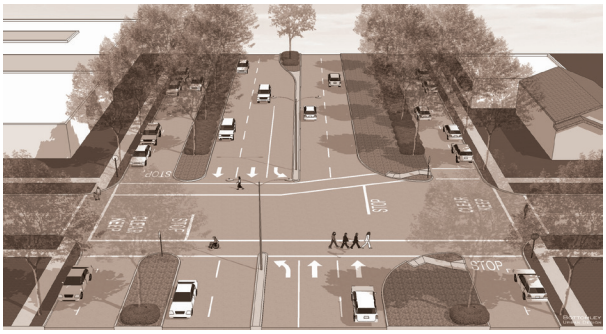
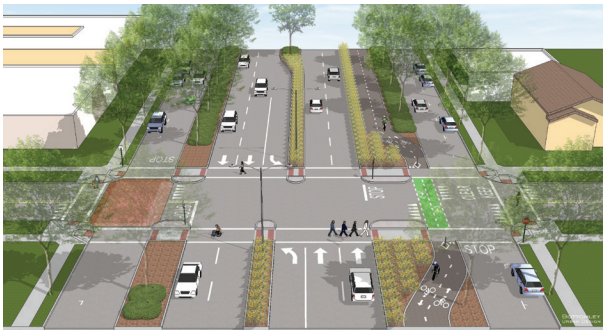
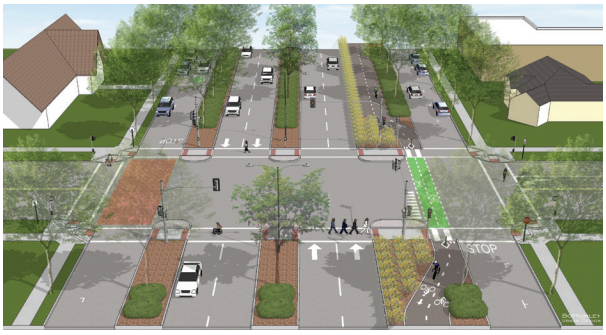
Esplanade Corridor Safety and Accessibility Study



Prepared for the City of Chico

September 9, 2016

TRAFFIC ENGINEERING
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Table of Contents

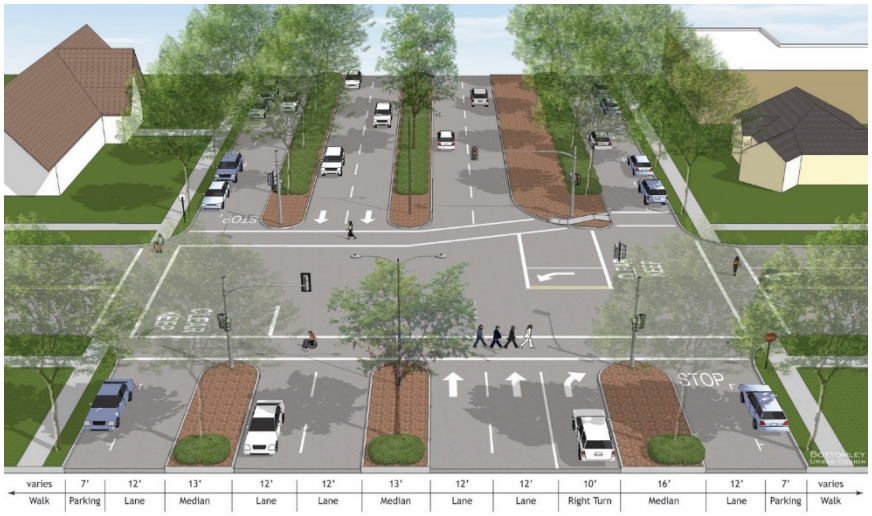
Appendices

A. Traffic Data
B. Intersection Level of Service Calculations
C. Travel Time Calculations
D. Collision Analysis
E. Outreach Documentation
F. Public Opinion Survey Results
G. Corridor Alternatives
H. Cost Estimate

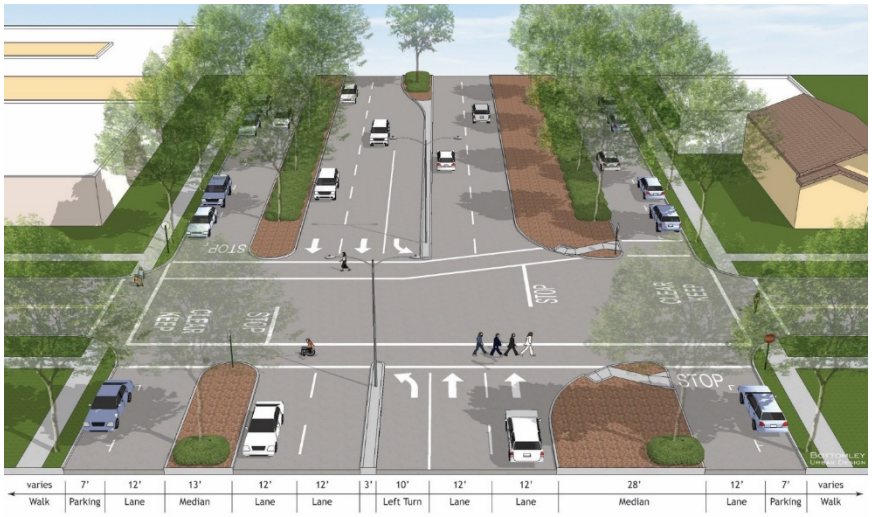
Executive Summary

The purpose of the *Esplanade Corridor Safety and Accessibility Study* was to examine transportation alternatives that would enhance mobility, connectivity, safety, and accessibility for roadway users of all ages and abilities, including automobiles, trucks, buses, and other large vehicles, bicyclists, and pedestrians, on the Esplanade from 11th Avenue to Memorial Way in the City of Chico. Oleander Avenue between Memorial Avenue and 10th Street was also included in the study.

The traditional boulevard corridor is served with frontage roads separated by medians with a wider median on the east side which is an old streetcar right-of-way. Signalized intersections in the corridor do not have north-south left-turn lanes. Unsignalized intersections are served by north-south left-turn lanes which result in extremely narrow medians.



Existing Conditions – Typical Signalized Intersection



Existing Conditions – Typical Unsignalized Intersection

Community engagement and local business outreach was a key priority of the *Esplanade Corridor Safety and Accessibility Study* process. The purpose of the Community Engagement Process was to create an open, inclusive process that engaged a representative cross-section of area residents and stakeholders. In addition to two online surveys and numerous stakeholder meetings held throughout June 2015, the community engagement included the following events.

- Business Walk – July 24, 2015
- Workshop #1 – September 9, 2015
- Workshop #2 – November 19, 2015
- Workshop #3/City Council – April 5, 2016

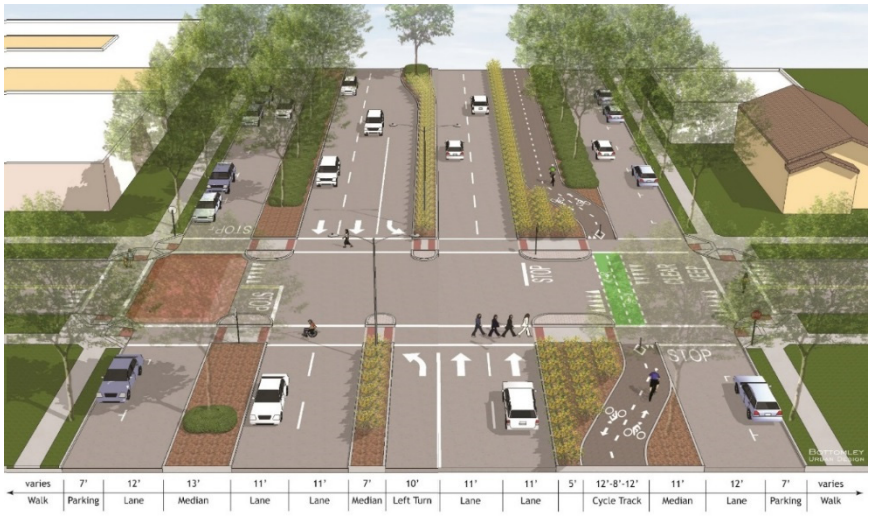
The following deficiencies were identified through the technical analysis and public outreach process:

- Significant collision experience, especially involving bicycles throughout the corridor.
- Pedestrian safety concerns and lack of pedestrian crossing signals
- ADA accessibility issues and lack of proper curb ramps
- Lack of any bicycle facilities and safety concerns
- Chico High School Area congestion and safety
- Esplanade to Memorial Avenue accessibility
- Use of the Bidwell State Parks access for bypass vehicle traffic
- Deficient First Avenue traffic capacity
- Chico Junior High School area access and congestion
- General vehicle guidance and confusion

On May 3, 2016, the City Council approved the majority of the project components which were recommended in the plan:

- ADA improvements (ramps, sidewalk gap closures).
- Pedestrian refuge islands at all signalized and non-signalized intersections both at center islands and islands separating travel lanes from frontage roads.
- Traffic signal equipment upgrades (pedestrian countdown signal heads with adequate time to cross Esplanade).
- Consistent pavement markings and signage ("Keep Clear" pavement delineations with either green pavement and/or slightly raised colored concrete option).
- Traffic signal timing plan with pedestrian push button and vehicle detection (use detection based system during peak times, use existing 28mph progression during non-peak times).
- Oleander Changes (Roundabout at Memorial, install traffic signal at 1st Avenue, change stop controls at 8th and 9th Avenues to all free flow bicycle traffic, add bike warning at 5th Avenue with Sharrow pavement markings).
- **Esplanade Bicycle Improvements** – "Class IV" separated bicycle facility on east side of Esplanade in the old Railroad right of way, provides two-way bike traffic for entering/exiting bike bridge at 11th Avenue, "Sharrows" at west side frontage road.
- Correction of ADA non-compliant slopes and connections on both sides of Esplanade north of 11th Avenue to the bike bridge on the east side as well as to the pedestrian ramp on the west side.

Approved Plan – Typical Signalized Intersection



Approved Plan – Typical Unsignalized Intersection

The plan recommendations related to Chico High School and intersection modifications at Esplanade/Memorial Way and Esplanade/1st Avenue were deferred for further discussion, analysis, and outreach to the public. These components included:

- New traffic signal at Esplanade/Sacramento Avenue.
- Minor widening on the Chico High School side of Lincoln Avenue and West Sacramento Avenue for expansion of pick-up/drop-off frontage.
- Conversion of Lincoln Avenue to two-way traffic between Esplanade and Arcadian Avenue.
- Turnaround traffic circles at Lincoln Avenue/Arcadian Avenue and Sacramento Avenue/Magnolia Avenue.
- New northbound left-turn lane at Esplanade/Lincoln Avenue.
- Esplanade signal timing plan specific for school hours to favor access to/from Chico High School
- New northbound/southbound left-turn lane on Esplanade at Memorial Way traffic signal as a short term mitigation.
- New roundabout at Esplanade/Memorial Way with full four-way access as a long term mitigation.
- New northbound/southbound left-turn lane on Esplanade at 1st Avenue traffic signal as a short term mitigation.
- New roundabout at Esplanade/1st Avenue with full four-way access as a long term mitigation.
- Updated signal timing plan to accommodate higher volumes on 1st Avenue.

The **Council Approved Plan** was evaluated in terms of intersection operations and travel time. Under this scenario, all of the signalized intersections along the corridor would operate at LOS C or better. The unsignalized intersections would operate at LOS D or better overall. All of these conditions would be considered acceptable according to City standards. Speeds would decrease from the range of 23-24 mph to approximately 20-21 mph due to the added delay primarily from the delay created by the pedestrian signal timing. Travel time would increase on average from approximately 180 seconds between Memorial Way and 11th Avenue to approximately 205 seconds, or an **increase of 25 seconds**.

The **Council Approved Plan plus Roundabouts** was also evaluated. Under this scenario, all of the signalized intersections and the two roundabout intersections would operate at LOS C or better. The unsignalized intersections would operate at LOS D or better overall. All of these conditions would be considered acceptable according to City standards. Speeds would decrease from the range of 23-24 mph to approximately 21 mph due to the added delay primary created by the pedestrian signal timing. Average travel time would increase from approximately 180 seconds for the trip between Memorial Way and 11th Avenue to approximately 203 seconds, or an **increase of 23 seconds**.

On June 15, 2016, an ATP grant application was submitted for the elements recommended by the City Council. The ATP (Active Transportation Program) is a potential funding source for projects in California which include the types of improvements that are proposed for the Esplanade and Oleander.

The project cost for the ATP enhancement project was estimated at $7,660,888.

Introduction and Setting

Introduction

The Esplanade is an historic tree-lined boulevard in the City of Chico that connects the northern neighborhoods to the southern downtown area. The Esplanade is classified as an arterial in the *Chico 2030 General Plan* and currently accommodates up to 24,000 vehicles per day as well as thousands of bicyclists and pedestrians per day. The location of the City-maintained project corridor is shown in Figure 1.

The corridor provides access and connections to the following routes and land uses:

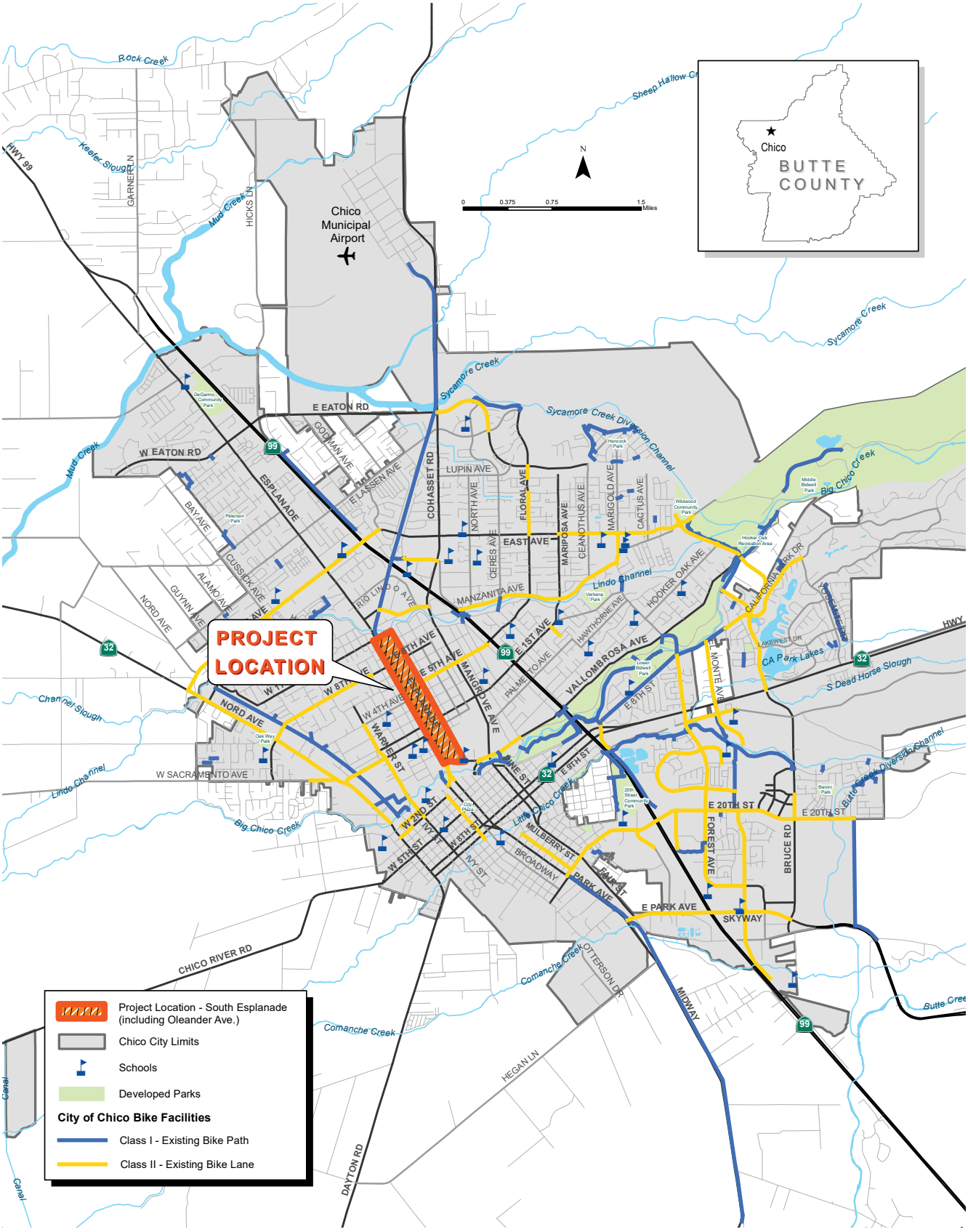
- Airport Bike Path at the north end of the study area
- Enloe Hospital between 5th and 6th Avenues
- State Route (SR) 99 to the east via 1st Avenue
- Chico High School between Sacramento and Lincoln Avenues
- Museum of Northern California Art at East Washington Avenue
- Bidwell Mansion Historic Park at Memorial Way
- Gateway Science Museum at Memorial Way
- Chico Junior High School at Oleander Avenue/Memorial Way
- Chico State University at the southwest end of the corridor
- Bidwell Park at the southeast end of the corridor
- Chico Downtown at the south end of the corridor

The Esplanade first earned its reputation as a traditional tree-lined boulevard when John Bidwell planted six rows of trees to define public travel ways for buggies, wagons, bicycles, and pedestrians. For 50 to 60 years, the Esplanade ran with streetcar rail service (between the south side of the City and the airport) on the east side. In the late 1950s, City Engineer Fred Davis came up with a plan to reconfigure the Esplanade with a wider center roadway and traffic signals at every other intersection, timed for through progression at 28 miles per hour (mph). The only thing that has changed since the inception of Fred Davis' design in the 1950s has been the addition of right-turn pockets in place of the streetcar rail line.

