Eureka Broadway Multimodal Corridor Plan

Humboldt County Association of Governments

February 2021

Executive Summary

This Executive Summary provides a brief overview of the following *Eureka Broadway Multimodal Corridor Plan (Eureka BMCP)* report and highlights the resulting **Preferred Concept**. While this Executive Summary was prepared to convey an overall summary of the report, the study and its appendices should be referenced for additional detail on methodology and findings.

The Humboldt County Association of Governments (HCAOG), in coordination and cooperation with the City of Eureka and Caltrans, initiated the preparation of the Eureka BMCP. The Eureka BMCP evaluates the portion of US 101 through the City of Eureka referred to as the Broadway Corridor (from Herrick Avenue to 4th Street). The objective of the Eureka BMCP is to develop a Preferred Concept with comprehensive multimodal improvements that address the corridor's long-standing issues, including safety, multimodal access and mobility, peak-hour congestion, and blight.

The multimodal improvements must be feasible, equitable, cost-effective, and have community support. The Preferred Concept will serve to guide future Broadway Corridor programming decisions over a 20-year timeframe based on available funding. Requisite technical information consistent with State and Federal grant program guidelines and implementation phasing of the multimodal improvement package were also key elements of the Eureka BMCP.

Ultimately, this Preferred Concept proposes new parallel and connecting transportation facilities that have the potential to enhance corridor safety, enhance multimodal connectivity, reduce corridor congestion, improve corridor reliability, plan for sea level rise, and expand access to coastal visitor destinations, essential local services, and regional commerce. In addition, the Preferred Concept with associated multimodal improvements highlights the priorities for the Broadway Corridor while positioning the corridor for funding opportunities which provide the highest return on investment (benefit-cost) of limited regional transportation funding over the next 20 years.

Report Organization

Upon review of past planning and other corridor-related documents and establishment of evaluation performance metrics (Chapter 2 of the report), the public was engaged for their input (Chapter 3) and a thorough assessment of existing conditions was conducted (Chapter 4). These combined efforts led to the identification and evaluation of a focused group of **Corridor Alternatives** (Chapter 5). Ultimately, a list of multimodal and safety improvements were identified within the Preferred Concept for the Broadway Corridor (Chapter 6) and evaluated for its respective benefits and costs (Chapters 8 and 9). Due to the immediate need for safety improvements to address the corridor's statistically high rates of fatal and injury crashes, near term safety improvements were also identified (Chapter 7).

Eureka BMCP Approach

Recognizing the significant costs necessary to implement the improvements identified in the Eureka BCMP, funding will be sought through competitive grant programs, including the Solutions for Congested Corridor Program (SCCP). In order to ensure eligibility of improvements towards programs like SCCP, the Eureka BMCP follows the California Transportation Commission's

Comprehensive Multimodal Corridor Plan Guidelines (December 2018) and Caltrans Corridor Planning Guide (February 2020). As such, the existing and future conditions of the Broadway Corridor are assessed using the Caltrans Smart Mobility Framework, a performance-based analysis performed to develop and evaluate alternative corridor improvement concepts. The results of the performance analysis were combined with substantial input from the public to inform the ultimate selection of the Preferred Concept recommendation. The Eureka BMCP Preferred Concept with associated multimodal improvements establishes the funding priorities for the corridor that best meet both the local and regional goals while providing the highest return on investment (benefit-cost) of limited regional transportation funding over the next 20 years.

The Eureka BMCP builds on a solid foundation of plans, policy documents, and community outreach efforts already completed for the Broadway Corridor.

Corridor Planning Context and History

In the process of identifying recommended plan concepts, previous studies and recommendations were explored. The City of Eureka in coordination with the HCAOG, Caltrans, and Humboldt County have considered numerous improvements to the Broadway Corridor, starting with the original bypass concepts back in 1963. For over 50 years, the City of Eureka has recognized the challenges that results from the corridor's position as a high volume regional highway that also serves as both the City's traditional "Main Street" and primary local arterial serving the City's major employment and commercial areas.

The Broadway Corridor, in the Eureka BCMP study area, is an essential north-south connection for both local and regional travel, accommodating upwards of 35,000 vehicles per day. For significant portions of the 3-mile corridor, the existing right-of-way is bounded by employment and commercial buildings, and is segmented by a high density of signalized and un-signalized intersections.

The historical approach to addressing congestion and mobility issues along the Broadway Corridor was planned realignment of US 101 to shift regional highway traffic away from the city's central core along Broadway, as presented in the *Route 101 Draft EIS* (1971). Various bypass options, including easterly bypasses and westerly bypasses that would require tunneling, bridges, and new rights of way through environmentally sensitive lands have been introduced and abandoned.

Past planning efforts have also included operational improvements that remain within the existing US 101 right-of-way, new couplets from 4th Street to Koster Street through the "Balloon Track", and new bypass roadway connections along the waterfront. Significant effort has been made in the Eureka BCMP to remain within developed rights-of-way, including the existing US 101 alignment. However, in order to accommodate a "Complete Street" cross section that safely and efficiently provides access to all travel modes without unacceptably increasing congestion, the Preferred Concept recommends shifting portions of the existing vehicular traffic from the current alignment to new alignments west of the existing Broadway Corridor. The cost and complexity of implementing these alignments is well-established and recognized. However, as shown in this study, and as measured in a benefit-to-cost ratio, such connections demonstrate a positive return on investment.

Public Outreach Overview

The Eureka BMCP outreach effort was robust in its focus on informing and engaging the public in the corridor concept alternative evaluation process and ultimate selection of the Preferred Concept. This outreach effort included two community workshops, a Stakeholder Focus Group, and an online engagement campaign including an interactive mapping tool to gather comments from the public.

Corridor Alternatives

A wide range of alternatives were examined while eliminating concepts that were infeasible or did not meet the plan's many objectives. The Eureka BMCP evaluated several alternatives for their ability to meet the corridor's mobility goals, enhance community resiliency and climate adaptation, and minimize right-of-way and environmental impacts.

The Eureka BMCP identified three approaches to corridor alternative recommendations:

1. Maintain vehicular travel only along the existing alignment,
2. Split northbound/southbound corridor vehicular travel via parallel couplets, or
3. Implement a road diet along the Broadway Corridor while shifting some vehicular travel to parallel routes.

Within these approaches were opportunities to consider adjustments to the number of travel lanes and direction of travel flow, and the subsequent effects on limiting or increasing available right-of-way for multimodal and safety improvements. Seven alternative and accompanying multimodal and safety improvements were identified and assessed using stakeholder-generated quantitative criteria, including environmental sensitivity and impact.

Preferred Concept

The Double Couplet alternative was chosen as the Preferred Concept for the Eureka BMCP, and includes multimodal and transit improvements. This alternative would create two one-way couplets to split northbound and southbound travel along two segments of the Broadway Corridor. Northbound travel would be accommodated along the existing alignment, and southbound travel would be shifted to an improved one-way Koster Street (Koster Couplet) and a new one-way facility north of Vigo Street to Bayshore Mall (Southern Couplet).

The primary benefits associated with the Preferred Concept include the following:

- More available ROW on Broadway
    - Continuous Class IV separated bikeways & sidewalk
    - Multimodal Access to Broadway Corridor
    - Transit Bus-On-Shoulder Lanes
- One-way directional couplets & intersection modifications
    - Signal optimization and reduced delay
    - Reduced vehicular conflicts

- Community & Stakeholder Support
    - Maintains access to local businesses
    - Improved safety & mobility

The Preferred Concept also provides opportunities for traffic calming features due to additional right of way made available by the couplet solutions. As shown in the following image, located at the Koster Couplet join near Del Norte Street, providing multimodal improvements changes the landscape of the corridor to emphasize local multimodal travel by beautifying the corridor and highlighting bicycle and pedestrian facilities.

Performance Assessment

The performance metrics selected for the Eureka BMCP informed each of the six Smart Mobility Framework objectives to ensure that the resulting improvement recommendations provide a balanced, sustainable, and multimodal assessment of current and forecasted corridor conditions.

Equal attention was given to document the beneficial outcomes of measures not directly reflected in the benefit-cost assessment. These include: Plan Consistency (with existing plans); Policy Consistency; Environmental/Institutional Sensitivity; Adaptation; Economic Development and, Community Acceptance.

Benefit Monetization

The societal costs and benefits were monetized based on the societal cost information from the Caltrans 2018 Economic Parameters, using the Caltrans Cal-B/C analysis tool. All quantified benefits were annualized and projected to reflect a 20-year design year condition (i.e., life-cycle costs). These monetized benefits were then combined with currently available planning level improvement cost opinions (described below) to yield a holistic benefit-cost estimate for each project alternative. The total estimated benefit for the proposed corridor improvements was $426,619,081 over 20 years.

Preliminary planning-level costs estimates were developed by project team planning and engineering staff. The individual corridor improvement cost estimates are presented in the report. The total estimated life-cycle costs for the proposed corridor improvements is $155,380,000.

The comprehensive benefit cost for all improvements proposed within the study corridor. When monetized to a 20-Year life cycle, the benefit-cost equates to 2.75. **This means that the overall benefit over 20-years is 275% over the actual capital and maintenance costs expended over that same period of time**.

Total Project Life Cycle Cost	Total Project Life Cycle Benefit
$155,380,000	$426,619,081
Total B/C	**2.75**

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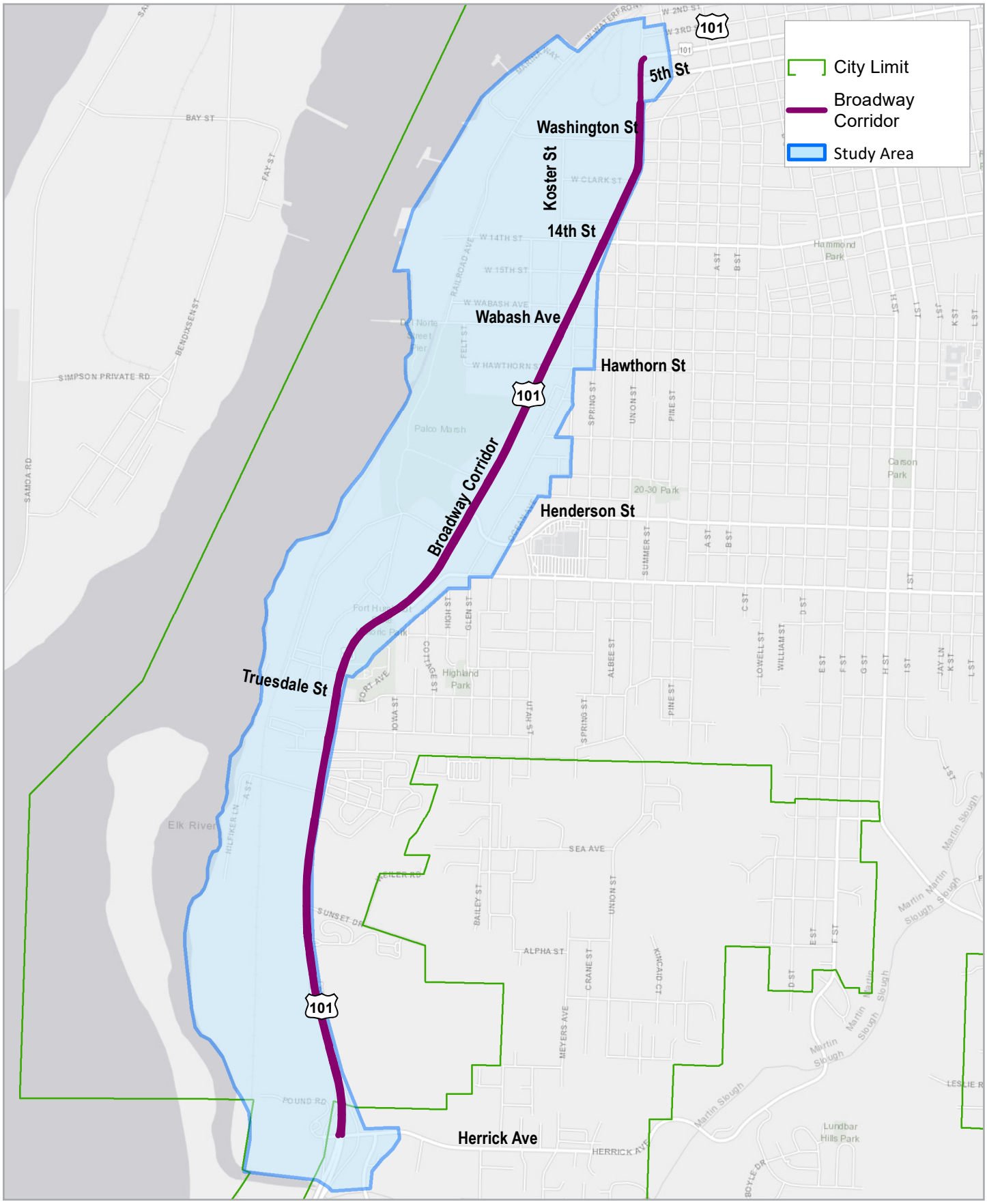
1. Introduction

US 101 is part of the California Freeway and Expressway System. Within Caltrans District 1, the highway connects the Humboldt County communities of Fortuna, Eureka, Arcata, and McKinleyville. For all communities except Eureka, US 101 bypasses the town or is an expressway. The Broadway Corridor is a portion of US 101 which serves as the north-south regional entry into the City of Eureka from Herrick Avenue to 4th Street, as shown in Figure 1.1. The Broadway Corridor is the most highly traveled street in the City of Eureka, and is the only local "Main Street" highway within Caltrans District 1, serving upwards of 35,000 vehicles per day. The corridor experiences congestion as a result of high vehicle volumes combined with frequently spaced intersections and driveways, creating unreliable travel conditions that highlight deficiencies in the transportation system.

As the primary link between the City's downtown core and commercial areas west and south along US 101 to the residential areas to the east, the Broadway Corridor accommodates a mix of local and regional travel demand needs. Due in part to high vehicular travel demand and the lack of convenient and safe facilities for the movement of pedestrians, bicycles, and public transit, this corridor has a significant crash history and in particular, ones involving pedestrians and bicyclists, that needs attention and correction.

Therefore, with these concerns over corridor congestion, safety, and overall mobility, the Humboldt County Association of Governments (HCAOG), in coordination and cooperation with the City of Eureka and Caltrans, initiated the preparation of the Eureka Broadway Multimodal Transportation Corridor Plan (Eureka BMCP). Drawing on past plans and studies while expanding the scope beyond the roadway itself, the focus of the Eureka BMCP was to address the most pronounced issues in the corridor that included:

- Lack of multimodal connectivity particularly for bicycle and pedestrian access;
- Increased safety risk and conflicts between motorists and active transportation users due to high traffic volumes, competing mobility needs, lack of multimodal options, and the high proportion of driveways and access points along the corridor;
- Compromised feasibility to provide enhanced public transit service due to travel time unreliability and transit accessibility challenges;
- Lack of easily accessible, continuous parallel routes to support local and regional travel demand;
- Capacity constraints at key intersections that cause queuing and delays, extensive bottleneck durations, and unreliable travel times for both motorists and transit;
- Compromised emergency response times, evacuation routes and incident clearance capabilities.
- Lack of aesthetic continuity, which adversely effects the community feeling and sense of place.
- Need for comprehensive Sea Level Rise planning in the project area and with US 101.



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HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

Project No. 11197450
Revision No. -
Date 11/12/2020

STUDY CORRIDOR BOUNDARY

FIGURE 1.1

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Data source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: mclark

1.1 Study Purpose

The purpose of the Eureka BMCP was to identify a set of fundable and implementable capital improvement projects that could improve both mobility and safety along the busiest transportation corridor in Humboldt County, as well as the busiest corridor in Caltrans District 1 overall. This study evaluated proven and creative improvement alternative concepts and select a Preferred Concept with a set of complimentary roadway and multimodal projects that would have independent utility, correct existing safety and congestion problems, and have a consensus of community support. In addition, the Eureka BMCP aims to position HCAOG for success for seeking State and Federal grant funding by delivering competitive grant-ready projects, with supporting descriptions, analysis, and illustrations.

1.2 Study Approach

To determine the most cost-effective solutions for resolving the various safety and operational needs on the Broadway Corridor, the Eureka BMCP evaluates projects against stakeholder-generated quantitative criteria, including environmental sensitivity and impact, and against critical performance metrics used to allocate funding through applicable competitive grant or Caltrans funding programs, including SB 1 Solutions for Congested Corridors, HSIP, and ATP.

Using the Smart Mobility Framework approach, a performance-based analysis was performed to develop and evaluate alternative corridor improvement concepts. The results of the performance analysis were then combined with substantial input from the public to inform the ultimate selection of the Broadway Corridor Preferred Concept recommendation. The Broadway Corridor Preferred Concept with associated multimodal improvements would then establish the funding priorities for the corridor that best met both the local and regional goals while providing the highest return on investment (benefit-cost) of limited regional transportation funding over the next 20 years.

Within the guidance of the overall Study Purpose and Study Approach, the Eureka BMCP focused on the following primary study objectives:

- Draw from existing data sources and apply advanced data collection technology and resources such as multiple “Big Data” data sources and video to establish travel characteristics, vehicle/bicyclist/pedestrian counts, vehicle speeds, and travel time variation trends to establish an accurate baseline;
- With direct input from the public, develop a preferred corridor concept that: 1) maximizes efficiency and safety for multimodal users; 2) achieves acceptable operating conditions relative to projected future demand; 3) improves air quality, economic development, and social equity; 4) is context sensitive in accord with Broadway Street’s rural and scenic character; 5) minimizes potential impacts to the natural environment, and 6) improves transit reliability and accessibility.
- Consistent with Caltrans’ *Smart Mobility Framework 2010* and the *2018 Comprehensive Multimodal Corridor Plan Guidelines* and *SB 1 Solutions for Congested Corridors Program Guidelines* from the California Transportation Commission (CTC), perform a transparent and objective performance-based analysis to identify a preferred corridor concept to calculate life-cycle benefit-costs that support infrastructure investment decisions made by HCAOG, Caltrans District 1, and other stakeholders including the County of Humboldt and the City of Eureka.

1.3 Public Outreach Overview

An effective community engagement program creates confidence in the planning process, promotes broad-based understanding, and reflects the interests and needs of the community. Successful implementation of the improvements recommended in this plan required cooperation between Caltrans, HCAOG, Humboldt County and City of Eureka and the community as a whole.

The Eureka BMCP outreach effort was robust in its focus on reaching the diverse communities. This outreach effort included the following:

- Community Workshops
    - November 13, 2019
    - August 25, 2020
- Staff Working Group, including:
    - City of Eureka
    - Humboldt County Association of Governments
    - Caltrans District 1
- Stakeholder Groups
- Coastal Commission
- Media
- Project Logo Branding and Project Information Cards
- Online Engagement
- Interactive Mapping Tool

The input received through these various channels helped inform and select the Eureka BMCP preferred improvement concept and associated multimodal improvements. The community workshops, their participation and insights as well as each of the other outreach efforts are more fully described in the **Public Outreach** section of this report.

1.4 Organization of this Plan

This plan is organized into seven chapters. These chapters include:

- Chapter 1 – Introduction: includes a brief study background, study purpose, study approach/objectives, public outreach overview and organization of this Eureka BMCP document
- Chapter 2 – Planning Guidance and Metrics: examines past planning documents for planning context and the Caltrans Smart Mobility Framework for performance criteria for selection of priority of improvements
- Chapter 3 – Public Outreach: summarizes outreach process conducted to gather feedback on potential solutions and preferred concepts

- Chapter 4 – Existing Conditions: documents findings from field observations, technical analyses, and models
- Chapter 5 – Corridor Alternatives: outlines the potential improvements identified for the corridor based on the existing conditions analysis and prior outreach conducted during the Broadway Corridor Gateway Corridor Improvement Plan
- Chapter 6 – Performance Assessment: evaluates the preferred concept under current and future conditions based on performance metrics described in the Introduction
- Chapter 7 – Preferred Concept
- Chapter 8 – Benefit Monetization: describes the Preferred Corridor Plan that evolved from the Public Outreach and Performance Assessment efforts
- Chapter 9 – Near Term Safety Guide

In addition, appendices provided under separate cover have more detail on analysis methodology, data, and findings as well as community feedback.

2. Planning Guidance and Metrics

In providing an overall framework and planning guidance for the preparation of this Eureka Broadway Multimodal Corridor Plan (Eureka BMCP), an understanding of all past transportation related planning studies needed to be understood, as well as the performance criteria for establishing a Multimodal Corridor Plan that meets mobility needs, is fundable and implementable. For this planning effort, the Caltrans *Smart Mobility Framework 2010,* as described in the following pages was utilized. It is consistent with the *2018 Comprehensive Multimodal Corridor Plan Guidelines,* the *SB 1 Solutions for Congested Corridors Program Guidelines* from the California Transportation Commission (CTC) and the recent *Corridor Planning Process Guide, February 2020* from Caltrans, Division of Transportation Planning.

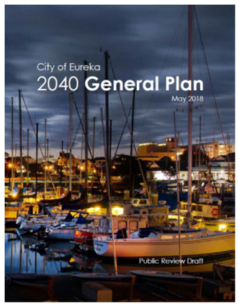
2.1 Planning Context

The transportation planning history of this north-south transportation corridor through the City of Eureka is rich. Its richness in history is however, both a good news and bad news story. Starting as far back as 1963, the City of Eureka and Caltrans recognized that US 101 through the City of Eureka was both important as a regional corridor for commerce and local travel for the community. Studies for a Eureka Bypass were initiated and an environmental document was prepared in the 1970s with accompanying Memorandum of Agreements (MOAs) between the City and Caltrans to pursue funding and eventual construction of their preferred Bypass alignment through the City. While no longer an option being considered for near-term implementation, a Bypass may ultimately be implemented 25-100 years in the future if population trends and corridor congestion continue.

With continued resolve, both the City of Eureka and Caltrans aim to identify a transportation corridor solution that will not only meet the needs of the motoring public, but also the multimodal needs of the community. To this end, the City of Eureka, Humboldt County Association of Governments (HCAOG) and Caltrans have conducted a number of recent transportation planning studies that will help provide a planning context and significant resources of data and public input that will help in the final selection of a preferred Multimodal Transportation Corridor Plan. These relevant planning studies are briefly summarized in the following sections.

2.1.1 Broadway Engineered Feasibility Study (2014)

The Broadway Engineered Feasibility Study examined a range of future sustainable improvements to improve safety, operations and mobility for pedestrians, bicycles and vehicles. The study limits extended from the K-Mart intersection to the beginning of the 4th and 5th Street couplet along US Highway 101 (US 101), also known as the Broadway corridor. The intent of the study was to provide a reference document that would be used as a guide for projects initiated in the future within the identified study limits. The study did not recommend or select a preferred improvement scenario for further project development, but identified the potential operational and safety benefits as well as the potential impacts associated with alternative corridor improvements, including access management, multimodal improvement concepts and intersection controls.



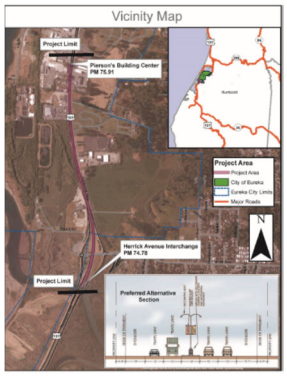
2.1.2 City of Eureka 2040 General Plan (2018)

With the adoption of the City of Eureka General Plan Update in 2018, the City established a roadmap for the long-term physical, social and economic future of Eureka. It provided goals, policies and programs to direct land use and development decisions, manage resources, deliver public services and provide infrastructure. As such, there is the potential to continue to expand non-coastal dependent manufacturing base in the Westside Industrial Area and as well as for expanding their downtown into the Marina District (Balloon Track) with high-quality mixed use commercial development with bottom floor retail and office and residential uses on upper floors. For Broadway (US 101), the General Plan identified intersection and other transportation operational and safety enhancements along with the need for multimodal improvements to support the mobility needs of the corridor.

2.1.3 Koster Couplet Feasibility Study (2017)

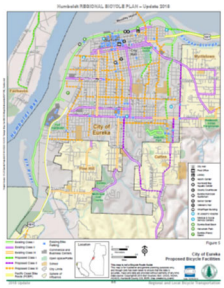
The purpose of this Caltrans study was to continue to address the needs of the Broadway (US 101) north-south corridor to identify solutions to resolve continued corridor congestion and provide needed multimodal facilities to improve overall safety and operations. The concept of using Koster Street as a couplet was to facilitate transportation within the Broadway corridor between Del Norte and 4th Streets to allow for bike lanes, wider sidewalks, parking and landscaping, thereby improving the livability of the corridor. The end result was to be a corridor more comparable to and consistent with US 101 through downtown on 4th and 5th Streets. In identifying the benefits of such a solution, Caltrans conducted substantial research into crash history and traffic operations. Caltrans, however, does not provide a specific recommendation for the couplet, which is still subject to further study and environmental clearance.

2.1.4 Project Study Report-Project Development Support for the US 101 Eureka South Entry Project (2015)



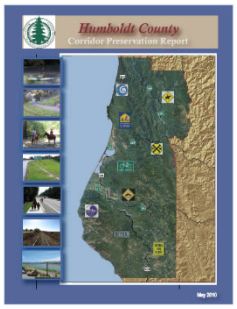
This PSR-PDS for US 101 was to identify the needed improvements to calm traffic entry into the City of Eureka from the US 101 freeway from the south and provide urban arterial enhancements for overall multimodal safety. These enhancements included the installation of new curb and gutter, sidewalks, Americans with Disabilities Act (ADA) compliant facilities, center median islands, bike lanes, safety lighting and intersection lighting. A community gateway sign and landscaping improvements were also identified in the PSR-PDS. The significance of Caltrans efforts to slow traffic at the very south end of the City will ultimately greatly enhance the overall safety and operations of the corridor from Herrick Avenue to the Pierson Building Center south of Bayshore Mall.

2.1.5 Humboldt County Regional Bicycle Plan (2018)



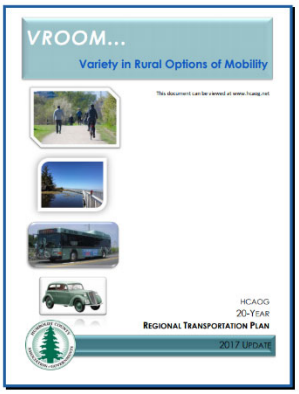
The purpose of the Humboldt Regional Bicycle Plan was to advance the development of a fully integrated active transportation network throughout Humboldt County, including within the City of Eureka. Therefore, the regional bike plan not only looked at achieving strong intra-city connections between inner-city communities, but inter-city connections with adjacent jurisdictions and the rural County as a whole. The vision of the bike plan was to be user-friendly, so that all age groups and abilities could use at least some portion of the system. The waterfront trail, which traverses through a portion of the Eureka BMCP study area within the City of Eureka is a good example of meeting both commuter needs and active recreational opportunity for all age groups.

2.1.6 HCAOG Corridor Preservation Report (2010)



The purpose of the HCAOG Corridor Preservation Report is to identify corridor preservation benefits and strategies for preserving, acquiring and utilizing public transportation corridors for multimodal uses. Within the study area within the City of Eureka, US 101 and the roughly parallel railroad alignment were identified as key regional transportation corridors that need to be protected and maintained to help allow safer evacuation of the community from the urban center of the City of Eureka should there be a significant public safety emergency. The report identifies the general need along the corridor to limit private development encroachment and potentially widen roadways to help assure available connections and capacity to the regional and rural circulation systems to safely evacuate the more populated areas of the City.

2.1.7 HCAOG Regional Transportation Plan (RTP) (2017)



The purpose of the RTP is to identify long-range transportation improvements covering a 20-year planning horizon for all of Humboldt County and its cities. The RTP covers roadway, pedestrian, bicycle, public transportation, aviation, and goods movement. In addition, the RTP provides a financial element to identify funding for planned and programmed transportation projects. The RTP is required to be updated and submitted to the California Transportation Commission (CTC) and Caltrans every four years.

2.2 Smart Mobility Framework

Caltrans' *Smart Mobility Framework 2010: A Call to Action for the New Decade* provides a broad planning framework to guide multimodal and sustainable transportation planning and project development. It also provides tools to assess how plans, programs, and projects meet Smart Mobility goals throughout the state.

Smart Mobility moves people and freight while enhancing California's economic, environmental, and human resources by emphasizing convenient and safe multimodal travel, speed suitability, accessibility, management of the circulation network, and efficient use of land.

The Smart Mobility Framework is premised on six key objectives, listed in Table 2.1: Location Efficiency; Reliable Mobility; Health and Safety; Environmental Stewardship; Social Equity; and, Robust Economy. These six objectives are informed through the application of seventeen candidate performance measures. The Smart Mobility Framework process is consistent with both the 2018 Comprehensive Multimodal Corridor Plan Guidelines and the SB 1 Solutions for Congested Corridors Program Guidelines from the California Transportation Commission (CTC).

Table 2.1 Smart Mobility Framework Objectives

Location Efficiency	Support for Sustainable Growth
	Transit Mode Share
	Accessibility and Connectivity
Reliable Mobility	Multimodal Travel Mobility
	Multimodal Travel Reliability
	Multimodal Service Quality
Health and Safety	Multimodal Safety
	Design and Speed Suitability
	Pedestrian and Bicycle Mode Share
Environmental Stewardship	Climate and Energy Conservation
	Emissions Reduction
Social Equity	Equitable Distribution of Impacts
	Equitable Distribution of Access and Mobility
Robust Economy	Congestion Effects on Productivity
	Efficient Use of System Resources
	Network Performance Optimization
	Return on Investment

Source: Caltrans' Smart Mobility Framework 2010: A Call to Action for the New Decade

The fundamental premise of the Smart Mobility Framework is to ensure that planning or programming decisions for transportation improvements are performance based, transparent, and address sustainable outcomes and objectives. The performance metrics selected for the Broadway Corridor informed each of the six Smart Mobility Framework objectives to ensure that the resulting improvement recommendations provide a balanced, sustainable, and multimodal assessment of current and forecast corridor conditions.

Requisite rubrics include: planning level cost opinions; vehicular delay and buffer time reduction; level of traffic stress scores; mode shift and vehicle miles traveled (VMT) reduction; crash reduction benefit; health and air quality benefit; societal cost and benefit monetization factors (per Caltrans 2018 Economic Parameters); and return on investment (i.e., benefit-cost). Equal attention will be given to documenting the beneficial outcomes of measures not directly reflected in the benefit-cost assessment. These include: Plan Consistency (with existing plans); Policy Consistency (HCAOG, the City of Eureka, the County of Humboldt, and Caltrans); Environmental/Institutional Sensitivity; Adaptation; Economic Development and, Community Acceptance. Metrics selected for this Broadway Corridor Plan are described on the following section. Results from this analysis were combined with substantial input from the public to inform the selection of the preferred multimodal corridor improvement package.

2.3 Performance Metrics

The performance metrics selected to evaluate this Plan are coordinated with the six objectives outlined in the Smart Mobility Framework to ensure the resulting improvement recommendations provide a balanced, sustainable, and multimodal assessment of current and future corridor conditions.

Many of these performance measures do not have established standards but were analyzed to better understand the existing and future operational characteristics of Broadway Corridor and inform a comparative analysis of improvement concept alternatives. Use of additional metrics other than vehicular Level of Service (LOS) is consistent with the Smart Mobility Framework and with the recent Senate Bill (SB) 743 intended to streamline the California Environmental Quality Act (CEQA) process. Some metrics such as delay, crash reduction, mode shift, and vehicle miles of travel reduction can be monetized and were incorporated into a benefit-cost analysis. Other quantifiable indices, such as suitability scores (i.e. level of traffic stress analysis), adaptation assessments, economic development assessments, and environmental justice impacts, etc. are not conducive to being monetized. Although some of the presented performance metrics cannot be monetized, assessment of the results of these analyses provide value to informing improvement recommendations.

The measures of effectiveness for the Broadway Corridor performance metrics and analysis tools used to generate the measure of effectiveness is mapped in matrix form in Table 2.2. Also shown is whether the measure can be monetized for inclusion in a benefit-cost assessment.

The performance measures by Smart Mobility Framework objectives and the methodologies employed to evaluate existing and future conditions are described in Appendix A.

Table 2.2 Performance Measures of Effectiveness

Analysis Purpose	Measure of Effectiveness	Model or Analysis Tool												Monetized Benefit?
		GEATM	Traffic Analysis Software	NPMRDS/INRIX	Level of Traffic Stress	NCHRP 552 Method	TCRP 118 Elasticity Method	HSM Part C CMFs	SB1 Emissions Calc.	GIS Analysis	Online Mapping Tools	IMPLAN	Literature Review	
Baseline Travel Demand	Trips, Ridership, VMT	■												Y
Future Travel Demand	Trips, Ridership, VMT	■												Y
Roadway Operations	Delay, Buffer Time	■	■	■										Y
Transit Ridership	Ridership, VMT Reduction						■						■	Y
Pedestrian/Bike Connectivity	Access, Comfort Level				■					■				N
Pedestrian/Bike Mode Shift	Trips, VMT Reduction					■				■				Y
Safety	Collision Reduction							■		■				Y
Air Quality	Emissions Reduction	■				■	■		■					Y
Social Equity	Access, Benefit/Burden				■					■	■			N
Economic Development	B/C, Induced/Indirect Benefit											■		N
Health	Recreational Activity	■				■					■			Y
Adaptation	Network Vulnerability										■		■	N

3. Public Outreach

The City of Eureka, the Humboldt County Association of Governments (HCAOG), and Caltrans collaborated on this plan to identify projects that will be competitive to receive funding and can ultimately be constructed. The public outreach team for the project assisted with presentations to community, civic, business and non-profit groups to provide information on the plan and to provide opportunities for input.

The Eureka BMCP outreach effort focused on informing and engaging the public in the corridor concept alternative evaluation process and ultimate selection of the Preferred Concept. Project information, including event schedules, links to relevant documents, as well as a comment page, were made available via the project website: www.eurekabroadwaycorridorplan.com

This outreach effort included:

- Two Public Workshops with Live-Polling
- Stakeholder Focus Group
- Online Local Business-Owners Survey (Survey Monkey)
- Online interactive mapping tool (Social Pinpoint)
- Online comment page via the project website (through September 15, 2020)

In addition, key findings and recommendations were presented at the City of Eureka Council Meeting on Thursday, October 29, 2020.

