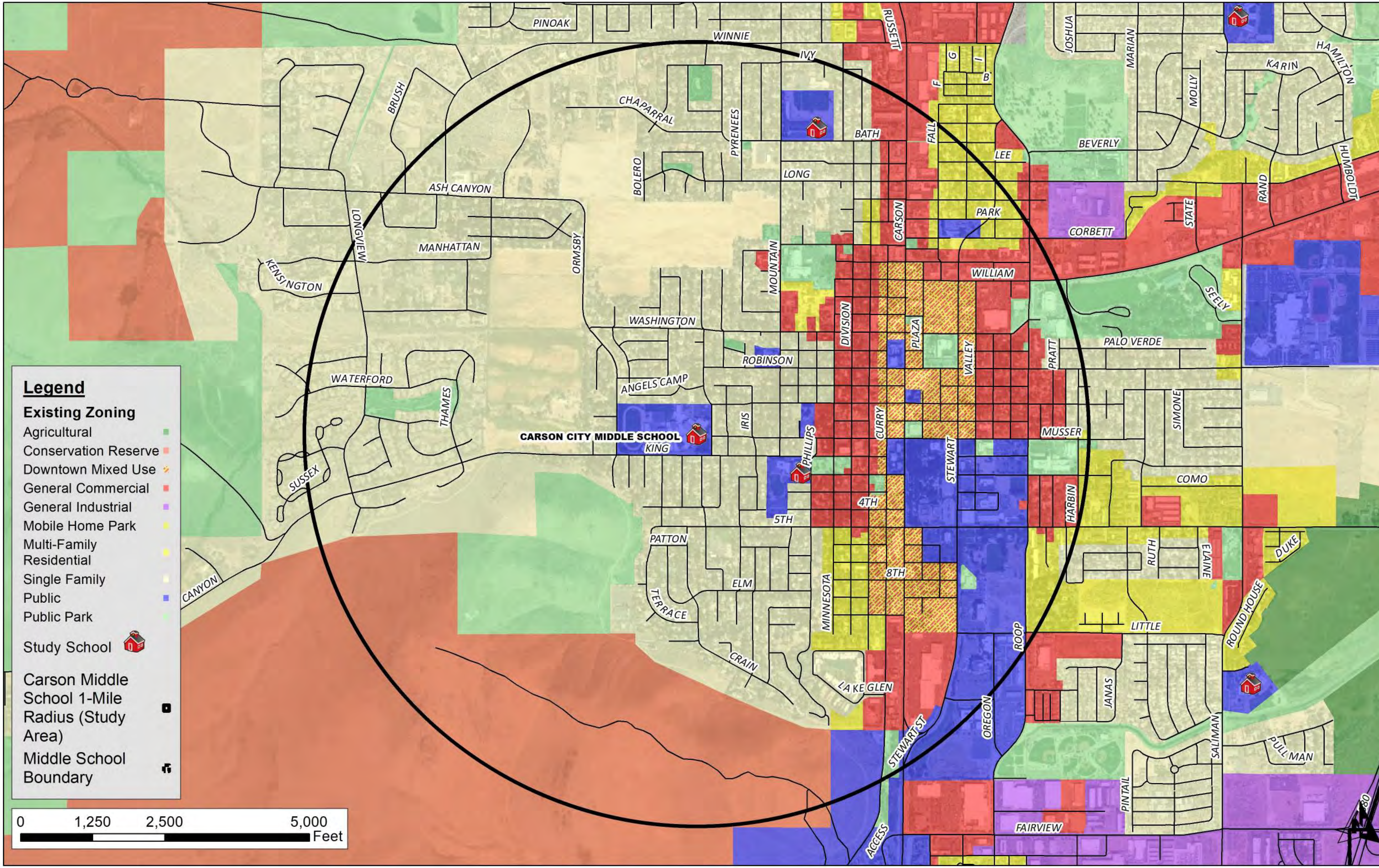
Mark Twain Elementary School Existing Zoning



Al Seeliger Elementary School Existing Zoning



Carson Middle School Existing Zoning



Eagle Valley Middle School Existing Zoning