High School Pedestrians

Bicycles on the frontage road

The historical timeline of the Esplanade corridor between 1859 and the present is summarized on page 7.



900-17chi 2016.ai 9/16

Esplanade Corridor Safety and Accessibility Study

Figure 1 – Project Location

Esplanade Timeline

1849	John Bidwell purchases "Rancho del Arroyo Chico."
1860	The City of Chico founded by John Bidwell.
1870	Arrival of the California and Oregon Railroad.
1872	City of Chico became incorporated .
1887	Establishment of the State Normal School, which later became California State University, Chico.
1898	**John Bidwell planted six rows of trees creating the public travel lanes for buggies, wagons, bicycles, and pedestrians.**
1904	**Northern Electric Railway (NERY) runs rail service along the east side of the Esplanade.**
1913	Dr. Newton Thomas Enloe opened the original Enloe Hospital on Flume Street in Chico.
1918	NERY goes out of business and reorganized as the Sacramento Northern Railroad (SNRR).
1920	**The Esplanade was still unpaved and was designated as US Highway 99E.**
1937	Dr. Enloe purchases parcel of land at 1531 The Esplanade where the hospital moved and still stands.
1947	SNRR ends passenger streetcar service.
Late 1950s	**Fred Davis and Earl Talken redesign The Esplanade, reconfigured from a two lane street bordered by side-streets, to a multiple-roadway boulevard.**
1960s	**The center two rows of trees were removed, the center roadway was widened, and traffic signals were installed and timed at 28 miles per hour.**
1965	**The Highway 99E freeway was completed. Traffic volumes on the Esplanade decrease.**
Mid 1970s	**The railroad tracks, which ran along the Esplanade, through downtown and along Park Avenue, were removed.**
1980	Enloe Hospital four-story addition was built with the main entrance moved to Magnolia Avenue.
1995	**The Esplanade was repaved with right-turn lanes installed where the rail bed had once been.**
2002	**The Esplanade was featured along with other great Boulevards from around the world in '*The Boulevard Book: History, Evolution, Design of Multiway Boulevards*' by Allan B. Jacobs, Professor emeritus from the University of California, Berkeley.**
2005	**Octavia Boulevard which stands on the right-of-way of the former Central Freeway, was completed in San Francisco and was modeled using the design of The Esplanade.**
2007-2010	The Enloe Hospital is expanded including a new expanded emergency department and a 742-space parking structure.
2015	**The *Esplanade Corridor Improvement Study* is initiated to identify strategies to improve the safety and operations of vehicles, bicycles, pedestrians, and transit along the corridor between Memorial Way and 11th Avenue.**


1898


1910


1920

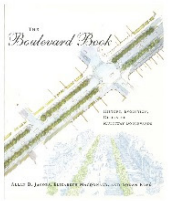

1940


1947


1950


1960


1995



2002


2005


2015

Project Goals and Objectives

The purpose of the *Esplanade Corridor Safety and Accessibility Study* was to examine transportation alternatives that would enhance mobility, connectivity, safety, and accessibility for roadway users of all ages and abilities, including automobiles, trucks buses, and other large vehicles, bicyclists, and pedestrians, on the Esplanade from 11th Avenue to Memorial Way in the City of Chico.

The City's primary goal is to incorporate "Complete Streets" features and provide safer connectivity for all users between the downtown and destinations along the corridor.

> ***Complete Streets*** is a transportation policy and design approach that requires streets to be planned, designed, operated, and maintained to enable safe, convenient and comfortable travel and access for users of all ages and abilities regardless of their mode of transportation.

A safe, connected, and convenient corridor with Complete Streets features is one of the best methods to encourage the use of alternative transportation modes and active recreation and provide easy access to businesses and other destinations. Providing transportation mode choices, as well as opportunities for recreation, have become priorities for many communities. An increase in the number of people walking and biking for transportation and recreation has a range of benefits, including some that can be measured, such as improved traffic level of service and a reduction in vehicle emissions, traffic, and parking congestion. Other benefits may be harder to quantify but are no less important, such as improved public health, an enhanced sense of place and community, connection with nature, and economic development.

The following study objectives were established at the beginning of the process with City staff:

Study Objectives

- Provide safe connectivity for all users between the downtown and destinations along the corridor
- Enhance Access for the disabled community members
- Maintain acceptable vehicle traffic operations
- Improve transportation safety, especially for pedestrians and bicyclists
- Engage the community in envisioning the future and providing input on preferences/priorities
- Develop a preferred street design for the corridor

Study Area

The study area consists of the Esplanade from 11th Avenue at the northern end to the Big Chico Creek bridge and the entrance to downtown at the southern end, and includes Oleander Avenue between Memorial Avenue and 10th Street. Both the Esplanade and Oleander are under jurisdiction of the City of Chico. Some frontage improvements, such as sidewalks, exist where there are developed parcels along the corridor but generally not along undeveloped parcels. The Study Area intersections are shown in Figure 2.

900-17chi 2016.ai 9/16

Esplanade Corridor Safety and Accessibility Study

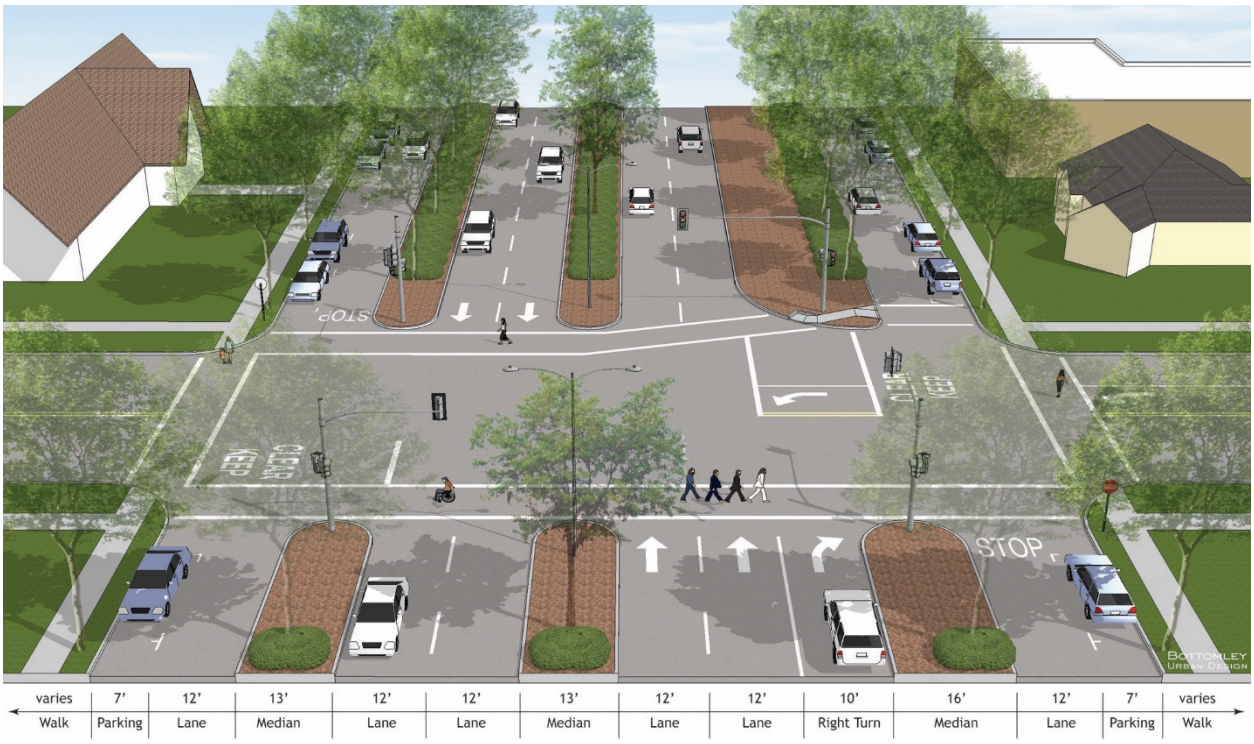
Figure 2 – Study Area

Esplanade Corridor Characteristics

The posted speed limit on the Esplanade is 30 mph and the side streets have speed limits varying from 25 mph (most east-west streets) to 35 mph (1st Avenue). The traffic signals are timed so that most traffic travels the corridor at 28 mph without having to stop, although there are exceptions during peak periods. Every other intersection on the corridor is signalized without north-south left-turn access. These signalized intersections also have northbound right-turn pockets. The uncontrolled, or unsignalized intersections have north-south left-turn access. The corridor also includes a wider median on the east side which was once the right-of-way for a streetcar which ran to the airport. Following is a description of the two typical intersection cross-sections for the corridor.

Signalized Intersections

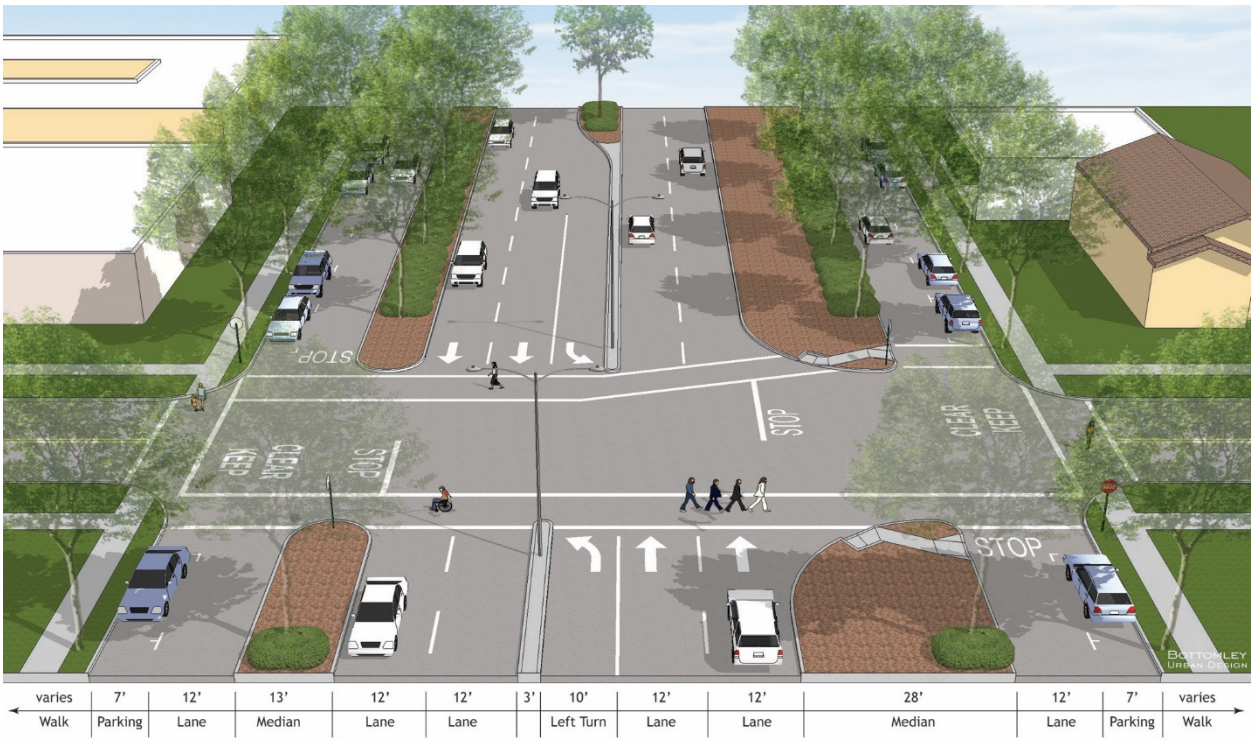
Signalized intersections on the Esplanade typically have two 12-foot southbound lanes, two 12-foot northbound lanes, one 10-foot northbound right-turn pocket cut into the location of the old streetcar right-of-way, and 19-foot one-way frontage roads on either side, which include a 12-foot travel lane and a 7-foot parking lane. The center medians are typically 13 feet wide. (The typical cross section shown is the intersection with 1st Avenue.)



Existing Conditions – Typical Signalized Intersection

Unsignalized Intersections

Unsignalized intersections on the Esplanade typically have two 12-foot through lanes and one 10-foot left-turn lane both northbound and southbound, and one-way frontage roads on either side, with 12-foot travel lanes and 7-foot parking lanes. The median on the east side, separating the northbound major travel lanes from the minor frontage road, is wider because of the old streetcar right-of-way. The center medians are typically 3 feet wide at these intersections. (The typical cross section shown is the intersection with 2nd Avenue.)



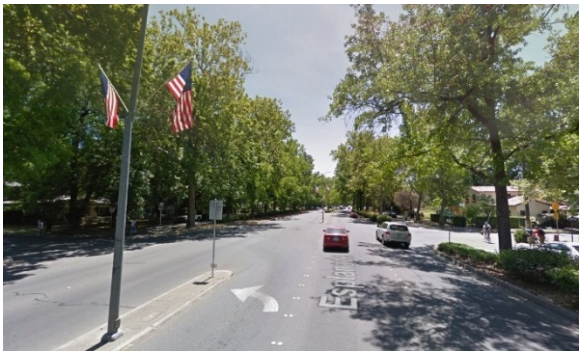
Existing Conditions – Typical Unsignalized Intersection

Esplanade Study Intersections

The study intersections along the Esplanade are all either two-way stop-controlled on the minor approaches or controlled with traffic signals. All intersections are lighted by overhead street lights. These intersections, which are shown on Figure 2, include:

1. **Esplanade/Memorial Way** is a four-way signalized intersection with the west leg being the driveway to a parking lot for the Bidwell Mansion a State Historic Park and the Gateway Science Museum. There are pedestrian crosswalks along the east, north, and south legs of the intersection. Left turns are not allowed from the Esplanade.

2. **Esplanade/Frances Willard Avenue** is a two-way stop-controlled intersection with stop signs on Frances Willard Avenue. There are left-turn lanes in both directions on the Esplanade. Uncontrolled marked crosswalks are provided across the south leg.

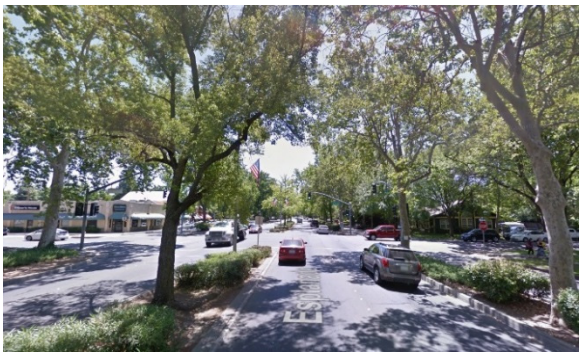
3. **Esplanade/Lincoln Avenue** is an offset four-legged signalized intersection. There is a right-turn pocket northbound, and left turns are not allowed northbound, southbound or westbound. Yellow school crosswalks are located across the south and west legs of the intersection.


4. **Esplanade/Sacramento Avenue** is an offset four-legged intersection, where the east leg does not connect to the Esplanade, and is therefore considered a tee-intersection with Sacramento Avenue, which is stop-controlled on the west leg. There are uncontrolled marked crosswalks across the south and west legs.


5. **Esplanade/1st Avenue** is a signalized intersection with permitted left turns on eastbound and westbound 1st Avenue; left turns are prohibited on northbound and southbound Esplanade. There is a right-turn pocket on northbound Esplanade. There are marked crosswalks across every leg of the intersection.


6. **Esplanade/2nd Avenue** is a two-way stop-controlled intersection with stop controls on the eastbound and westbound 2nd Avenue approaches and left-turn lanes on the northbound and southbound approaches. There are uncontrolled marked crosswalks across the north and south legs.


7. **Esplanade/3rd Avenue** is a signalized intersection with permitted left turns on the eastbound and westbound 3rd Avenue approaches. Left-turns are prohibited from Esplanade, which has a right-turn pocket on the northbound approach. There are uncontrolled crosswalks across the north and south legs of the intersection.

8. **Esplanade/4th Avenue** is a two-way-stop controlled intersection with stop controls on the eastbound and westbound approaches and left-turn lanes on the northbound and southbound approaches. There are uncontrolled marked crosswalks across the north and south legs.

9. **Esplanade/5th Avenue** is a signalized intersection with permitted left turns on the eastbound and westbound 5th Avenue approaches. Esplanade has a right-turn pocket on the northbound approach, while left-turns are prohibited. There are uncontrolled marked crosswalks across the north and south legs of the intersection.

10. **Esplanade/6th Avenue** is a two-way-stop controlled intersection with stop controls on the eastbound and westbound approaches and left-turn lanes on the northbound and southbound approaches. There are uncontrolled marked crosswalks across the north and south legs.

11. **Esplanade/7th Avenue** is a signalized intersection with permitted left-turns on the eastbound and westbound 7th Avenue approaches. As with the other signalized intersection, left-turns are prohibited from Esplanade, and there is a right-turn pocket on northbound Esplanade. There is an uncontrolled marked crosswalk across the south leg of the intersection.


12. **Esplanade/8th Avenue** is a two-way stop-controlled intersection with stop controls on the eastbound and westbound 8th Avenue approaches and left-turn lanes on the northbound and southbound Esplanade approaches. There are uncontrolled marked pedestrian crosswalks across the south and west legs.