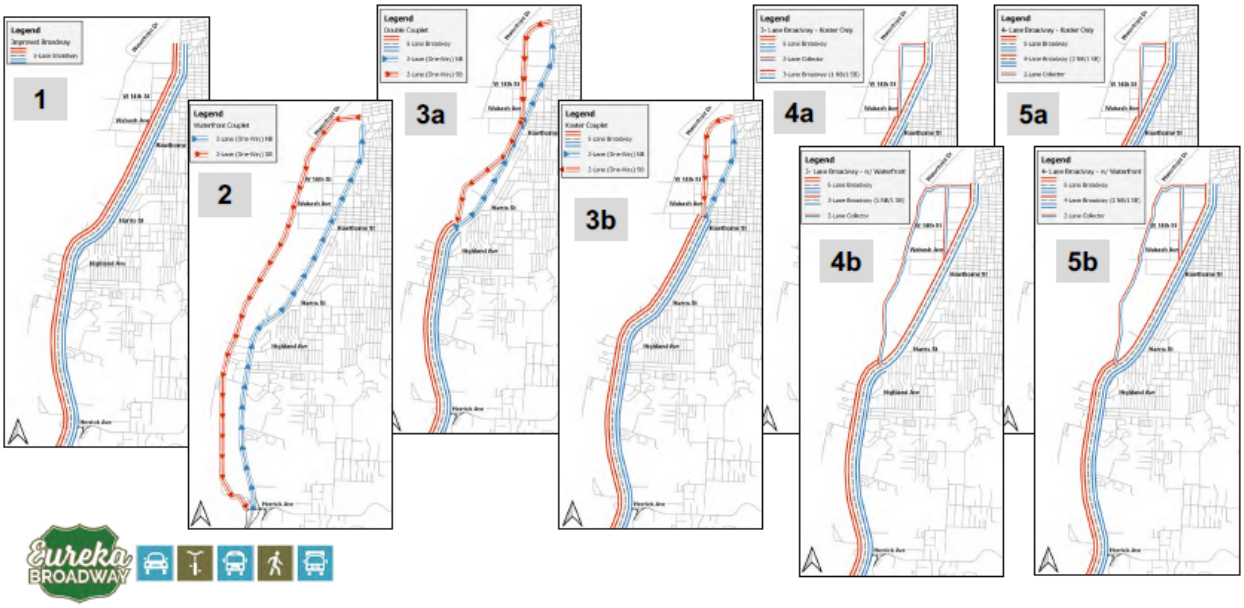
Due to COVID-19 restrictions beginning in March 2020, the project team adapted its outreach program to a virtual platform, allowing participants to attend meetings and make comments online. In addition, members of the public were able to provide additional comments via the project website through September 15, 2020. These comments are included in Appendix G.

3.1 Public Workshops

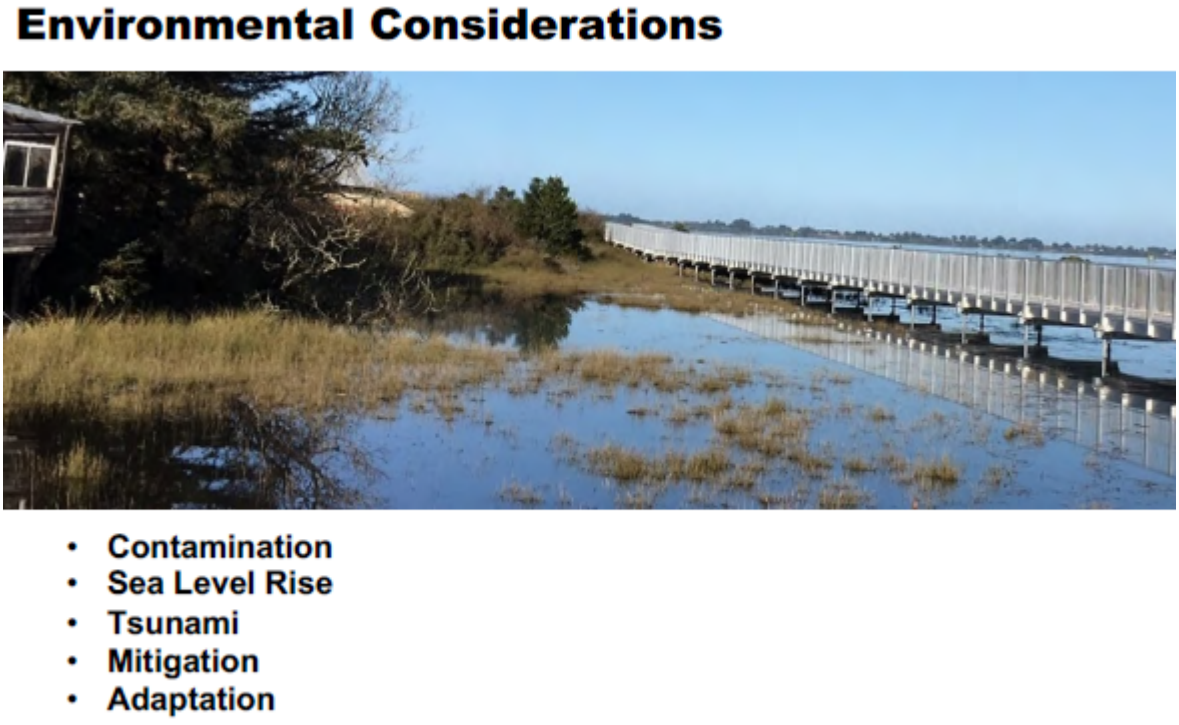
The first public workshop was held Wednesday, November 13, 2019 at the Wharfinger Building in Eureka. It was promoted via posters (in English and Spanish) throughout the project area, news releases, and social media and website postings. Over 100 people attended this workshop.

The second public workshop was held virtually on August 25, 2020 (due to COVID-19 restrictions) on-line via Zoom. It was promoted via news releases, social media, and website postings. Comments were received from the public during meeting as well as via the project website.

During the second public workshop, the project team utilized a PowerPoint presentation to present the project status, including the alternatives development and initial assessment results. Below is an example slide from the presentation.



In addition, environmental considerations related to contamination, sea level rise, tsunami risk, mitigation, and adaptation were also presented. Below is an example slide from the presentation.



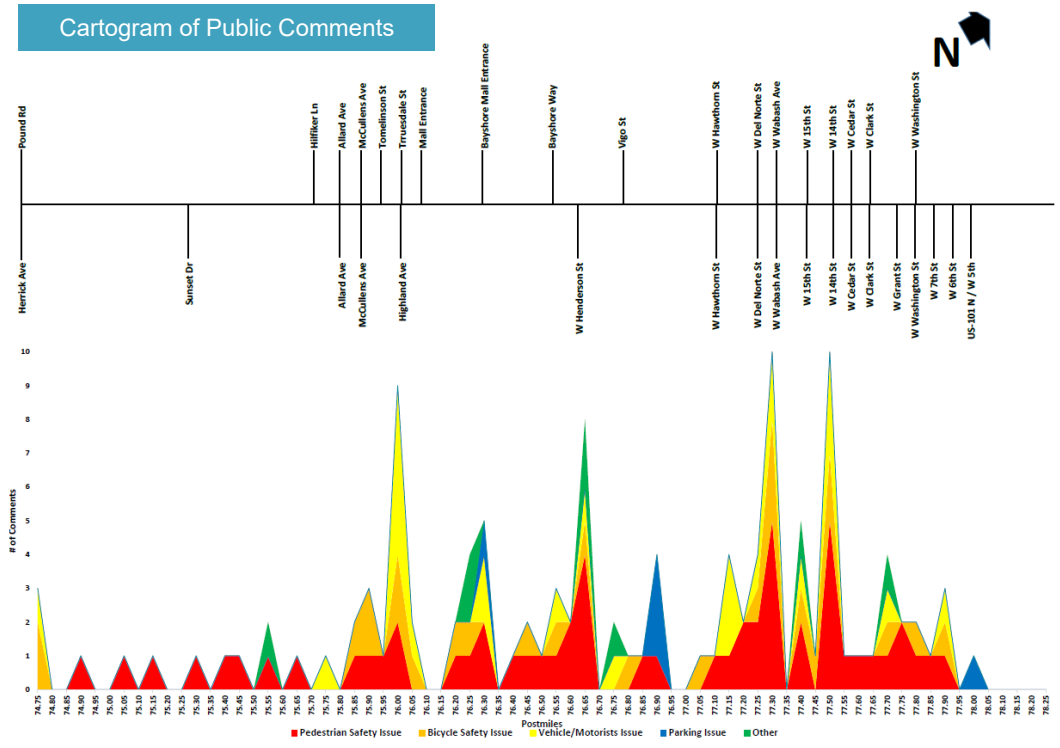
3.2 Public Comments

3.2.1 Public Workshop Comments

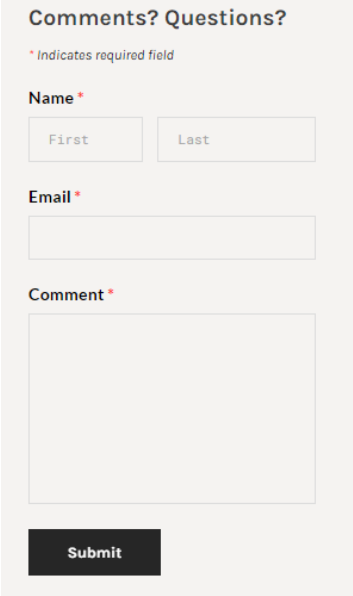
The following highlights areas of concern as identified by the community via the interactive mapping stations at the public workshop in November 2019. The full list of comments, as well as accompanying map and cartogram, is provided in Appendix G.

- Pedestrian safety issues are a primary concern for the entire Broadway Corridor.
    - Improve and add pedestrian crossings at mid-block and signalized intersection locations, and include priority pedestrian calls at signalized crossings.
- Bicyclist safety issues are a primary concern for the entire Broadway Corridor, especially near McCullens Avenue, Truesdale Street, Wabash Avenue, and 14th Street.
    - Desire to ensure adequate bicycle lane protection/width.
- Vehicle/Motorist issues are a concern, especially near Truesdale Street, Hawthorn Street, Wabach Avenue, and 14th Street.
- Desire to prioritize traffic calming improvements.
- Desire to avoid shifting US 101 traffic to a new Waterfront Drive extension.
- Desire to preserve sensitive areas, including wetlands.
- Desire to enhance the southern “gateway” entrance into the City of Eureka.

Cartogram of Public Comments



3.2.2 Website Comment Page Summary



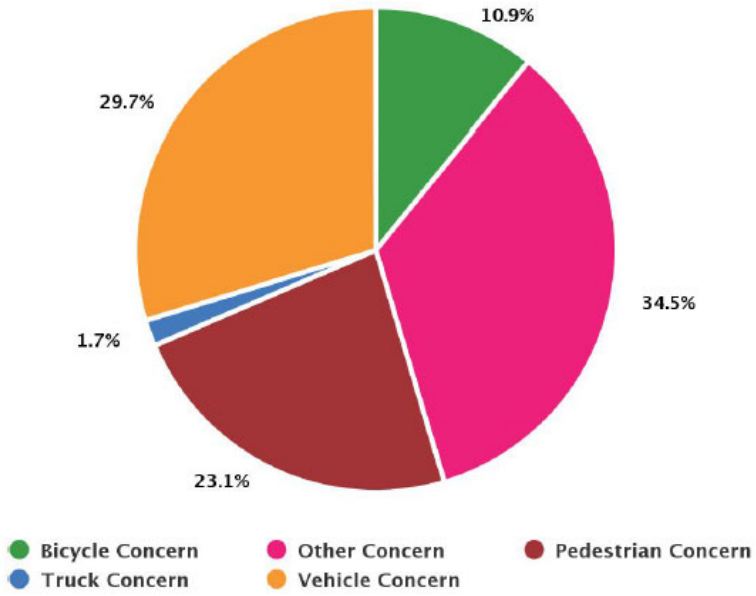
Between October 1, 2019 and November 15, 2020, there were almost 4,000 visits to the project website, including 2,419 unique visits. The community was able to leave comments via a comment/question submittal form on the website homepage. Approximately 50 unique comments were left via comment/question submittal form.

3.2.3 Social Pinpoint Online Map Comments

Over the course of the project, the community could leave comments on an interactive map to express their concerns about issues related to pedestrians, bicyclists, traffic (vehicle and trucks), or other concerns. The following pie chart shows the breakdown of comment types by frequency that were left on the interactive map.

As shown, the community expressed significant concern for pedestrian and vehicle issues. Those comments designated as “Other Concern” included the following topic areas:

- General comments on vehicular traffic congestion
- Desire for corridor beautification
- Desire for improved transit bus stops
- Both support and opposition for alternative roadways, including a bypass
- Strong opposition for a Waterfront Drive extension



3.2.4 Pop-Up Events

Members of the consultant team staffed a booth at the Eureka Farmers Market during October 2019 to promote the public workshop, handout informational bilingual cards, and take comments. These comments are provided in Appendix G.

3.3 Survey Responses

3.3.1 Public Survey Responses

During the first public workshop in November 2019, the community participated in a "live polling" survey. The following highlights the results, and the full survey is provided in Appendix G. *Note: Only 6 individuals participated in the "live polling" survey.*

- Individuals do not feel comfortable walking along the Broadway Corridor due to length of travel, lack of designated paths, and lack of safe crossings.
    - The following improvements (in order of vote majority) should be prioritized to enhance pedestrian comfort levels along the Broadway Corridor:
        1. Safe crossings/crosswalks
        2. Sidewalks separated from traffic with landscaped planting strips
        3. Completely dedicated/separated paved paths
- Individuals do not feel comfortable bicycling along the Broadway Corridor due to the high level of stress experienced and lack of designated paths or connections.
    - The following improvements (in order of vote majority) should be prioritized to enhance pedestrian comfort levels along the Broadway Corridor:
        1. Dedicated/separated paved path
        2. On-street bike lanes adjacent to parking

3.3.2 Local Business Community Survey Responses

Working collaboratively with the Eureka Chamber of Commerce, a survey was distributed to 142 individuals within local business community to gauge support or opposition for the improvement types associated with corridor alternatives. Some of the questions and responses are summarized below, and the full survey is provided in Appendix G.

- Would you support improvements that made it easier to bike or walk to your business?
    - **Yes (74%)** / No (26%)
- Would you support reducing the number of driveways on Broadway to improve traffic flow and safety?
    - **Yes (63%)** / No (37%)

- Would you support raised or planted medians along Broadway to beautify and improve traffic flow and safety even if it could mean changing how customers access your business?
    - **Yes (66%)** / No (34%)
- To reduce congestion, improve safety, and add multimodal improvements (sidewalks, bike lanes, transit stops) on Broadway, would you support improved connections that could shift portions of traffic from Broadway to local streets like Koster Street or Waterfront Drive-Railroad Avenue?
    - **Yes (73%)** / No (27%)
- To reduce congestion, improve safety, and add multimodal improvements (sidewalks, bike lanes, transit stops) on Broadway, would you support making Broadway one-way northbound, and moving all southbound traffic to a new one-way street along Koster Street or Waterfront Drive-Railroad Avenue?
    - Yes (46%) / **No (54%)**

Overall, the following was deduced from the local business community survey responses:

- Businesses are accessed equally via both local streets and Broadway/US 101
- Few or no customers/employees bike/walk or take transit to local businesses
- Most customers/employees park in parking lots or along local side streets, not along Broadway
- Strong support for multimodal improvements
- Strong support for corridor access modification
- Strong support for shifting portions of Broadway/US 101 traffic to parallel routes
- Mixed support for couplet solutions with one-way northbound travel on Broadway/US 101

4. Baseline Conditions

4.1 Regional Context

US 101 is a key highway route within Northern California that also serves as the "Main Street' in the City of Eureka. South of 4th/5th Street to Herrick Avenue, US 101 is known as Broadway, and within this report as the Broadway Corridor (Broadway). The Broadway Corridor is an essential north-south connection within the City of Eureka's transportation network, serving as the primary route for both local and regional trips. Many commuters in Humboldt County travel on US 101 to employment centers in the communities of Eureka, Arcata, McKinleyville, Fortuna, and others. In addition, Humboldt State University is located in Arcata just north of Eureka, and College of the Redwoods is located in Humboldt Hill just south of Eureka. Tourist travel between Oregon and Northern California also adds to traffic on US 101 as individuals visit coastal towns in Humboldt County. With a gap in the STAA network on US 101 approximately 75 miles south of Eureka at Richardson Grove State Park, Broadway also serves as the STAA-compliant connection to commercial and industrial centers outside the region via SR 299.

4.2 Local Context

The City of Eureka's residential areas are located south and east of US 101 and are accessed via a grid of local streets connecting to US 101. The City's commercial areas border US 101 from Herrick Avenue to 6th Street, and the City's central downtown and historic areas are located along US 101 from Broadway to SR 255. The following commercial corridors are situated along US 101 and consist of strip and larger-scale retail, lodging, and other services: South Broadway, Bayshore Mall, Central Broadway, and North Broadway[1]. Other commercial centers including Eureka Mall, Wabash Avenue, and the Westside Industrial Area are accessed via local streets adjacent to the Broadway Corridor.

Local streets funnel east-west traffic in a grid-pattern onto Broadway at controlled and uncontrolled intersections. The major signalized intersections along Broadway include Henderson Street, W Wabash Avenue, W 14th Street, and W Washington Street. Additional signalized intersections include 6th Street, Hawthorn Street, Vigo Street, McCullen Avenue, and two driveways for the Bayshore Mall. Vigo Street and the two mall driveways do not provide access into the City to the east.

Despite the grid pattern and traffic signals, significant corridor deficiencies limit safe and efficient mobility along Broadway through and within the City of Eureka. The primary corridor deficiencies include high collision rates, high travel demand, access challenges, and limited or non-existent multimodal facilities.

[1] *2040 General Plan*, City of Eureka, May 2018.

4.2.1 Transportation Facilities

The Broadway Corridor study area extends from 4th Street and ends at the US 101 off-ramps north of Herrick Avenue. Broadway is a high capacity urban principal four lane arterial with a continuous two-way left-turn lane. Lane width is generally 12-feet, with two lanes of travel in both directions and two-way left-turn lane. While on-street parking is generally prohibited along Broadway, it is allowed in some locations—primarily between Vigo Street and Wabash Avenue. In other locations, drivers ignore the “no parking” signs, creating challenges for bicyclists.

Along the corridor, gaps in the multimodal network exist, including segments without sidewalks and intersections without marked crosswalks. In addition, some existing sidewalks and crosswalks do not sufficiently accommodate pedestrian demand and need to be replaced or restriped. Other potential challenges for pedestrians include signs that obstruct clear paths (e.g., a pole in the middle of a sidewalk), sight-line obstructions/restrictions (e.g., vegetation growing across or overhanging sidewalks), and lack of curb ramps. There are no existing bicycle facilities along the Broadway Corridor. However, the corridor is considered part of the Pacific Coast Bike Route (PCBR), with connections to the existing Class I trail which runs parallel to Waterfront Drive along the coast.

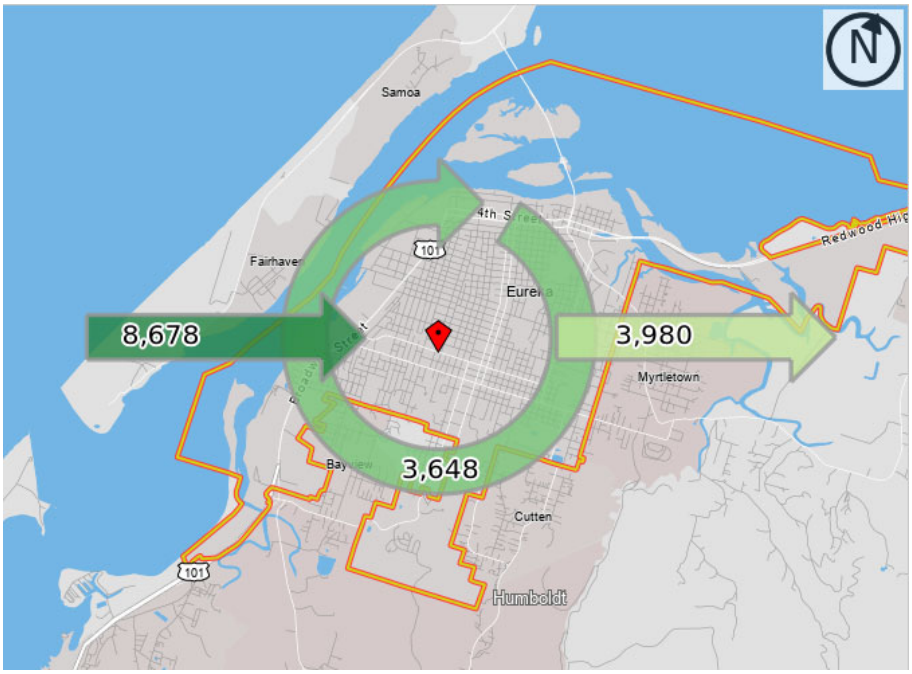
4.3 Travel Patterns

The City of Eureka’s employment and commercial areas are primarily located along US 101 through the city limits. Within the Plan’s study area between Herrick Avenue and 4th Street, Broadway/US 101 provides access to large commercial centers including Bayshore Mall, local commercial areas, and industrial areas. The City’s downtown and commercial core areas are located northeast of the Plan’s study area, between Broadway and Q Street. The area is separated by 4th and 5th Streets, which form a one-way couplet designated as US 101. Other employment areas include the Hospital Medical District located along Harrison Avenue, and commercial areas located along Harris Street and Wabash Avenue.

There are approximately 12,326 individuals who are employed within the City of Eureka (LEHD, 2017), with approximately 8,678 individuals commuting into the city for work and 3,648 individuals both living and working within the city. Approximately 3,980 City of Eureka residents commute outside of the city for work.

Figure 4.1 presents the commute patterns into and out of the city, as described above. As shown in Table 4.1, approximately one-third of those individuals who are employed within the City of Eureka also live within the city.

Figure 4.1 City of Eureka Commute Patterns



Source: LEHD OnTheMap, 2017.

Table 4.1 City of Eureka Employment

Where City of Eureka Employees Live	Employees (#)	
	Count	Percent
City of Eureka	3,648	29.6%
City of Arcata	902	7.3%
McKinleyville CDP	894	7.3%
City of Fortuna	632	5.1%
Myrtletown CDP	611	5.0%
All other locations	*5,639*	*45.7%*
Source: LEHD OnTheMap, 2017		

4.3.1 US 101 Corridor Work Zones

As mentioned above, the City's work zones are primarily located along US 101 throughout the city, including the Broadway Corridor within the study area and the downtown area between Broadway Street and Myrtle Avenue. Additional analysis was completed using LEHD Origin-Destination Employment Statistics (LODES) to illustrate employment travel patterns on a Census block level (see Figure 4.2 for LEHD boundaries of US 101 Corridor Work Zones).

There are 11,272 individuals who are employed within the US 101 corridor work zones from approximately Herrick Avenue to Myrtle Avenue. As mentioned above, there are approximately 12,326 individuals who are employed within the City of Eureka. Therefore, approximately 92 percent of all jobs located within the City of Eureka are located along the US 101 corridor.

As shown in Figure 4.2, these employees reside within the City of Eureka and throughout Humboldt County. Within the City of Eureka, employees are fairly evenly distributed, with employees residing in census blocks south and east of US 101. Outside of the City of Eureka, a significant portion of employees come from the south (primarily Humboldt Hill and Pine Hills) and the northeast (Arcata and McKinleyville). Overall, over 60 percent of employees working within the City of Eureka's employment centers along US 101 travel less than 10 miles from their home to work. However, approximately 20 percent of employees working within the City's employment centers along US 101 travel more than 50 miles from their home to work.

4.3.2 Broadway Corridor Work Zones

There are 4,652 individuals who are employed within the Broadway Corridor work zones from approximately Herrick Avenue to the City's downtown area. As shown in Figure 4.3, within the City of Eureka, employees are fairly evenly distributed, with employees residing in census blocks south and east of US 101. Outside of the City of Eureka, a significant portion of employees come from the southeast (primarily Fields Landing, Humboldt Hill, and Pine Hills) and the northeast (Arcata). Overall, over 56 percent of employees working within the City of Eureka's employment centers along US 101 travel less than 10 miles from their home to work. However, approximately 25 percent of employees working within the City's employment centers along US 101 travel more than 50 miles from their home to work.

Figure 4.2 US 101 Corridor Work Zones

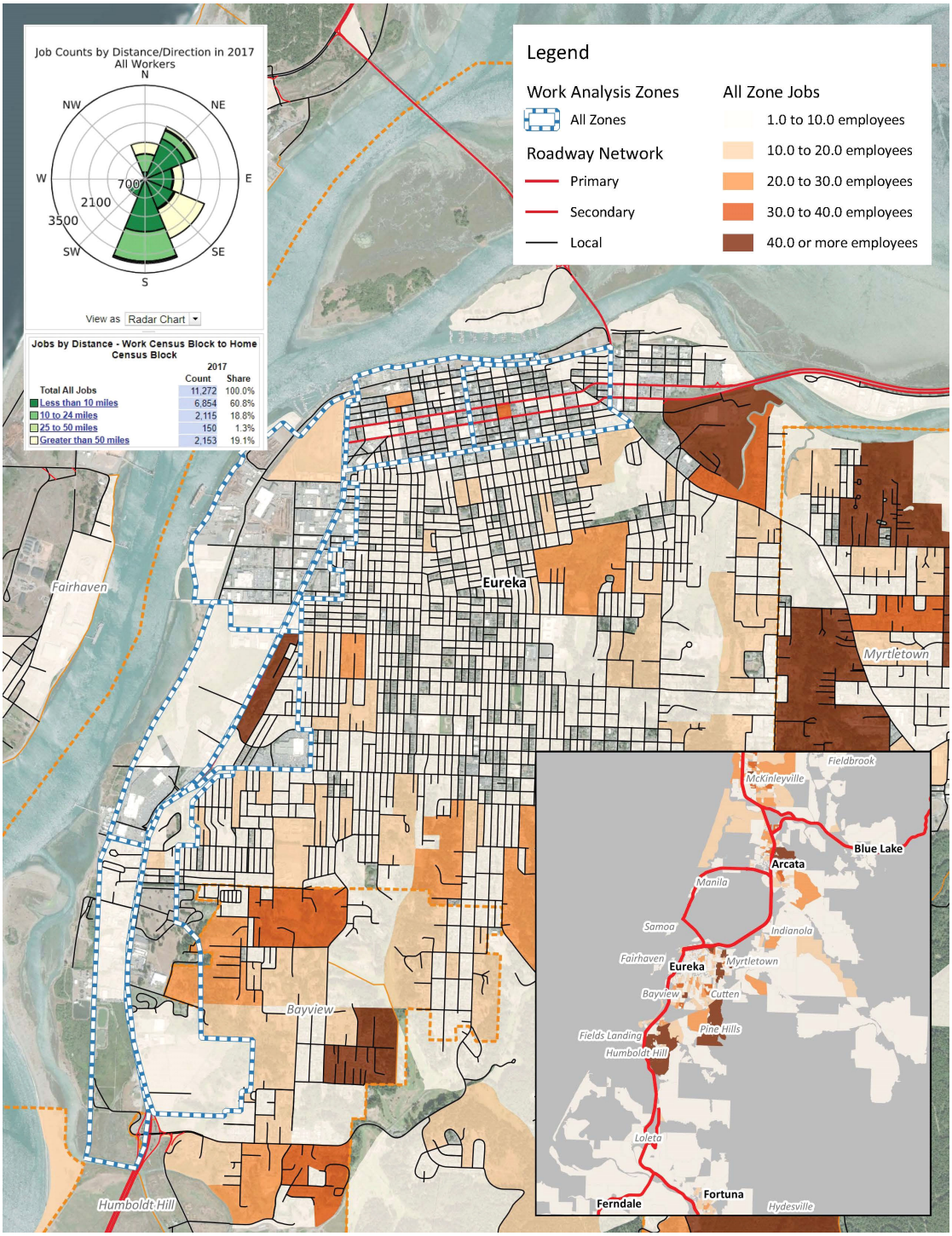
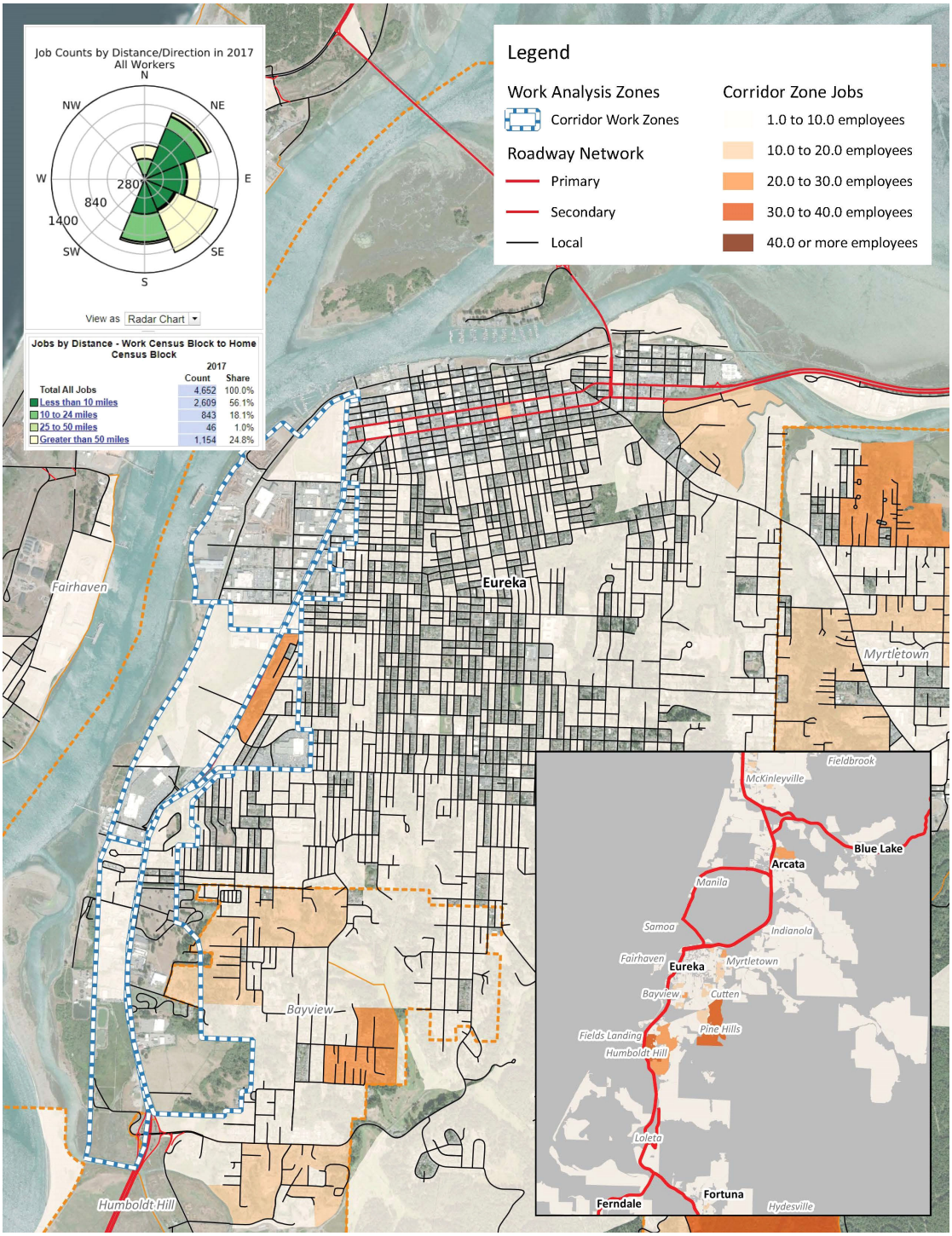


Figure 4.3 Broadway Corridor Work Zones



4.4 Crash Data

The data source for property-damage-only (PDO) crashes was Statewide Integrated Traffic Records System (SWITRS). The data source for fatal and injury crashes was the Transportation Injury Mapping System (TIMS), which uses data from SWITRS. Crashes occurring within the study area were analyzed over a five-year period for the years between 2014 and 2018.

4.4.1 Safety Context

According to the California Office of Traffic Safety (OTS, 2017), the City of Eureka ranks #1 throughout the state for total fatal and injury crashes (compared to 93 other similarly sized cities). In addition, the City ranks #2 for pedestrian and #3 for bicyclist fatal and injury crashes, as shown in Table 4.2.

Table 4.2 City of Eureka OTS Rankings (2017)

Type of Crash	2017 OTS Ranking*
Total Fatal & Injury	1
Pedestrians	2
Bicyclists	3
Alcohol Involved	13
Speed Related	15

**Ranking as compared to 93 other similar sized cities, 2017.*

The Broadway Corridor is considered a high stress corridor with statistically high rates of fatal and injury crashes, specifically those involving bicyclists and pedestrians. During the 5-year analysis period, there were 305 total crashes along the Broadway Corridor, including 9 fatalities and 9 severe injury crashes. Although the Broadway Corridor accounts for less than 2% of the total roadway miles within the City, between the years of 2014 to 2018, the Broadway Corridor alone accounted for 16% of total injury crashes and nearly 50% of the total fatal crashes within the City of Eureka. Table 4.3 presents the total number of fatal and injury crashes that occurred along the Broadway Corridor compared to the entire City of Eureka between 2014 and 2018. In addition, there were 156 property-damage-only crashes along the Broadway Corridor during the same timeframe.