13. **Esplanade/9th Avenue** is a signalized intersection with permitted left-turns on the eastbound and westbound 9th Avenue approaches. As is typical for the corrridor, left-turns are prohibited from Esplanade, and it has a right-turn pocket on the northbound approach. There is an uncontrolled marked crosswalk across the north leg of the intersection.


14. **Esplanade/10th Avenue** is a two-way-stop controlled intersection with stop controls on the eastbound and westbound 10th Avenue approaches and left-turn lanes on the northbound and southbound Esplanade approaches. There is an uncontrolled marked crosswalk across the south leg.

15. **Esplanade/11th Avenue** is a signalized intersection with permitted left-turns on the eastbound and westbound 11th Avenue approaches, and protected left-turn phasing on the northbound approach. There are marked crosswalks across the south and east legs of the intersection.

Esplanade Cross Streets

Following are descriptions of the cross streets along the Esplanade study corridor in geographical order from south to north:

Memorial Way is a two-lane road with marked and unmarked on-street parallel parking on both sides of the street to the east of Esplanade, and a parking lot for Bidwell Mansion and a State historic park to the west of Esplanade. Chico Junior High School is located on the northeast corner with Oleander Avenue.

Frances Willard Avenue is a local residential street with parallel parking on either side of the street.

Lincoln Avenue is a local residential street with parallel parking on either side of the street.

Sacramento Avenue is a two-lane road that provides access to residential neighborhoods and to Chico High School. There is a posted speed limit of 30 mph west of Esplanade.

1st Avenue has one lane in each direction, provides access to SR 99, and has a posted 35-mph speed limit. Parallel parking is available on both sides of the street.

2nd Avenue is a local residential street with parallel parking on either side of the street.

3rd Avenue is a local residential street with parallel parking on either side of the street. There is some angled parking at businesses on 3rd Avenue.

4th Avenue is a two-lane road with parallel parking and a double yellow centerline west of Esplanade.

5th Avenue is a two-lane road with a double yellow centerline and parallel parking. East of Esplanade there are Class II bike lanes and a posted 30-mph speed limit.

6th Avenue is a two-lane road with parallel parking on either side of the street. There are marked parking spaces west of Esplanade.

7th Avenue is a two-lane road with parallel parking on either side of the street.

8th Avenue is a two-lane road with parallel parking on either side of the street, a double yellow center-line and a posted speed limit of 25 mph. This road provides direct access to Nord Avenue/SR 32 to the west.

9th Avenue is a two-lane road with parallel parking on either side of the street.

10th Avenue is a two-lane road with parallel parking on either side of the street and a posted speed limit of 25 mph.

11th Avenue is a two-lane road with parallel parking on either side of the street, a double yellow center line and a posted 35-mph speed limit sign to the west of Esplanade. The airport trail starts immediately northeast of the intersection with the Esplanade.

Oleander Avenue

Oleander Avenue is a local street with a posted speed limit of 25 mph. The south end of the corridor connects to Memorial Avenue near Chico Junior High School. The north end of Oleander Avenue terminates at 10th Avenue near Chico Nut Company. The intersections on the corridor are all controlled with stop signs with some oriented to stop north-south traffic and others to stop east-west traffic. The intersection at 3rd Avenue is controlled with an all-way stop control. The road width varies from 44 feet at the south end to 36 feet in the central area to 20 feet of pavement at the north end.

Related Plans and Policies

The following documents include policies and data related to the Esplanade corridor.

General Plan (City of Chico)

The City of Chico's *2030 General Plan* was completed in April 2011. The General Plan recognizes that an efficient multimodal circulation system, along with good land use planning, is essential to supporting the goals of economic vitality, a high quality of life, reduced greenhouse gas emissions, and a sustainable Chico. The Circulation Element establishes a multimodal transportation network that accommodates vehicles, transit, bicycles, and pedestrians. This network is intended to enhance mobility for the entire community.

Following are relevant goals from the General Plan related to the Esplanade corridor.

Goal CIRC-1: Provide a comprehensive multimodal circulation system that serves the build-out of the Land Use Diagram and provides for the safe and effective movement of people and goods.

Goal CIRC-2: Enhance and maintain mobility with a complete streets network for all modes of travel.

Goal CIRC-3: Expand and maintain a comprehensive, safe, and integrated bicycle system throughout the City that encourages bicycling.

Goal CIRC-4: Design a safe, convenient, and integrated pedestrian system that promotes walking.

Goal CIRC-5: Support a comprehensive and integrated transit system as an essential component of a multimodal circulation system.

Goal CIRC-9: Reduce the use of single-occupant motor vehicles.

Bicycle Classifications - Highway Design Manual

The *Highway Design Manual*, California Department of Transportation (Caltrans), 2015, classifies bikeways into four categories:

- **Class I Multi-Use Path** – a completely separated right-of-way for the exclusive use of bicycles and pedestrians with cross flows of motorized traffic minimized.
- **Class II Bike Lane** – a striped and signed lane for one-way bike travel on a street or highway.
- **Class III Bike Route** – signing only for shared use with motor vehicles within the same travel lane on a street or highway.
- **Class IV Bikeway** – also known as a separated bikeway, is a bikeway for the exclusive use of bicycles and includes a separation between the bikeway and the motor vehicle traffic lane. The separation (or, "buffer") may include, but is not limited to, grade separation, flexible posts, inflexible physical barriers, or on-street parking. (Note: Caltrans *Design Information Bulletin Number 89: Class IV Bikeway Guidance (Separated Bikeways/Cycle Tracks)*, December 2015, provides detailed guidance on Class IV Bikeways.)

Urban Area Bicycle Plan (City of Chico)

The 2012 *Chico Urban Area Bicycle Plan* lays out the City's comprehensive bicycling system. Despite the City's many natural and man-made barriers complicating bicycle circulation throughout the city and inhibiting the ability of bicyclists to make direct, convenient connections between origins and destinations, Chico continues to seek ways to overcome the barriers and strives to maintain its reputation as a Silver level Bicycle Friendly Community as awarded by the League of American Bicyclists. Implementation of the Plan would provide a network of connected bicycle facilities for use by the City's residents, including school-aged students and seniors, with links to activity centers within the City as well as neighboring communities. Additionally, the Plan seeks to provide enhanced recreational cycling opportunities and attract bicycle tourism.

The current update to the Bike Plan proposes a Class IV facility on Esplanade between Memorial Avenue and 11th Avenue and a Class III bikeway on Oleander Avenue. The Bike Plan also proposes bike facilities along cross-streets of the Esplanade corridor, including the following in the vicinity of the study area:

- **West 11th Avenue -** Class II bike lanes from Esplanade to Nord Avenue via W Lindo Avenue
- **East 10th Avenue** – Class III bike route from Esplanade to Oleander Avenue
- **9th Avenue** – Class III bike route from Magnolia Avenue to Sheridan Avenue
- **3rd Avenue** – Class III bike route from Arcadian Avenue to Sherman Avenue
- **1st Avenue** – Class II bike lanes from Warner Street to east of SR-99
- **West Sacramento Avenue** – Class II bike lanes from Warner Street to Esplanade
- **West Lincoln Avenue** – Class III bike route from Arcadian Avenue to Esplanade
- **East Lincoln Avenue** – Class III bike route from Esplanade to Oleander Avenue
- **Memorial Way** – Class III bike route from Esplanade to Vallombrosa Avenue
- **Sol-Wil-Le-No Avenue** – Class III bike route from Arcadian Avenue to Esplanade

Base Traffic Conditions

Traffic data collection and traffic operational analysis consisted of the following roadway characteristics on the study corridor:

- Traffic volumes
- Pedestrian and bicycle volumes
- Collision history
- Corridor travel time
- Intersection level of service (vehicle delay)
- Queuing
- Pedestrian facilities and crosswalk locations
- Available bicycle facilities
- Transit usage
- On-street parking

Traffic Data Collection

Transportation data for the Esplanade corridor was collected in May 2015. Collection was on typical weekdays while local schools, including Chico High School and CSU Chico, were in session and without the presence of special events or adverse weather. This included collection of the following data:

- On May 14, 2015 24-hour roadway segment vehicle counts at the following locations:
  - Esplanade between Memorial Way and Frances Willard Avenue
  - Esplanade between Sacramento Avenue and 1st Avenue
  - Esplanade between 2nd and 3rd Avenues
  - Esplanade between 4th Avenue and 5th Avenue
  - Esplanade between 6th and 7th Avenue
  - Esplanade between 8th and 9th Avenues
  - Esplanade between 10th and 11th Avenues

- On May 14, 2015 full turning movement counts for the a.m. peak (7:00-9:00 a.m.) and p.m./school peak (2:30-5:30 p.m.) were taken at the following locations:
  - Esplanade/Memorial Way
  - Esplanade/1st Avenue

- On May 14, 2015 turning movement counts excluding through traffic for the a.m. peak (7:00-9:00 a.m.) and p.m./school peak (2:30-5:30 p.m.) were taken at the following locations:
  - Esplanade/Frances Willard Avenue
  - Esplanade/Lincoln Avenue
  - Esplanade/Sacramento Avenue

- On May 14, 2015 turning movement counts excluding through traffic for the a.m. peak (7:00-9:00 a.m.) and p.m. peak (3:30-5:30 p.m.) were taken at the following locations:
  - Esplanade/2nd Avenue
  - Esplanade/3rd Avenue
  - Esplanade/4th Avenue
  - Esplanade/5th Avenue
  - Esplanade/6th Avenue
  - Esplanade/7th Avenue

- Esplanade/8th Avenue
- Esplanade/9th Avenue
- Esplanade/10th Avenue
- Esplanade/11th Avenue

For the intersections with turning movement counts which excluded through traffic counts, full turning movement volumes were created using the 24-hour machine counts to increase the accuracy of the data.

Pedestrian and Bicycle counts were recorded using the video tapes during the May 14, 2015 traffic count at the following locations:

- Esplanade/Memorial Way
- Esplanade/Frances Willard
- Esplanade/Lincoln Avenue
- Esplanade/Sacramento Avenue
- Esplanade/1st Avenue
- Esplanade/3rd Avenue

- Speed Surveys for the following segments on the corridor were collected on May 20, 2015:
  - Between Big Chico Creek and Memorial Way
  - Between East Washington Avenue and Sacramento Avenue
  - Between 3rd Avenue and 4th Avenue
  - Between 9th Avenue and 10th Avenue

Copies of the data collected are provided in Appendix A.

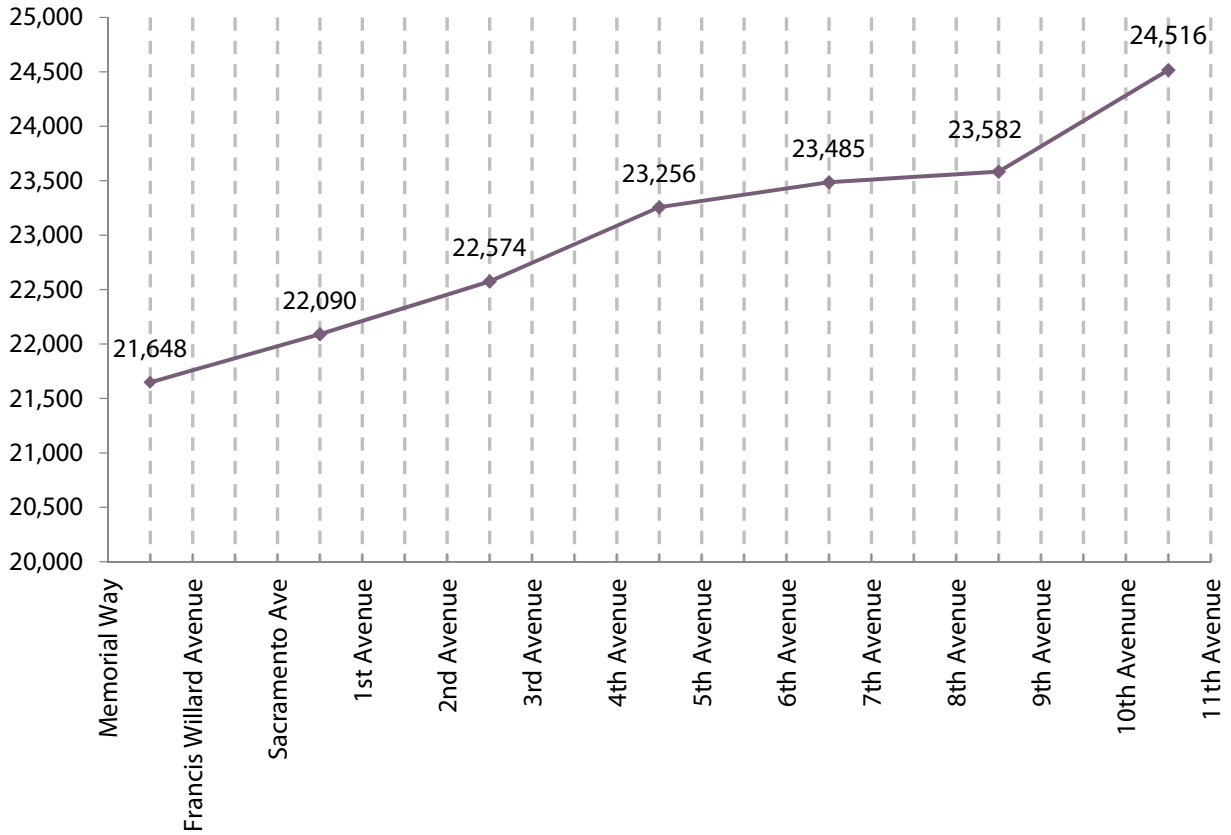
Traffic Volumes

Daily Traffic

Vehicle traffic volume counts for the Esplanade, which are included in Appendix A, were found to be lowest at the south end of the corridor, generally increasing towards the north where there is as much as 13 percent more traffic. These counts are summarized in Table 1 and displayed in Graph 1.

Table 1 – Esplanade Daily Traffic Volumes

Location along the Esplanade	Northbound	Southbound	Total
Between Memorial Way and Francis Willard Ave	12,659	8,989	21,648
Between Sacramento Ave and 1st Ave	10,825	11,265	22,090
Between 2nd Ave and 3rd Ave	11,828	10,746	22,574
Between 4th Ave and 5th Ave	11,987	11,269	23,256
Between 6th Ave and 7th Ave	12,455	11,030	23,485
Between 8th Ave and 9th Ave	12,132	11,450	23,582
Between 10th Ave and 11th Ave	12,881	11,635	24,516



Graph 1 – Esplanade Average Daily Traffic Volume

Charts displaying the hourly distribution of traffic on the Esplanade at the seven points of data collection are provided in Appendix A. Generally throughout the day the northbound and southbound traffic peak at nearly the same volumes, but southbound volumes have a dramatic spike around 7:00 a.m. for counts north of Sacramento Avenue.

Peak Hour Traffic Volumes

Operating conditions during the weekday a.m. and p.m. peak periods were evaluated to capture the highest level of congestion along the corridor. The morning peak hour occurs between 7:00 and 9:00 a.m. and reflects conditions during the home to work or school commute, while the p.m. peak hour occurs between 4:00 and 6:00 p.m. and reflects the level of congestion during the homeward-bound commute. Turning movement counts at intersections on the south end of the corridor were collected from 2:30 to 5:30 p.m. to capture the school dismissal peak period.

Peak hour intersection turning movement volumes at the study intersections are included in Appendices A and B.

Pedestrian and Bicycle Crossing Volumes

Pedestrian and bicycle crossing volume counts were collected at the study intersections at the same time as the vehicle counts. A summary of the counts is included in Appendix A.

Intersection Levels of Service

Methodology and Standards

Level of Service (LOS) is used to rank traffic operation on various types of facilities based on traffic volumes and roadway capacity using a series of letter designations ranging from A to F. Generally, Level of Service A represents free flow conditions and Level of Service F represents forced flow or breakdown conditions. A unit of measure that indicates a level of delay generally accompanies the LOS designation.

The study intersections were analyzed using methodologies published in the *Highway Capacity Manual* (HCM), Transportation Research Board, 2010. This source contains methodologies for various types of intersection control, all of which are related to a measurement of delay in average number of seconds per vehicle. The study intersections were evaluated using the Synchro 8 application. The signalized methodology is based on factors including traffic volumes, green time for each movement, phasing, whether or not the signals are coordinated, truck traffic, and pedestrian activity. Average stopped delay per vehicle in seconds is used as the basis for evaluation in this LOS methodology. Signal timing sheets were obtained from the City of Chico for the study intersections on the corridor and input into Synchro for the analysis. The ranges of delay associated with the various service levels are shown in Table 2.

Table 2 –Intersection Level of Service Ranges

LOS	Two-Way Stop-Controlled	Signalized
A	Delay of 0 to 10 seconds	Delay of 0 to 10 seconds
B	Delay of 10 to 20 seconds	Delay of 10 to 15 seconds
C	Delay of 20 to 35 seconds	Delay of 15 to 25 seconds
D	Delay of 35 to 55 seconds	Delay of 25 to 35 seconds
E	Delay of 55 to 80 seconds	Delay of 35 to 50 seconds
F	Delay greater than 80 seconds	Delay greater than 50 seconds

Reference: *Highway Capacity Manual*, Transportation Research Board, 2010

The City's Level of Service standards have traditionally been applied to signalized intersections or to the overall intersection LOS for unsignalized intersections. Since the Esplanade corridor is served by scheduled transit, LOS E conditions would be considered acceptable.

Level of Service Standards

The City of Chico's standards of significance are established in the City's General Plan (Policy CIRC-1.4 Level of Service Standards):

Until a Multimodal Level of Service (MMLOS) methodology is adopted by the City, maintain LOS D or better for roadways and intersections at the peak PM period, except as specified below:

- LOS E is acceptable for City streets and intersections under the following circumstances:
  - Downtown streets within the boundaries identified in Figure DT-1 of the Downtown Element.
  - Arterials served by scheduled transit.
  - Arterials not served by scheduled transit, if bicycle and pedestrian facilities are provided within or adjacent to the roadway.
- Utilize Caltrans LOS standards for Caltrans' facilities.
- There are no LOS standards for private roads.

Exceptions to the LOS standards above may be considered by the City Council where reducing the level of service would result in a clear public benefit. Such circumstances include, but are not limited to, the following:

- If improvements necessary to achieve the LOS standard results in impacts to a unique historical resource, a highly sensitive environmental area, requires infeasible right-of-way acquisition, or some other unusual physical constraint exists.

- If the intersection is located within a corridor that utilizes coordinated signal timing, in which case, the operation of the corridor as a whole should be considered.

Existing Intersection Levels of Service

Under existing conditions, all of the signalized intersections along the corridor were found to be operating at LOS C or better. Most intersections were found to be operating at a LOS B, except for Esplanade/11th Avenue which operates at LOS C due to the added impact of allowing left-turn movements from the Esplanade. The unsignalized intersections are all operating at LOS A overall. Side street movements are operating mostly at LOS C or better. Eastbound movements from 6th Street and 8th Street, operate in the LOS D to F range during the peak hours. All of these conditions would be considered acceptable based on applicable City standards.

A summary of the intersection level of service calculations is shown in Table 3 and copies of the Level of Service calculations are provided in Appendix B.

Table 3 – Existing Intersection Levels of Service				
Study Intersection Approach	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
Esplanade/Memorial Way	8.7	A	8.4	A
Esplanade/Frances Willard Ave	2.7	A	1.5	A
Westbound Approach	*11.1*	*B*	*9.2*	*A*
Eastbound Approach	*9.3*	*A*	*9.1*	*A*
Esplanade/Lincoln Ave	7.8	A	5.9	A
Esplanade/Sacramento Ave	2.4	A	1.6	A
Eastbound Approach	*11.4*	*B*	*10.3*	*B*
Esplanade/1st Ave	12.9	B	10.5	B
Esplanade/2nd Ave	0.9	A	0.8	A
Westbound Approach	*12.9*	*B*	*13.5*	*B*
Eastbound Approach	*15.1*	*B*	*12.2*	*B*
Esplanade/3rd Ave	7.1	A	5.4	A
Esplanade/4th Ave	1.6	A	1.5	A
Westbound Approach	*16.7*	*C*	*21.5*	*C*
Eastbound Approach	*26.2*	*A*	*19.0*	*C*
Esplanade/5th Ave	7.8	A	6.6	A
Esplanade/6th Ave	1.9	A	1.2	A
Westbound Approach	*21.2*	*C*	*16.1*	*C*
Eastbound Approach	*28.7*	*D*	*13.8*	*B*
Esplanade/7th Ave	7.2	A	5.7	A
Esplanade/8th Ave	6.4	A	3.3	A
Westbound Approach	*26.7*	*D*	*13.9*	*B*
Eastbound Approach	*61.2*	*F*	*30.3*	*D*
Esplanade/9th Ave	9.7	A	7.7	A
Esplanade/10th Ave	1.1	A	0.9	A
Westbound Approach	*10.1*	*B*	*10.9*	*B*
Eastbound Approach	*20.7*	*C*	*15.4*	*B*
Esplanade/11th Ave	24.7	C	13.6	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Speed Surveys

Speed surveys were collected for four segments on the corridor, including between Big Chico Creek and Memorial Way, Washington Avenue and Sacramento Avenue, 3rd Avenue and 4th Avenue, and 9th Avenue and 10th Avenue, to determine if the flow of traffic was at a speed higher or lower than the speed limit. The 85th percentile speed of the traffic was found to be approximately the same as the posted 30-mph speed limit.

- Between Big Chico Creek and Memorial Way the 85th percentile speed was 30 miles per hour.
- Between East Washington Avenue and Sacramento Avenue the 85th percentile speed was 32 miles per hour.
- Between 3rd Avenue and 4th Avenue the 85th percentile speed was 29 miles per hour.
- Between 9th Avenue and 10th Avenue the 85th percentile speed was 32 miles per hour.

Graphs summarizing the cumulative speed profiles for each of the roadway segments are provided in Appendix A.

Vehicle Travel Time

Travel time surveys were conducted along the study corridor during the peak period of 4:30 – 5:30 p.m. and off-peak period of 10:00 – 11:00 a.m. Travel time was then calibrated in the Synchro 8 and SimTraffic application, which was also used for the intersection level of service evaluation. Details of the SimTraffic simulated travel time and speed and travel time estimates are included in Appendix C. Table 4 provides a summary of simulated average travel time and average speeds along the corridor between Memorial Way and 11th Avenue during typical peak and off-peak periods.

Table 4 – Existing Peak Period Travel Time

Direction of Travel	On-Peak		Off-Peak	
	Average Travel Time	Average Speed	Average Travel Time	Average Speed
Northbound Esplanade	2:51	25.1	2:40	26.8
Southbound Esplanade	2:55	24.5	2:32	28.3

Notes: Travel Time is measured in minutes: seconds, Speed is measured in miles per hour (mph)

In the southbound direction average speeds varied between 24.5 mph (on-peak) and 28.3 mph (off-peak) while in the northbound direction average speeds varied between 25.1 mph (on-peak) and 26.8 mph (off-peak).

Charts providing more details of the travel time in both directions during the peak hours are provided in Appendix C.

Bicycle Travel

Additional surveys of bicycle travel in the corridor were collected including travel time, stopping activity and use of helmets. Following are the results:

- Travel Time (on frontage road, stopping at all intersections) was 7:45 minutes.
- Travel Time (on frontage road, no stopping) was 6:00 minutes.
- 23 percent of stopping occurred at cross streets.
- 27 percent were wearing helmets.

Pedestrian Network

Crosswalk Markings

Marked pedestrian crosswalks are provided at all study intersections; however, at some intersections, crossings are not provided on one or more legs of the intersection. All crosswalks within the study area have standard crosswalk markings, two transverse white or yellow lines perpendicular to the flow of traffic. At Memorial Way and 1st Avenue there are crosswalks on all four legs. All other intersections have crosswalks on one or two sides of the intersection. There are generally not marked crosswalks across the frontage streets. These north-south crosswalks include ones on the west sides of Esplanade at Lincoln Avenue, Sacramento Avenue and 8th Avenue and on the

east side of Memorial Way. 1st Avenue has crosswalks along all legs of the intersection. There are east-west crosswalks across the frontage streets on the east side at Memorial Way and on the west side at 11th Avenue.

Signalized Crossings

Crossings at Memorial Way and 11th Avenue are the only locations with push buttons and pedestrian count-down heads. None of the other signalized intersections have pedestrian signal heads. Pedestrians are expected to walk on the "green ball" and use their judgment to determine if there is enough time to complete the crossing of Esplanade. In addition, existing traffic signals along the corridor do not meet regulations in the *Manual for Uniform Traffic Control Devices* (MUTCD) for the amount of green time that should be provided for pedestrians to cross Esplanade.

Esplanade crossing at Lincoln Avenue

Sidewalks

There are continuous sidewalks on either side of the frontage roads from Memorial Way to 7th Avenue. On the west side of the frontage street there are gaps in the sidewalk between 7th and 8th Avenue along with gaps on the north corner of 9th Avenue and between 10th and 11th Avenues. On the east side of Esplanade there are almost no sidewalks between 8th and 9th Avenue along with significant gaps between 9th Avenue and 11th Avenue.

ADA Curb Ramps

At all marked crosswalk locations that have sidewalks, curb ramps are provided. However, the majority of these ramps do not meet current ADA ramp design standards. In the 1990's, the City was required to adopt an ADA Transition Plan to address improvements needed to meet accessibility requirements and accommodate disabled persons. The City developed this plan in accordance with the Federal Highway Administration's requirements and Council appointed an ADA Transition Committee to guide implementation. In their role of identifying and prioritizing needed improvements, the committee prioritized the installation of accessibility improvements along the Esplanade corridor from the bicycle/ pedestrian bridge at 11th Avenue to Downtown Chico.

Medians

There are existing raised medians on all sections of the Esplanade in the study corridor between Esplanade and the frontage roads and between the northbound and southbound lanes. The majority of the medians do not have ADA accessible curb ramps which would assist in making these medians refuge islands. At unsignalized intersections, the center median is only 3 feet wide, which is inadequate to provide pedestrian refuge where it is needed most.

Bicycle Network

Existing Bicycle Facilities

No bicycle facilities are currently provided along the Esplanade. Of the cross streets within the study area, Class II bike lanes are provided on East 5th Avenue and West 8th Avenue while 3rd Avenue and Lincoln Avenue are designated as Class III bike routes.

The following bicycle issues were noted for the Esplanade in the current update of the Bike Plan:

- The Esplanade is a **major north-south connector** for people that bicycle in Chico.
- The Esplanade **does not currently cater to people of all ages and abilities** to comfortably ride on the frontage roads adjacent to the main roadway, though many bicyclists ride on them.
- The qualitative bicycle level of traffic stress (BLTS) analysis shows the Esplanade to be one of the ***least comfortable*** **bike routes in the city**.
- A **high number of intersection conflict points exist**, creating dangerous conditions for people bicycling and unpredictable riding behavior that can lead to collisions with motor vehicles—collision data demonstrates repeated occurrence of crashes involving bicyclists on this corridor.
- Innovative strategies to improve conditions for people that bicycle on the Esplanade will be explored as part of the Chico Bicycle Master Plan Update (currently under development), including **bicycle-only signals, intersection pavement markings**, and other treatments that can **separate motorists and bicyclists in space and/or time**.

Bike Parking

There is no designated bike parking along the corridor. Bicyclists park their bikes at bike racks on private property or locked to various street furniture, such as sign poles.

Transit Operations

Transit Facilities

Transit service in the study area is provided by the regional bus service, Butte Regional Transit Authority (B-Line). There are currently two routes that run alone the corridor. Route 15 runs Monday through Saturday from 6:15 a.m. to 9:30 p.m. and runs from Ceres Avenue/Lassen Avenue to the transit center in Downtown Chico with twenty-minute to one-hour headways. Route 16 operates Monday through Saturday from 7:00 a.m. to 7:00 p.m. and runs between SR 99 and the transit center in Downtown Chico with one-hour headways. There are six bus stop locations in each direction on the frontage roads within the study corridor. Buses generally travel on the frontage roads unless there are no passenger pickups in which case the drivers sometimes move to the main travel lanes.

B-Line Bus on frontage road

Dial-a-Ride

B-Line Paratransit service is a door-to-door service. It is available to all destinations within three-quarters of a mile of any Butte Regional Transit fixed route, within Chico, Oroville, or Paradise. It is intended for those who are unable to independently use the transit system due to a physical or mental disability as well as those who are not currently served by any RTA bus route.

Vehicle Parking

On-street vehicular parking along the Esplanade corridor is provided on the frontage roads and cross streets.

Collision History and Safety Conditions

All Collisions

The collision history for the study area was reviewed to determine any trends or patterns that may indicate a safety issue. Collision records for the study intersections were obtained from the Caltrans Highway Patrol as published in their Statewide Integrated Traffic Records System (SWITRS) reports. The most current five-year period available for the study intersections is January 2010 through December 2014.

As presented in Table 5, the calculated collision rates for the study intersections were compared to average collision rates for similar facilities statewide, as indicated in *2012 Collision Data on California State Highways*, Caltrans.

Table 5 – Collision Rates at the Study Intersections Compared to Statewide Average

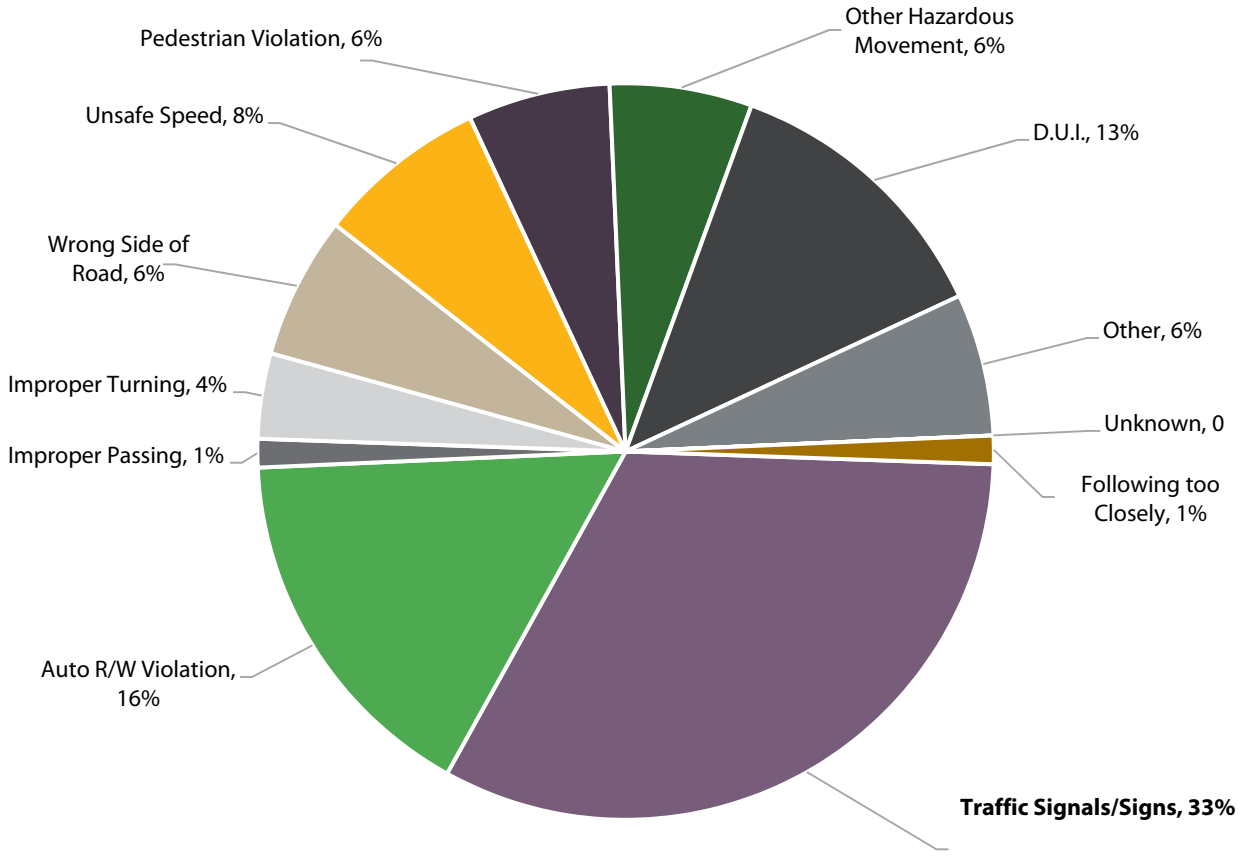
Study Intersection	Number of Collisions (2010-2014)	Collision Rate (c/mve)	Statewide Rate (c/mve)	Injury Rate	Fatality Rate
Esplanade/Memorial Way	6	0.17	0.27	**83.3%**	0.0%
Esplanade/Frances Willard Ave	1	0.03	0.15	**100.0%**	0.0%
Esplanade/Lincoln Ave	4	0.11	0.27	**50.0%**	0.0%
Esplanade/Sacramento Ave	6	0.15	0.15	**83.3%**	0.0%
Esplanade/1st Ave	14	0.27	0.27	**71.4%**	0.0%
6. Esplanade/2nd Ave	1	0.03	0.15	**100.0%**	0.0%
Esplanade/3rd Ave	7	0.19	0.27	**85.7%**	0.0%
Esplanade/4th Ave	6	**0.16**	0.15	**83.3%**	0.0%
Esplanade/5th Ave	5	0.12	0.27	**80.0%**	0.0%
1Esplanade/6th Ave	0	0.00	0.15	0.0%	0.0%
Esplanade/7th Ave	8	0.21	0.27	**100.0%**	0.0%
Esplanade/8th Ave	7	**0.17**	0.15	**85.7%**	0.0%
Esplanade/9th Ave	11	**0.28**	0.27	**72.7%**	0.0%
Esplanade/10th Ave	1	0.03	0.15	0.0%	0.0%
Esplanade/11th Ave	4	0.10	0.27	**75.0%**	0.0%

Note: c/mve = collisions per million vehicles entering; **Bold** = actual rate greater than the Statewide average rate

The calculated collision rates are higher than the statewide average collision rate for similar facilities for Esplanade/ 4th Avenue, Esplanade/8th Avenue, and Esplanade/9th Avenue. Nearly all of the intersections had calculated injury rates higher than statewide averages, with the exception of Esplanade/6th Avenue and Esplanade/10th Avenue.