Table 4.3 Total Fatal and Injury Crashes along Broadway Corridor (2014-2018)

	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	TOTAL
Broadway Corridor	**9**	**9**	**45**	**90**	**153**
City of Eureka	19	80	358	482	**939**
% of total	*47%*	*11%*	*13%*	*19%*	*16%*

Crash rates along the Broadway Corridor were calculated and compared to statewide basic average rates for highway segments using Caltrans' *2015 Collision Data on State Highways*. Crash rates were calculated for total crashes based on segment facility type, length, speed limit, and traffic volume. Statewide basic average rates represent the average number of accidents (ACC) that occur on similar highway segments per million vehicle miles (MVM), or ACC/MVM. Fatal and injury crashes were also compared to statewide averages based on the proportion of total crashes.

As shown in Table 4.4, both the middle segment (between Truesdale Street and Hawthorn Street) and northern segment (between Hawthorn Street and 4th Street) have crash rates that exceed statewide averages. The entire corridor has fatal and injury crash rates that exceed statewide averages. Fatal crash rates are exceptionally high, with two-times the proportion of fatal crashes along the middle and northern segments, and over five-times the proportion of fatal crashes along the southern segment (between Herrick Avenue and Truesdale Street).

Table 4.4 Crash Rates

Broadway Corridor Segments	% Fatal & Injury (F + I)		% Fatal (F)		Crash Rate (ACC/MVM)	
	Broadway Corridor	Statewide Average	Broadway Corridor	Statewide Average	Broadway Corridor	Statewide Average
1 - Southern (Herrick Ave to Tomlinson St)	54.1%	33.1%	6.6%	1.3%	1.03	1.67
2 - Middle (Tomlinson St to Hawthorn St)	54.3%	33.1%	2.9%	1.3%	1.67	1.67
3 - Northern (Hawthorn St to 4th St)	44.1%	42.9%	1.4%	0.7%	2.83	1.98

Note: Rates that exceed statewide averages are shown in red text.

4.4.2 Bicycle and Pedestrian Crashes

During the 5-year analysis period, there were 37 total crashes involving a bicyclist or a pedestrian along the Broadway Corridor, including 5 fatalities and 5 severe injury crashes. Table 4.5 presents the total number of bicycle and pedestrian crashes that occurred within the Broadway Corridor study area between 2014 and 2018, compared to total crashes. As shown, bicycle and pedestrian crashes make up 12% of the total collisions yet make up 56% of total fatal and total severe injury crashes along the study corridor.

Table 4.5 Total Bicycle & Pedestrian Crashes (2014-2018)

	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	TOTAL
Total Crashes	**9**	**9**	**45**	**90**	**152**	**305**
Bicycle/Pedestrian	5	5	13	10	3	**37**
% of total	*56%*	*56%*	*29%*	*11%*	*2%*	*12%*

Between the months of January and October in 2020, there have been two bicyclist fatalities, one pedestrian fatality, and one severe pedestrian injury along the corridor, as shown in Table 4.6. With five bicycle or pedestrian fatalities over a five-year period (2014-2018), the current trend of three

fatalities within a 10-month timeframe underscores the need to implement both long and short term safety improvements for this corridor.

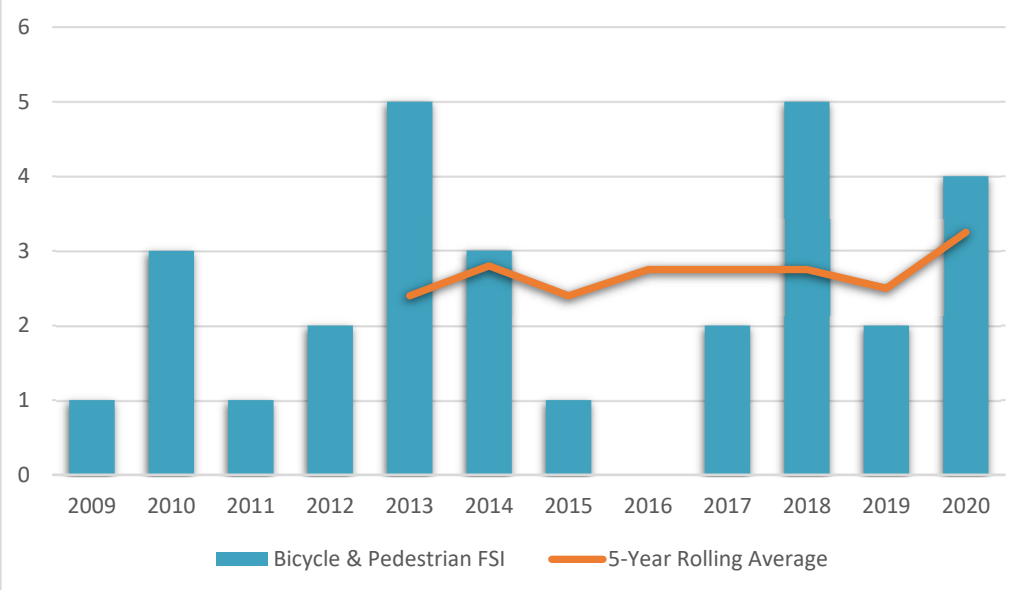
Table 4.6 Broadway Corridor Bicycle & Pedestrian Fatal/Injury Crashes (2020)

Date	Cross-street	Injury Type	Type	Pedestrian Action
2/12/2020	Del Norte St	Minor Injuries	Pedestrian	Crossing in crosswalk
3/7/2020	Hawthorn St	Fatal Injuries	Pedestrian	Crossing - not in crosswalk
3/11/2020	Bayshore Way	Minor Injuries	Bicycle	-
6/6/2020	Henderson St	Major Injuries	Pedestrian	In road - includes shoulder
10/1/2020	n/o Vigo St	Fatal Injuries	Bicycle	-
10/24/2020	Wabash Ave	Fatal Injuries	Bicycle	-

Source: City of Eureka Police Department, 2020.

High rates of bicycle and pedestrian collisions are not uncommon along the Broadway Corridor. As Figure 4.4 shows, the 5-year rolling average has increased between 2013 and 2020. *Note: 2020 crashes only include available crash data between January and October.*

Figure 4.4 Bicycle & Pedestrian Fatal/Severe Injury Crashes (2009-2020)



4.4.3 Night Crashes

During the 5-year analysis period, there were 69 total crashes that occurred during the night (i.e., under dark conditions) along the Broadway Corridor, including 3 fatalities and 5 severe injury crashes. Table 4.7 presents the total number of night crashes that occurred within the Broadway Corridor study area between 2014 and 2018, compared to total crashes. As shown in Table 4.7, night crashes make up 33% of total fatal and 56% of total severe injury crashes along the study corridor. Lighting improvements are included as safety recommendations in Chapters 5 and 6.

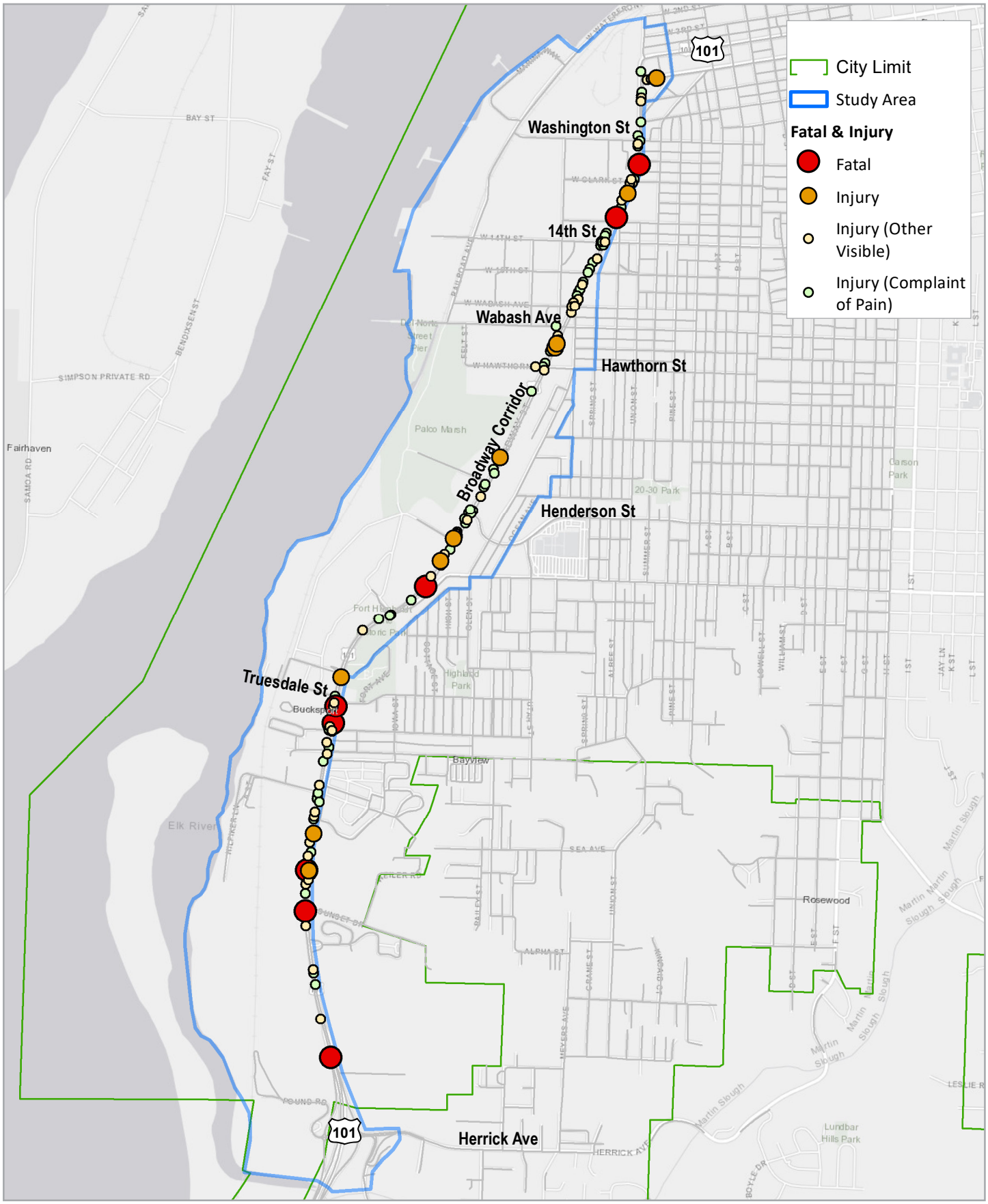
Table 4.7 Total Bicycle & Pedestrian Crashes (2014-2018)

	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	TOTAL
Total Crashes	**9**	**9**	**45**	**90**	**152**	**305**
Night (Dark)	3	5	12	11	38	**69**
% of total	*33%*	*56%*	*27%*	*12%*	*25%*	*23%*

4.4.4 Historical Crash Locations

During the 5-year analysis period, fatalities occurred at the intersections of Broadway at Sunset Street (involving a pedestrian) and Broadway at Highland Street. Fatalities occurred along the corridor (between intersections) just south of Herrick Avenue, between Sunset Road and Piersons, between McCullens Ave and Tomlinson Street, between Harris Street and Bayshore Way, between Cedar Street and Clark Street, and between Clark Street and Grant Street.

Figure 4.5 presents the locations of all fatal and injury crashes during the 5-year analysis period, and Figure 4.6 presents the locations of those crashes that involved bicyclists or pedestrians.



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GHD

HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

Project No. 11197450
Revision No. -
Date 11/12/2020

5-YEAR FATAL & INJURY CRASHES (2014-2018)

FIGURE 4.5

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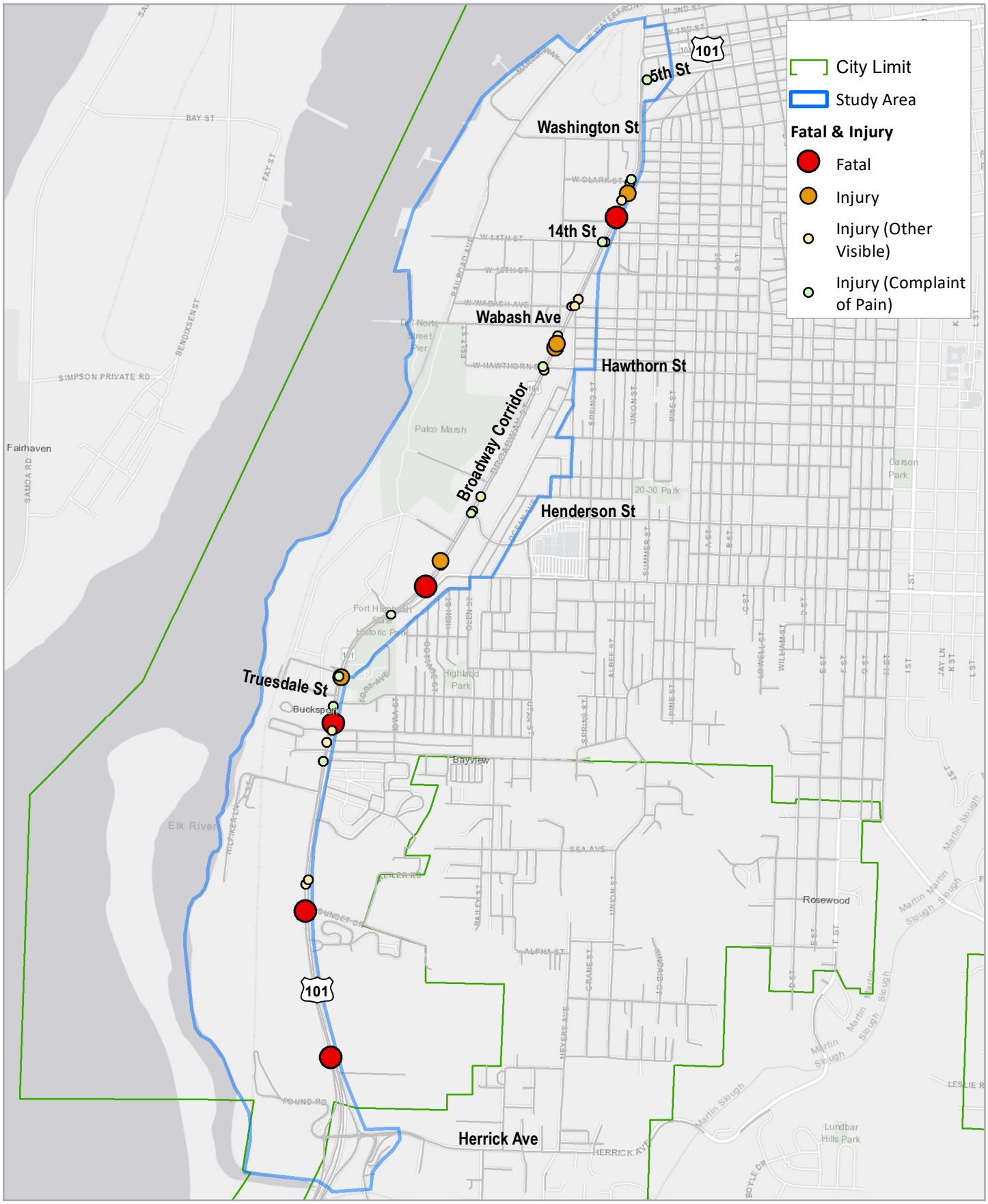
Print date: 13 Nov 2020 - 08:59

Data source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: mclark



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Miles

Map Projection: Lambert Conformal Conic
Horizontal Datum: NAD 1983 2011
Grid: NAD 1983 2011 StatePlane California I FIPS 0401 Ft US

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GHD

HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

5-YEAR FATAL & INJURY BICYCLE OR PEDESTRIAN CRASHES (2014-2018)

Project No. 11197450
Revision No. -
Date 11/12/2020

FIGURE 4.6

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Print date: 13 Nov 2020 - 08:58

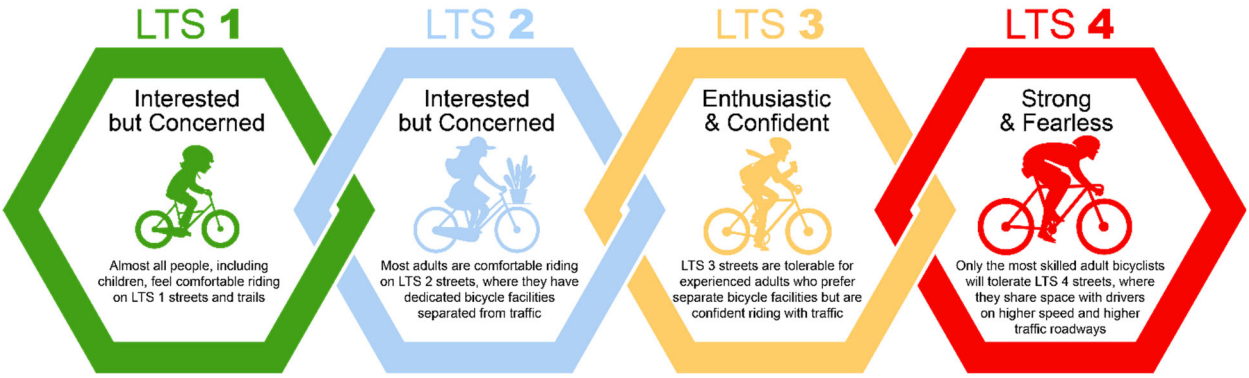
Data source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: mclark

4.5 Bicycle Level of Traffic Stress

Level of Traffic Stress (LTS) are calculated for roadway segments and intersections using the methods documented in the paper, *Low Stress Bicycling and Network Connectivity*, Mineta Transportation Institute, Report 11-19, May 2012. Bicycle LTS quantifies the stress level of a given roadway segment by considering a variety of criteria, including street width (number of lanes), speed limit or prevailing speed, presence and width of bike lanes, and the presence and width of parking lanes. Bicycle LTS is a suitability rating system of the safety, comfort, and convenience of transportation facilities from the perspective of the user. Moreover, the methodology allows planning practitioners to assess gaps in connectivity that may discourage active users from traversing roadways.

Bicycle LTS scores roadway facilities into one of four classifications or ratings for measuring the effects of traffic-based stress on bicycle riders, with 1 being the lowest stress or most comfortable, and 4 being the highest stress or least comfortable (see Figure 4.7). Generally, LTS score of 1 indicates the facility provides a traffic stress tolerable by most children and less experienced riders, such as multi-use paths that are separated from motorized traffic. An LTS score of 4 indicates a stress level tolerable by only the most experienced cyclists who are comfortable with high-volume and high-speed, mixed traffic environments. LTS 3 and 4 represent high stress conditions for bicyclists and reflect the need for visibility and safety improvements. The figure below presents the four scoring classifications, subsequent tables show the criteria associated with determining the LTS score.

Figure 4.7 Bicycle Level of Traffic Stress (LTS) Definitions

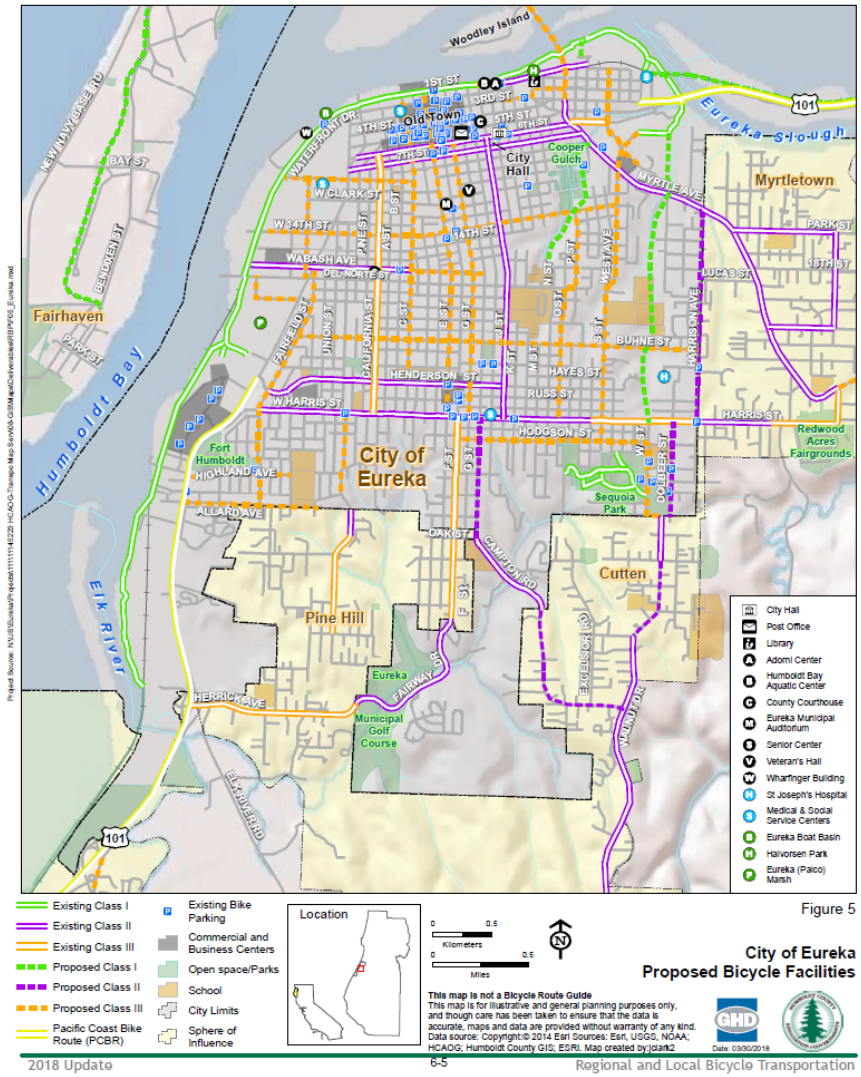


The City of Eureka's existing bicycle network is shown on Figure 4.8. Corridor segments and intersection approaches in the study area were both evaluated for LTS. An overall LTS score was determined by applying the worst score between adjacent street segments and intersection approaches. Figure 4.9 displays the overall existing condition LTS for the study corridor. The Broadway Corridor and crossings of and approaches to the Broadway Corridor are assumed to be high stress due to the traffic volume and speed of the roadway. Most local streets within the study area are considered low stress routes; however, higher stress roadways bisect these areas throughout the study area to create pockets of low stress connectivity with high stress barriers at streets with higher functional classifications, street widths, speeds, and volumes. In addition, there

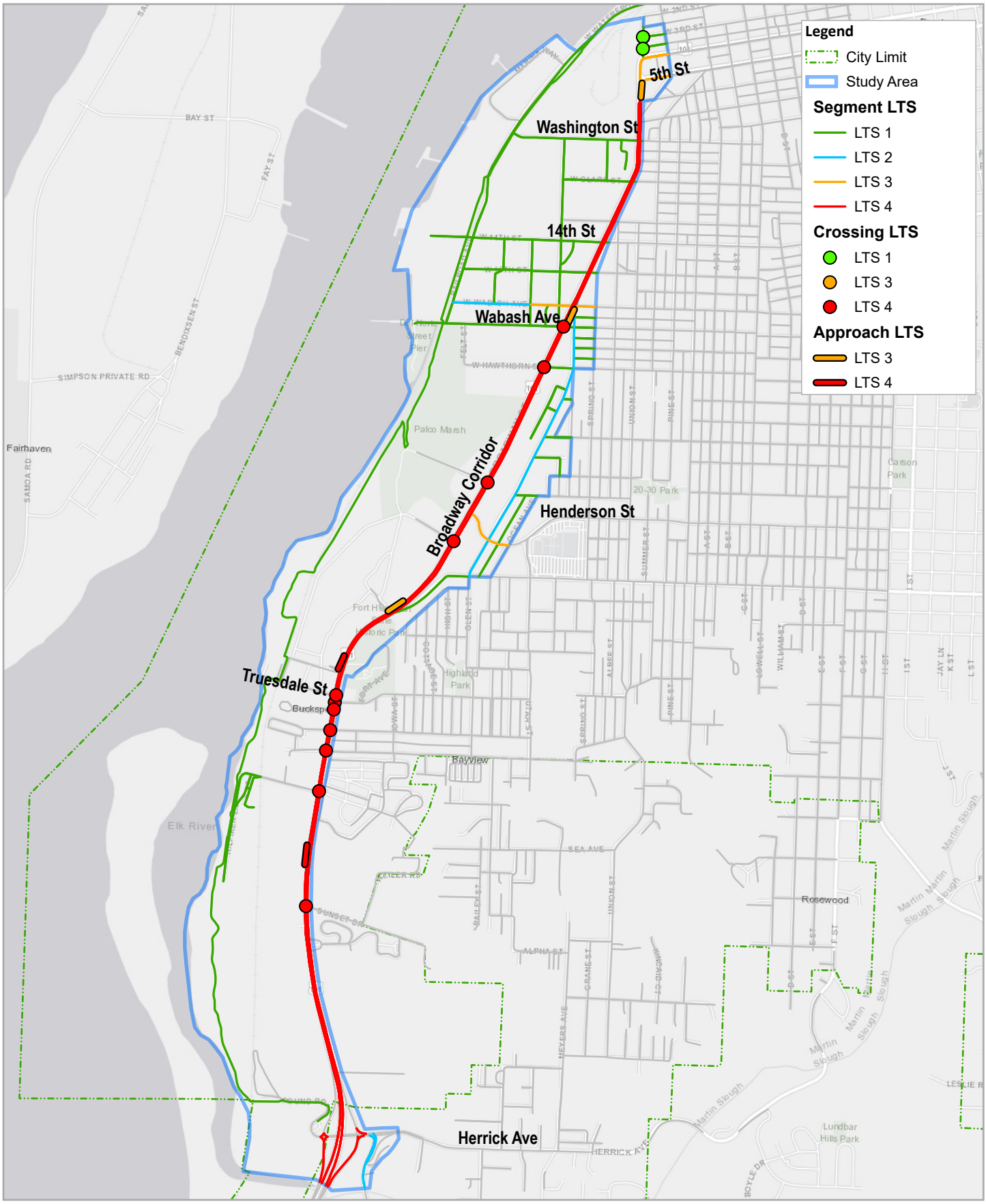
are existing Class II bike lanes along Wabash Avenue on either side of the Broadway Corridor, along Henderson Street and Harris Street east of Fairfield Street, and along 7th Street and 6th Street east of Commercial Street. Given that the Broadway Corridor bisects primarily residential areas from commercial centers, it serves as a high stress barrier to cross-town mobility between key destinations.

The main barriers to low stress connectivity for bicyclists within the Broadway study corridor are the high traffic volumes, vehicular speeds greater than or equal to 35 miles per hour, and a lack of continuous and/or protected bicycle infrastructure. These high stress facilities serve to discourage access to and bicycling on the Broadway Corridor itself (north-south bicycle travel). The Broadway Corridor also bifurcates the relatively low stress cross-streets on either side of the corridor, posing as a barrier to east-west bicycle travel and connectivity to residential areas and other destinations in the rest of the City.

Figure 4.8 Existing Bicycle Network



Source: Humboldt Regional Bicycle Plan, 2018.



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GHD

HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

EXISTING LEVEL OF TRAFFIC STRESS (LTS)

Project No. 11197450
Revision No. -
Date 11/13/2020

FIGURE 4.9

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Print date: 13 Nov 2020 - 09:55

Data source: World Light Gray Reference: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
World Light Gray Canvas Base: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: pthornton

4.6 Transit Services

The Humboldt Transit Authority (HTA) is the primary intercity transit system in the county which provides service along US 101. Within the City of Eureka, HTA operates a fixed-route service under the Eureka Transit Service (ETS). ETS operates four routes Monday through Friday and three routes on Saturdays, and these routes run every hour on the hour. Within the Eureka BMCP study area, transit service is provided primarily via the Red, Gold, and Rainbow routes. The Green route provides service to the area surrounding Bayshore Mall. In addition, the Gold Route and Rainbow Route service the Broadway Corridor during Saturdays. Figure 4.10 presents the ETS route map for weekday service.

The City's paratransit system, Dial-A-Ride, provides transit service to those who are unable to use ETS due to physical or mental disability. The Redwood Transit System (RTS) and the Southern Humboldt Intercity route provide regional connections to Eureka and surrounding communities in Humboldt County.

Figure 4.10 ETS Transit Service Routes

Source: HTA ETS (https://hta.org/agencies/eureka-transit-service/)

4.7 Roadway & Intersection Operations

Count data was collected for peak hour periods in the AM (7:00 to 9:00 AM) and PM (4:00 to 6:00 PM) for 24 key intersections on the Broadway Corridor. To supplement this new traffic count data, 2018 count data from five (5) additional intersections used in the 2016 Broadway Redevelopment Transportation Impact Study was utilized in the analysis. In addition, the Eureka BMCP evaluated 14 of the 29 key intersections for Level of Service (LOS) analysis to focus the analysis on the Broadway Corridor. Daily roadway volumes were collected by Caltrans during the month of September 2019 at nine locations along the Broadway Corridor between McCullen Avenue and 6th Street (see Appendix F). Table 4.8 presents hourly roadway volume on the hour, with the peak hour highlighted in green. As shown, volume along the Broadway Corridor generally peaks between 4:00 and 6:00 PM. However, volume is fairly consistent between the hours of 11:00 AM and 6:00 PM. Average daily traffic (ADT) ranges from 27,654 to 35,734.

Table 4.8 Existing Roadway Volume along Broadway Corridor

Time	McCullen Ave	Truesdale St	Harris St	Henderson St	N of Henderson St	N of Wabash Ave	7th St	Commercial St	Btw 5th & 6th St
12:00 AM	166	172	165	168	141	153	135	135	121
1:00 AM	123	118	125	122	117	123	112	110	96
2:00 AM	103	109	108	111	107	108	98	93	89
3:00 AM	127	126	130	130	129	104	113	108	99
4:00 AM	214	225	220	224	234	203	224	217	229
5:00 AM	526	541	529	538	543	474	511	481	485
6:00 AM	913	922	889	949	920	812	923	878	833
7:00 AM	1,977	1,887	1,809	1,919	1,755	1,547	1,835	1,664	1,564
8:00 AM	2,204	2,078	2,016	2,198	1,840	1,841	2,056	1,934	1,648
9:00 AM	1,985	1,894	1,918	2,098	1,918	1,802	2,080	2,033	1,695
10:00 AM	2,021	1,855	2,052	2,226	1,969	1,814	2,131	2,159	1,794
11:00 AM	2,274	2,097	2,322	2,547	2,176	2,079	2,333	2,357	2,010
12:00 PM	2,241	2,082	2,332	2,620	2,225	2,171	2,416	2,467	2,101
1:00 PM	2,310	2,138	2,408	2,614	2,244	2,194	2,418	2,377	2,043
2:00 PM	2,373	2,137	2,448	2,635	2,242	2,134	2,366	2,303	2,008
3:00 PM	2,366	2,249	2,427	2,661	2,283	2,153	2,407	2,364	2,006
4:00 PM	2,469	2,400	2,588	2,771	2,398	2,320	2,483	2,450	2,151
5:00 PM	2,590	2,387	2,594	2,813	2,293	2,330	2,447	2,463	2,056
6:00 PM	1,819	1,763	1,941	2,034	1,694	1,700	1,717	1,626	1,427
7:00 PM	1,324	1,316	1,466	1,546	1,363	1,294	1,304	1,283	1,132
8:00 PM	1,020	1,040	1,111	1,168	1,003	1,046	1,004	976	870
9:00 PM	767	793	793	830	741	780	717	691	622
10:00 PM	460	462	472	516	449	479	417	404	350
11:00 PM	254	266	273	296	261	285	252	248	225
ADT	**32,626**	**31,057**	**33,136**	**35,734**	**31,045**	**29,946**	**32,499**	**31,821**	**27,654**

4.7.1.1 Intersection Operations

Intersection operations were quantified using Synchro software through the determination of Level of Service (LOS) at key intersections. LOS is a qualitative metric that describes the experience of motorists. Intersections and approaches are assigned scores from "A" through "F" with A being free-flowing traffic with little to no congestion and F being highly congested. LOS criteria are established to determine whether a given roadway facility is providing the desired quality of service. The methodologies used to determine LOS (i.e. delay, speed, density) were based on the Highway Capacity Manual (HCM) 6th Edition. Caltrans operating standards have been applied that identify the cusp between LOS C and D as the acceptable threshold for Broadway Corridor.

Table 4.9 Existing Intersection LOS Results

Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
			Delay	LOS	Delay	LOS
SB Offramp to Herrick Ave.	**TWSC**	**D**	9.8	A	**OVR**	**F**
NB Offramp to Herrick Ave.	TWSC	D	13.4	B	13.6	B
Elk River Rd. NB @ Herrick Ave.	**TWSC**	**D**	**159.0**	**F**	**90.4**	**F**
Broadway & Old K-Mart Entrance	Signal	D	3.7	A	5.0	A
Broadway & Piersons/Tetrault Entrance	Signal	D	17.8	B	43.4	D
Broadway & McCullens Ave.	Signal	D	9.8	A	50.1	D
Broadway & S. Bayshore Mall Entrance	Signal	D	6.2	A	33.5	C
Broadway & N. Bayshore Mall Entrance	Signal	D	5.0	A	34.9	C
Broadway & Henderson St.	**Signal**	**D**	17.5	B	**68.4**	**E**
Broadway & Hawthorn St.	Signal	D	18.9	B	39.5	D
Broadway & Wabash Ave.	Signal	D	26.3	C	25.9	C
Broadway & 14th Ave.	Signal	D	11.9	B	21.7	C
Broadway & Washington St.	Signal	D	10.7	B	17.5	B
Broadway & 6th St.	Signal	D	5.9	A	7.8	A

Notes:
1. TWSC = Two Way Stop Control
2. LOS = Delay based on average of all approaches for Signal, and worst approach for TWSC
3. **Bold** = Unacceptable Conditions
4. OVR = Delay greater than 300 seconds.

4.7.1.2 Roadway Congestion (Speed-Based Analysis)

The Federal National Performance Rule Congestion Threshold performance measure was used to determine the performance of roadway segment operating conditions within the study corridor: Uncongested (>= 60 % of free-flow) vs. Congested (< 60% of free-flow). Under the federal definition, a roadway is considered congested if peak period travel speeds fall below 60% of free flow speeds. This includes delays experienced at intersections. The analysis is based on NPMRDS speed data collected over a two-year period and reflects the AM/PM peak hours. Given that free flow speed is a key variable for calculating this performance measure, free flow speed was

empirically estimated for each roadway segment using NPMRDS data between the hours of midnight and 3 AM.