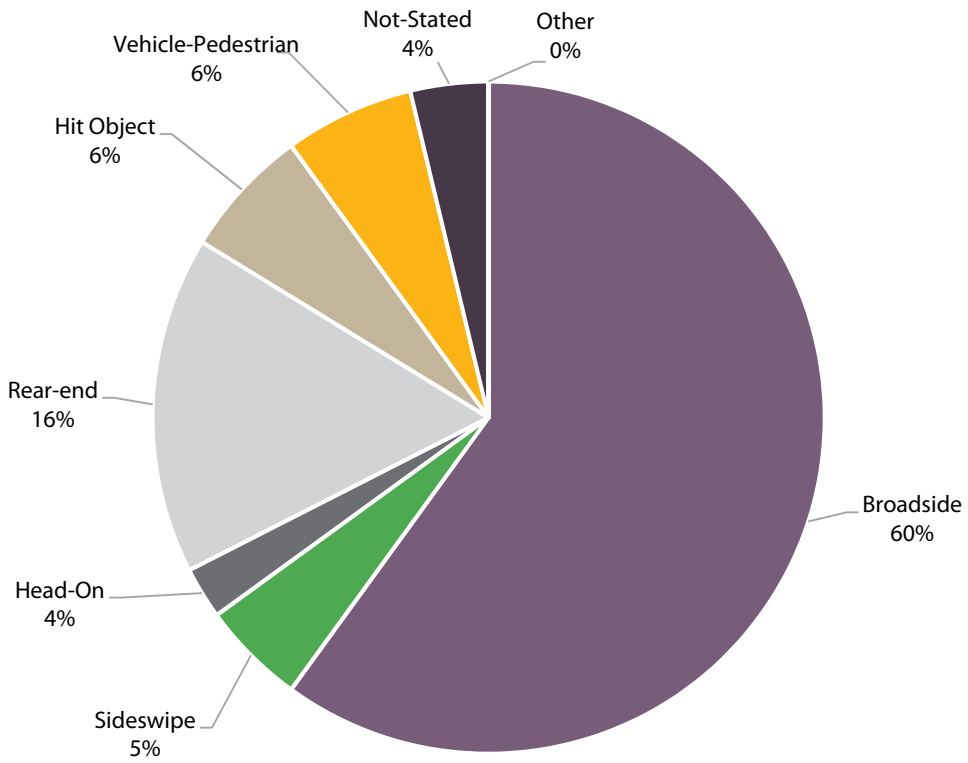
Overall, one-third of the reported collisions at the intersections along the Esplanade were identified in SWITRS as having a primary collision factor of "Traffic Signals and Signs" which could imply confusion or conflicts with traffic signals or signage. Another one-sixth of the reported collisions had a Primary Collision Factor of automobile right-of-way violations. DUIs were listed as the primary collision factor for 13 percent of the reported collisions and

unsafe speeding occurred in 8 percent of the collisions. The percentage breakdown of the collisions is shown in Graph 2.



Graph 2 – Primary Collision Factor

The collision types included 60 percent listed as broadside, 16 percent listed at rear-end, and 6 percent listed as vehicle-pedestrian. The percentage breakdown of the collision types is shown in Graph 3.



Graph 3 – Type of Collision

A collision map of the intersection-related collisions is provided in Appendix D.

Pedestrian and Bicycle Collisions

Collisions involving just pedestrian and bicycles were also reviewed. Because these types of collisions are less common than vehicle collisions, the analysis period was extended to 10 years including January 2004 to December 2013. Over a 10-year period, there were 36 collisions involving either a bicyclist or pedestrian. The intersection with the largest number of pedestrian and bicycle collisions was at Esplanade/1st Avenue.

It should be noted that there is not a published methodology for evaluating the significance of pedestrian and bicycle collisions at intersections. Therefore, one was developed for this process. Pedestrian and bicycle collision rates were calculated for each of the study intersections based on the corresponding pedestrian and bike volumes at those intersections. These rates were then compared to average collision rates for similar facilities statewide, as indicated in *2012 Collision Data on California State Highways*, Caltrans.

> *For example, the Caltrans data indicates that a four-way signalized intersection experiences 0.27 collisions per million vehicles entering the intersection. The intersection of Esplanade/1st Avenue was determined to have a bicycle collision rate of 1.27 bicycle collisions per million bicycles entering the intersection. This rate was 4.7 times the 0.27 average rate which was considered "Extremely High" in the rating scale developed as part of this process.*

Maps of the pedestrian and bicycle collisions along the corridor reported in the most recent ten years for which data is available are also included in Appendix D. Based on this data, the following high collision rates were identified:

- Pedestrian rate 9.4 times the Statewide Average at Esplanade/Sacramento Avenue.
- Pedestrian rate 6.1 times the Statewide Average at Esplanade/8th Avenue.
- Pedestrian rate 6.1 times the Statewide Average at Esplanade/1st Avenue.
- Bicycle rates extremely high at more than 3 times the Statewide Avenue at intersections with Sacramento Avenue, 1st Avenue, 3rd Avenue, 4th Avenue, 7th Avenue, 8th Avenue, and 9th Avenue.
- Bicycle rates significantly above average (1.5 to 3 times the Statewide Avenue) at intersections with Memorial Way, Lincoln Avenue, 5th Avenue, and 11th Avenue.

Community Outreach

Introduction

Community engagement and local business outreach was a key priority of the *Esplanade Corridor Safety and Accessibility Study* process. The engagement effort was a collaborative endeavor between City staff and the consultant team. The purpose of the Community Engagement Process was to create an open, inclusive process that engaged a representative cross-section of area residents and stakeholders. This section outlines the community involvement goals of the corridor study project, describes key target audiences and stakeholders, identifies the engagement strategies employed to reach them, and summarizes the public input received.

The community engagement timeline diagram included the following events.

Goals

- Communicate the purpose, benefits and impacts of the *Esplanade Corridor Safety and Accessibility Study* to all community members and stakeholders.
- Provide ample and diverse opportunities for community members and stakeholders to offer input on the study development and project related issues.
- Engage a representative cross-section of community members and stakeholders in each phase of the planning processes.

Outreach Process

The process included thorough outreach and involvement of the community. The consultant team met with business owners in the vicinity of the Esplanade during the summer of 2015 when the project was initiated. The consultant team met with stakeholders in June 2015, including representatives from Enloe Hospital; Chico Unified School District; including Chico Junior High, Chico High School, and facilities administration; California State Parks (Bidwell Mansion); Gateway Science Museum; Butte County Association of Governments; B-Line Transit; Chico Velo; neighborhood associations; Chico Chamber of Commerce; Chico Heritage Association; Museum of Northern California Art; and CSU Chico. The meeting notes from the Stakeholder meetings are included in Appendix E.

The first public workshop was held on September 9, 2015, with existing conditions summarized and the public given the opportunity to indicate desired features to be incorporated into upgrades of the corridor. Alternatives for the corridor were presented at a second public workshop on November 19, 2015. The third and final workshop was held at a City Council meeting on April 5, 2016. Public testimony and input was taken following the presentation. The slides presented at the three workshops are included in Appendix E.

Media included flyers, press releases, on-line surveys, and a project web page: www.chico.ca.us/capital_project_services/EsplanadeCorridorImprovementStudy.asp. There was also significant local newspaper and TV coverage of the process.

Issues Raised by the Public

General Public Comments from Online Surveys

- Improve pedestrian crossings
- Provide bicycle facilities
- Don't touch the trees

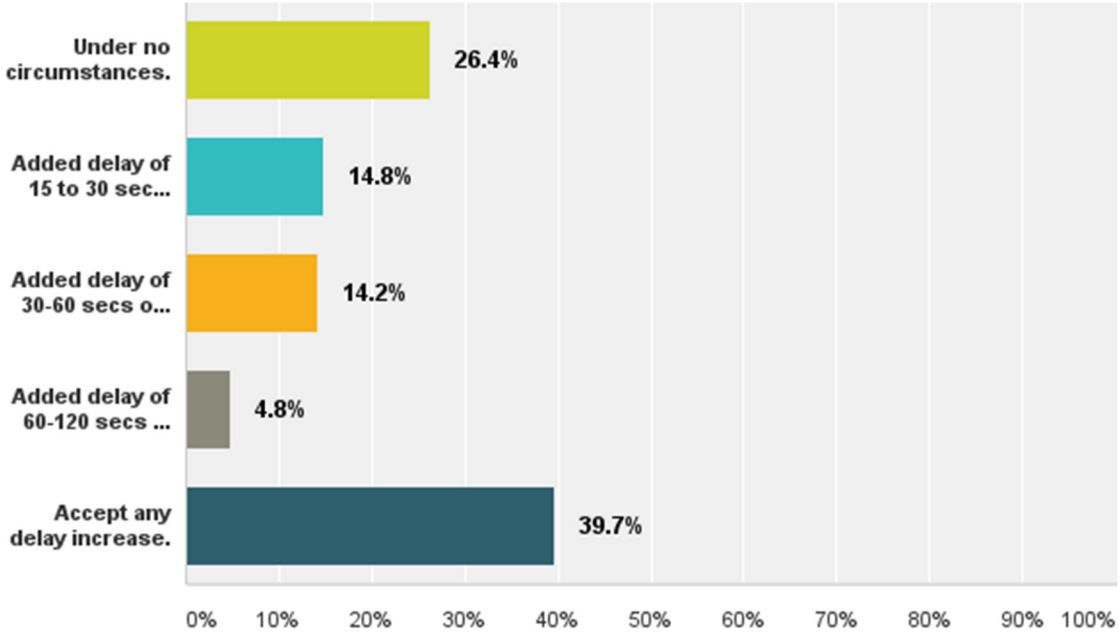
- Traffic around the High School is a problem
- Don't change the 28 mph vehicle traffic flow
- Public loves the historical nature of the Esplanade

On-line Public Opinion Surveys

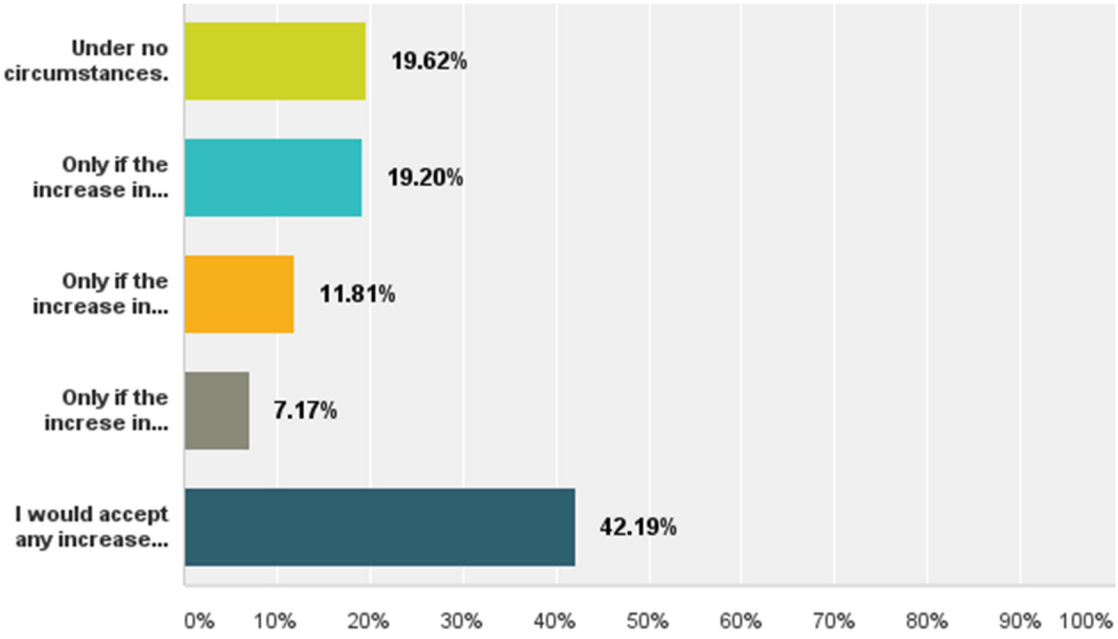
Two on-line surveys were highly advertised through local media and received more than 1,100 responses. The results are included in Appendix F.

A key question was asked in both surveys to determine the willingness of the community to accept vehicle delay on the corridor in exchange for pedestrian and bicycle improvements. The results are shown below.

From Survey #1 *– Would you accept longer travel times driving north-south on the Esplanade in favor of safer pedestrian and bicycle crossings, and more capacity for local east-west traffic? (Note: Average vehicle travel time in each direction on the corridor during peak periods is currently approximately 175 seconds.)*



From Survey #2 *– The ultimate plan could result in longer travel times driving north-south on the Esplanade in order to serve safer pedestrian and bicycle crossings, more accessibility for school access, safety around the high school, and access for local traffic. (Note: Average vehicle travel time in each direction to drive the full corridor during peak periods is currently approximately 175 seconds.) Would you be willing to accept longer travel times driving north-south on the Esplanade in exchange for these modifications?*



The results of these questions indicated that approximately 77 percent of those responding were willing to accept some level of delay in exchange for pedestrian and bicycle improvements.

Another question from the second survey asked to rank the most important to least important improvement components from the plan. The results of this ranking are provided in Table 6.

Table 6 – Ranking of Improvement Components

Rank	Alternative	Score
Most Important	Bicycle Improvements to Esplanade	**2546**
2nd	High School Access and Pick-up/Drop-off Improvements	2500
3rd	Pedestrian X-ing Signals and Revised Signal Timing	2453
4th	ADA Compliant Curb Ramps	2219
5th	Ped Refuge Islands/Medians	2123
6th	Sidewalk Rehabilitation	2073
7th	Minimize Vehicle Travel Time Traveling North-South	1650
8th	Left-turn Access at First Avenue and Memorial Avenue	1602
9th	Realignment of the Frontage Roads	1536
Least Important	Access Restrictions from Stop-Controlled Intersections	1271

Issues to Address

Identified Deficiencies

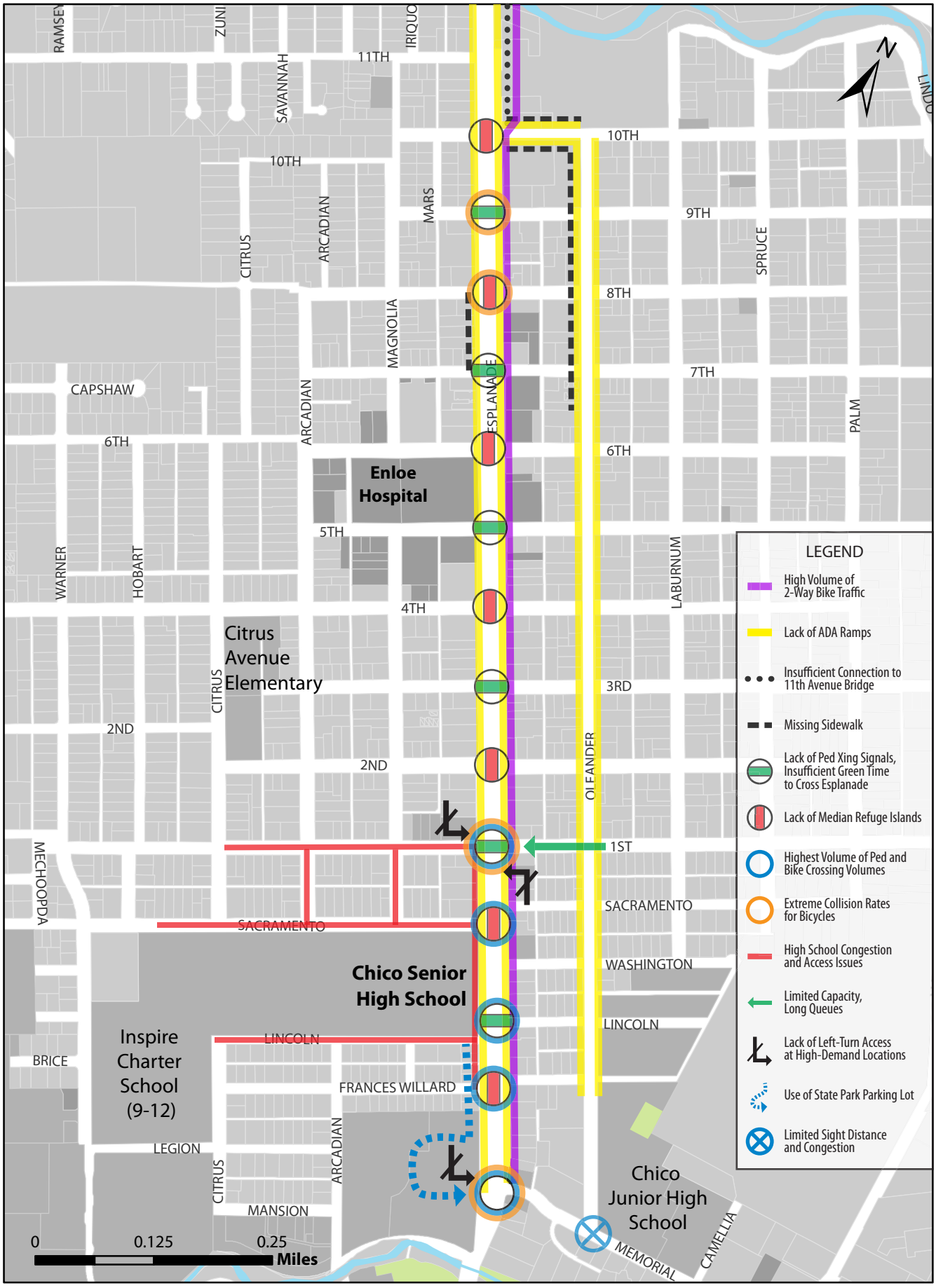
As part of the analysis of traffic data, field observations, planned improvements, and meetings with the community, the following critical issues were identified to be addressed as part of the study.

- The Esplanade should be a complete street that serves automobiles, trucks, pedestrians, and bicyclists in an attractive environment that is easy to navigate for all users.
- The corridor should provide well-connected, comfortable bicycle facilities with access to activity centers for a range of age groups and abilities.
- Safe, continuous pedestrian facilities should be provided that comply with requirements of the Americans with Disabilities Act, including improvements to intersection control. Pedestrian amenities such as benches and lighting should be provided.
- The network of active transportation facilities should provide a connection from the Downtown area to the High School and Enloe Hospital, and to the regional bike paths to the north.
- Given the amount of east-west crossing time, the width of the corridor is prohibitive for pedestrians. Crossing distances should be accommodated with longer east-west green time.
- Operation for automobiles and trucks should be maintained at acceptable levels now and in the future.
- There is confusion as to who has the right-of-way at the frontage road intersections.
- The number of collisions in the vicinity of Chico High School is concerning and needs to be addressed.
- The vehicle traffic volumes on 1st Avenue are almost four times as much as any other east-west street, but those approaches get the same amount of green time as all the other east-west streets.
- Permitted left turns result in broadside collisions.
- Some of the landscaping inhibits sight distance for motorists.

A summary of the transportation deficiencies on the corridor identified is shown in Figure 3. Following are detailed deficiencies by issue or mode.

Collision Experience

- Pedestrian Collision hot spot at Esplanade/Sacramento Avenue.
- Bicycles are approximately five times more likely to be in an accident than those travelling in a vehicle.
- As shown in Table 7, bicycle collisions represent approximately 15 percent of all collisions in the study area, but only 3 to 4 percent of the trips on the corridor.



900-17chi 2016.ai 9/16

Esplanade Corridor Safety and Accessibility Study

Figure 3 – Existing Deficiencies

W-Trans

Table 7 – Daily Trips vs. Collisions				
Mode	**Daily Trip Volume**		**Collisions per Year**	
	Trips	**%**	**Collisions**	**%**
Vehicle	21,343	94.3%	16	81.6%
Bicycle	812	**3.6%**	3	**15.3%**
Pedestrian	447	2.1%	0.6	3.1%
Total	**22,632**	**100.0%**	**20**	**100.0%**

Pedestrian Safety Concerns

- Existing traffic signals along corridor do not meet regulations in accordance with the *Manual for Uniform Traffic Control Devices* (MUTCD) for amount of time provided for pedestrians to cross the roadway. This is a significant safety issue that creates additional liability for the City.
- High volume of pedestrian crossings near Chico High School and moderate volume near Enloe Hospital.
- Absence of pedestrian crossing signals at signalized intersections.
- Highest concentration of reported accidents involving pedestrians near Chico High School.
- Absence of refuge medians at unsignalized intersections.
- Confusion as to vehicle-pedestrian right-of-way at intersections of E-W streets with frontage roads.

ADA Accessibility Issues

- 2006 FHWA letter recommending an update to ADA Transition Plan in accordance with Federal Regulations as outlined in 28 CFR Part 353.150.(d).
- The 2006 FHWA letter outlines Accessible pedestrian signal controls, referencing Section 4E.06 of the MUTCD that states if "a particular signalized intersection presents difficulties for pedestrians who have visual disabilities to cross safely and effectively, an engineering study should be conducted that considers the safety and effectiveness for pedestrians in general, as well as the information needs of pedestrians with visual disabilities."
- Lack of ADA accessible ramps and routes.
- Missing sidewalk sections on the Esplanade, on the west side between 7th Avenue and 8th Avenue, as well as along the west side of Oleander from 10th Avenue to 7th Avenue.
- Insufficient ramp and sidewalk connections to the 11th Avenue trail bridge.
- Sidewalk surface inconsistencies.

Lack of Bicycle Facilities and Safety Concerns

- Relatively high volume of bicycle use on the Esplanade frontage roads.
- High volume of two-way bicycle traffic on one-way frontage roads, especially on the east side.

- High rate of bicycle collisions on the Esplanade corridor with extremely high rates which are more than twice the average at nine intersections (Memorial Way, Lincoln Avenue, Sacramento Avenue, 1st Avenue, 3rd Avenue, 4th Avenue, 7th Avenue, 8th Avenue, and 9th Avenue).
- Non-existent bicycle lanes, markings, and bicycle circulation signage guidance.
- Non-existent and unclear bicycle connection between Esplanade and the 11th Avenue trail bridge.
- Recent bicycle fatality at Oleander Avenue/1st Avenue.
- Driver confusion and vehicle-bicycle conflicts at intersections with frontage roads at east-west streets.

High School Area Congestion and Safety

- Very high volume of pedestrian crossings at Lincoln Avenue and Sacramento Avenue near Chico High School. Existing usage of the public Right-of-Way by pedestrians and bicyclists is occurring at high frequencies, without identified routes of travel. This creates significant liability for the City relating to Safety of the Public.
- Severe congestion and shortage of pick-up/drop-off facilities around Chico High School.
- No signalized intersection to assist left-turns from Chico High School onto the Esplanade.
- Poor vehicle circulation and access around Chico High School causing traffic infiltration around the neighborhood.

Esplanade to Memorial Avenue Accessibility

- Lack of left-turn access at Memorial Avenue causes traffic to seek other neighborhood routes to access Chico Jr. High School from southbound Esplanade.
- Lack of left-turn access at Memorial Avenue causes traffic to travel along the west side frontage road and into the State Park parking lot traffic circle to access eastbound Memorial Way.

Bidwell State Parks Access and Use by the Public

- California State Parks has officially requested that the City modify the intersection of Esplanade/Memorial Way which would discourage vehicles from using their parking lot to access eastbound Memorial Way.

First Avenue Traffic Capacity

- Green time given to First Avenue traffic is the same as all other cross streets while the traffic volume is at least four time higher.
- Limited 'green time' at First Avenue results in restricted capacity and excessive queuing, especially vehicles turning left from westbound First Avenue to southbound Esplanade, which generates driver frustration and tendency to access less than optimal signal gaps.
- Lack of left-turn access causes traffic to access First Avenue via other neighborhood streets including left-turn movements at less than optimal uncontrolled locations.
- Prevailing conditions have generated the highest traffic collisions on the corridor which exceed the average accident experience for similar facilities.

Chico Junior High School Area Access and Congestion

- Congestion and restricted driver sight distance at Memorial Way/Oleander Avenue intersection.
- Expanded student population will cause additional capacity pressure on the Memorial Way/Oleander Avenue intersection during school hours.

General Vehicle Guidance and Confusion

- Lack of pavement markings and signage results in confusion between drivers, pedestrians and bicycles on right-of-way priority at frontage road intersections with east-west streets.
- Low hedge landscaping along the corridor restricts driver sight distance at frontage road intersections.

Alternative Components

Following is a discussion of the potential modifications to various facilities and design treatments intended to resolve deficiencies which were examined during the study process.

Right of Way

The overall goal of all of the alternatives was to stay within the existing right-of-way of the corridor while also maintaining the historical boulevard layout as much as possible.

Travel Lanes

There are currently six travel lanes on the Esplanade, including the frontage roads. There are two travel lanes in each direction on the main part of the corridor and one travel lane in each direction, separated by medians, on the frontage roads. Vehicle traffic volumes do not warrant the expansion of existing travel lanes. Therefore, all alternatives included the same geometric lane conditions with the exception of the northbound right-turn lanes which are discussed under the bicycle facilities.

Pedestrian Measures

ADA Compliant Curb Ramps

All alternatives included ADA compliant curb ramps. An "ADA Ramp" is one that meets specific standards set forth by the Americans with Disabilities Act. The standards for an ADA compliant curb ramp includes a curb ramp that is at least 36 inches wide, with flared sides and detectable warnings, otherwise known as "truncated domes" which are the dome-shaped bumps that cover the first two feet of the ramp. The ramp must have a slope of 8.33 percent or less and transitions from the ramp to the walkway or street must be at a flush level and free of abrupt level changes.

Pedestrian Crossing Signal Indications Equipment

In order to be in compliance with MUTCD requirements for pedestrian crossing time, all alternatives included an upgrade to the traffic signal equipment. Pedestrian "countdown" signal heads and push button activation would be provided along with adequate crossing time provided for the pedestrians (discussed below).

Traffic Signal Timing for Pedestrians

In order to provide adequate crossing time for pedestrians at the signalized intersections, the signal timing plan was adjusted and vehicle detection was assumed to be added to the system. One issue identified through the public outreach effort was the concern that changes to the Esplanade could result in the loss of the synchronized signal timing (aka free flow 28 mph) and result in increased vehicle travel times. To also provide some flexibility and to simulate the current 28 mph flow conditions, the City could choose the option of multiple timing plans such as one which returns the corridor to its current condition during off peak periods.

Refuge Medians for Pedestrians

Refuge medians provide a "halfway point" in the roadway for pedestrians to stop as they cross the roadway. A pedestrian refuge allows pedestrians to cross one direction of traffic at a time, reducing the complexity of the crossing. Raised medians and refuge islands provide a space to install improved lighting at pedestrian crossing locations. In order for the pedestrian crosswalks to be more ADA compliant, the corridor alternatives included

both the addition of curb ramps to the medians as well as the expansion of the center median at the unsignalized intersections.

Bicycle Facilities

Clearly marked facilities create a distinct right-of-way for cyclists, making it more comfortable for cyclists of all abilities to choose to ride. Clearly marked facilities promote cycling by making connections to bicycle routes and trails easier to see. Bicycle connectivity to the Airport Bike Path at 11th Avenue was a goal of the study, so alternatives for the connection from the north end of the corridor to the Airport Bike Path were considered and included in the final design.

Bike Lanes within the Primary Travel Way

Bike lanes within the primary travel lanes were considered in the process, but were generally rejected by the public in favor of either bicycle travel in the frontage roads or as part of a new Class IV facility.

Marked Bike Facilities on the Frontage Roads

One of the alternatives included marked bicycle facilities on the existing frontage roads using "bicycle boulevard" signing and striping techniques. Bicycle Boulevards use signs, pavement markings, and speed and volume management measures to discourage through trips by motor vehicles and create safe, convenient bicycle crossings of busy arterial streets. A shared lane marking, otherwise known as a "sharrow," is a tool used to create clearly marked bicycle facilities and indicate a shared lane environment for bicycles and automobiles. Among other benefits, shared lane markings reinforce the legitimacy of bicycle traffic on the street, designate proper bicyclist positioning, and may be configured to offer directional and wayfinding guidance.

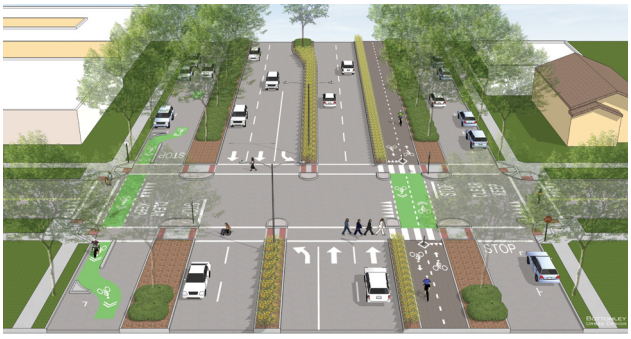
Separated Class IV Bike Facility in the Old Streetcar Right-of-Way

Since the median on the east side of the Esplanade is approximately 28 feet wide, one of the bike facility alternatives included a two-way separated (Class IV) bikeway in the old streetcar right-of-way. The streetcar right-of-way converted to a Class IV Separated Bikeway would dedicate and protected space for bicyclists thereby improving their comfort and safety. A discussion of Class IV Bicycle Facility Best Practices is included in Appendix G and includes design guidance.

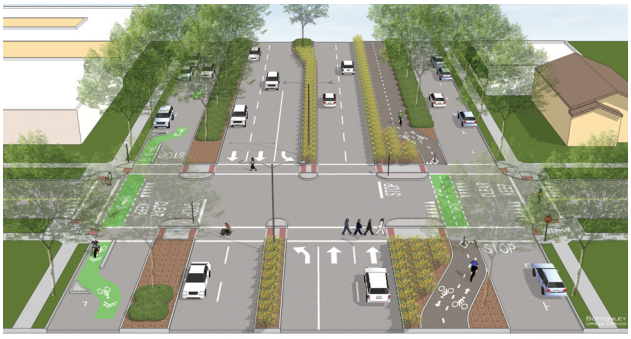
Separated Bicycle Crossing Options

Given the close proximity of the frontage roads to the main travelway of the Esplanade with the potential Class IV Separated Bikeway located between the two, the design of the Class IV crossings of the east-west cross streets was a crucial design consideration. A number of crossing options were explored and are shown in Figure 4. The primary goal of the crossing treatment was to reduce conflicts between bicycles with left- and right-turning vehicles while not creating new conflicts with the frontage road. The options included (from top to bottom on Figure 4):

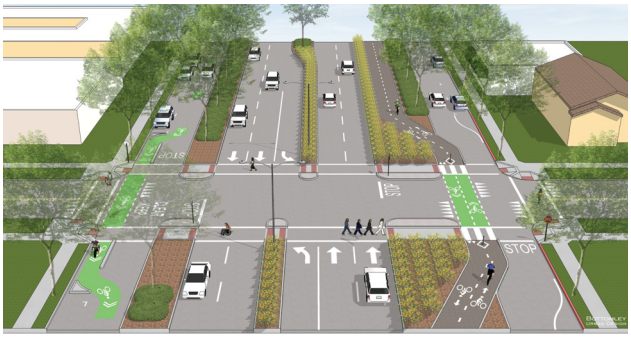
- **Flush with Esplanade** – This was the original concept design which did not provide adequate separation from the Esplanade.
- **Preferred Set-Back Crossing** – This became the preferred alternative which would meet design guidelines for separated intersection setbacks.
- **Pushed Out with More Set-Back** – By creating more set-back, the bikeway would impact operations on the frontage roads.
- **Pushed Out to Outer Flank** – This design would cross the bicyclist at a similar location to the pedestrian, but would require an exaggerated crossing from the median to the right side of the Frontage roads.
- **Reoriented Frontage Road** – An extensive change which was rejected by the public would significantly change the geometrics of the historical boulevard.



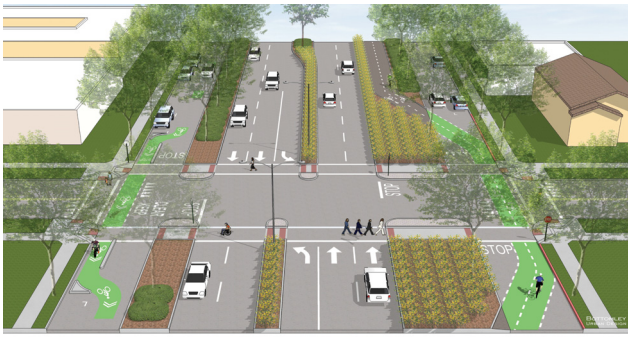
Original Concept
Flush with Esplanade



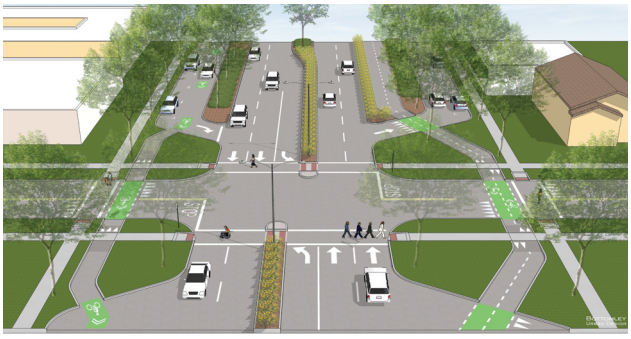
New Preferred
Set Back Crossing



Pushed Out
with More Set Back



Pushed Out
to Outer Flank



Reoriented
Frontage Road

900-17chi 2016.ai 9/16

Esplanade Corridor Safety and Accessibility Study

Figure 4 – Separated Bike Crossing Options

Frontage Roads

In combining the pedestrian and bicycle facility treatments, several optional designs were created for the frontage road intersections which are shown in Figure 5. These options included:

- Do Nothing
- Shared Space Treatments
- One-way Channelization on Frontage Roads
- Re-oriented Frontage Roads
- Separated 2-Way Bikeway

The alternative corridor designs for both the signalized and unsignalized intersections are included in Appendix G.

Intersection Treatments

Esplanade/1st Avenue and Esplanade/Memorial Way

The intersections of the Esplanade with 1st Avenue and Memorial Way do not have northbound-southbound left-turn access similar to most signalized intersections on the corridor. However, both of these east-west streets have the highest "latent" left-turn demand with 1st Avenue accessing the SR-99 interchange and Memorial Way providing access to Chico Junior High School and Vallombrosa Avenue. Alternatives for new left-turn access were considered in the form of either left-turn lanes with continued signalization or with roundabouts. These options are shown in Appendix G.

Roundabouts

Intersection control in the form of roundabouts was considered at Esplanade/1st Avenue and Esplanade/ Memorial Way. Roundabouts reduce delay, improve traffic flow, and are typically less expensive than traffic signals. Contrary to common perceptions, roundabouts actually move traffic through an intersection more quickly, and with less congestion on approaching roads. Roundabouts promote a continuous flow of traffic. Unlike intersections with traffic signals, drivers do not have to wait for a green light at a roundabout to get through the intersection. Traffic is not required to stop – only yield – so the intersection can handle more traffic in the same amount of time. Roundabouts were presented as alternatives for these intersections for the following reasons:

- City has experience with existing roundabouts.
- Roundabouts will allow for better corridor traffic flow.
- Can address State Parks concerns.
- Safer traffic control option.
- Environmental benefits.
- Opportunity for urban design and gateway treatments.
- Lower operating costs ($6,000 savings per intersection per year).
- May attract potential funding (versus a traffic signal).