Congestion threshold results for the AM and PM peak hours are graphically presented Figure 4.12 and Figure 4.13, respectively. As shown, the Broadway Corridor is considered unreliable in both the northbound and southbound directions, and is considered both unreliable and congested on the northbound segment between Bayshore Mall and 14th Street.

4.7.1.3 Travel Time Reliability Analysis

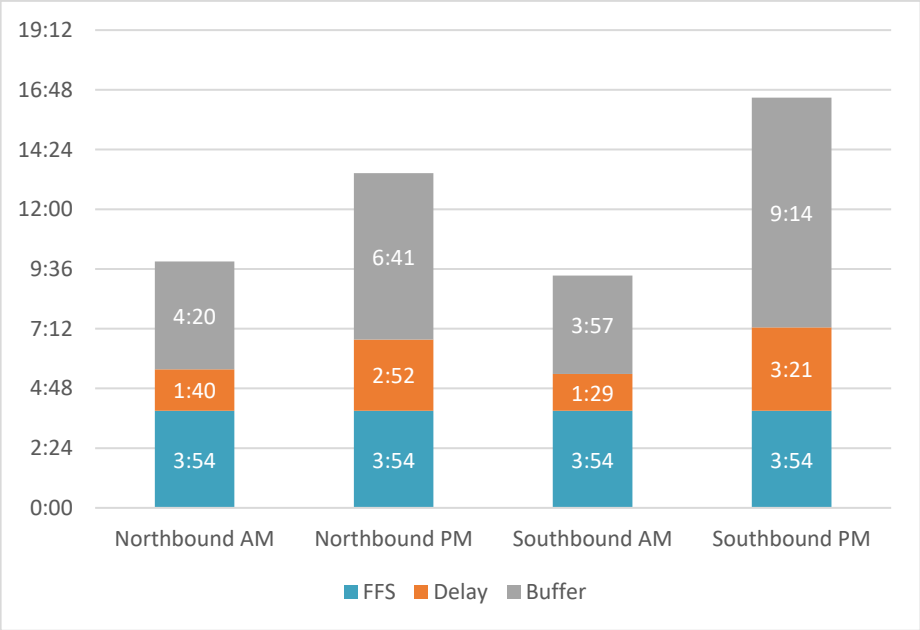
Travel time reliability is defined as the variation in travel time for the same trip from day to day ("same trip" implies a trip made with the same purpose, from the same origin, to the same destination, at the same time of the day, using the same mode, and by the same route). If variability is large, the travel time is considered to be unreliable, because it is difficult to generate consistent and accurate estimates for it. If there is little or no variation in the travel time for the same trip, the travel time is considered to be reliable.

NPMRDS speed data was used for baseline travel time reliability analysis. The following performance metrics for passenger vehicles were generated:

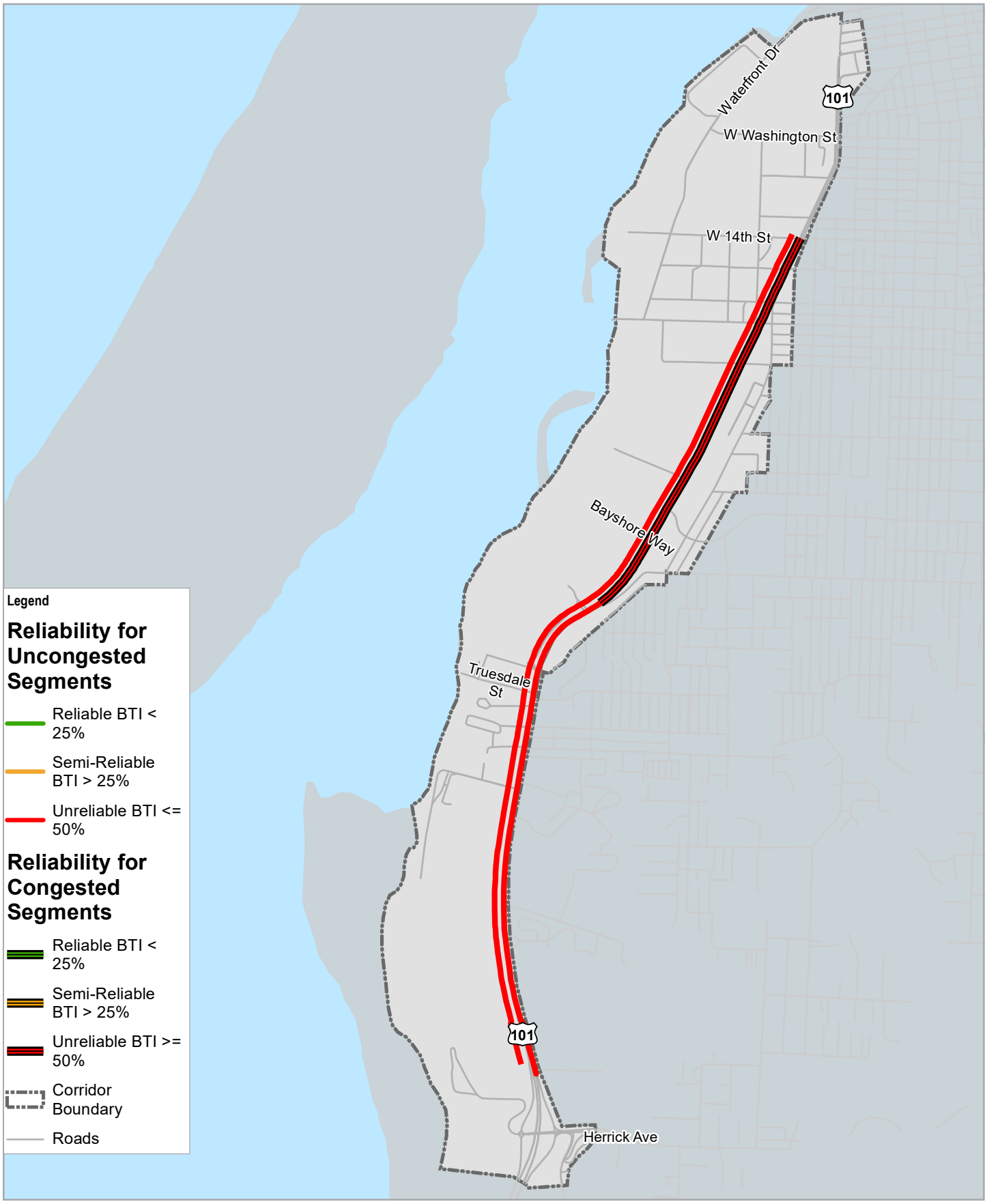
- Buffer time: the additional time a motorist needs to budget to ensure they arrive at their destination at the expected time 95 percent of the time
- Buffer time index (BTI): normalized buffer time for distance and is expressed as a ratio

Figure 4.11 presents the average time it takes vehicles to travel the Broadway Corridor during a typical weekday AM and PM peak hour period for both the northbound and southbound directions. As shown, for both AM and PM peak hour conditions, buffer time adds significant extra time to both northbound and southbound trips. As such, the corridor is understood to be unreliable under most peak hour conditions. This is especially true during the PM peak hour, where the increase in travel time is due primarily to increased buffer time associated with unreliable travel speeds.

Figure 4.11 Existing Corridor Travel Time



**FFS = Free Flow Speed*



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Eureka 101 BROADWAY

MULTIMODAL CORRIDOR PLAN

HCAOG

PV Peak Hour AM Travel Time Reliability and Congestion

Project No. 11197450
Revision No. -
Date NOVEMBER 2020

FIGURE 4.12

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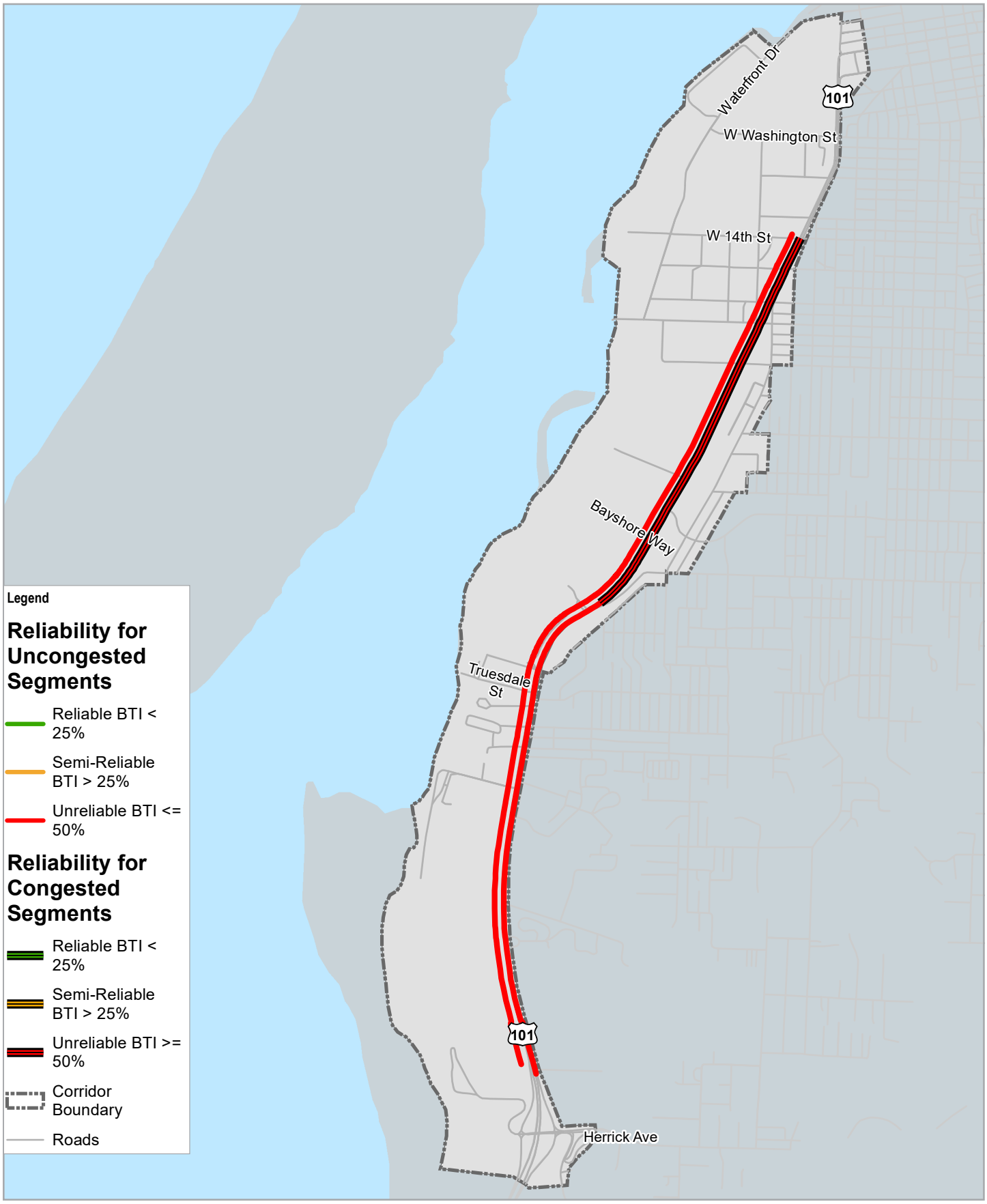
Data source: National Performance Management. Research Datase (NPMRDS) 06/2018 - 06/2019. TIGER, 2018. Created by: pthornton



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Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane California I FIPS 0401 Feet

GHD

Eureka 101 BROADWAY

MULTIMODAL CORRIDOR PLAN

HCAOG

PV Peak Hour PM Travel Time Reliability and Congestion

Project No. 11197450
Revision No. -
Date NOVEMBER 2020

FIGURE 4.13

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Data source: National Performance Management. Research Datase (NPMRDS) 06/2018 - 06/2019. TIGER, 2018. Created by: pthornton

5. Corridor Alternatives

This chapter presents the long-term corridor alternatives for the US 101/Broadway Corridor from Herrick Avenue to 4th Street that were evaluated during the Eureka Broadway Multimodal Transportation Corridor Plan (Eureka BMCP) planning process. These alternatives were developed in coordination and collaboration with the City of Eureka, HCAOG, Caltrans, and Humboldt County, and were evaluated throughout public outreach efforts conducted as part of this planning process.

The Eureka BMCP aims to build upon previous studies and concept recommendations while maintaining a focus on the abovementioned goals and Smart Mobility Framework criteria. The corridor alternatives presented in this chapter were developed to address a variety of goals, including the following:

- Safety Improvements
- Multimodal & Transit Mobility
- Travel Demand and Congestion
- Climate Adaptation (Sea Level Rise)
- Economic/Community Enhancement
- Emergency Preparedness/Resiliency

5.1 Previous Studies

In the process of identifying recommended plan concepts, previous studies and recommendations were explored. The City of Eureka, in coordination with the HCAOG, Caltrans, and Humboldt County have considered numerous improvements to the Broadway Corridor, starting with the original bypass concepts back in 1963. For over 50 years, the City of Eureka has recognized the challenges that results from the corridor's position as a high volume state highway that also serves as the primary route for local activities and provides access to the City's major employment and commercial areas.

The following concepts, among others, were completed to address these competing mobility demands. These previous studies are described in further detail in Appendix B.

- **US 101 Bypass** (Draft Environmental Impact Statement, Caltrans, 1971)
- **Broadway Corridor Complete Street Solution** (Feasibility Study, Caltrans District 1, 2014)
- **South Entry Traffic Calming Solution** (Project Study Report, 2015)
- **Koster Couplet** (Feasibility Study, Caltrans District 1, 2017)

Other attempts to address congestion and high collision rates have been, and continue to be, small incremental changes that have little impact on the larger, regional system of traffic circulation and corridor wide treatments.

5.1.1 Bypass Considerations

A number of Eureka bypass options have been contemplated in the past, including a westerly alignment requiring a bridge system to the Samoa peninsula utilizing New Navy Base Road, and perhaps more feasibly, an easterly bypass through the Cutten area and unincorporated Humboldt County. Freeway conversion options within Eureka have also been considered in the past, that would require grade separation of US 101 through the City.

One of the primary concerns with any bypass, or new alignment, stems from the potential that a capacity increasing highway facility would not be permitted by the Coastal Commission in the Coastal Zone. Another Eureka bypass option that would avoid the Coastal Zone altogether could involve an alignment that diverges from the existing US 101 alignment south of the Hookton Road Interchange and connects to State Route 299 between Blue Lake and Glendale Boulevard.

Bypass concepts could significantly reduce traffic volumes on Broadway by rerouting regional travel demand outside the City. If travel demand is sufficiently reduced on the existing US 101 alignment through the City, a lane reduction (road diet) on Broadway could be considered that would allow for the space within the existing cross section to be reallocated to multimodal safety improvements.

Bypass alignments, however, would likely be costly, require miles of new rights-of-way, and have significant impacts to environmental and cultural resources. In addition, social and economic impacts could result from the reduction in the amount of regional visitor traffic into Eureka.

While none of these concepts were eventually adopted as plans for the Broadway Corridor, and this study does not make recommendations to further consider a bypass options for US 101, this study does evaluate alternatives that shift traffic volume from the current corridor alignment with the goal to reduce crash rates, alleviate congestion, provide more right-of-way for multimodal improvements along Broadway Corridor, and provide a safe and accessible commercial corridor within the city.

5.2 Corridor Concept Alternatives

The Eureka BMCP identified three approaches to corridor alternative recommendations:

1. Maintain vehicular travel only along the existing alignment,
2. Split northbound/southbound corridor vehicular travel via “couplets” of parallel one-way streets in opposite directions, or
3. Implement a road diet along the Broadway Corridor while shifting some vehicular travel to parallel routes.

Within these approaches were opportunities to consider adjustments to the number of travel lanes and direction of travel flow, and the subsequent effects on limiting or increasing available right-of-way for multimodal and safety improvements.

The following is the preferred list of alternatives that were evaluated for the Broadway Corridor.

5.2.1 Improve Broadway

Operational and Safety Improvements on Improved Broadway within Existing Right-of-Way
Improve Broadway Street along its existing alignment, without providing additional or replacement connections for US 101 traffic. The focus of this approach is on improving operations by enhancing intersection signal timing and considering roundabouts at key locations, limiting vehicular turn conflicts by implementing access management solutions, and modifying existing cross-sections to widen sidewalks along the Broadway Corridor.

5.2.2 Waterfront Couplet

Broadway One-Way Northbound; Waterfront Drive One-Way Southbound
Create a one-way couplet to split northbound and southbound travel along the Broadway Corridor. Northbound travel would be accommodated along the existing alignment, and southbound travel would be shifted to an improved one-way Waterfront Drive (Waterfront Couplet). The couplet would reconnect with the existing Broadway alignment at Herrick Avenue. The focus of this approach is on alleviating vehicular traffic volume along the existing alignment, and on providing additional right-of-way for multimodal and transit improvements along the Broadway Corridor.

5.2.3 Koster Couplet

Broadway One-Way Northbound; Koster Couplet One-Way Southbound
Create a one-way couplet to split northbound and southbound travel along the Broadway Corridor. Northbound travel would be accommodated along the existing alignment, and southbound travel would be shifted to an improved one-way Koster Street (Koster Couplet). The couplet would reconnect with the existing Broadway alignment at Del Norte Street. The focus of this approach is on alleviating vehicular traffic volume along the existing alignment, and on providing additional right-of-way for multimodal and transit improvements along the Broadway Corridor from 4th Street to Del Norte Street.

5.2.4 Double Couplet

Broadway One-Way Northbound; Koster Couplet & Southern Couplet One-Way Southbound
Create two one-way couplets to split northbound and southbound travel along the Broadway Corridor. Northbound travel would be accommodated along the existing alignment, and southbound travel would be shifted to an improved one-way Koster Street (Koster Couplet) and a new one-way facility north of Vigo Street to Bayshore Mall (Southern Couplet). The Southern Couplet would reconnect with the existing Broadway alignment at Bayshore Mall. The focus of this approach is on alleviating vehicular traffic volume along the existing alignment, and on providing additional right-of-way for multimodal facilities along the Broadway Corridor from 4th Street to Bayshore Mall.

5.2.5 Road Diet (3- or 4-Lane Broadway) with Parallel Connection(s)

Reduced Capacity on Broadway with Connections to Koster Street and/or Waterfront Drive
Maintain two-way traffic on Broadway while reducing the number of travel lanes to either 3-lanes (one northbound/one southbound lanes and a center turn lane) or 4-lanes (two northbound/one southbound lanes and a center turn lane), while transitioning some vehicular capacity west with improved connections to parallel routes on Koster Street and/or Waterfront Drive. The focus of this

approach is on maintaining two-way traffic flow along Broadway while reducing the number of travel lanes and providing additional right-of-way for multimodal facilities along Broadway. The Broadway road diets utilizing Koster Street only would extend to Del Norte Street, while those utilizing both Koster Street and Waterfront Drive would extend to approximately Bayshore Mall.

This approach resulted in four alternatives: 3-Lane Broadway with Improved Koster Street Connection; 3-Lane Broadway with Improved Koster Street and Waterfront Drive Connections; 4-Lane Broadway with Improved Koster Street Connection, and 4-Lane Broadway with Improved Koster Street and Waterfront Drive Connections.

5.3 Multimodal & Transit Improvements

Each corridor concept alternative includes improvements to the multimodal and transit network. However, due to limited right-of-way (ROW) along portions of the existing Broadway Corridor alignment, alternatives that shift US 101/Broadway Corridor vehicular capacity to parallel routes allow for a larger cross-section to be utilized for multimodal and transit improvements. As such, the width of ROW available for multimodal improvements affects the type and effectiveness of multimodal and transit improvements that can be implemented. In addition, alternatives that reduce the number of vehicular travel lanes along the Broadway Corridor allow for shorter crossing distances for pedestrians, as well as reduced conflict with vehicles approaching from two directions. The existing ROW for each segment area is as follows, and is presented in Appendix H:

1. Southern Segment: 95 to 102-feet
2. Middle Segment: 96 to 115-feet
3. Northern Segment:
    a. Hawthorn Street to Wabash Avenue: 98 to 99-feet
    b. Wabash Avenue to 14th Street: 73 to 84-feet
    c. 14th Street to 4th Street: 65 to 70-feet

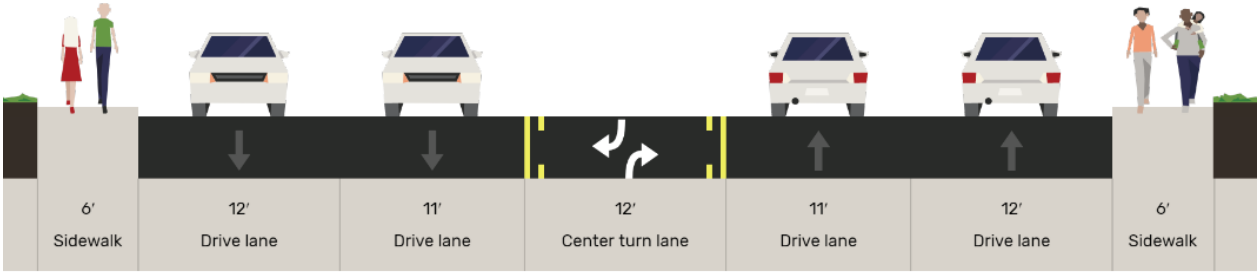
Shifting southbound vehicular travel to one-way couplets, and removing the need for a center two-way left-turn lane, allows for approximately 33 to 36-feet of ROW to be utilized for necessary multimodal and safety improvements, even along segments with existing ROW constraints. For example, even along the most constrained portions of the corridor, couplet alternatives would allow for accommodating two vehicular lanes, transit lanes, Class IV bikeways with 4-feet of physical separation from vehicles, and improved pedestrian crossings.

In contrast, the “Improve Broadway” concept does not reduce the number of travel lanes along the corridor, and therefore provides minimal opportunity for new available ROW along segments with existing ROW constraints. This is especially true for the northern segment where the existing cross-section of 65 to 70-feet does not allow for sufficient space to accommodate four travel lanes, center turn lanes, sidewalks, and adequate bicycle improvements. Along the most constrained segments, “Improve Broadway” could provide a maximum of 12-feet of ROW for multimodal and safety improvements by removing center turn lanes. However, this would only allow for Class II striped bike lanes without adequate separation from motorists, and would limit the opportunity for improved

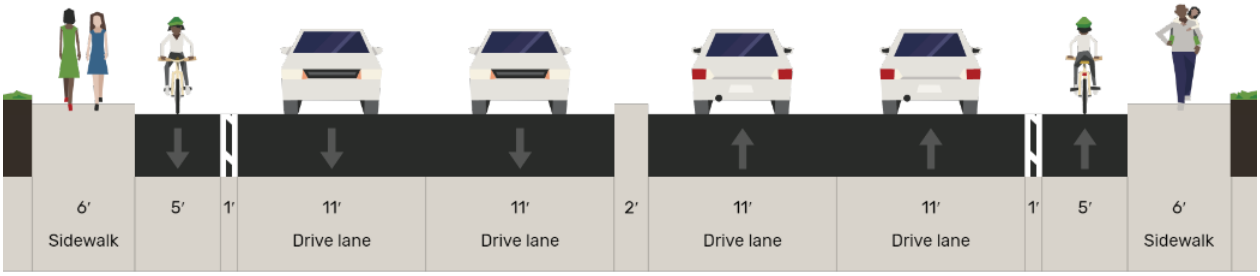
pedestrian crossing. In addition, at intersections where left turn lanes are necessary, there is no room for Class II bike lanes, and bicyclists would be required to 'share the lane' with motorists.

The following images depict 70-foot cross-sections for existing conditions and improved conditions along Broadway Corridor for the "Improved Broadway" and couplet alternatives ("Koster Couplet" and "Double Couplet") through portions of the northern segment (source: Streetmix).

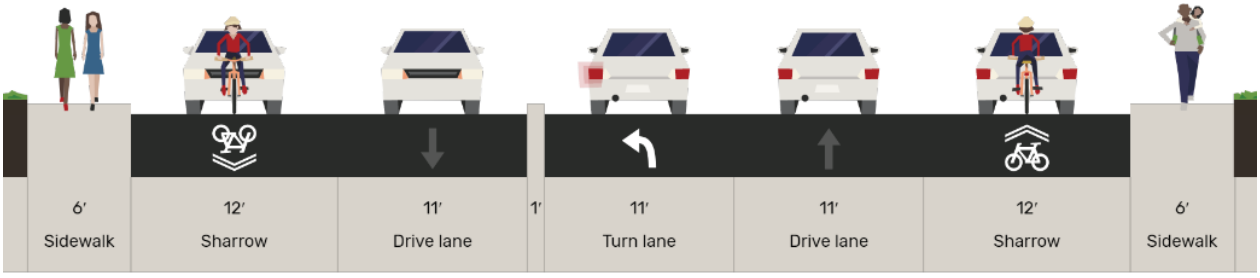
Existing Broadway Corridor 70-foot Cross-section



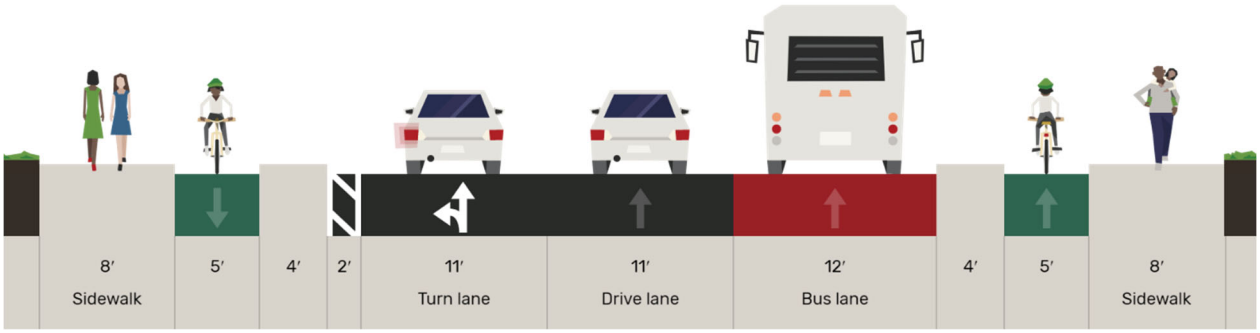
"Improved Broadway" – Broadway Corridor 70-foot Cross-section (no turn lanes)



"Improved Broadway" – Broadway Corridor 70-foot Cross-section (at intersections)



Couplet Alternatives – Broadway Corridor 70-foot Cross-section



The following sections describe typical examples of some of the recommended multimodal and transit improvements. The provided images are not exact depictions of the recommended improvements, but rather provide examples of multimodal improvement types. All images are sourced from the National Association of City Transportation Officials (NACTO) *Urban Bikeway Design Guide*, *Second Edition,* 2014 or Caltrans *Main Street, California: A Guide for Improving Community and Transportation Vitality,* 2013.

5.3.1 Pedestrian improvements

- Sidewalk gap closure and widening (10-foot sidewalks where feasible; 6-foot minimum)
- High visibility pedestrian crossings with flashing beacons and/or median refuge islands

Examples of Pedestrian Crossings with Flashing Beacons & Median Refuge Island

Source: NACTO, 2014.

Source: Caltrans, 2013.

Source: Caltrans, 2013.

5.3.2 Bicycle improvements

- Improved connections to the existing Waterfront Class I shared-use trail and existing and proposed Class II and Class III facilities on local streets.
- Class IV bikeways: Known as separated bikeways or cycle tracks, Class IV bikeways provide a separate travel way that is designated exclusively for bicycle travel adjacent to the roadway and are protected from vehicular traffic by physical separation. The separation may include, but is not limited to, grade separation, planters, flexible posts, inflexible posts, physical barriers, or on-street parking. *Note: Class IV separated bikeways can only be provided where sufficient ROW is available along the Broadway Corridor.*

Class IV Separated Bike Lane with Raised Curb

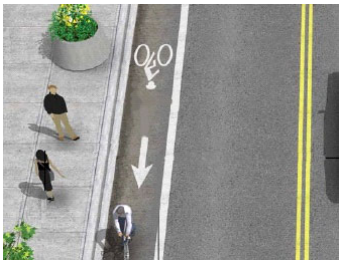
Source: NACTO, 2014.

Class IV Separated Bikeway at Transit Stop

Source: NACTO, 2014.

- Class II bike lanes: Class II facilities provide a striped and signed lane for one-way bicycle travel on each side of a street or highway within the paved area of a roadway. No physical separation is provided between cyclist and motorists. *Note: Class II bike lanes would only be recommended under alternatives where sufficient ROW is not available along constrained portions of the Broadway Corridor, such as within the northern segment under the "Improve Broadway" alternative.*

Class II Bike Lane

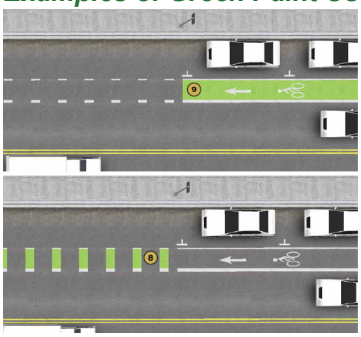


Source: NACTO, 2014.

Additional bicycle facility types that aim to improve bicyclist safety through improved visibility and physical separation include the following:

- Green Paint/Conflict Markings: May be installed within bicycle lanes or the extension of the bicycle lane through an intersection or a conflict area as a supplement to bike lane markings.
- Bike Boxes: Designated area to queue in front of automobiles at signalized intersections

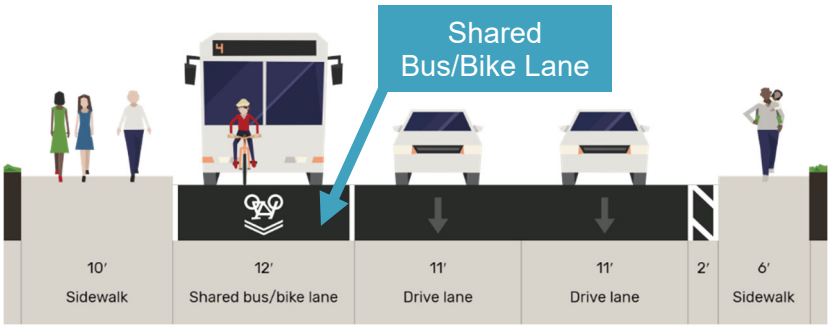
Examples of Green Paint Used to Denote Bikeways and Conflict Areas



Source: NACTO, 2014.

5.3.3 Transit improvements

- Transit Lanes and Bus-On-Shoulder Lanes: Transit lane for buses along roadways and at intersection approaches along the existing Broadway alignment and new couplets. To provide bicycle access along the couplets, the highest and best use of the 12-foot shoulder on the couplets should be evaluated to determine if the proposed transit shoulder should be a shared transit/bike lane (see example cross-section). *Note: Transit lanes can only be provided where sufficient ROW is made available through lane removal along the Broadway Corridor.*



- Improved bus stops
    - Safe crossing through bikeways & comfortable bus shelters

5.3.4 Safety Improvements

The abovementioned multimodal improvements all aim to improve corridor safety for bicyclists and pedestrians. Additional safety measures could be implemented to improve the visibility of bicyclists and pedestrians, reduce vehicular conflicts, and optimize travel flow. Safety improvements recommended for the corridor are identified in Chapter 8 of this report. In addition, near term safety improvement recommendations are presented in Chapter 7. The following is a list of safety improvements (or "countermeasures") from Caltrans's *Local Roadway Safety Manual* (Version 1.5, April 2020) that could improve safety and reduce crashes along the corridor:

- Install/Improve Traffic Signals
- Add Leading Pedestrian Interval (LPI) phases at signalized intersections
- Install/Upgrade Intersection/Segment Lighting
- Install/Upgrade Signs and Pavement Markings
- Convert roadway from 2-way to 1-way Traffic
- Install Median Barrier

5.3.5 Traffic Calming Improvements

The abovementioned multimodal and safety improvements all aim to calm vehicular traffic through the corridor by changing the landscape of US 101 from a high-speed highway to a local main street with design features that accommodate all modes of traffic. Additional traffic calming measures that could be implemented to alert motorists that they are entering the City of Eureka and potential reduce speeds include the following:

- Gateway signage such as a monument, especially along the southern segment as vehicles enter the city. *Image on the right sourced from the "Eureka South Entry Project" PSR, 2015.*
- Landscape and other aesthetic improvements along sidewalks and/or center medians
- Wayfinding signage to assist travelers in locating local amenities

5.4 Alternatives Performance Assessment

Through an extensive public outreach and stakeholder involvement process, the corridor concept alternatives described above were evaluated using stakeholder-generated criteria, including environmental sensitivity and impact, presented in Table 5.1.

Scores were given to each alternative based on qualitative assessments of the respective opportunities and constraints, such as number of travel lanes, direction of travel, roadway alignment, available ROW, and access management. The scores were based on the alternatives' potential to worsen conditions, have little to no change in conditions, improve conditions, or significantly improve conditions as compared to Year 2045 (Baseline) conditions with no improvements to the Broadway Corridor. The assessment score key is presented in Table 5.2. Details on the alternatives' specific opportunities and constraints is provided in Appendix C.

Table 5.1 Performance Assessment Criteria

Alternative Screening Criteria		Description
Safety	Speed Reduction	Potential to reduce crashes between road users through traffic calming and speed reduction measures, access management strategies to reduce conflicts, and changes in intersection design.
Multimodal Mobility	Level of Comfort	Potential to improve connectivity and safety of bicycle and pedestrian infrastructure that results in reduced vehicular speeds, enhanced multimodal connectivity, and increased bicycle protection and separation from vehicles along segments and at intersections.
Vehicle Operations	Segment Capacity	Potential to increase vehicular capacity with strategic cross-section design along Broadway Corridor and provides additional capacity via alternate parallel routes for north-south travel through the study area.
	Signal Optimization	Potential to improve vehicular traffic flow along Broadway Corridor due to signal optimization and intersection lane reconfiguration.
Accessibility + Economic Opportunity	Local Business Visibility	Potential to increase local business visibility along high-volume corridors via adjacent vehicular traffic, improved multimodal connections, and landscaping and other beautification opportunities.
	Directionality/ Path of Travel	Potential to increase connections to economic opportunity by improving access to and enhancing spaces surrounding commercial areas along the corridor.
Deliverability	Uses Available ROW	Avoids the need to obtain additional right-of-way to construct project roadway facilities.
Environmental	Avoids Sensitive Areas	Avoids construction of new roadway facilities through environmentally sensitive or culturally significant areas.
Community Impact	Waterfront Access	Potential to increase access to the City's waterfront area to highlight the City's unique resource and encourage increased recreational and community activity.
Community Feedback	Stakeholder Support	Project is supported by members of the Focus Group.

Table 5.2 Assessment Score Key

Assessment Score Key	
Worsens Conditions	- -
Little/No Change in Conditions	-
Improves Conditions	+
Significantly Improves Conditions	+ +

Table 5.3 presents the assessment screening results for the corridor concept alternatives and represent the results of comprehensive project team and community input. These scores were utilized to provide a framework for evaluating the alternatives and ultimately determining the Preferred Concept for the corridor. The Preferred Concept was then evaluated against critical performance metrics used to allocate funding through applicable competitive grant programs, as presented in Chapter 8 – Performance Assessment.

Table 5.3 Assessment Screening Results

Alternative Screening Criteria		Improve Broadway	Waterfront Couplet	Double Couplet	Koster Couplet	3-Lane Broadway	3-Lane Broadway (With Waterfront)	4-Lane Broadway	4-Lane Broadway (With Waterfront)
Safety	Speed Reduction	+	+	+	+	+ +	+ +	+ +	+ +
Multimodal Mobility	Level of Comfort	-	+ +	+ +	+	+	+ +	+	+ +
Vehicle Operations	Segment Capacity	-	+	+	+	- -	-	- -	+
	Signal Optimization	-	+ +	+ +	+	- -	- -	- -	- -
Accessibility + Economic Opportunity	Local Business Visibility	-	- -	-	-	-	-	+	+
	Directionality/ Path of Travel	- -	- -	-	-	-	+	-	+
Deliverability	Uses Available ROW	+ +	- -	- -	- -	+	- -	+	- -
Environmental	Avoids Sensitive Areas	+	- -	- -	-	+	- -	+	- -
Community Impact	Waterfront Access	-	+	+	-	-	+	-	+
Community Feedback	Stakeholder Support	+	- -	+	+	- -	- -	+	- -

5.5 Retained Alternatives

Due to a focus on safety and multimodal improvements along the corridor and their respective traffic calming benefits, the alternatives scored well regarding speed reduction and the bicyclist/pedestrian level of comfort. Segment capacity and signal optimization were improved for one-way couplet alternatives, and no alternative negatively impacted community access to the Waterfront area.

The primary difference amongst alternatives centered on whether or not to maintain all Broadway/US 101 vehicular traffic along the existing alignment, or to shift some vehicular traffic to new or existing parallel routes. As mentioned above, the alternatives result in different opportunities for multimodal/transit improvements, use of available ROW, and avoiding environmentally sensitive areas.

Due to the changing characteristics along the corridor (including adjacent land use types, right-of-way width, environmental context, and travel demand), the corridor was subdivided into three segment areas for further evaluation (see Figure 5.1):

1. Southern Segment: Herrick Avenue to Truesdale Street
2. Middle Segment: Truesdale Street to Hawthorn Street
3. Northern Segment: Hawthorn Street to 4th Street

Consistent with the assessment criteria results (Table 5.3), the following determinations were made in coordination with the project team, stakeholders, and members of the public:

- Due to environmental constraints, such as wetlands, proximity to the bay and limited connectivity between concept and existing facilities, concepts which included a Waterfront Drive extension through the middle and/or southern segments were eliminated. *"Waterfront Couplet", "3-Lane Broadway (with Waterfront)", and "4-Lane Broadway (with Waterfront)" were eliminated from further evaluation.*
- Due to the potential to severely reduce segment capacity, concepts which included a 'road diet' along the existing alignment were eliminated. *"3-Lane Broadway" and "4-Lane Broadway" were eliminated from further evaluation.*

The three alternatives that were retained for further evaluation include "Improve Broadway", "Koster Couplet", and "Double Couplet".

5.5.1 Preferred Concept Development

Since the southern segment portion of the corridor was found to have no alignment alternatives outside of the existing state highway ROW, all retained alternatives share the same concept design for the southern segment south of Truesdale Street. Therefore, the "Improve Broadway" alternative is recommended for the southern segment from Herrick Avenue to Truesdale Street.

The Koster Couplet and the Double Couplet alternatives both include the creation of the one-way couplet along Koster Street and provide the same improvements along Broadway within the northern segment, including one-way vehicular travel, Class IV separated bikeways, transit, and opportunities for shorter pedestrian crossing distances, among others. Within the middle segment,

the Double Couplet alternative provides the opportunity to extend these improvements further south with the addition of a second couplet (the "Southern Couplet") from north of Vigo Street to Bayshore Mall, providing a more comprehensive network of multimodal improvements along the corridor. Therefore, the middle and northern segments have two improvement options:

Option 1: Improve Broadway along the existing alignment to avoid requiring new ROW through potentially sensitive areas.

Option 2: Shift southbound US 101/Broadway vehicular traffic to parallel routes via the Koster Couplet (northern segment) and/or Southern Couplet (middle segment).

The options for the Preferred Concept are described for each segment area below. Each option includes comprehensive multimodal and safety improvements discussed in previous sections.

1. Southern Segment: Herrick Avenue to Truesdale Street
    - Option 1: Improve Broadway + Class IV Separated Bikeways + Transit Lanes
2. Middle Segment: Truesdale Street to Hawthorn Street
    - Option 1: Improve Broadway + Class II Bike Lanes or Class IV Separated Bikeways
    - Option 2: Southern Couplet + Class IV Separated Bikeways + Transit Lanes
3. Northern Segment: Hawthorn Street to 4th Street
    - Option 1: Improve Broadway + Class II Bike Lanes (with removed center turn lanes) or Class III Bike Lanes (with center turn lane, and at intersections with turn lanes)
    - Option 2: Koster Couplet + Class IV Separated Bikeways + Transit Lanes

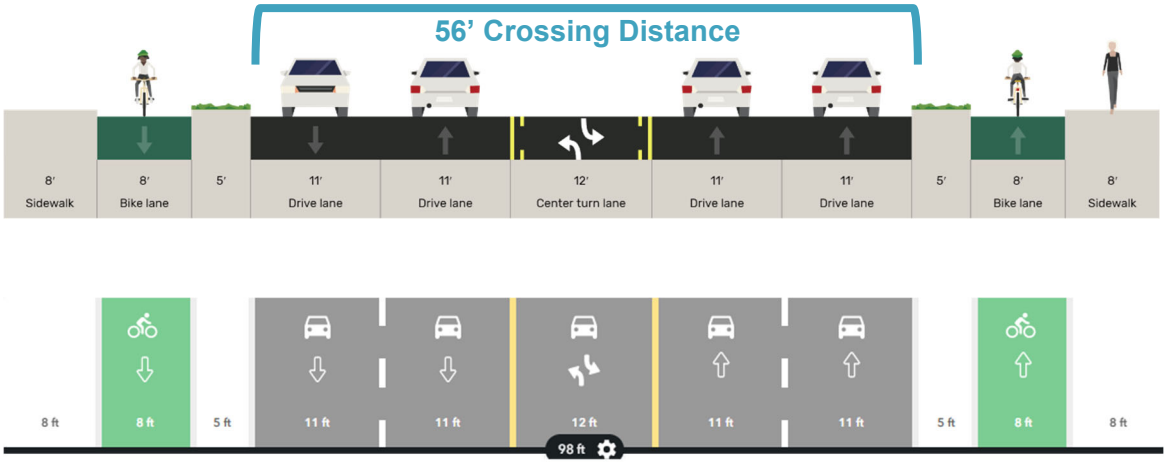
5.5.2 Middle Segment Multimodal Improvements

It should be noted that multimodal improvements could be implemented along the middle segment portion of the Broadway Corridor within existing right-of-way under the "Improve Broadway" alternative. These improvements could include complete sidewalks and Class IV Bikeways in the northbound and southbound directions (see example cross-sections below). However, this design would still fall short of the full multimodal solution recommended for the Broadway Corridor, which includes improved pedestrian crossings, bulb-outs at intersections, wider sidewalks, and transit lanes, among others.

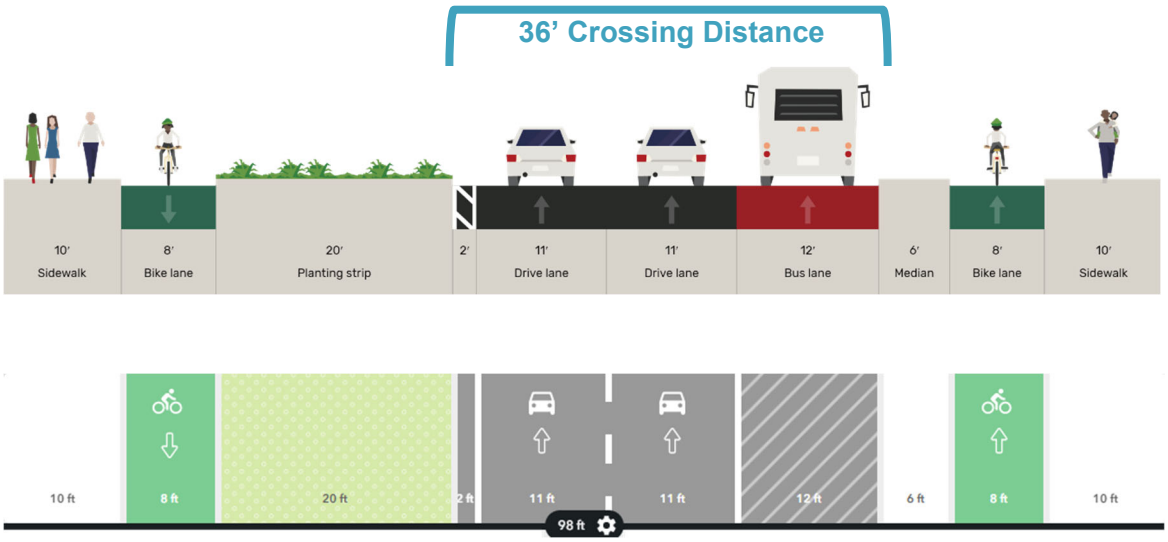
In addition, the type and effectiveness of multimodal improvements differs greatly depending on the level of traffic stress experienced by the user (bicyclist or pedestrian). By eliminating the two southbound travel lanes along the existing Broadway Corridor alignment, the "Southern Couplet" within the middle segment could achieve reduced vehicular conflict points, improved coordination and efficiency of vehicular movements, and reduced crossing widths for pedestrians. As such, the "Southern Couplet" would allow opportunities to implement a more comfortable and effective multimodal and transit network.

The following cross-section examples compare the opportunities for multimodal improvements under the "Improve Broadway" and "Southern Couplet" alternatives for the middle segment portion of the Broadway Corridor:

Middle Segment with "Improve Broadway" – Potential 98-Foot Cross-Section

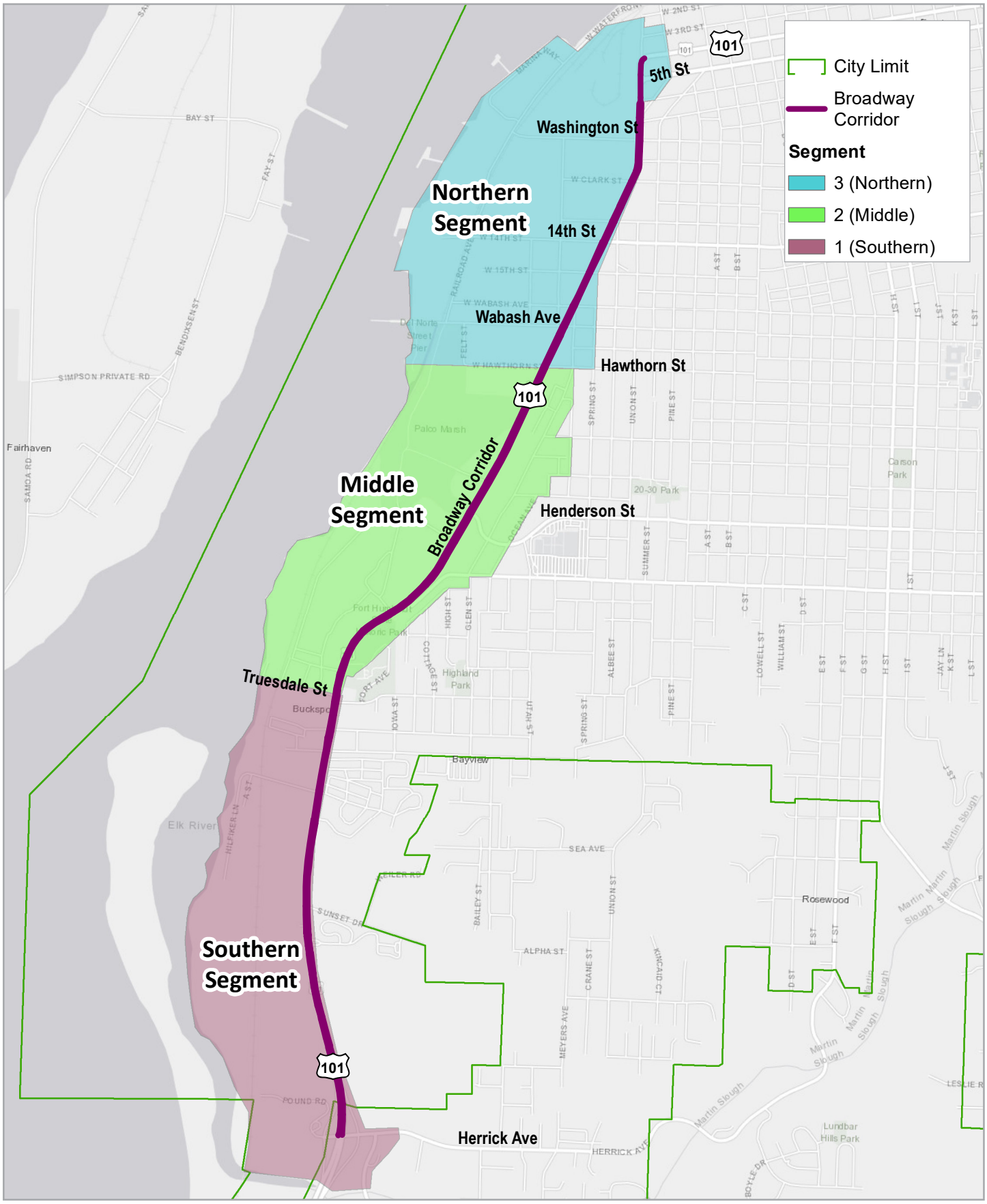


Middle Segment with "Southern Couplet" – Potential 98-Foot Cross-Section



5.5.3 Preferred Concept Recommendation

Due to the opportunity to extend the extensive network of multimodal and transit improvements further south to Bayshore Mall, and to provide opportunities for safer pedestrian crossings along Broadway, the Preferred Concept is recommended to include both the Koster Couplet and the Southern Couplet. The Preferred Concept is presented in more detail in Chapter 6.



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HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

Project No. 11197450
Revision No. -
Date 11/12/2020

STUDY CORRIDOR SEGMENT AREAS

FIGURE 5.1

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6. Preferred Concept

The Double Couplet alternative with accompanying multimodal improvements, was chosen as the Preferred Concept for the Eureka BMCP. As described in the previous chapter, this alternative would create two one-way couplets to split northbound and southbound travel along two segments of the Broadway Corridor. Northbound travel would be accommodated along the existing alignment, and southbound travel would be shifted to an improved one-way Koster Street (Koster Couplet) and a new one-way facility north of Vigo Street to Bayshore Mall (Southern Couplet). Figure 6.1 presents the preliminary alignment of the Preferred Concept.

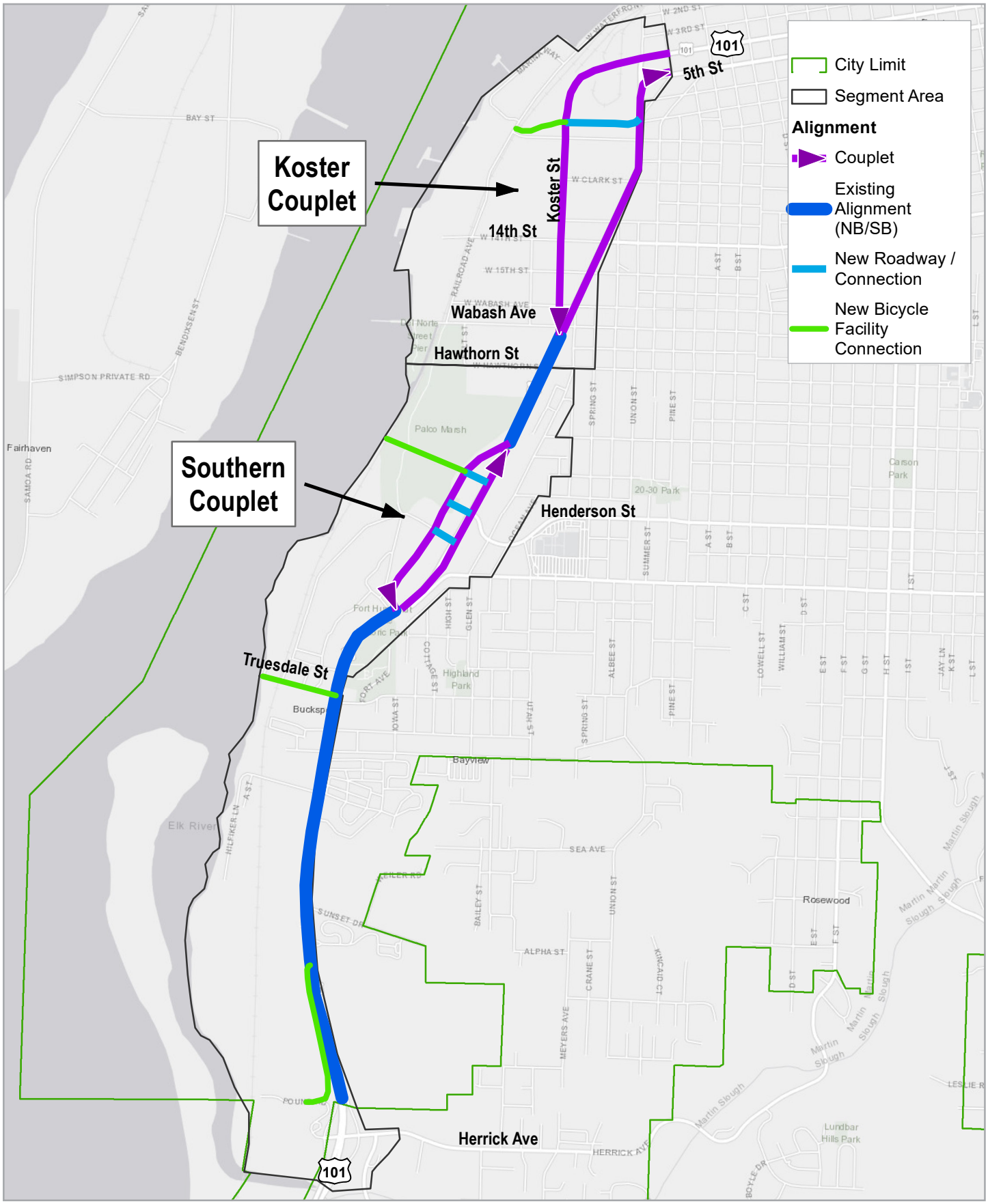
The Koster Couplet would extend the existing 4th Street westbound US 101 alignment southwest across the vacant land known as the Balloon Track, connecting with Koster Street at Washington Street. The Koster Couplet would continue south and reconnect with the existing Broadway alignment south of Del Norte Street.

The Broadway Corridor would split again north of Vigo Street to create a second couplet (the "Southern Couplet"), running parallel to and west of the existing Broadway alignment. The Southern Couplet would reconnect with the existing Broadway alignment at the North Bayshore Mall Entrance/Harris Street intersection. For portions of the Broadway Corridor that are not split into northbound/southbound couplets, 4-lanes of travel will be maintained (2 northbound/2 southbound lanes), with center medians to control access and provide turn-channelization.

The preferred alternative includes Class IV separated bike lanes, improved transit facilities, new and upgraded pedestrian crossings, new and upgraded traffic signals, lighting improvements, as well as opportunities for beatification such as street trees and other landscaping. The primary mobility and safety benefits associated with the Preferred Concept include:

- More available ROW on Broadway for Multimodal & Transit Improvements
    - Continuous Class IV separated bikeways to reduce Level of Traffic Stress (LTS)
    - Multimodal Access to Broadway Corridor with continuous bicycle facilities, sidewalks and improved pedestrian mid-block and intersection crossings
    - Transit Lanes to improve transit service reliability and prioritization
- One-way directional couplets & intersection modifications
    - Signal optimization and reduced delay associated with one-way traffic
    - Improved pedestrian and bicyclist visibility and reduced conflict zones at intersections
- Community & Stakeholder Support
    - Maintains access to local businesses
    - Improved safety & mobility

Figure 6.2 presents the signalized intersection and pedestrian improvements including in the Preferred Concept. Figure 6.3 presents the multimodal (bicycle facility and transit lanes) included in the Preferred Concept.



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HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

PREFERRED CONCEPT
PRELIMINARY ALIGNMENT

Project No. 11197450
Revision No. -
Date 11/12/2020

FIGURE 6.1

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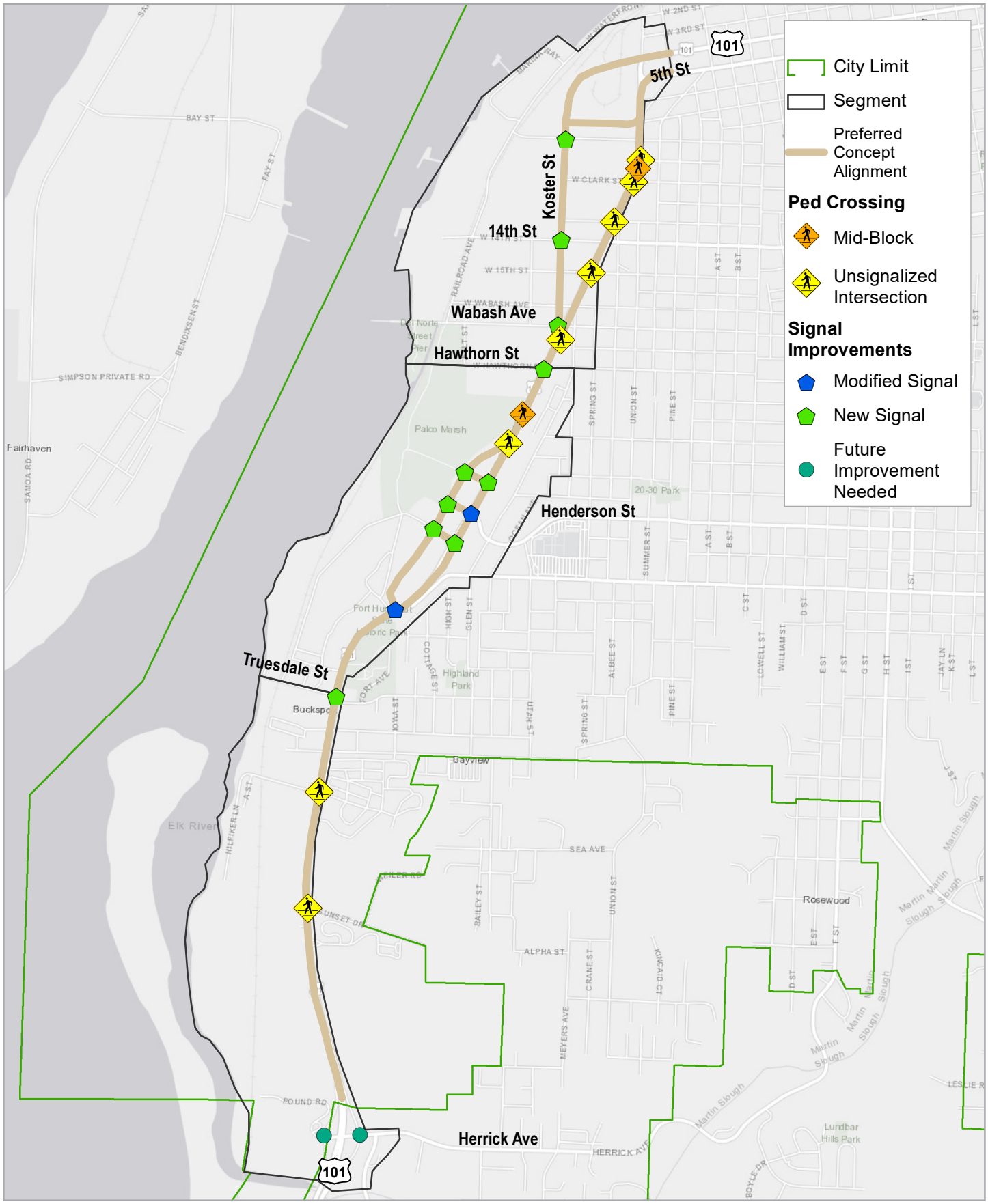
Data source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: mclark



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HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

Project No. 11197450
Revision No. -
Date 11/12/2020

PREFERRED CONCEPT INTERSECTIONS & CROSSINGS

FIGURE 6.2

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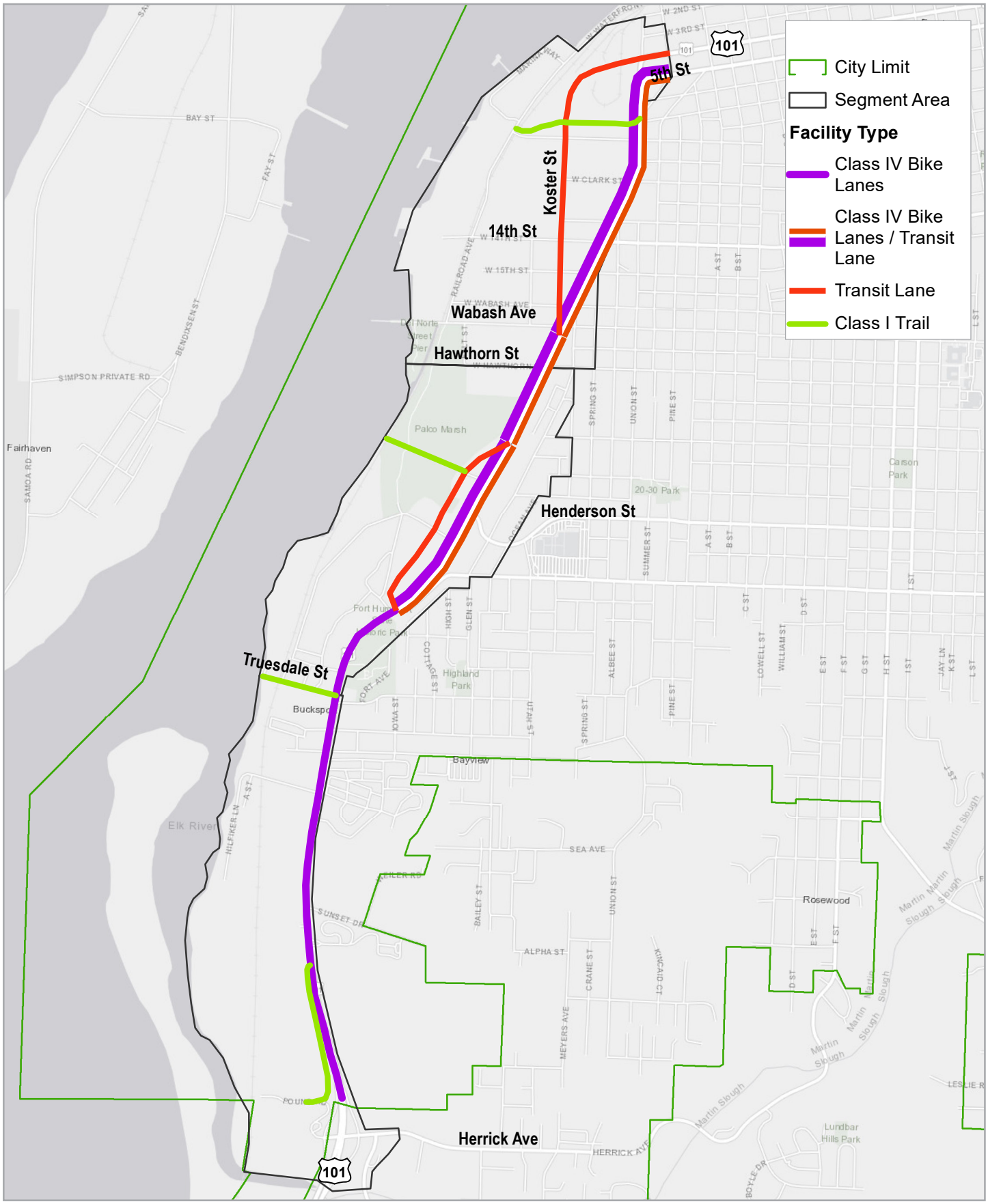

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HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

PREFERRED CONCEPT
MULTIMODAL FACILITIES

Project No. 11197450
Revision No. -
Date 11/12/2020

FIGURE 6.3

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Data source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: mclark

The following sections describe the improvements included in the Preferred Concept for the 3 segment areas (southern, middle, and northern).

6.1 Southern Segment: Herrick Avenue to Truesdale Street

The southernmost of the three segments extends from the Herrick overpass to Truesdale Street. This portion of the corridor was found to have no other alignment alternatives outside of the existing state highway right-of-way due to environmental constraints, such as wetlands, proximity to the bay and limited connectivity between concept and existing facilities.

One recent outcome from the plan is that a proposal was submitted by Caltrans with consultation with the City of Eureka to the Caltrans 2020 SHOPP (State Highway Operation & Protection Program) to fund the southern extents of the project from Herrick Avenue to Truesdale Street, estimated at approximately $13 million. This is a competitive internal Caltrans proposal process and, if successful, could be the next step towards project implementation. The proposed project includes: Two new pedestrian crossings (at Hilfiker Lane and Truesdale Street) and improved existing crossings; Class I Path (south of K-Mart) and Class IV Separated Bikeway (north of K-Mart); Sidewalk gap fill, and Dedicated bus lanes and Transit Signal Priority (TSP).