Parking

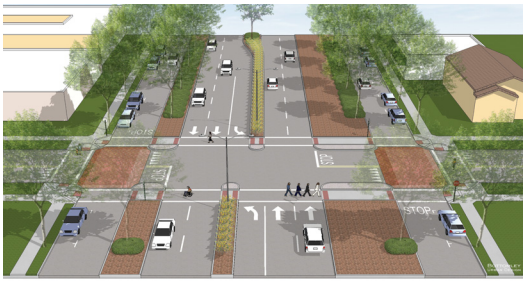
The corridor currently incudes on-street parking on the Esplanade along the frontages of businesses and homes. The alternatives propose to maintain on-street parking where it currently exists at a standard parallel parking width of 7 to 8 feet.

West Side **East Side**

Do Nothing

Do Nothing

Shared Space

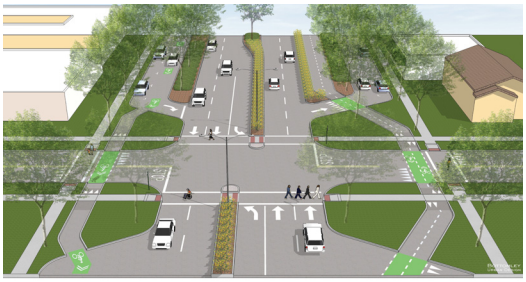


Shared Space

One-Way Channelized

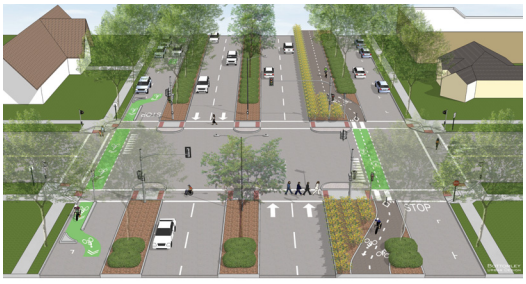
One-Way Channelized

Reoriented Frontage Road



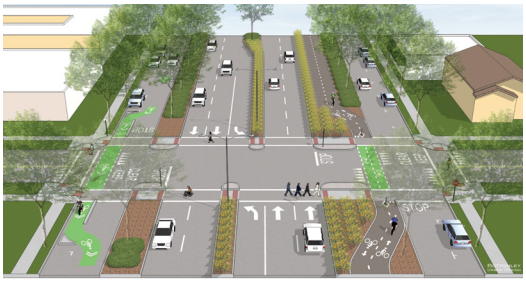
Reoriented Frontage Road

One-Way Channelized



Separated Bike Two-Way (Signalized)

One-Way Channelized



Separated Bike Two-Way (Unsignalized)

900-17chi 2016.ai 9/16

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Figure 5 – Frontage Road Options

Plan Recommendations

Factors in Determining Recommendations

The recommendations were assembled based on a number of factors which were considered throughout the plan process:

- Comments from the City Council
- Input from key stakeholders
- Public input through the workshops and emails
- On-line surveys
- Need to meet traffic engineering standard practices and state guidelines
- Traffic Engineering analysis
- Collision history review
- Input from City staff
- Experience of the consulting team

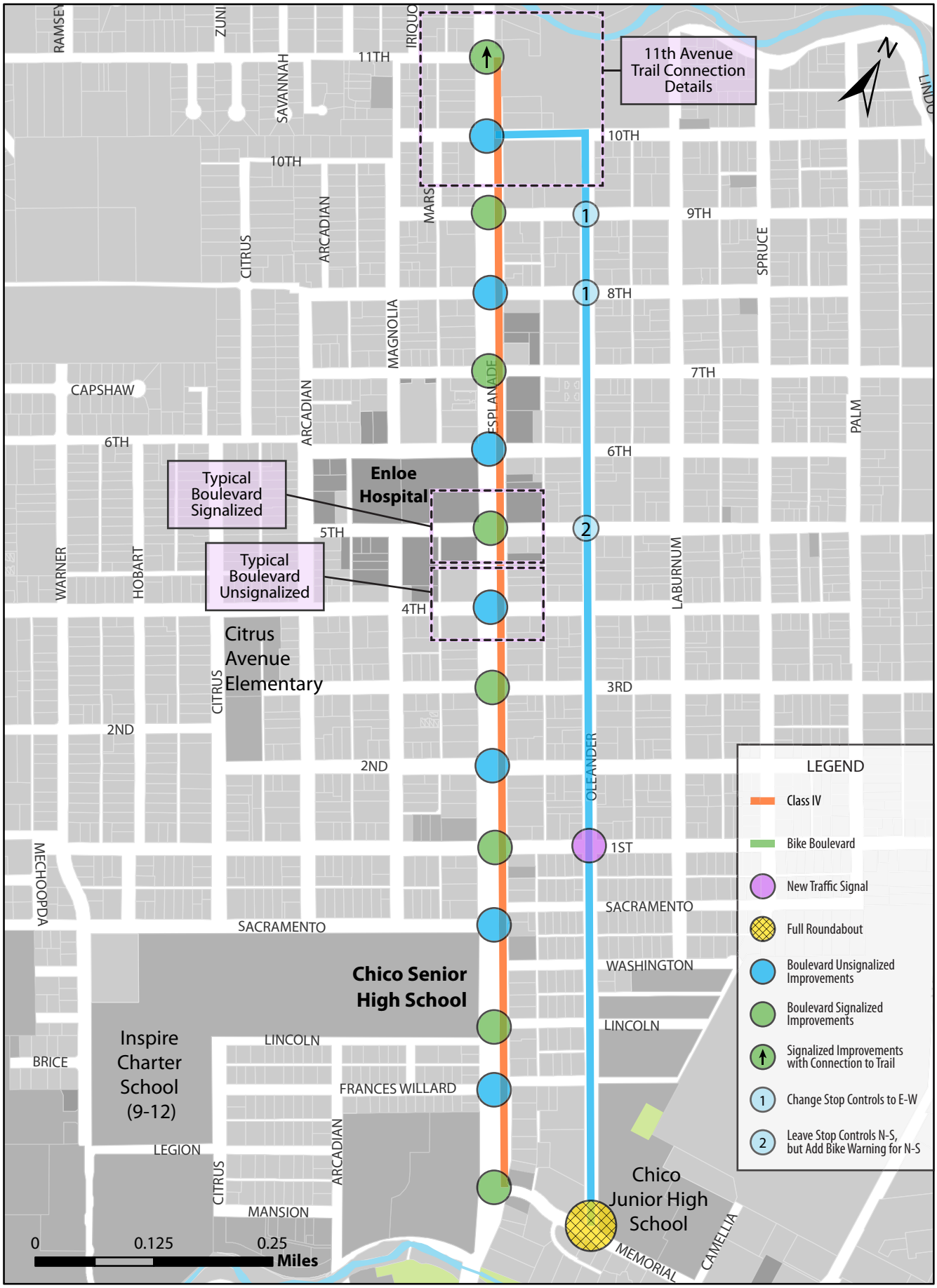
Council Approved Plan Components

On May 3, 2016, the City Council approved the majority of the project components which were recommended. These features are discussed below. A map summarizing the Council Approved Plan Components are shown in Figure 6.

Pedestrian Recommendations

- New pedestrian countdown crossing signal heads and pedestrian push button activation at all existing traffic signals on the Esplanade with sufficient crossing timing which meets Federal guidelines.
- Vehicle detection on all approaches replacing timed signalization with an on-demand detection system.
- Adequate pedestrian crossing refuge islands at unsignalized intersections on the Esplanade.
- Consistently marked pedestrian crosswalks at all crossing locations.
- Enhanced signal timing plan to respond to vehicles, bikes and pedestrian needs.
- Off-Peak signal timing plan to simulate existing 28-mph free flow.

The pedestrian traffic signal heads, curb ramps and detection recommended as part of the plan are shown on page 49.



900-17chi 2016.ai 9/16

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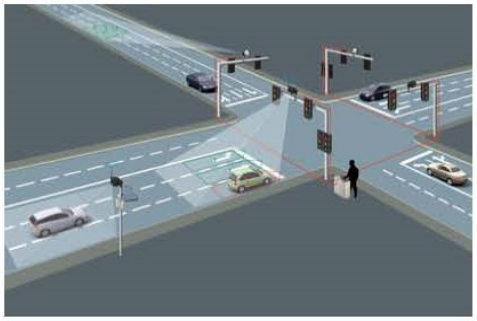
Figure 6 – Council Approved Plan Components

ADA Curb Ramp

Pedestrian
Signal Heads

Pedestrian
Push Buttons



Vehicle Detection

Examples of Pedestrian Improvements

ADA Recommendations

- Improved connection to the 11th Avenue trail bridge with adequate walkway and ramps, as well as accessibility off of the Lindo Channel bridge on both the west and east sides of the Esplanade.
- ADA acceptable curb ramps at all crosswalk locations.
- Sidewalk plan to provide missing sidewalks and reconstruct uneven sidewalk surfaces.

Bicycle Facility Recommendations

- Two-way Class IV bike trail on old rail right-of-way (east side) with appropriate safety crossing measures.
- Discouragement of wrong-way riders on the west side frontage road with a shared space pavement design to slow vehicle and bicycle traffic through these conflict zones.
- Marked bicycle route on Oleander Avenue which favors minimal stopping except at 1st Avenue and 5th Avenue.
- New traffic signal at Oleander Avenue/1st Avenue with bike crossing emphasis.

Chico High School Area Recommendations

Note: Other plan components intended to enhance High School area circulation and provide additional areas of pick-up and drop-off around the campus were not approved by Council, so were deferred for further discussion, analysis and outreach to the public. These components are discussed later in this section.

Chico Junior High School Recommendations

- New single-lane roundabout at Memorial Way/Oleander Avenue near Chico Junior High School.
- Suggested future Safe Routes to School assessment to evaluate the campus safety more fully.

Example of Single Lane Roundabout

General Vehicle Guidance Recommendations

- Clear and consistent pavement markings at frontage road intersection areas.
- Creation of the shared space area at crossings of the east-west streets and frontage roads.
- Vehicle detection at all approaches of signalized intersections.
- Traffic signal indications guiding cross traffic to stop "outside" of the frontage road.

11th Avenue Connection Recommendations

- Enhanced connections between the 11th Avenue bicycle/pedestrian trail bridge and the Esplanade as well as 10th Avenue to Oleander Avenue. (Diagrams provided in Appendix G.)

Esplanade to Memorial Recommendations

Note: Other plan components intended to provide north-south left-turn access at the Memorial Way intersection were not approved by Council, so were deferred for further discussion, analysis and outreach to the public. These components are discussed later in this section.

First Avenue Recommendations

Note: Other plan components intended to provide north-south left-turn access at the First Avenue intersection were not approved by Council, so were deferred for further discussion, analysis and outreach to the public. These components are discussed later in this section.

Bidwell Mansion State Park Access Recommendations

- Reorientation of the west side frontage road to eliminate the connection to the Bidwell Mansion State Park parking lot.

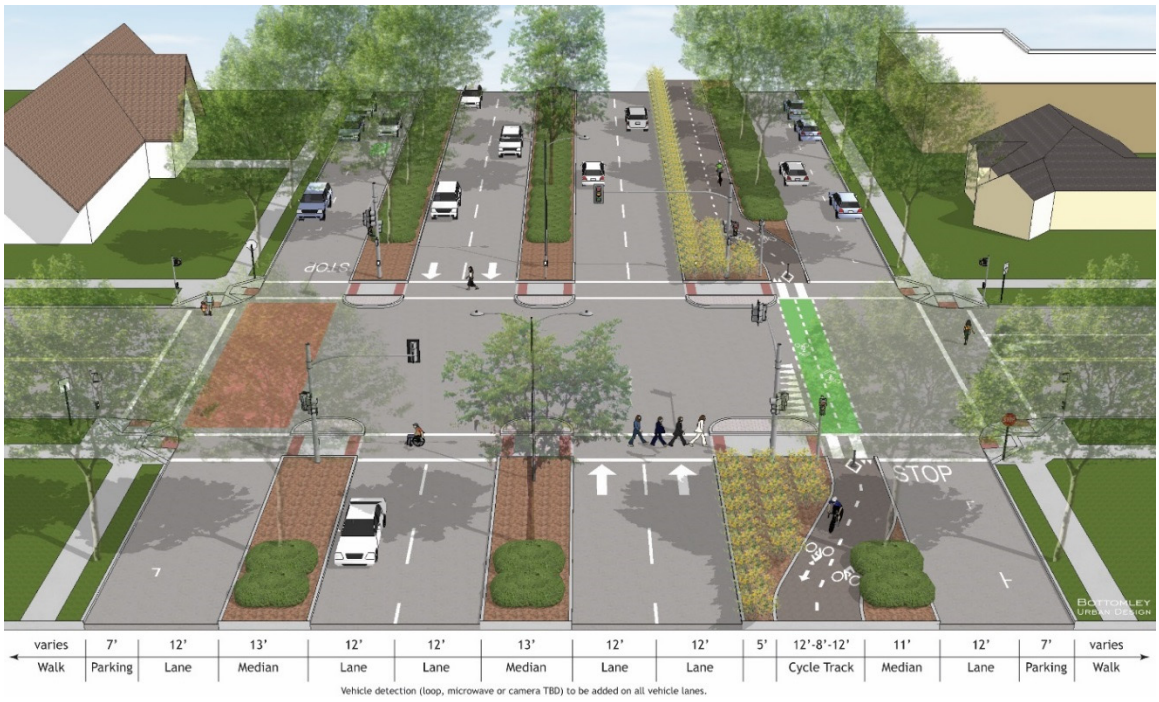
Other Amenities Recommendations

- Recommendation for a future Landscaping Plan to eliminate visual obstructions and upgrade all landscaping as appropriate.
- Recommendation for a future Lighting Plan to upgrade efficiency, function and aesthetics of lighting equipment.

Typical Cross Section and Intersection Treatments

Typical Signalized Intersection

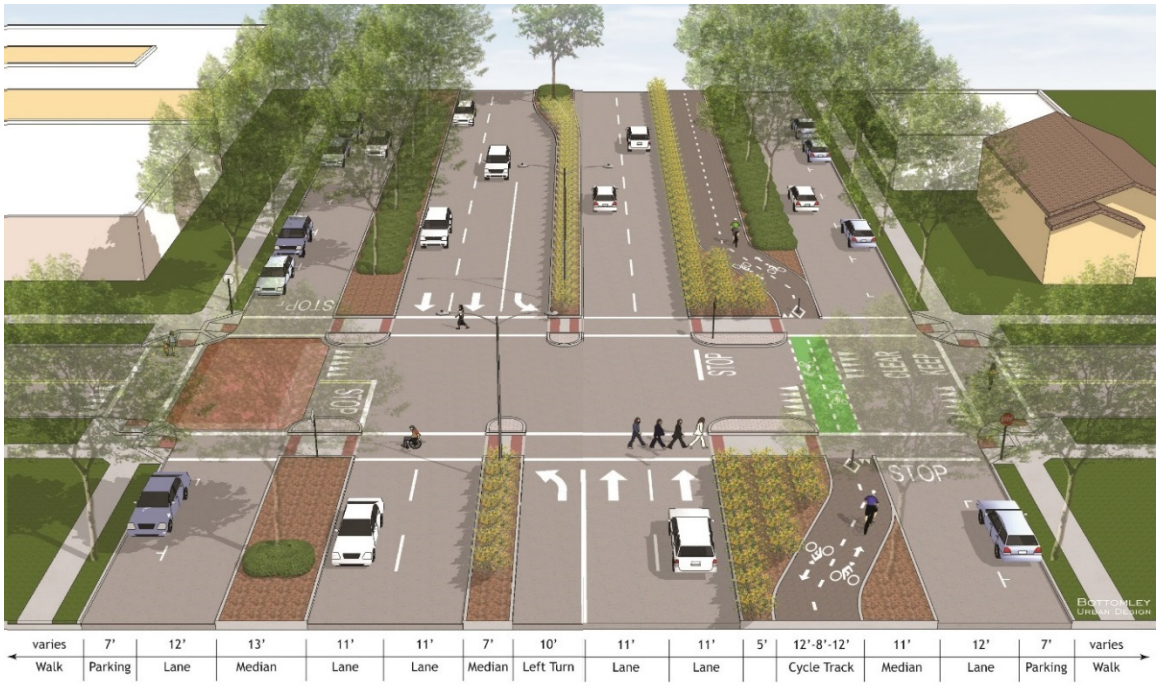
- Provide a two-way separated bikeway in the eastern median with bike signals coordinated with the main Esplanade traffic signals.
- Provide textured "mixing zone" at the intersection of southbound frontage and east-west cross streets.
- Eliminate northbound right-turn pocket.
- Provide pedestrian refuge islands on all medians.
- Update signal timing with adequate crossing time in the east-west directions.
- Refresh striping and add any missing crosswalks.
- Northbound and southbound left-turn pockets at 1st Avenue and Memorial Way.



Council Approved Plan – Typical Signalized Intersection

Typical Unsignalized Intersection

- Provide a two-way separated bikeway in the eastern median.
- Provide textured "mixing zone" at the intersection of southbound frontage and east-west cross streets.
- Provide pedestrian refuge islands on all medians.
- Refresh striping and add any missing sidewalks.