The following improvements are recommended for the southern segment of the Broadway Corridor:

Multimodal Improvements

- Continuous 8-foot sidewalks
- Class I Bike Path from K-Mart to Existing Waterfront Trail
- Class IV Separated Bikeways along existing Broadway Corridor alignment
- Improved Pedestrian Crossings (Intersections and Mid-Block)
    - Mid-Block crossings at Sunset Road and Hilfiker Lane

Transit Improvements

- Improved Bus Stops

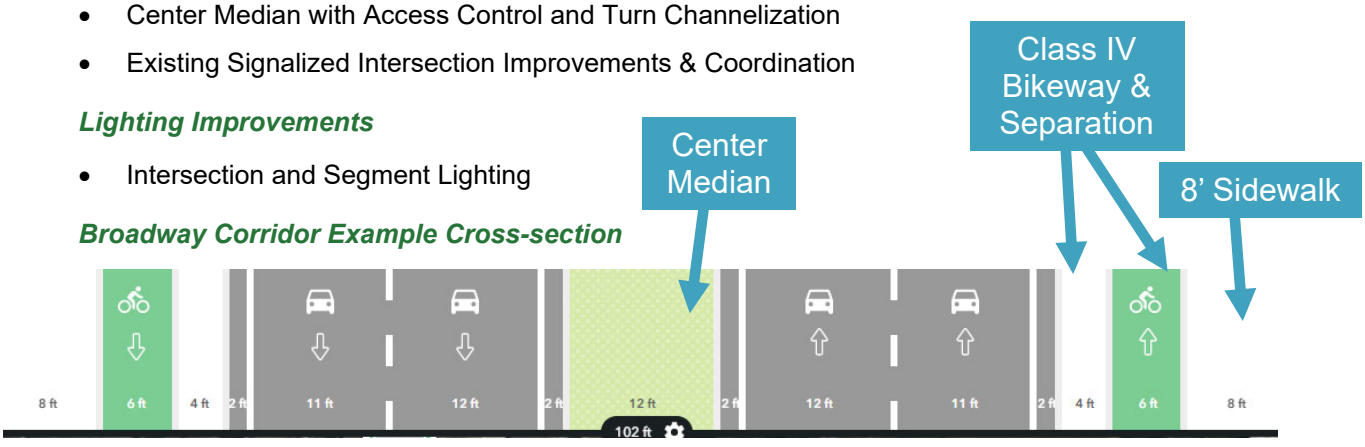
Operational Improvements

- Center Median with Access Control and Turn Channelization
- Existing Signalized Intersection Improvements & Coordination

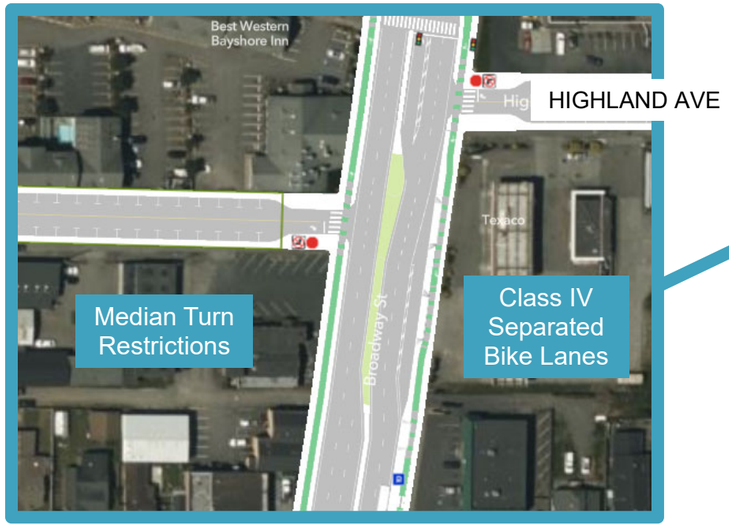
Lighting Improvements

- Intersection and Segment Lighting

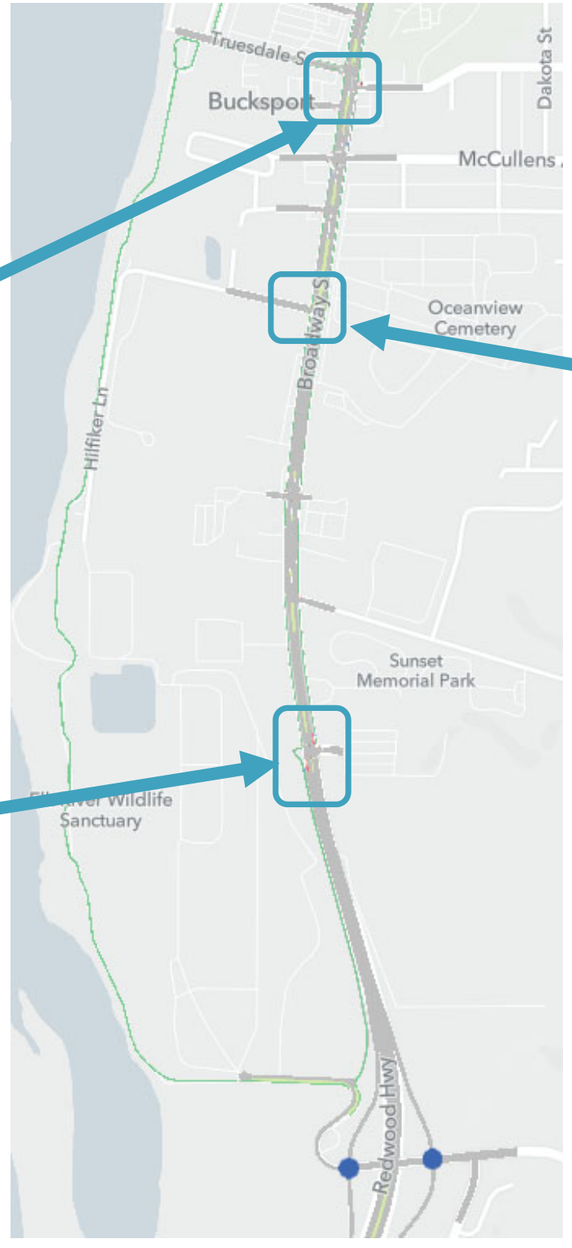
Broadway Corridor Example Cross-section



Southern Segment Improvement Highlights



HIGHLAND AVE



Signalized Pedestrian Crossing

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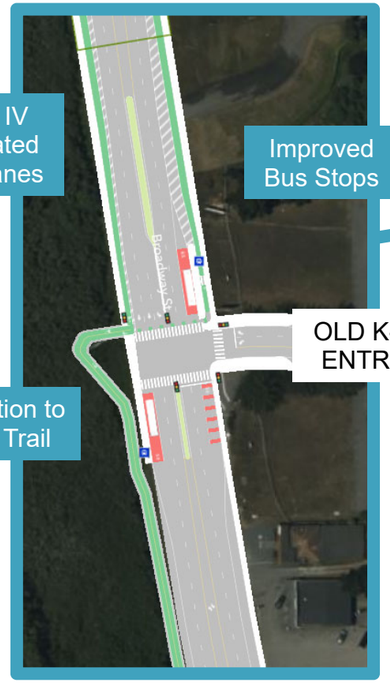
Class IV Separated Bike Lanes

Improved Bus Stops



OLD K-MART ENTRANCE

Class I Trail Connection to Existing Waterfront Trail

6.2 Middle Segment: Truesdale Street to Hawthorn Street

The middle segment is located from Truesdale Street to Hawthorn Street, and includes major intersections and constriction/conflict points at Harris and Henderson Streets. The Double Couplet option would include a new Southern Couplet southbound Broadway west of the existing right-of-way. Concept design would require additional analysis and engineering to determine design feasibility. However, one proposed alignment would follow the west edge of existing private parcels between Hawthorn Street and the north Bayshore Mall entrance traffic signal. Likely funding sources for construction area dependent upon favorable benefit/cost ratios.

The two alternatives evaluated for central leg of the corridor (Improve Broadway and Double Couplet) were vastly different in their potential benefits and associated costs. Due to its potential for new additional ROW for multimodal and safety improvements, made available by shifting vehicular traffic to the couplet, the Double couplet results in significant mobility and safety benefits (both monetary and societal), as compared to the Improve Broadway alternative. As such, the Double Couplet alternative (with the Southern Couplet) is more financially feasible.

However, a significant trade-off with the "Southern Couplet" is potential impacts to the existing habitat areas west of Broadway, such as the Palco Marsh and Maurer Marsh. These impacts could be offset with habitat restoration efforts on City-owned parcels adjacent to the Palco and Maurer Marshes. This mitigation for the project could help unite segmented habitat areas that have been created over the years as well as create new habitat with removal of fill. Additionally, formalized access points to the Waterfront Trail could be included to increase appropriate use of these natural areas and expanding the walking and biking network in the City. Overall, the Southern Couplet will need to be designed to be resilient to near-term sea-level rise projections, but also consider long term adaptation to long term projections, otherwise known as adaptive capacity.

The following improvements are recommended for the middle segment of the Broadway Corridor:

Multimodal Improvements

- Class IV Separated Bike Lanes along existing Broadway Corridor alignment (NB/SB)
- Connections to existing Waterfront Class I shared-use trail via Class II facilities along Truesdale Street and a new Class I facility near Vigo Street
- Improved Pedestrian Crossings (Un-Signalized Intersections and Mid-Block)
    - Intersection crossing north of Vigo Street at new Southern Couplet split
    - Mid-block crossing between Vigo Street and Hawthorn Street

Transit Improvements

- Begin Bus-On-Shoulder lane at North Mall Entrance/Harris Street intersection along Broadway/US 101 NB and US 101 SB *Note: To provide bicycle access along the couplets, the highest and best use of the 12-foot shoulder on the couplets should be evaluated to determine if the proposed transit shoulder should be a shared transit/bike lane.*

Operational Improvements

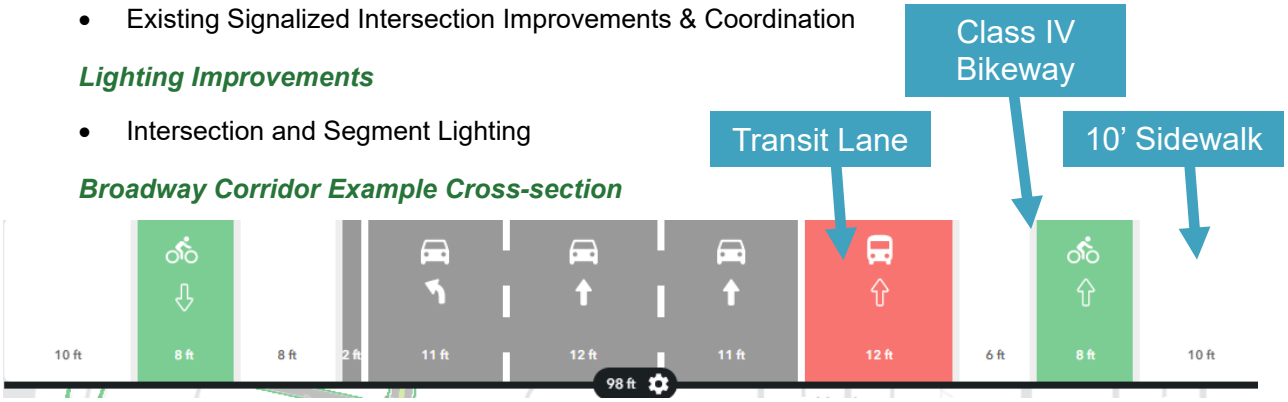
- "Southern Couplet" with connections via Bayshore Way, Henderson Street, and Vigo Street

- Center Median with Access Control and Turn Channelization
- Redesigned Intersection at North Mall Entrance/Harris Street
- New Traffic Signals: Broadway @ Truesdale Street; US 101 SB @ Bayshore Way and Henderson Street; Broadway/US 101 NB @ Bayshore Way and Vigo Street
- Existing Signalized Intersection Improvements & Coordination

Lighting Improvements

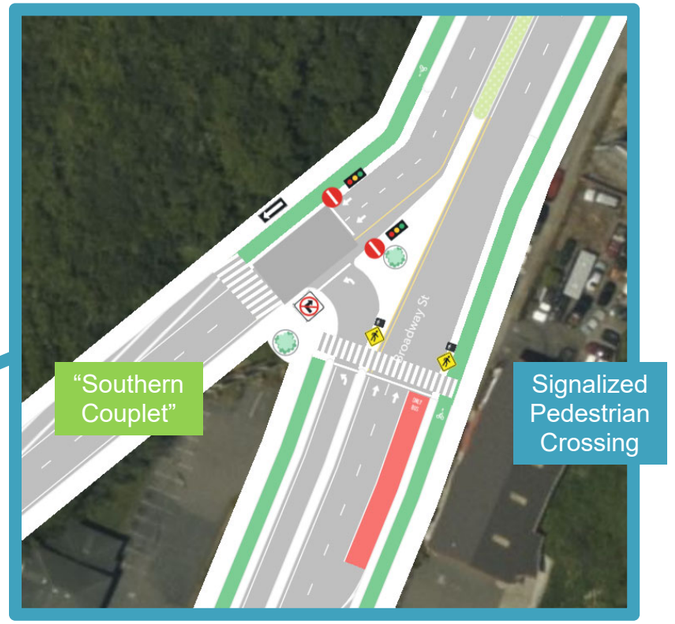
- Intersection and Segment Lighting

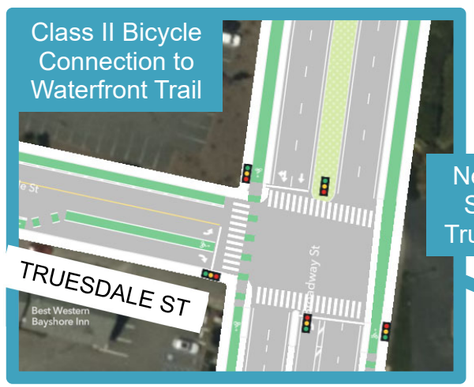
Broadway Corridor Example Cross-section

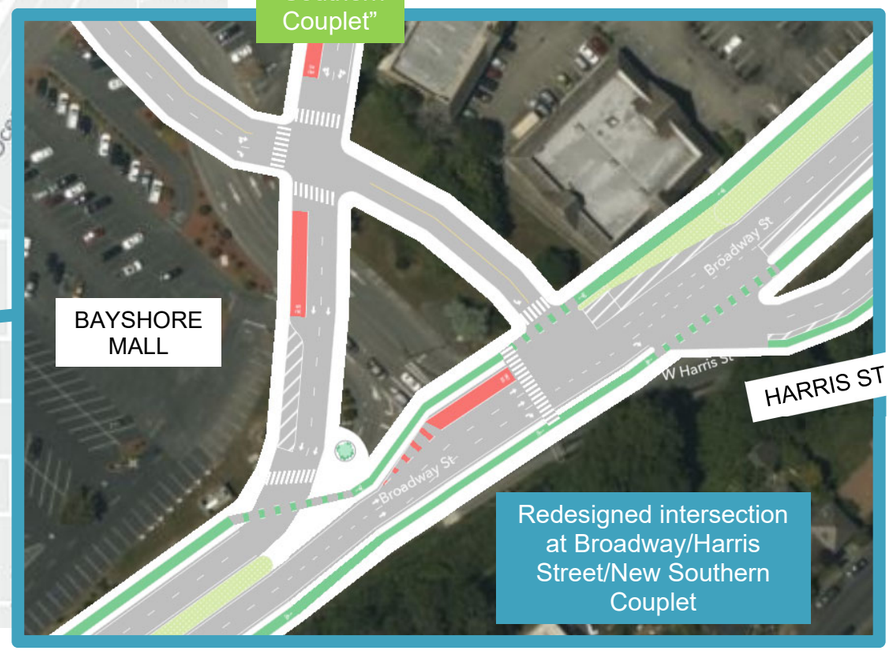


Southern Couplet Roadway Directions

Middle Segment Improvement Highlights







6.3 Northern Segment: Hawthorn Street to 4th Street

The northern most segment of the corridor is from Hawthorn Street to 4th Street. The existing right-of-way (ROW) in this part of Broadway is the narrowest out of all the segments. This lack of roadway width does not allow for adequate bicycle and safety improvements within the existing roadway. While Class II bike lanes could be accommodated within the existing ROW (except at intersections with turn lanes), alignments that shift US 101/Broadway Corridor vehicular capacity to parallel routes allow for a larger cross-section to be utilized for necessary multimodal and safety improvements. The width of ROW available for improvements affects the type and effectiveness of multimodal and safety improvements that can be implemented, such as buffered Class IV bikeways with 4-feet of physical separation from vehicles versus striped Class II bike lanes with no physical separation.

The following image provides an example of the potential gateway entrance to the northern segment at the start of the Koster Couplet at Del Norte Street. The improvements associated with the northern segment Koster Couplet provide opportunities for traffic calming, beautification, and improved mobility for all users.

A previous planning effort by Caltrans introduced the concept of the Koster Couplet, which would transition Koster Street into a one-way southbound Broadway, and using the existing Broadway Corridor as the northbound alignment. By using a couplet type approach many benefits are realized, including significant safety improvements, ample roadway for non-motorized and transit improvements, and operational improvements.

One significant challenge of this alternative is crossing through the "Balloon Track," a previous railroad yard that has been studied and identified to have existing hazardous waste contamination. The cost of clean-up is difficult to accurately quantify; however, it will be significant. The City of Eureka is currently looking at that site to be considered as a "Brownfield" site by the EPA and potentially being able to bring federal dollars to assist in the cleanup efforts. Although a significant cost, cleanup is feasible and the benefits far outweigh those of staying within the constrained ROW.

The following improvements are recommended for the northern segment of the Broadway Corridor:

Multimodal Improvements

- Class IV Separated Bike Lanes along existing Broadway Corridor alignment (NB/SB)
- Connections to existing Waterfront Class I shared-use trail via a new Class I from the Commercial Street extension
- Improved Pedestrian Crossings (Un-Signalized Intersections and Mid-Block)
    - Broadway @ Del Norte Street, 15th Street, Cedar Street, Clark Street, and Grant Street
    - Mid-block crossing between Clark Street and Cedar Street

Transit Improvements

- Begin Bus-On-Shoulder lane at North Mall Entrance/Harris Street intersection along Broadway/US 101 NB and US 101 SB *Note: To provide bicycle access along the couplets, the highest and best use of the 12-foot shoulder on the couplets should be evaluated to determine if the proposed transit shoulder should be a shared transit/bike lane.*

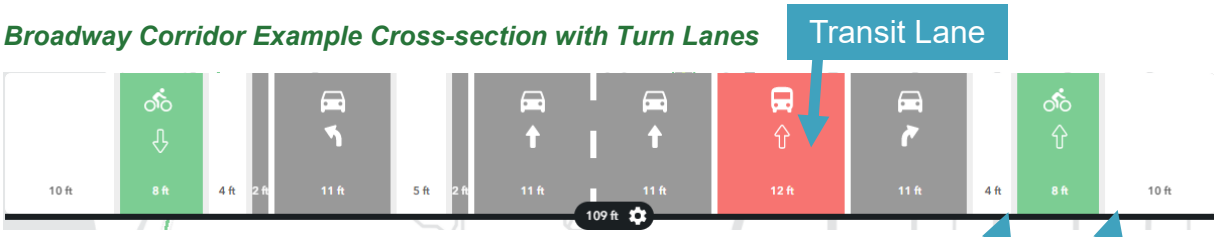
Operational Improvements

- "Koster Couplet"
    - With connections via existing cross streets
- Median with Access Control and Turn Channelization (Hawthorn Street to Del Norte Street)
- New Traffic Signals
    - Koster Street @ Washington Street, 14th Street, and Wabash Avenue
- Existing Signalized Intersection Improvements & Coordination

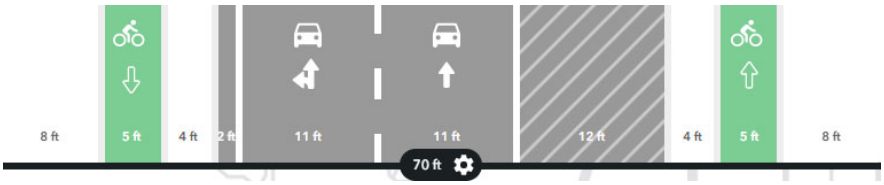
Lighting Improvements

- Intersection and Segment Lighting (in addition to improved pedestrian crossings

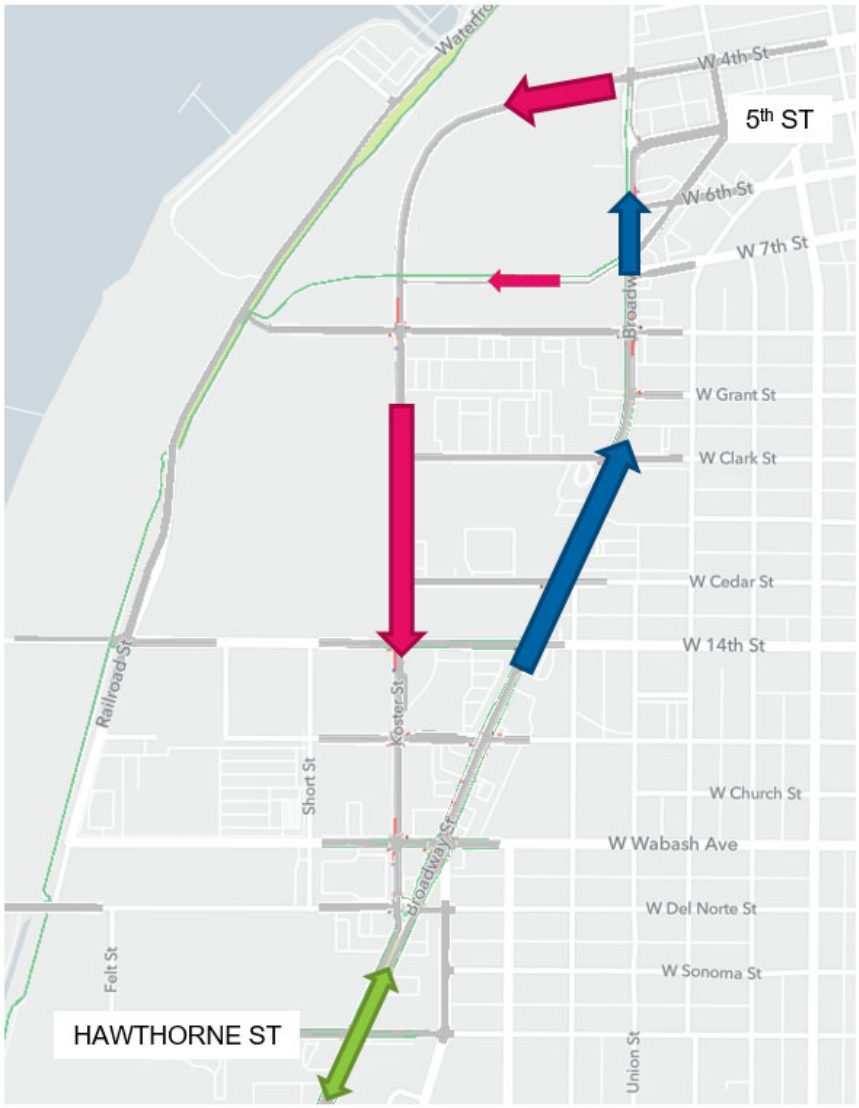
Broadway Corridor Example Cross-section with Turn Lanes



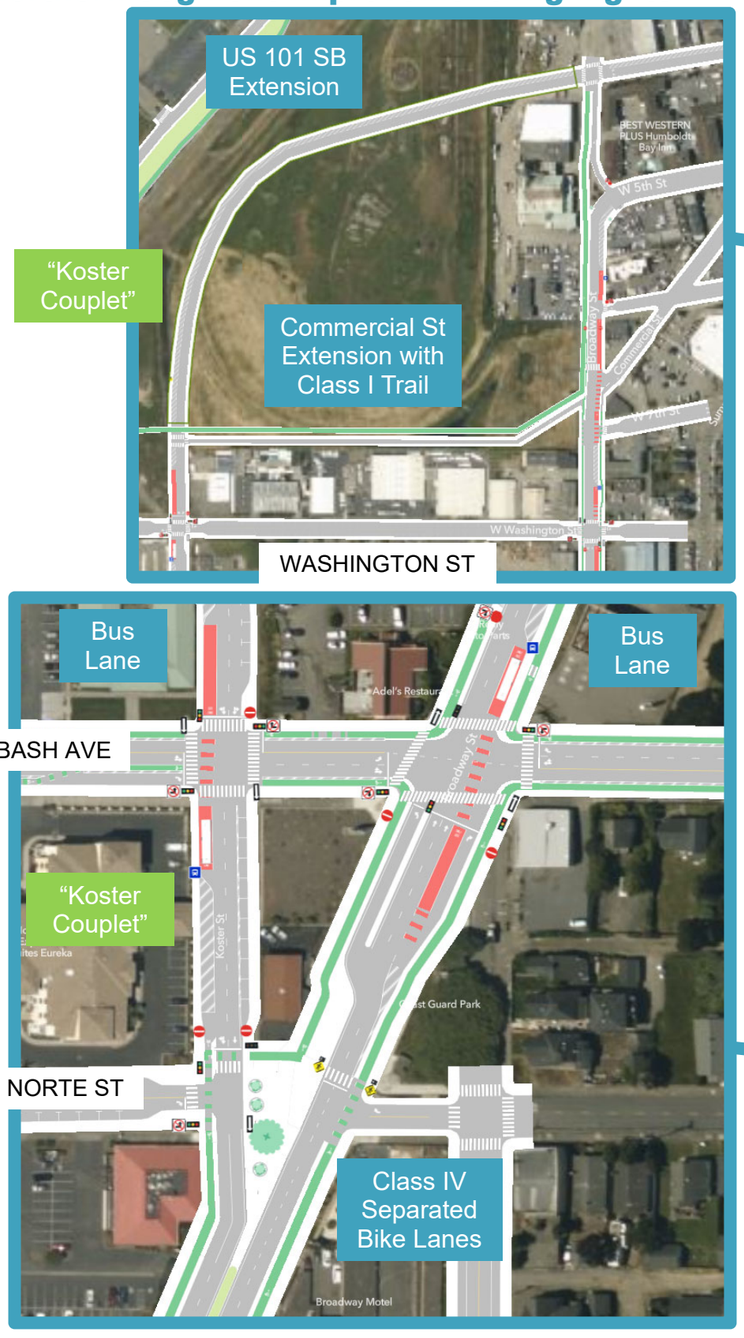
Broadway Corridor Example Cross-section without Turn Lanes

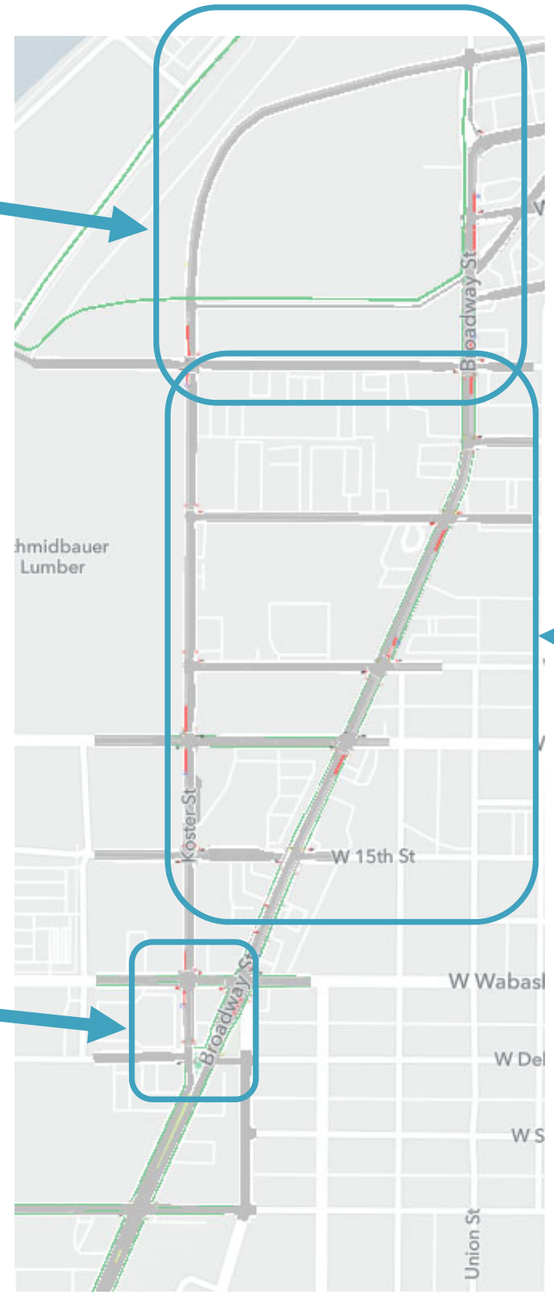


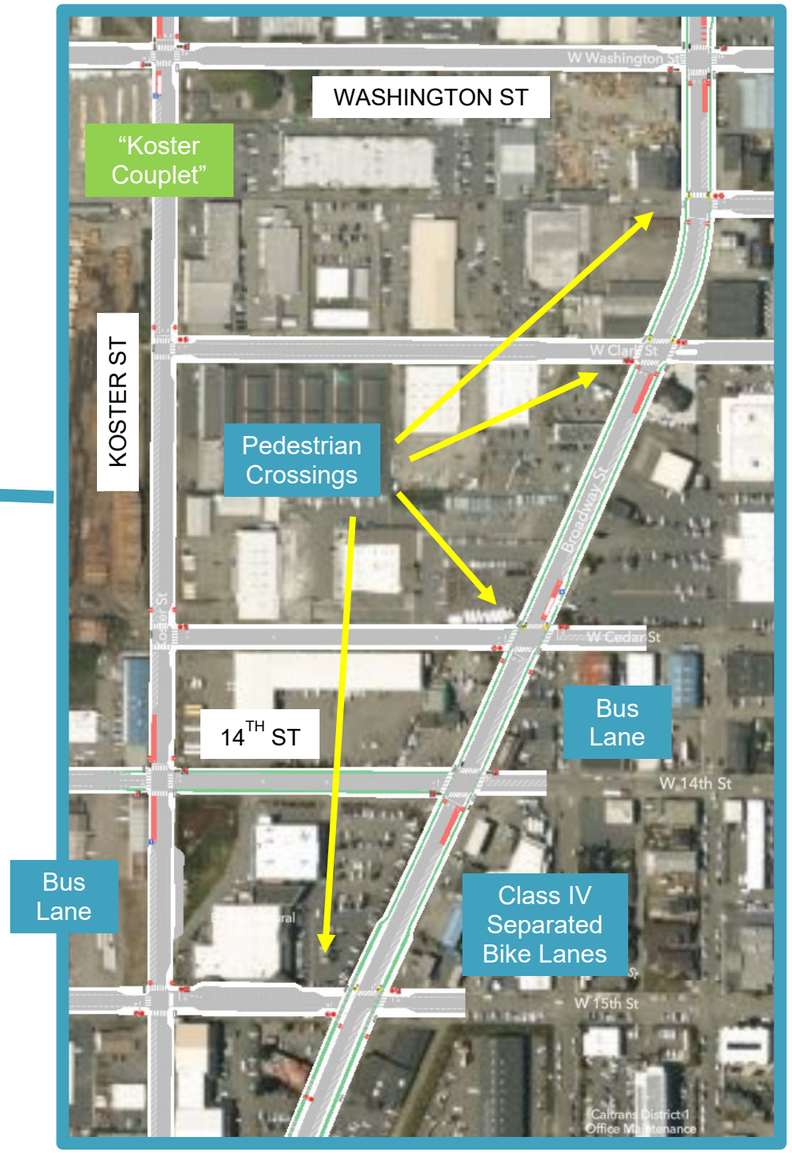
Koster Couplet Roadway Directions



Northern Segment Improvement Highlights







7. Near Term Safety Improvements

Due to the severity and frequency of crashes along the Broadway Corridor, and the overwhelming public support for safety improvements to address existing issues, the Eureka BMCP includes near term safety improvement recommendations. These recommendations aim to contribute to the larger goal of corridor multimodal and safety improvements, while recognizing that the Preferred Concept has a longer implementation timeframe. This section summarizes the primary crash types and contributing factors affecting the Broadway Corridor as presented in Chapter 4 (Section 4), and provides an overview of recommended safety measures that have the potential to be implemented under near term conditions. These improvements may be funded by a variety of mechanisms, including Caltrans safety funds, State and Federal grant programs, and local sources.

7.1 Crash History Summary

The Broadway Corridor (between Herrick Avenue and 4th Street) is considered a high stress corridor with statistically high rates of fatal and severe injury (FSI) crashes, specifically those involving bicyclists and pedestrians. Between the years of 2014 to 2018, the Broadway Corridor alone accounted for 16% of total injury crashes and nearly 50% of the total fatal crashes within the City of Eureka.

During the 5-year analysis period, there were 350 total crashes along the Broadway Corridor, including 9 fatalities and 9 severe injury crashes. Of the 9 fatalities crashes, approximately 56% involves a bicyclist or pedestrian, and 33% occurred during night conditions. Of the 9 severe injuries, approximately 56% involved a bicyclist or pedestrian, and 56% occurred during night conditions. Table 7.1 presents the total number of crashes that occurred within the Broadway Corridor study area between 2014 and 2018.

Table 7.1 Total Crashes along Broadway Corridor (2014-2018)

	Fatal	Severe Injury	Other Visible Injury	Complaint of Pain	PDO	TOTAL
Total Crashes	**9**	**9**	**45**	**90**	**156**	**309**
Bicycle/Pedestrian	5	5	13	9	3	**35**
% of total	*56%*	*56%*	*29%*	*10%*	*2%*	*11%*
Night (Dark)	3	5	12	11	38	**69**
% of total	*33%*	*56%*	*27%*	*12%*	*24%*	*22%*

As discussed in Chapter 4 (Section 4), fatal and severe injury (FSI) crashes involving a bicyclist or pedestrian are not uncommon along the Broadway Corridor. Between 2009 and 2020, FSI crashes involving a bicyclist or pedestrian range from 1 per year to 5 per year. In 2020 alone (between January and October), there have been 3 fatal crashes (1 pedestrian and 2 bicyclists) and 1 severe injury crash (pedestrian) along the Broadway Corridor. As such, safety improvements (or countermeasures) are needed immediately to assist in preventing these statistically high rates of FSI crashes involving bicyclists and pedestrians.

7.2 Near Term Safety Improvements

Near term safety improvements were identified in coordination with the City of Eureka and Caltrans, and with support from Coalition for Responsible Transportation Priorities, Environmental Protection Information Center (EPIC), Humboldt Baykeeper, and Northcoast Environmental Center (see Appendix D). The identified improvements can be implemented now within the existing right-of-way pending environmental review and project design. All improvements require additional analysis and engineering to determine design feasibility.

The primary focus of the near term safety improvements is on bicyclist and pedestrian visibility while crossing the Broadway Corridor at intersections or mid-block locations and providing new and/or additional locations for these crossings. The following safety improvements types were identified:

- Pedestrian Crossing
    - Leading pedestrian intervals (LPI) at signalized intersections
    - Bulb-outs
    - Pedestrian refuges at intersection crossings
    - Crossings with flashing beacon (see image) or pedestrian hybrid beacon

Source: NACTO, 2014.

- Bicycle Crossings
    - Minor street approach bicycle lane striping
    - Green conflict paint at intersections and/or driveways
- Sidewalk gap fill
- Access management
    - Raised medians at certain locations to modify vehicular turns onto/off of Broadway

7.3 Location Recommendations

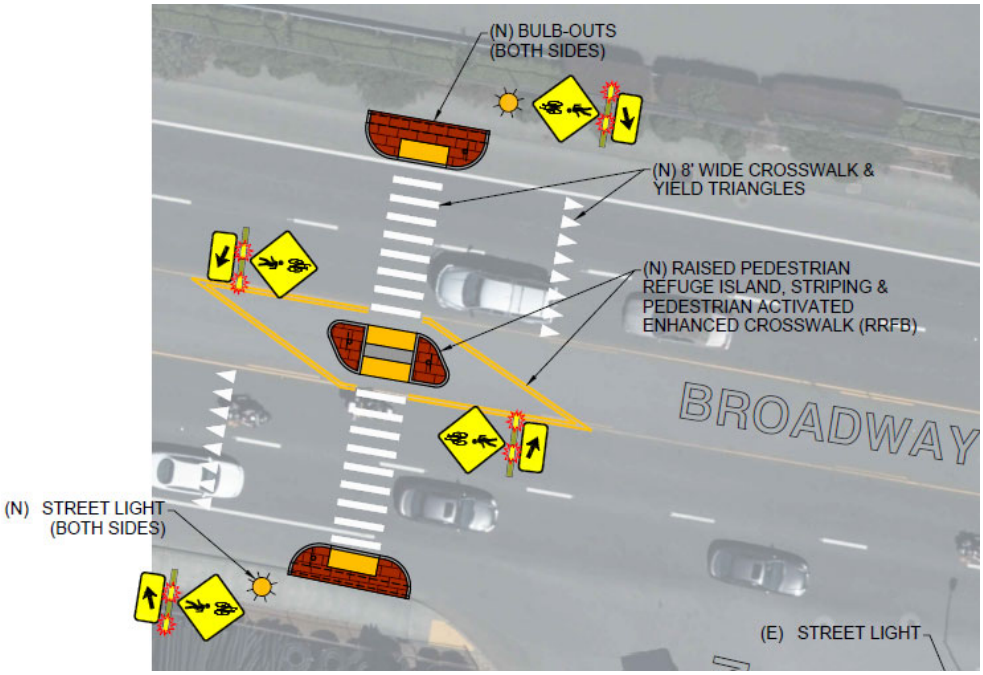
The following locations were identified as priority locations for near term pedestrian crossings along the Broadway Corridor, as shown on Figure 7.2. These pedestrian crossings are recommended at un-signalized intersections and between intersections (mid-block) along the corridor. The crossings will include visibility improvements such as pavement striping and lighting. Location recommendations for other near term improvement types are not provided in this report and require further evaluation.

- Mid-block crossing between Vigo Street and Hawthorn Street
- Mid-block crossing just south of Del Norte Street
- Mid-block crossing between Clark Street and Cedar Street
- Crossing at the Hilfiker Lane intersection
- Crossing at the Truesdale Street intersection

In addition, some near term improvements are recommended at locations with corresponding long term improvements included in the Preferred Concept. For example, a pedestrian crossing is recommended at Truesdale Street in the near term; however, a traffic signal is recommended at Truesdale Street under the Preferred Concept. These near term improvement recommendations are intended to be upgraded over the long term to those listed in the Preferred Concept.

Preliminary plans for these near-term pedestrian crossings are currently being developed. Below is an example of a pedestrian crossing with a raised refuge island, striping, and pedestrian activated enhanced crosswalk at the intersection of Broadway and Hilfker Lane. Additional consideration should be given to bicycle paths of travel if and when bikeways are implemented on Broadway.

Figure 7.1 Preliminary Pedestrian Crossing Design



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HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

Project No. 11197450
Revision No. -
Date 11/12/2020

NEAR TERM (NT) SAFETY IMPROVEMENT LOCATIONS

FIGURE 7.1

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Data source: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: mclark

8. Performance Assessment

The performance metrics selected for the Eureka Broadway Multimodal Corridor Plan (BMCP) informed each of the six Smart Mobility Framework objectives to ensure that the resulting improvement recommendations provide a balanced, sustainable, and multimodal assessment of current and forecasted corridor conditions. Additional detail on the employed methodologies is provided in Appendix A. Requisite rubrics include:

- Crash reduction benefit
- Mode shift and vehicle miles travelled
- Level of traffic stress scores
- Health and air quality benefit
- Vehicular delay and buffer time reductions

Equal attention was given to document the beneficial outcomes of measures not directly reflected in the benefit-cost assessment. These include:

- Plan and policy consistency
- Environmental/Institutional sensitivity
- Adaptation
- Economic development
- Community acceptance

Using these tools to measure effectiveness, the following benefit quantitative and qualitative analyses are summarized below and presented in the following sections:

- Safety
- Induced Demand/Bicycle Mode Shift
- Multimodal Connectivity/Level of Traffic Stress
- Transit Ridership
- Vehicle Operations
- Air Quality
- Environmental Justice and Social Equity
- Economic Development
- Adaptation Assessment
    - Climate Change Vulnerability
- Plan and Policy Consistency
    - Community Support

8.1 Safety

8.1.1 Overview

Based on contributing factors identified in the crash assessment, the methodology defined in Part C of the Highway Safety Manual (HSM) was applied to estimate the potential safety performance of the Eureka BMCP Preferred Concept. Safety countermeasures were applied to estimate the reduction in crashes based on their respective potential to reduce crashes at intersections (signalized and un-signalized) or along roadways, and for total crashes involving vehicles only, bicycle or pedestrian crashes, or crashes that occurred at night (i.e., in the dark). Safety countermeasures and crash reduction factors (CRFs) derived from Caltrans's *Local Roadway Safety Manual* (Version 1.5, April 2020) were then applied to estimate the reduction in crashes resulting from the implementation of safety-related countermeasures.

The safety countermeasures that are applicable to specific portions of the Eureka BMCP Preferred Concept are presented in Table 8.1.

Table 8.1 Preferred Concept Safety Countermeasures

Type	ID	Description
Un-Signalized Intersection	NS03	Not Signal: Install Signal
	NS01	Not Signal (Night): Intersection Lighting
	NS07	Not Signal: Upgrade Intersection Pavement Markings
	NS20PB	Not Signal (PB): Install Pedestrian Crossings (Signs and Markings)
	NS21PB	Not Signal (PB): Install/Upgrade Pedestrian Crossing
Signalized Intersection	S01	Signal (Night): Intersection Lighting
	S02	Signal: Improve Signal Hardware
	S03	Signal: Improve Signal Timing/Coordination
	S21PB	Signal (PB): Leading Pedestrian Interval (LPI)
Roadway Segment	R34PB	Roadway: Install Sidewalk/pathway
	R33PB	Roadway: Separated Bike Lanes
	R01	Roadway (Night): Segment Lighting
	R20	Roadway: Convert from 2-way to 1-way Traffic
	R35PB	Roadway (PB): Install/Upgrade Pedestrian Crossing
	R37PB	Roadway (PB): Rectangular Rapid Flashing Beacon (RRFB)
	R03	Roadway: Install Median Barrier

8.1.2 Safety Crash Modification Results

Vehicular and bicycle/pedestrian related crashes and countermeasures identified to improve safety were summarized for input into the Highway Safety Improvement Program (HSIP) analyzer to compute anticipated crash reduction. The anticipated crash reductions associated with each

countermeasure are presented in Table 8.2. Estimated crash reductions are monetized using societal cost estimates from the Caltrans 2018 Economic Parameters as presented in Chapter 9.

Table 8.2 Crash Reduction Summary

Countermeasures		Total Crashes					Crash Reduction (#)			
Type	ID	Total	FSI	Injury (Non-Severe)	PDO	CRF	Total	FSI	Injury (Non-Severe)	PDO
Un-Signalized Intersection	*NS03*	**12**	0	9	3	0.3	**4**	0	3	1
	NS01	**3**	0	3	0	0.4	**1**	0	1	0
	NS07	**3**	0	1	2	0.25	**1**	0	0	1
	NS20PB	**1**	0	1	0	0.25	**0**	0	0	0
	NS21PB	**1**	0	1	0	0.35	**0**	0	0	0
Signalized Intersection	*S01*	**6**	0	4	2	0.4	**2**	0	2	1
	S02	**33**	0	20	13	0.15	**5**	0	3	2
	S03	**40**	0	24	16	0.15	**6**	0	4	2
	S21PB	**6**	0	6	0	0.6	**4**	0	4	0
Roadway Segment	*R34PB*	**10**	5	3	2	0.8	**8**	4	2	2
	R33PB	**29**	10	16	3	0.45	**13**	5	7	1
	R01	**57**	8	17	32	0.35	**20**	3	6	11
	R20	**171**	9	62	100	0.35	**60**	3	22	35
	R35PB	**12**	5	7	0	0.35	**4**	2	2	0
	R37PB	**14**	5	9	0	0.35	**5**	2	3	0
	R03	**130**	10	57	63	0.25	**33**	3	14	16

CRF = Crash Reduction Factor
FSI = Fatal/Severe Injury Crash
PDO = Property Damage Only

8.2 Bicycle Mode Shift

To estimate the induced demand associated with the bicycle improvements proposed in the Eureka BMCP, the project team utilized the National Cooperative Highway Research Program (NCHRP) 552 methodology provided in the Guidelines for Analysis of Investment in Bicycle Facilities.

The facilities included in the benefit analysis presented herein include the Class IV separated bike lanes along the length of the Broadway Corridor from the former K-Mart driveway to Commercial Street, and the Class I multiuse trail from the former K-Mart driveway to the existing Class I trail near Pound Road. The methodology employed, estimated benefits and associated benefit-cost ratio is described in the following sections.

8.2.1 Induced Demand

Induced demand takes into account percentage of child and adult population, bicycle commute mode share, percentage of children who bicycle, and the population within three buffer distances, 0.5 miles, 1.0 miles, and 1.5 miles, of the proposed facility. These variables are incorporated into the equations provided in the NCHRP methodology.

The result of the estimated induced demand analysis is reported below. Table 8.3 presents the estimates of new adult, children, and commuter cyclists that would be added to the study area transportation network with implementation of the Eureka BMCP Preferred Concept multimodal improvements.

The number of total new commuters (399 per day) is used to calculate the reduction in vehicle miles traveled (VMT) associated with bicycle mode shift. Other benefits, such as health and recreation benefits, are also monetized, but are not included in VMT reduction calculations.

Table 8.3 Study Area Induced Demand Results

Total New Commuters	
1.5 miles (2,400 m)	112
1 mile (1,600 m)	199
0.5 mile (800 m)	88
Total New Adult Cyclists, High Estimate	
1.5 miles (2,400 m)	301
1 mile (1,600 m)	537
0.5 mile (800 m)	238
Total New Adult Cyclists, Moderate Estimate	
1.5 miles (2,400 m)	128
1 mile (1,600 m)	228
0.5 mile (800 m)	101
Total New Adult Cyclists, Low Estimate	
1.5 miles (2,400 m)	91
1 mile (1,600 m)	162
0.5 mile (800 m)	72
Total New Child Cyclists	
1.5 miles (2,400 m)	22
1 mile (1,600 m)	39
0.5 mile (800 m)	17
Total New Cyclists	
High Estimate	**1,553**
Moderate Estimate	**935**
Low Estimate	**802**

8.2.2 VMT Reduction

Induced demand/bicycle mode shift can be measured by the reduction in vehicle trips and vehicle miles traveled (VMT) associated with the proposed bicycle improvements using the methodology described above. The number of trips and VMT reduced was calculated using the number of new commuters estimated using the NCHRP methodology and the average person trip length (9.2 miles) reported by the 2017 National Household Transportation Survey (NHTS). Because the NCHRP 552 methodology uses new commuters to estimate decreased auto trips, trip reductions and VMT are annualized under the assumption that a working year is comprised of 47 weeks and 5 days per week to account for the typical work week and vacations. These measures are reported in Table 8.4.

Table 8.4 Induced Bicycle Demand VMT Reduction

Induced Demand/ Bicycle Mode Shift	
Total New Commuters	399
Daily Commute Trips (2 trips)	798
Average Round Trip Length	9.2
Daily VMT Reduction	**7,346**

8.3 Multimodal Connectivity/Level of Traffic Stress

While the quantitative benefits associated with bicycle and pedestrian improvements are assessed using induced demand and bicycle mode shift, qualitative benefits of these improvements can be analyzed by examining improvements to multimodal connectivity throughout the corridor. Connectivity benefits associated with the improvements recommended in this plan are analyzed through the lens of Level of Traffic Stress (LTS). The LTS analysis presented herein incorporates Bicycle Level of Traffic Stress methodologies as a proxy for analyzing traffic stress for all active transportation network users, where a score of LTS 1 or 2 represent low stress conditions, whereas a score of LTS 3 or 4 represent high stress conditions. A description of bicycle LTS methodology is provided in Appendix A.

The Class IV separated bike lane and wide sidewalks with significant separation from motor vehicles, along with safety and visibility improvements at intersections and crossing, discussed above provide low stress connectivity for both bicyclists and pedestrians due to the physically separation from motor vehicles.

The multimodal improvements along the Broadway Corridor allow for low stress travel options for bicyclists and along and across the corridor, and provide connectivity to other low stress facilities proposed within the corridor study area. If multimodal facilities are provided, but they do not reduce the level of stress experience by the users, the resulting induced demand will be less. Overall, multimodal facilities that provide the highest levels of comfort and connectivity will result in higher usage. The LTS with the recommended improvements are displayed in Figure 8.1.

8.4 Transit Mode Shift

8.4.1 Overview

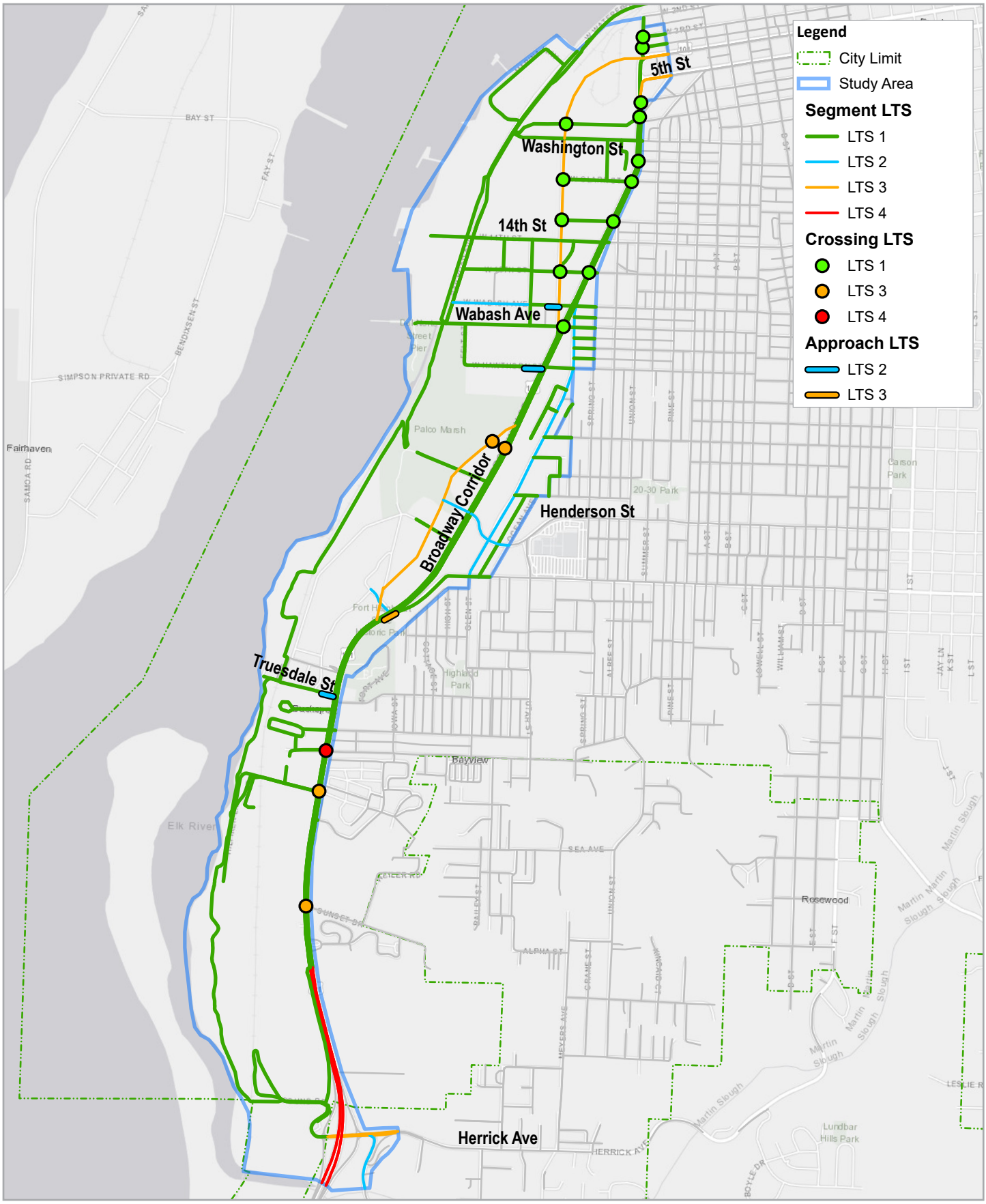
To assess the benefits associated with the transit improvements proposed in Eureka BMCP, the methodologies presented in Transit Cooperative Research Program (TCRP) Report 118: Bus Rapid Transit Practitioner's Guide were employed to project transit ridership. Transit improvements proposed in this plan include Transit Queue Jumps and Transit Signal Priority at signalized intersections, and Transit Lanes and/or Bus-On-Shoulder lanes north of the North Bayshore Mall entrance. In addition, a 30 minute increase in service frequency is assumed for weekday routes along the Broadway Corridor, including Eureka Transit Service (ETS), Redwood Transit System (RTS), and Southern Humboldt Intercity routes. The above improvements all serve to prioritize transit vehicle operations and travel times to improve on-time performance and reliability in ways that emulate BRT operations. These improvements justify the conservative application of the BRT Practitioners Guide Elasticity Methodology for estimating the mode shift analysis for improving the transit service frequency.

8.4.2 Ridership Projections and VMT Reduction

Available ridership data was provided by the Humboldt Transit Authority (HTA) for the Eureka Transit System (ETS). Annualized projections of ridership changes and the average person trip length (9.2 miles) reported by the 2017 National Household Transportation Survey (NHTS) were utilized to estimate a reduction in Vehicle Miles Traveled (VMT) associated with the proposed improvements. The annualized increase in ridership projected to occur as a result of the proposed service frequency improvements is presented in Table 8.5. Due to the inability to ensure funding for increases in service frequency by 30 minutes, the projected future transit VMT reduction will be reduced by half (to 2,725) in the Preferred Concept VMT reduction benefit calculations.

Table 8.5 Annualized Transit Ridership Increases and VMT Reduction

	Future Daily Ridership Increase	Future Annual Ridership Increase	Future Daily VMT Reduction	Future Annual VMT Reduction
Total	592	142,585	5,449	1,311,783



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HUMBOLDT COUNTY ASSOCIATION OF GOVERNMENTS
EUREKA BROADWAY
MULTIMODAL CORRIDOR PLAN

FUTURE LEVEL OF TRAFFIC STRESS (LTS)

Project No. 11197450
Revision No. -
Date 11/13/2020

FIGURE 8.1

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Data source: World Light Gray Reference: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community
World Light Gray Canvas Base: Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community. Created by: pthornton

8.5 Vehicle Operations

Unique 2045 (Baseline) and 2045 Eureka BMCP (Preferred Concept) future year volume sets that reflect the AM/PM peak hour circulation characteristics were developed to quantify vehicle operations. These future-year volume sets served as inputs to the Synchro model. Operational benefits associated with the 2045 Eureka BMCP Preferred Concept roadway network were quantified by changes to delay and travel time reliability, as well as vehicle miles traveled (VMT). Intersection and roadway volumes for 2045 (Baseline), and 2045 (Preferred Concept) scenarios were forecasted utilizing the Greater Eureka Area Travel Model (GEATM). On average, volume along the Broadway Corridor is forecasted to increase by approximately 7% by 2040.

Overall, the Preferred Concept is anticipated to improve operations along the Broadway Corridor without increasing total capacity available for northbound and southbound travel within the study area. Improvements in operations are associated with improved signal timings and coordination, installing new signalized intersections, and converting the corridor to one-way travel, among others.

8.5.1 Vehicle Delay

Table 8.6 presents the reduction in vehicle delay resulting from the Preferred Concept roadway and operational improvements. As shown, corridor travel time is anticipated to increase from existing to 2045 (Baseline) conditions. Implementation of the Preferred Concept reduces corridor travel time compared to 2045 (Baseline) conditions, with a maximum potential reduction in delay of 5 minutes and 8 seconds during the PM peak hour in the southbound direction.

Table 8.6 Corridor Travel Time and Delay

Scenario	Corridor Travel Time (min)					
	Northbound			Southbound		
AM Peak Hour	Free Flow Travel	Delay	Delay Reduction	Free Flow Travel	Delay	Delay Reduction
Existing	3:54	1:40		3:54	1:29	
Year 2045 (Baseline)		2:06			4:12	
Year 2045 (Preferred Concept)		1:27	0:39		0:17	3:55
	Northbound			Southbound		
PM Peak Hour	Free Flow Travel	Delay	Delay Reduction	Free Flow Travel	Delay	Delay Reduction
Existing	3:54	2:52		3:54	3:21	
Year 2045 (Baseline)		3:17			8:05	
Year 2045 (Preferred Concept)		2:23	0:54		2:57	5:08

8.5.2 Travel Time Reliability

Table 8.7 and Table 8.8 show the travel time and buffer time as well as indices for each of these metrics for each scenario (passenger vehicle and trucks combined). Future buffer times are proportional to correlation between Travel Time Index (TTI) between existing condition and future conditions. Average travel time in calculation of TTI (which is a ratio of average travel time and free flow travel time) was generated by adjusting National Performance Management Research Data Set (NPMRDS) observed travel times by results from Synchro traffic analysis while the free flow travel time was calculated based on an average speed of 45 miles per hour throughout the corridor.

Figure 8.2 through Figure 8.5 present reduction in travel time delay and buffer time for AM and PM peak hours in the north and southbound directions.

Table 8.7 Northbound Travel Time Results

Scenario	Corridor Travel Time (min)					
	Northbound					
AM Peak Hour	Average Travel Time	Free Flow Travel Time	Travel Time Index (TTI)	Growth in TTI	Buffer Time	Buffer Time Index (BTI)
Existing	5:34	3:54	10:15		4:20	1.11
Year 2045 (Baseline)	6:00	3:54	12:55	1.08	4:40	1.20
Year 2045 (Preferred Concept)	5:21	3:54	8:55	0.96	4:09	1.07
	Northbound					
PM Peak Hour	Average Travel Time	Free Flow Travel Time	Travel Time Index (TTI)	Growth in TTI	Buffer Time	Buffer Time Index (BTI)
Existing	6:46	3:54	17:38		6:41	1.71
Year 2045 (Baseline)	7:11	3:54	20:12	1.06	7:05	1.82
Year 2045 (Preferred Concept)	6:17	3:54	14:40	0.93	6:12	1.59

Table 8.8 Southbound Travel Time Results

Scenario	Corridor Travel Time (min)					
	Southbound					
AM Peak Hour	Average Travel Time	Free Flow Travel Time	Travel Time Index (TTI)	Growth in TTI	Buffer Time	Buffer Time Index (BTI)
Existing	5:23	3:54	9:07		3:57	1.01
Year 2045 (Baseline)	8:06	3:54	1:50	1.50	5:56	1.52
Year 2045 (Preferred Concept)	4:11	3:54	1:44	0.78	3:04	0.79
	Southbound					
PM Peak Hour	Average Travel Time	Free Flow Travel Time	Travel Time Index (TTI)	Growth in TTI	Buffer Time	Buffer Time Index (BTI)
Existing	7:15	3:54	20:36		9:14	2.37
Year 2045 (Baseline)	11:59	3:54	1:44	1.65	15:15	3.91
Year 2045 (Preferred Concept)	6:51	3:54	18:09	0.94	8:43	2.24

Figure 8.2 Northbound – AM Peak Hour Delay Reduction

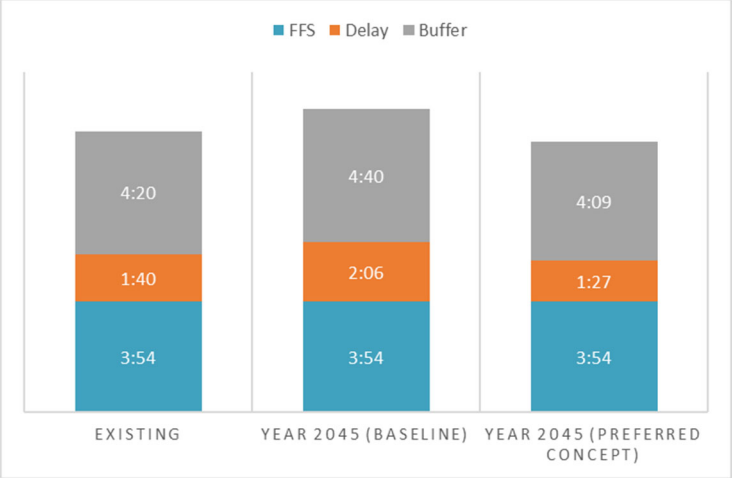


Figure 8.3 Northbound – PM Peak Hour Delay Reduction

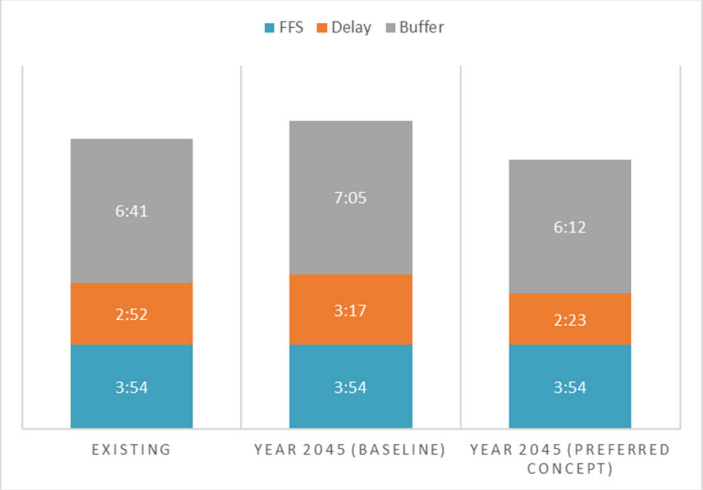


Figure 8.4 Southbound – AM Peak Hour Delay Reduction

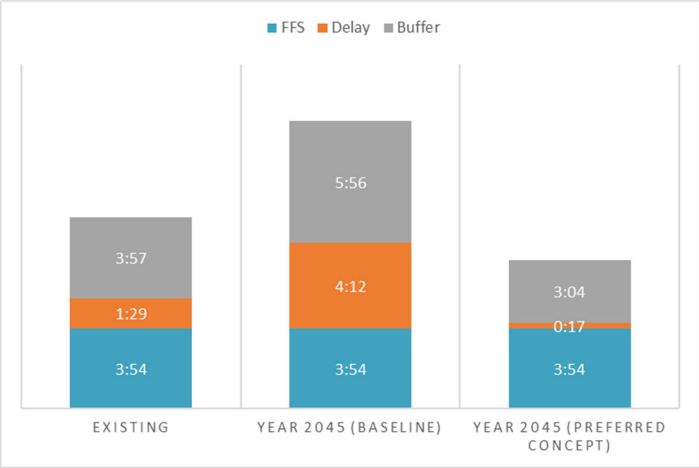
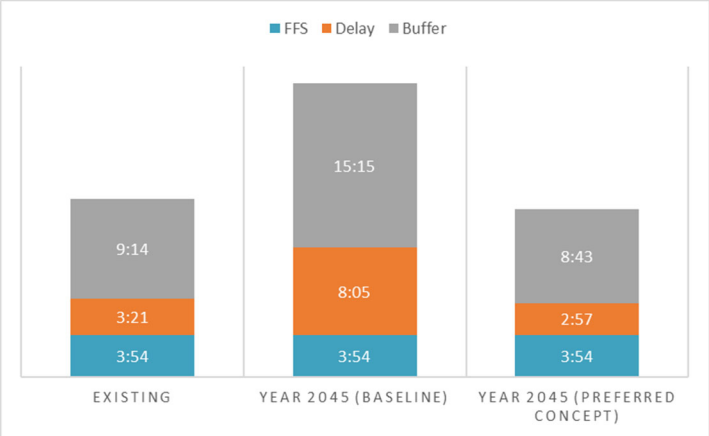


Figure 8.5 Southbound – PM Peak Hour Delay Reduction



8.5.3 Intersection Level of Service (LOS)

Intersection LOS was calculated utilizing Synchro software. Table 8.9 shows the LOS of the study intersections for the Preferred Concept network scenario for the AM and PM peak hours.

Table 8.9 Preferred Concept 2045 Network LOS

Intersection	Control Type[1,2]	Target LOS	AM Peak Hour		PM Peak Hour	
			Delay	LOS	Delay	LOS
SB Off-ramp to Herrick Ave.	**TWSC**	**D**	10.6	B	**OVR**	**F**
NB Off-ramp to Herrick Ave.	TWSC	D	14.8	B	15.1	C
Elk River Rd. NB @ Herrick Ave.	**TWSC**	**D**	**259.9**	**F**	**167.8**	**F**
Broadway & Old K-Mart Entrance	Signal	D	5.9	A	4.4	A
Broadway & Piersons/Tetrault Entrance	Signal	D	22.9	C	30.6	C
Broadway & McCullens St.	Signal	D	12.0	B	14.1	B
Broadway & S. Bayshore Mall Entrance	TWSC	D	13.8	B	24.5	C
Broadway & N. Bayshore Mall Entrance	Signal	D	8.2	A	15.2	B
Broadway & Henderson St.	Signal	D	20.1	C	24.9	C
Broadway & Hawthorn St.	Signal	D	33.2	C	50.9	D
Broadway & Wabash Ave.	Signal	D	13.2	B	16.0	B
Broadway & 14th Ave.	Signal	D	10.4	B	16.7	B
Broadway & Washington St.	Signal	D	7.3	A	10.3	B
Broadway & 6th St.	Signal	D	6.6	A	7.5	A

Notes:
1. TWSC = Two Way Stop Control
2. LOS = Delay based on average of all approaches for Signal, and worst approach for TWSC
3. **Bold** = Unacceptable Conditions
4. OVR = Delay greater than 300 seconds.

8.5.4 Vehicle Miles Traveled (VMT)

Daily vehicle miles traveled (VMT) for existing (2019) conditions was generated utilizing daily roadway volumes collected by Caltrans during the month of September 2019 at nine locations along the Broadway Corridor between McCullen Avenue and 6th Street. Daily VMT for 2045 (Baseline) and 2045 (Preferred Concept) scenarios were forecasted utilizing the Greater Eureka Area Travel Model (GEATM). VMT under the Preferred Scenario is calculated to include total VMT on both the existing corridor alignment as well as the new Koster Couplet and Southern Couplet. Table 8.10 presents the growth rates between GEATM 2015 and 2045 conditions for corridor based on total northbound and southbound volume along the existing Broadway Corridor alignment.

Table 8.10 GEATM Model Growth Rates (2015 to 2045)

Broadway Corridor Segment	Growth Rate
Clark St to 4th St	7.4%
Hawthorn St to Clark St	5.7%
Truesdale St to Hawthorn St	6.2%
Herrick Ave to Truesdale St	10.3%
Average	7.4%

Table 8.11 presents the daily VMT as well as the reduction due to bicycle and transit mode shift associated with the Eureka BMCP Preferred Concept. As shown, the Preferred Concept multimodal and transit improvements result in a reduction of 10,070 daily VMT along the corridor.

Table 8.11 Daily VMT

Scenario	Daily VMT
Existing Baseline	98,063
2045 (Baseline)	105,411
2045 (Preferred Concept)	**107,423**
Reduction Type	Daily VMT Reduction
Bicycle Mode Shift	-7,346
Transit Mode Shift*	-2,725
Total Reduction	**-10,070**
2045 (Preferred Concept) *Reduced*	**97,353**

**Transit Mode Shift Daily VMT is reduced by half to account for the inability to ensure funding for increases in service frequency by 30 minutes.*

8.6 Air Quality

Air quality benefits were estimated using the SB 1 Emissions Calculator (or Cal-B/C) tool developed by the California Transportation Commission (CTC). All requisite on-road activity inputs (i.e. study corridor VMT) for this analysis were generated by the Greater Eureka Area Travel Model (GEATM), the NCHRP 552 bicycle mode shift analysis, and TCRP-118 transit mode shift analysis.

Health-based criteria pollutants and climate change greenhouse gases (CO2 and CO2 equivalents) were quantified. Based on the on-road vehicle activity changes quantified, the SB 1 Emissions Calculator tool was used to calculate the change in these emissions as a result of the Eureka BMCP Preferred Concept improvements, which are presented in Table 8.12. The monetary benefits associated with these reductions are included in Chapter 9.

Table 8.12 Air Quality Benefits

Emissions Reduction	Average Annual (Tons)	Total Over 20 Years (Tons)
CO Emissions Saved	33.011	660.222
CO2 Emissions Saved	6,677.783	133,555.670
NOX Emissions Saved	6.889	137.778
PM10 + PM2.5 Emissions Saved	0.113	2.267
SOX Emissions Saved	0.065	1.307
VOC Emissions Saved	2.043	40.855

8.7 Environmental Justice and Social Equity

Impacts of construction and benefit of use should be shared across the community regardless of ethnicity, economic situation, or physical ability because improvements developed with public funds are for everyone. Projects that could potentially impact minority or low-income communities, or that will provide benefits that favor wealthier communities, need to be offset by mitigating activities, or another less impactful solution should be pursued.

Figure 8.6 presents CalEnviroScreen 3.0 results for vulnerable communities within the direct Eureka BMCP study area. Figure 8.7 presents low-income communities (per AB 1550) and Figure 8.8 presents poverty-level communities (per SB 535).

All the improvements identified in the Eureka BMCP Preferred Concept address regional corridor-wide needs. Given that the Broadway corridor itself serves a significant number of disadvantaged or low income and minority populations, all improvements promote a social equity perspective.