Council Approved Plan – Typical Unsignalized Intersection

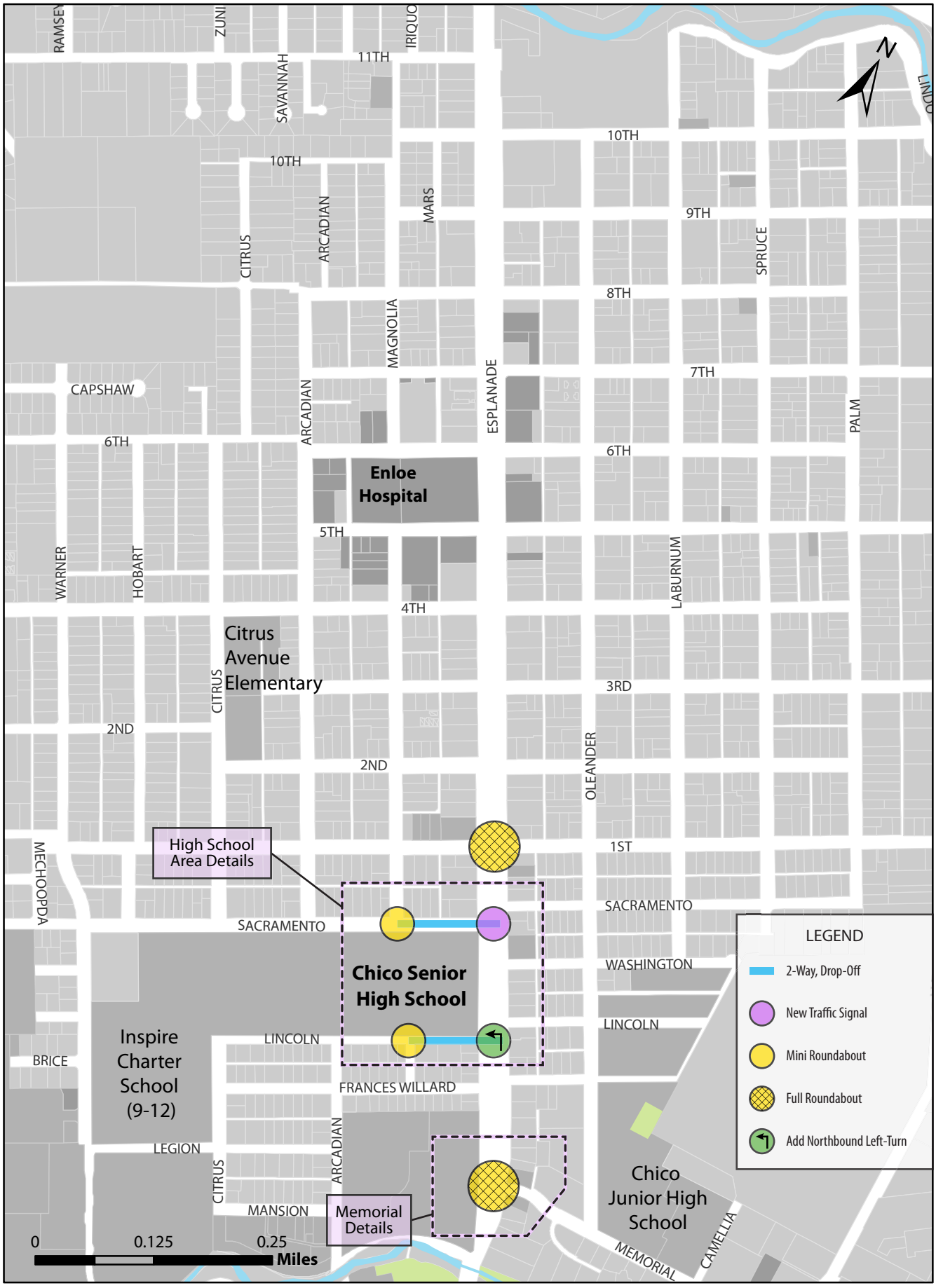
Deferred Plan Components

A number of plan recommendations related to Chico High School and intersection modifications at Esplanade/ Memorial Way and Esplanade/1st Avenue were not approved by Council, so were deferred for further discussion, analysis and outreach to the public. A map summarizing these "Deferred Components" is provided in Figure 7. The deferred components include:

Chico High School Area Deferred Components

- New traffic signal at Esplanade/West Sacramento Avenue.
- Minor widening on the Chico High School side of Lincoln Avenue and West Sacramento Avenue for expansion of pick-up/drop-off frontage.
- Conversion of Lincoln Avenue to two-way traffic between Esplanade and Arcadian Avenue.
- Turnaround traffic circles at Lincoln Avenue/Arcadian Avenue and Sacramento Avenue/Magnolia Avenue.
- New northbound left-turn lane at Esplanade/Lincoln Avenue.
- Esplanade signal timing plan specific for school hours to favor access to/from Chico High School.

These recommendations are shown in Appendix G.



900-17chi 2016.ai 9/16

Esplanade Corridor Safety and Accessibility Study

Figure 7 – Deferred Plan Components

Example of Mini Roundabout

Esplanade to Memorial Deferred Components

- New northbound/southbound left-turn lane on Esplanade at Memorial Way traffic signal as a short-term mitigation.
- New roundabout at Esplanade/Memorial Way with full four-way access as a long-term mitigation.

First Avenue Deferred Components

- New northbound/southbound left-turn lane on Esplanade at 1st Avenue traffic signal as a short-term mitigation.
- New roundabout at Esplanade/1st Avenue with full four-way access as a long-term mitigation.
- Updated signal-timing plan to accommodate higher volumes on 1st Avenue.

Esplanade Roundabout at Memorial Way and 1st Avenue

Bidwell Mansion State Park Access Recommendations

- The left-turn access and future roundabout at Esplanade/Memorial Way would preclude the need for traffic to enter the parking lot.

Operational Evaluation of the Plan

The plan recommendations were evaluated based on the vehicle traffic operations on the corridor. Specifically, the plan was assessed in terms of intersection levels of service and travel time along the corridor. These conditions were completed with existing traffic volumes with the **Council Approved Plan** and with the **Council Approved Plan Plus Roundabouts**.

- The **Council Approved Plan** includes the addition of a) traffic signal timing to accommodate pedestrian countdown signals, b) bicycle traffic signal control on the Class IV facility, c) the addition of a traffic signal at Esplanade/Sacramento Avenue and d) elimination of northbound right-turn lanes at the existing signalized intersections. This alternative assumed current roadway geometrics and northbound-southbound left-turn restrictions at Esplanade/1st Avenue and Esplanade/ Memorial Way.

- The **Council Approved Plan Plus Roundabouts** includes the same features as the Council Approved Plan, but with the addition of roundabout intersections at Esplanade/1st Avenue and Esplanade/Memorial Way with full turning movement access. For this scenario, northbound and southbound left-turn movements from adjacent intersections were diverted to 1st Avenue and Memorial Way where there would be new access.

Intersection Levels of Service

Existing with Council Approved Plan

The potential impacts of the Council Approved Plan were analyzed using the existing roadway volumes. Table 8 summarizes the levels of service at the study intersections with these modifications. Intersection level of service calculations are included in Appendix B.

Table 8 – Council Approved Plan Intersection Levels of Service				
Study Intersection ***Approach***	**AM Peak**		**PM Peak**	
	Delay	**LOS**	**Delay**	**LOS**
Esplanade/Memorial Way	12.4	B	10.2	B
Esplanade/Frances Willard Ave	2.7	A	1.6	A
Westbound Approach	*9.4*	*A*	*9.8*	*A*
Eastbound Approach	*10.8*	*B*	*10.6*	*B*
Esplanade/Lincoln Ave	11.6	B	6.0	A
Esplanade/Sacramento Ave	17.9	B	12.8	B
Esplanade/1st Ave	16.4	B	15.6	B
Esplanade/2nd Ave	0.9	A	0.8	A
Westbound Approach	*12.9*	*B*	*17.1*	*C*
Eastbound Approach	*16.1*	*C*	*15.8*	*C*
Esplanade/3rd Ave	10.5	B	6.0	A
Esplanade/4th Ave	2.7	A	2.4	A
Westbound Approach	*25.6*	*D*	*34.8*	*D*
Eastbound Approach	*59.0*	*F*	*40.0*	*E*
Esplanade/5th Ave	11.2	B	8.9	A
Esplanade/6th Ave	2.7	A	1.6	A
Westbound Approach	*32.3*	*D*	*25.9*	*D*
Eastbound Approach	*52.7*	*F*	*20.7*	*C*
Esplanade/7th Ave	7.7	A	6.4	A
Esplanade/8th Ave	32.7	D	7.7	A
Westbound Approach	*59.1*	*F*	*19.2*	*C*
Eastbound Approach	*372.0*	*F*	*99.5*	*F*
Esplanade/9th Ave	11.5	B	7.6	A
Esplanade/10th Ave	1.2	A	1.0	A
Westbound Approach	*11.1*	*B*	*13.0*	*B*
Eastbound Approach	*27.0*	*D*	*19.9*	*C*
Esplanade/11th Ave	23.6	C	12.7	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Under this scenario, all of the signalized intersections along the corridor would operate at LOS C or better. The unsignalized intersections would operate at LOS D or better overall. All of these conditions would be considered acceptable according to City standards.

Existing with Council Approved Plan Plus Roundabouts

The potential impacts of the Council Approved Plan Plus Roundabouts were analyzed using the existing roadway volumes, with diversions to account for the change in left-turn access. Table 9 summarizes the levels of service at

the study intersections with these modifications. Intersection level of service calculations are included in Appendix B.

Table 9 –Council Approved Plan Plus Roundabouts Intersection Levels of Service

Study Intersection *Approach*	AM Peak		PM Peak	
	Delay	LOS	Delay	LOS
Esplanade/Memorial Way	6.4	A	7.5	A
Esplanade/Frances Willard Ave	1.5	A	0.5	A
Westbound Approach	*12.7*	*B*	*13.1*	*B*
Eastbound Approach	*9.9*	*A*	*10.2*	*A*
Esplanade/Lincoln Ave	10.9	B	6.6	A
Esplanade/Sacramento Ave	21.6	C	12.9	B
Esplanade/1st Ave	12.9	B	28.4	C
Esplanade/2nd Ave	1.4	A	1.1	A
Westbound Approach	*28.1*	*D*	*32.5*	*D*
Eastbound Approach	*40.4*	*E*	*25.7*	*D*
Esplanade/3rd Ave	10.9	B	7.2	A
Esplanade/4th Ave	2.7	A	2.4	A
Westbound Approach	*25.6*	*D*	*34.8*	*D*
Eastbound Approach	*59.0*	*F*	*40.0*	*E*
Esplanade/5th Ave	10.0	A	7.8	A
Esplanade/6th Ave	2.7	A	1.6	A
Westbound Approach	*32.3*	*D*	*25.9*	*D*
Eastbound Approach	*52.7*	*F*	*20.7*	*C*
Esplanade/7th Ave	8.8	A	7.6	A
Esplanade/8th Ave	32.7	D	7.7	A
Westbound Approach	*59.1*	*F*	*19.2*	*C*
Eastbound Approach	*372.0*	*F*	*99.5*	*F*
Esplanade/9th Ave	10.8	B	7.3	A
Esplanade/10th Ave	1.2	A	1.0	A
Westbound Approach	*11.1*	*B*	*13.0*	*B*
Eastbound Approach	*27.0*	*D*	*19.9*	*C*
Esplanade/11th Ave	25.1	C	13.3	B

Notes: Delay is measured in average seconds per vehicle; LOS = Level of Service; Results for minor approaches to two-way stop-controlled intersections are indicated in *italics*

Under this scenario, all of the signalized intersections and the two roundabout intersections would operate at LOS C or better. The unsignalized intersections would operate at LOS D or better overall. All of these conditions would be considered acceptable according to City standards.

Travel Time Performance

Travel time performance for the plan alternatives were evaluated using the Synchro 8 and SimTraffic applications which were also used for the intersection level of service evaluation. Details of the SimTraffic travel time and speed and travel time estimates are included in Appendix C. Table 10 provides a summary of existing average travel time and average speeds along the corridor between Memorial Way and 11th Avenue vs. conditions with the Council Approved Plan and Council Approved Plan Plus Roundabouts.

Table 10 – Speed and Travel Time Performance

Scenario	AM Peak Hour				PM Peak Hour			
	NB		SB		NB		SB	
	Travel Time (sec)	Avg Speed (mph)	Travel Time (sec)	Avg Speed (mph)	Travel Time (sec)	Avg Speed (mph)	Travel Time (sec)	Avg Speed (mph)
Existing	178	24	188	23	181	24	179	24
Council Approved Plan	201.4	21	197.8	22	204.3	21	218.1	20
Plan + Roundabouts	205.7	21	199.2	21	203.4	21	203.7	21

- With the **Council Approved Plan**, speeds would decrease from the range of 23-24 mph to approximately 20-21 mph due to the added delay primarily from the delay created by the pedestrian signal timing. Travel time would increase on average from approximately 180 seconds between Memorial Way and 11th Avenue to approximately 205 seconds, or an increase of 25 seconds.

- With the **Council Approved Plan Plus Roundabouts**, speeds would decrease from the range of 23-24 mph to approximately 21 mph due to the added delay primary created by the pedestrian signal timing. Average travel time would increase from approximately 180 seconds for the trip between Memorial Way and 11th Avenue to approximately 203 seconds, or an increase of 23 seconds.

Conclusion

Council Action

On May 3, 2016, the City Council approved the following project components to be included in the Active Transportation Program (ATP) application.

- ADA improvements (ramps, sidewalk gap closures).
- Pedestrian refuge islands at all signalized and non-signalized intersections both at center islands and islands separating travel lanes from frontage roads.
- Traffic signal equipment upgrades (pedestrian countdown signal heads with adequate time to cross Esplanade).
- Consistent pavement markings and signage ("Keep Clear" pavement delineations with either green pavement and/or slightly raised colored concrete option).
- Traffic signal timing plan with pedestrian push button and vehicle detection (use detection based system during peak times, use existing 28mph progression during non-peak times).
- Oleander Changes (Roundabout at Memorial, install traffic signal at 1st Avenue, change stop controls at 8th and 9th Avenues to all free flow bicycle traffic, add bike warning at 5th Avenue with Sharrow pavement markings).
- **Esplanade Bicycle Improvements** – Class IV separated bicycle facility on east side of Esplanade in the old Rail Road right of way, provides two-way bike traffic for entering/exiting bike bridge at 11th Avenue, "Sharrows" at west side frontage road.
- Correction of ADA non-compliant slopes and connections on both sides of Esplanade north of 11th Avenue to the bike bridge on the east side as well as to the pedestrian ramp on the west side.

Based on the results of the Council action, the recommendation related to Chico High School and intersection modifications at Esplanade/Memorial Way and Esplanade/1st Avenue were deferred for further discussion, analysis and outreach to the public.

ATP Grant Application

On June 15, 2016, an ATP grant application was submitted for the Council Approved Plan elements discussed above.

The ATP (Active Transportation Program) is a potential funding source for projects in California which include the types of improvements that are proposed for the Esplanade and Oleander. The purpose of the ATP is to provide money to local agencies for the development of bikeways and walkways, installation of traffic control devices to improve safety at intersections for bicyclists and pedestrians, and for projects that are a part of Safe Routes to School plans, Recreational Trail projects, and/or Active Transportation Plans. The program is a consolidation of three existing programs, including the Transportation Alternatives Program (TAP), Bicycle Transportation Account (BTA), and State Safe Routes to School (SR2S), which streamlines the process of obtaining funding for active transportation projects and facilities. Some of the program goals include increasing biking and walking trips, improving safety and mobility for people using alternative modes, reducing greenhouse gas emissions, and focusing on ways to improve public health.

The ATP program is administered by Caltrans' Division of Local Assistance, Office of Active Transportation and Special Programs. The ATP program goals include the following:

- Increase the proportion of trips accomplished by biking and walking.
- Increase safety and mobility for non-motorized users.

- Advance the active transportation efforts of regional agencies to achieve greenhouse gas reduction goals.
- Enhance public health.
- Ensure that disadvantaged communities fully share in the benefits of the program.
- Provide a broad spectrum of projects to benefit many types of active transportation users.

The California Transportation Commission ATP Guidelines are available at: www.catc.ca.gov/programs/ATP.htm

Cost Estimates

The project cost for the ATP enhancement project was estimated at $7,660,888. The cost estimate is included in Appendix G.

Study Participants and References

Study Participants

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References

2012 Collision Data on California State Highways, California Department of Transportation, 2012
Active Transportation Program (ATP), California Transportation Commission, http://www.catc.ca.gov/programs/ATP.htm
B-Line (Butte Regional Transit), http://www.blinetransit.com/Schedules/index.html
California Manual on Uniform Traffic Control Devices for Streets and Highways, California Department of Transportation, 2014
Chico 2030 General Plan, City of Chico, 2011
Chico Urban Area Bicycle Plan, City of Chico, 2012
Chico, California Code of Ordinances, American Legal Publishing Corporation, 2016
Deputy Directive 64-R1: Complete Streets – Integrating the Transportation System, California Department of Transportation, 2008
Design Information Bulletin Number 89: Class IV Bikeway Guidance (Separated Bikeways/Cycle Tracks), California Department of Transportation, 2015
Guide for the Development of Bicycle Facilities, 4th Edition, American Association of State Highway and Transportation Officials, 2012
Highway Capacity Manual, Transportation Research Board, 2010
Highway Design Manual, 6th Edition, California Department of Transportation, 2012
Lessons Learned: Evolution of the Protected Intersection, Alta Planning + Design, 2015
NACTO Urban Bikeway Design Guide, 2nd Edition, National Association of City Transportation Officials, 2012
Separated Bike Lane Planning and Design Guide, Federal Highway Administration, 2015
Separated Bike Lane Planning and Design Guide, Massachusetts Department of Transportation, 2015
Statewide Integrated Traffic Records System, California Highway Patrol, 2010-2014

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