Figure 8.6 Environmental Burden and Vulnerable Communities

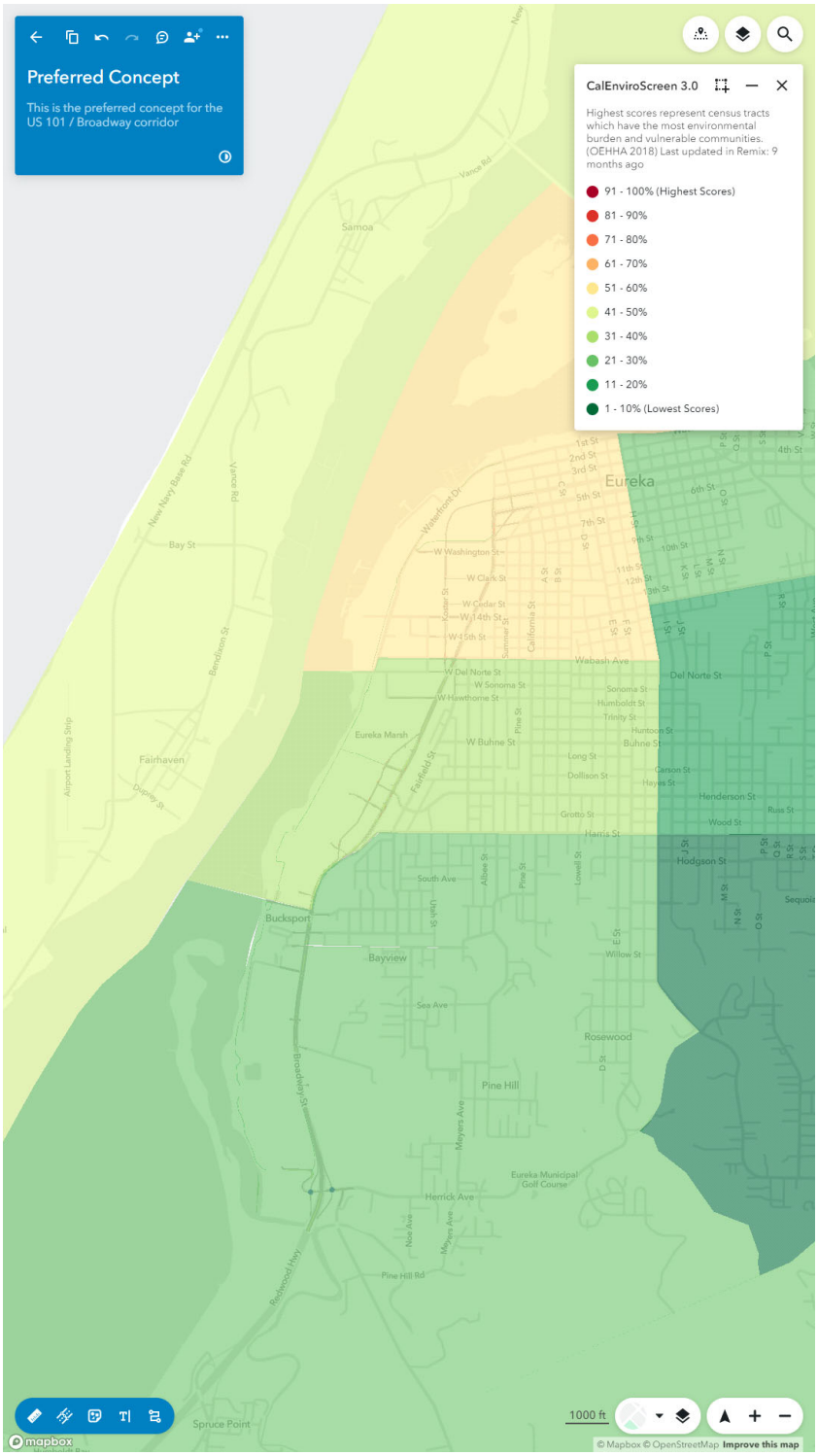


Figure 8.7 Low-Income Communities

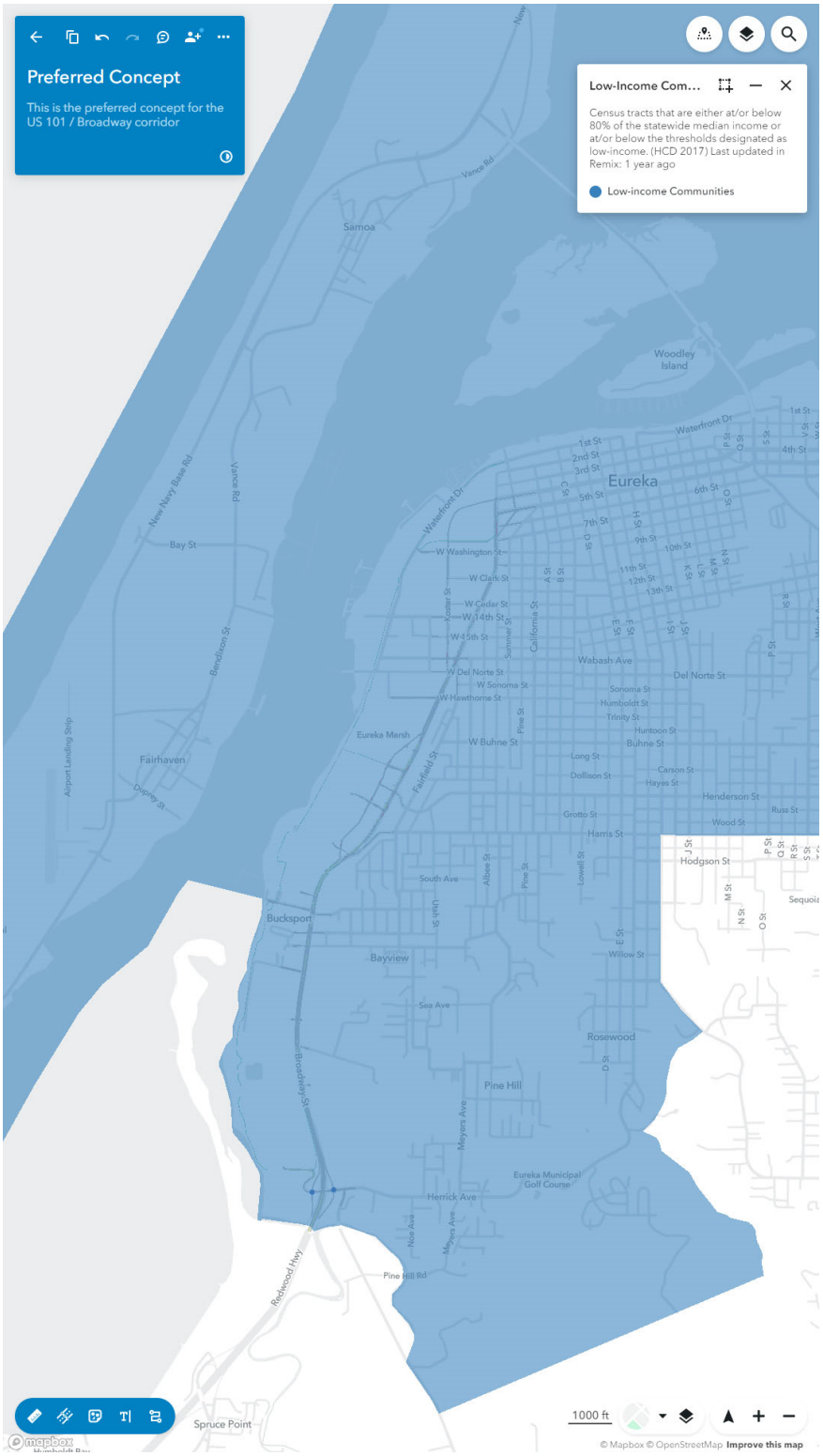
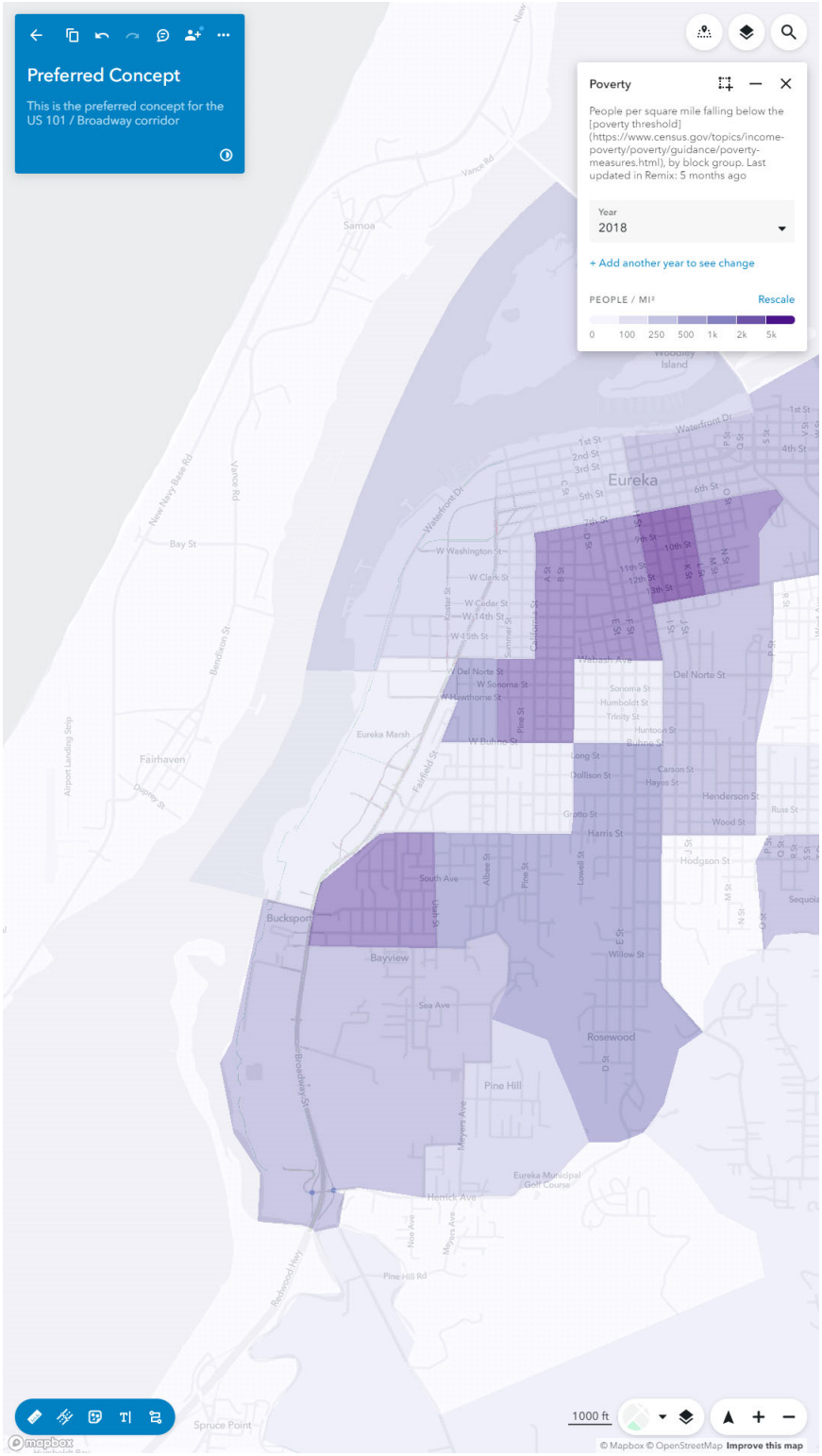


Figure 8.8 Poverty-Level Communities



8.8 Economic Development

The economic analysis of the mobility improvements associated with the Preferred Concept consists of two parts:

- Benefit-cost analysis comparing the user benefits of the improvement plan with the costs of implementation
- Economic impact analysis showing the regional impacts/benefits of the Corridor Plan to help achieve the economic forecasts of increased jobs, housing and people

8.8.1 Benefit-Cost Analysis

The quantification of the benefit-cost of the proposed improvements are contained in Chapter 9 of the report. To receive Federal or State grant funding, clear benefit to cost need to be calculated for the recommended improvements within the Preferred Concept.

8.8.2 Economic Impact Analysis

As a major infrastructure project, the Preferred Concept will impact its surrounding economy through direct, indirect, and induced impacts, as described below:

- **Direct impacts** – expenditure and employment involved in delivering the project (e.g. capital expenditure (CAPEX), operations expenditure (OPEX), employment of construction workers etc.).
- **Indirect impacts** – changes in sales, income or jobs in sectors that supply goods and services to the project (e.g. impacts on suppliers of maintenance equipment that will be used during the project operation).
- **Induced impacts** – increased economic activity within the region from household spending of the additional income generated by the project (e.g. the maintenance supplier now has more disposable income to spend on entertainment, groceries; similar reasoning for construction workers during the construction phase).

Direct impacts are known as primary effects. Indirect and induced impacts are known as secondary effects or 'flow on impacts'.

Indirect impacts of the Preferred Concept were estimated using IMPLAN. IMPLAN is an input-output model originally developed by the U.S. Forest Service that is now widely used for economic impact analysis throughout the United States. IMPLAN multipliers reflect a large set of data sources including: US Census, Bureau of Labor Statistics, County Business Patterns, Bureau of Economic Analysis and others.

Multipliers were sourced from IMPLAN, for Humboldt County, California, for the industry most representative of the activities being undertaken in the City of Eureka – namely *IMPLAN Industry Code 54 'Construction of new highways and streets'*.

For economic output, the indirect multiplier and induced multiplier are 0.188 and 0.260 respectively. This results in a Total multiplier of 1.448.

This indicates that every dollar expended during construction the Preferred Concept will generate an additional 44.8 cents of additional economic output through indirect and induced spending, within the County. Given the estimated project capital cost of approximately $155 million, this indicates that an additional $69 million in combined indirect and induced economic output may be expected, over approximately 20 years of construction.

Using IMPLAN data, an estimate of employment from Preferred Concept can also be developed. Multiplier data indicates that for every $1 million spent on direct construction costs, 4.96 direct jobs will be supported. Therefore, it is estimated 769 direct jobs will be supported during approximately 20 years of construction. In addition, indirect and induced spending effects will lead to an additional 151 and 258 jobs respectively, during the construction period.

Note that this is a preliminary economic impact analysis developed for indicative purposes only. A more thorough analysis should investigate leakages from the total construction spend, as well as multi-regional impacts.

8.9 Climate Adaptation Assessment

Global climate change is anticipated to increase the frequency and severity of extreme weather events, and associated natural disasters like wildfires and extreme floods. The US 101 corridor is currently the only north-south connection through Eureka to destinations north and south within Humboldt County, and therefore plays a major role in evacuation or emergency response scenarios. The Preferred Concept provides an opportunity to establish north-south connectivity redundancy that could aid circulation in the event of an evacuation or emergency response scenario. In the event of an evacuation scenario, for example, the directions of the Broadway Corridor and the Southern and Koster couplets could be switched to provide additional capacity for the necessary evacuation route. In the case of one or multiple lanes being blocked in one direction, the couplets could also be reverted to temporary two-way traffic to provide emergency circulation

The Preferred Concept has the potential to support the City's overall climate adaptation strategy, including vulnerability of utility corridors, and mitigating shoreline vulnerabilities. Specifically, the southbound couplets could provide a linear corridor that could protect the commercial and residential properties landward that are currently vulnerable to mid- to late-century sea level rise projections.

State guidance for sea level rise planning and adaptation would be applied in the project design and would consider a range of sea level rise projections relative to serviceability needs through mid to late century and its adaptive capacity beyond late century.

8.9.1 Climate Change Vulnerability Assessment

A qualitative assessment of climate change vulnerability was prepared, taking advantage of the Caltrans Vulnerability Assessment Interactive Online Mapping Tool (District 1). This assessment identifies risks associated with climate change along the corridor, and assesses the potential for the Eureka BMCP Preferred Plan improvements to either increase or decrease such risks.

This assessment is based on the 2018 Caltrans Climate Change Vulnerability Assessment Report, prepared by WSP for Caltrans District 1. In the 2018 Summary Report, Caltrans identifies in their

assessment approach, three action items that must be considered in evaluating the potential climate change impacts on the assets of the State's transportation infrastructure:

- Exposure – Will the asset be exposed to climate change?
- Consequence – If it is, how will the asset deteriorate or otherwise be impacted and how quickly will such impact occur?
- Prioritizations – Presuming the asset is impacted, how frequent, at what cost and what risk needs to be considered prior to making the investment for improving or replacing the asset?

With acknowledgement that climate change is occurring and significant adverse events are likely to continue to increase, the Caltrans report identifies the four primary climate change impacts for which the above action items need to be considered and the risks assessed, including sea level rise, wildfire, precipitation, and temperature.

The following figures present the areas of the Broadway Corridor that may be affected by storm surge (Figure 8.9), sea-level rise (Figure 8.10), and wildfire (Figure 8.11) as provided by the Caltrans Vulnerability Interactive Mapping Tool (District 1).

As shown, according to the Caltrans District 1 assessment, the Broadway Corridor from Herrick Avenue to approximately Sunset Drive and from 15th Street north to 5th and 4th Streets, along with shorter segments between Truesdale Street and Del Norte Street, would be vulnerable to storm surge (1.41 meters) and sea level rise (10 feet elevation). The portion of the Broadway Corridor between the Bayshore Mall and Del Norte Street would be vulnerable to 2085 wildfire exposure. It should be noted that the level of detail in these assessments is low at the local project-level scale, and may not be a fully accurate reflection of actual risk exposure.

8.9.2 Refined Sea Level Rise Vulnerability and Capital Improvement Adaptation Plan

In Fall 2020, the City of Eureka contracted with GHD separately to begin preparation of a refined Sea Level Rise vulnerability assessment and action plan, recognizing the need for increased detail relative to the Caltrans District 1 study. The City's plan is on-going and will include detailed storm water and sea level rise modeling based on the built physical environment and related infrastructure elements.

Figure 8.9 Caltrans Vulnerability Map – Exposed Storm Surge (1.41 meter)

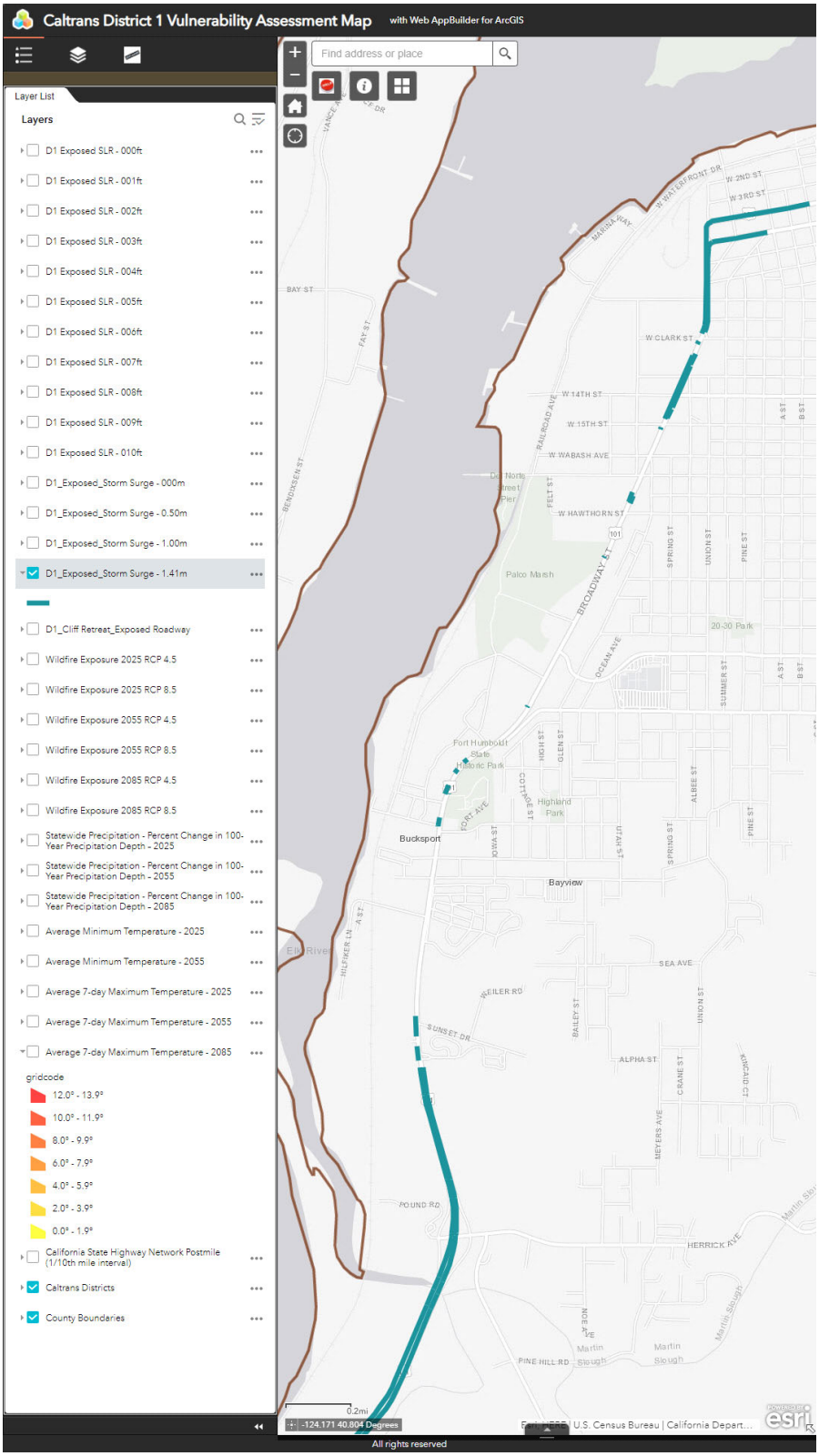


Figure 8.10 Caltrans Vulnerability Map – Exposed Sea-Level Rise (10 feet)

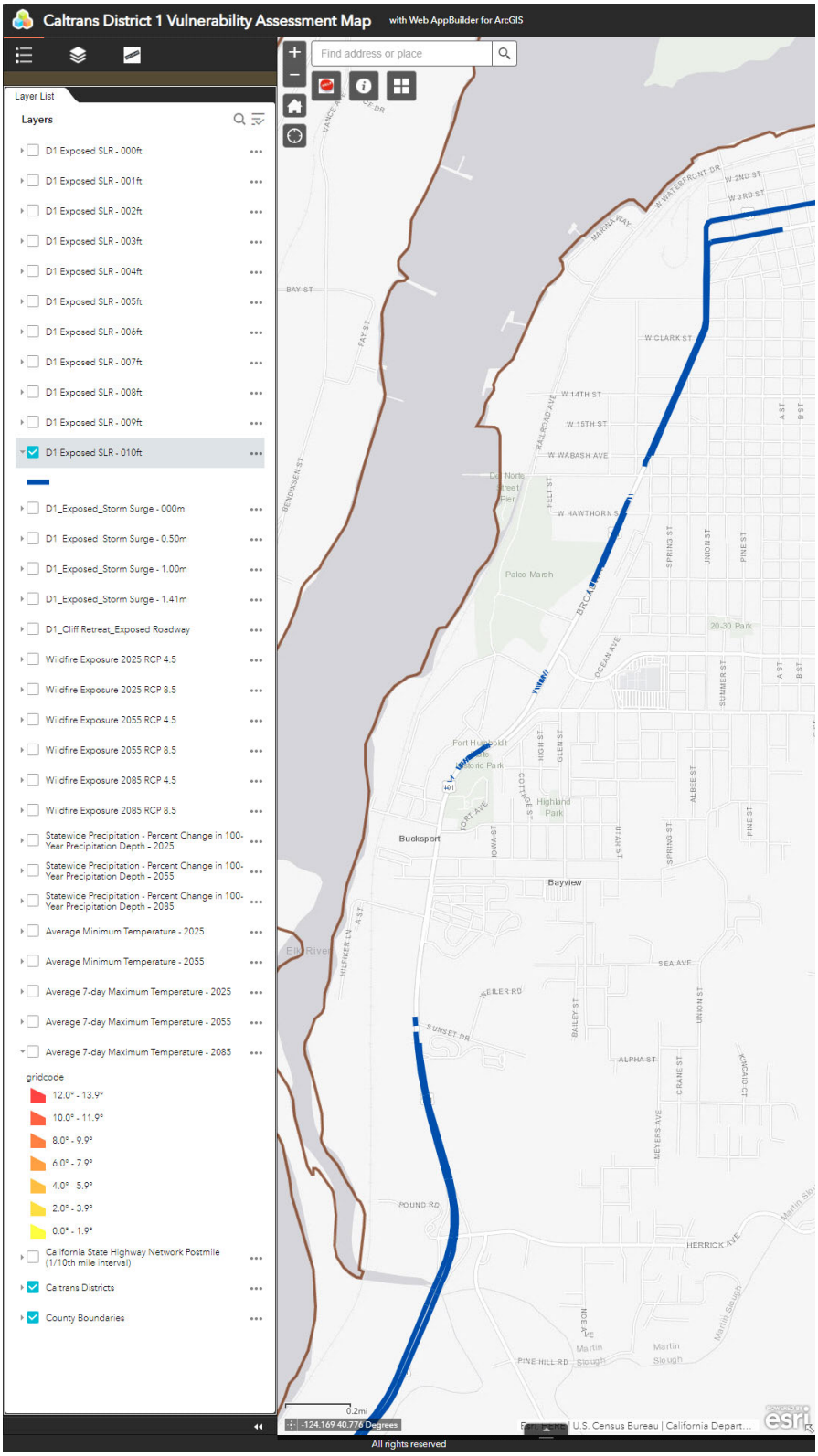
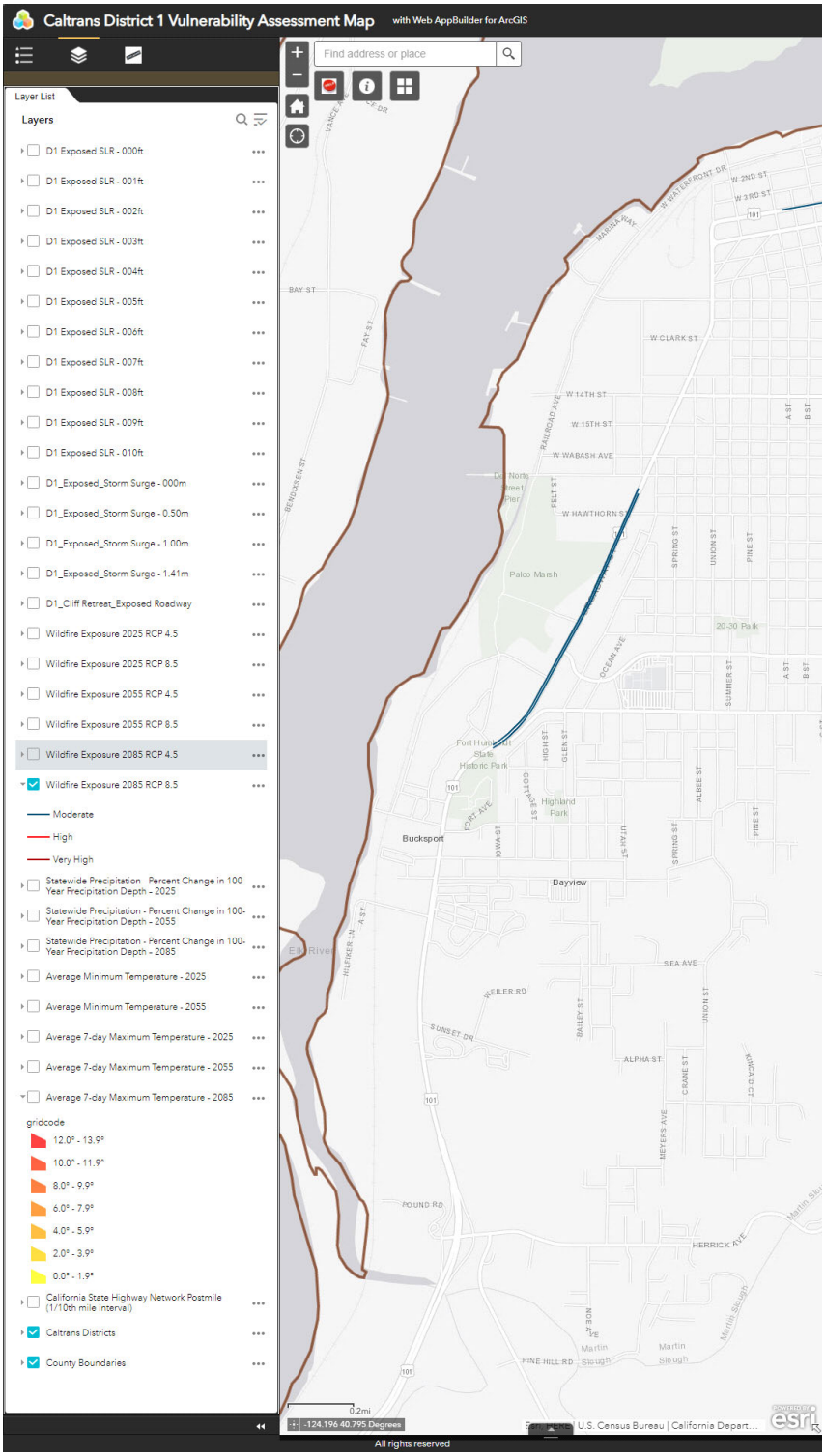


Figure 8.11 Caltrans Vulnerability Map – Wildfire Exposure (2085 RCP8.5)



8.10 Plan/Policy Consistency

In sorting and selecting a preferred corridor concept for the Eureka BMCP, both a quantitative and qualitative measures were considered and used. The Benefit/Cost Analysis quantified and compared metrics associated with traffic operations, safety, emissions and cost characteristics to help narrow and focus the selection to the most beneficial improvements to corridor circulation and safety. In addition to these quantitative metrics, qualitative measures, although often less objective, can provide further insights into the desirability and functionality of proposed improvements. Per the Smart Mobility Framework process, the following qualitative factors were also considered when evaluating and selecting the preferred alternative. These factors included:

- Plan Consistency
- Policy Consistency
- Community Acceptance (based on the community engagement process)
- Environmental/Institutional Sensitivity (per the adaptation assessment) (see Section 8.9)
- Social Equity (consideration of low income and minority population concentrations relative to the location of anticipated improvement impacts and benefits) (see Section 8.7)

8.10.1 Plan Consistency

An assessment was performed as to the general consistency of the corridor alternatives relative to the following plan documents emanating from the involved agencies: City of Eureka, HCAOG, and Caltrans. A detailed description of relevant documents is provided in Chapter 2.

The proposed Eureka BMCP was found consistent with the plan documents from the involved agencies. The multimodal improvements are consistent with the City's General Plan Circulation Element.

8.10.2 Policy Consistency

Recognizing the importance of the Broadway Corridor to both regional and local circulation, the involved agencies have been and are aligned in establishing policies that further the improvement of the corridor to enhance traffic operations, capacity, safety and multimodal opportunities and reduce environmental impacts.

Similar to the assessment made regarding Plan Consistency, the Eureka BMCP was found consistent with all policies established by the involved agencies.

8.10.3 Community Support

As described in Chapter 3 of this report, the Eureka BMCP planning process included a robust public outreach effort involving workshops (in-person and virtual), a project website with an interactive map, and public presentations at City Council meetings. Throughout the process, the public has been invited and encouraged to participate in identifying corridor solutions for Broadway. As such, the Preferred Concept reflects community support for mobility and safety improvements along the Broadway Corridor.

9. Benefit Monetization Assessment

This chapter summarizes the monetary benefits associated with the performance metrics analyses presented in Chapter 8, and presents the anticipated cost for implementing the Preferred Concept.

Benefits were monetized based on the societal cost information from the Caltrans 2018 Economic Parameters. All quantified benefits were annualized and projected to reflect a 20-year design year condition (i.e., life-cycle costs), and real-cost reduction of 4% was applied to account for the present worth of future dollars. These monetized benefits are then combined with currently available planning level improvement cost opinions (described below) to yield a holistic benefit-cost estimate for each project alternative.

The Caltrans 2018 Economic Parameters societal cost of time is provided below. The weighted average is based on the 7% truck percentage assumption used as part of this study. The weighted average of societal cost will be applied to both the reduction in delay and buffer time as follows:

- Automobile: $14.20 per hour /person
- Truck: $32.30 per hour /vehicle
- Weighted Average: $17.46 per hour / vehicle
- Fatal Accident: $9,800,000 per accident
- Injury Accident: $65,000 - $467,000 per accident
- PDO Accident: $4,374 per accident

9.1 Improvement Costs

Table 9.1 displays the planning-level cost estimates of improvements recommended in the plan per Segment Area (Southern, Middle, and Northern). The total cost for the Preferred Concept is estimated at $155,380,000. Preliminary planning-level costs were estimated by project team planning and engineering staff, and include environmental mitigation and remediation costs associated with the couplets. Detailed cost estimates are provided in Appendix E.

Table 9.1 Total Rounded Improvement Costs

Project Area	Total Cost
3 - North (Hawthorn St to 4th St)	$58,090,000
2 - Middle (Tomlinson St to Hawthorn St)	$79,250,000
1 - South (Herrick Ave to Tomlinson St)	$18,040,000
Total Project Cost	**$155,380,000**

9.2 Comprehensive Monetized Benefit Assessment

This section summarizes the monetary benefits associated with the performance metrics evaluated for the Preferred Concept.

9.2.1 Monetized Safety Benefits

Safety countermeasure monetized benefits are estimated only for intersections and roadway segments that had crashes that occurred within the crash analysis period (2014-2018). Table 9.2 presents the monetized safety countermeasure benefit for a 20-year life cycle.

Table 9.2 Safety Countermeasure – Life Cycle Monetized Benefit

Study Area	Total Benefit
South (Herrick Ave to Truesdale St)	*$46,134,680*
Middle (Truesdale St to Hawthorn St)	*$68,705,320*
North (Hawthorn St to 4th St)	*$96,991,120*
Total	**$211,831,120**

9.2.2 Monetized Bicycle Mode Shift Benefits

Table 9.3 provides the total estimated annual benefits associated with the proposed Preferred Concept bicycle improvements.

Table 9.3 Bicycle Mode Shift – Annual Monetized Benefit

Bicycle Facility Benefits	Annual Benefit
Annual Mobility Benefit	$ 3,857,063
Annual Health Benefit	
High Estimate	$ 198,784
Moderate Estimate	$ 119,680
Low Estimate	$ 102,656
Annual Recreation Benefit	
High Estimate	$ 4,212,100
Moderate Estimate	$ 1,956,400
Low Estimate	$ 1,470,950
Annual Decreased Auto Use Benefit	$ 17,262.49
Total Annual Benefit, High	$ 8,285,209
Total Annual Benefit, Moderate	$ 5,950,405
Total Annual Benefit, Low	$ 5,447,931

Due to the incorporation of bicycle mode shift VMT reduction into the air quality analysis and associated benefit, total annual bicycle mode shift benefits were adjusted to exclude Annual

Decreased Auto Use Benefit, bringing the total annualized benefit high estimate to $8,267,947. Air quality benefits, which include bicycle model shift VMT reduction, are presented in Table 9.7.

Annualized benefits were adjusted to account for a 20-year life cycle. Assuming a 20-year life span, and incorporating a four percent discount rate or P/A Factor to reflect the present worth of future dollars, the 20 year adjusted benefit for the study area is estimated to total $120.6 million, shown in Table 9.4.

Table 9.4 Bicycle Model Shift – Life Cycle Monetized Benefit

Total Annualized Benefit	Base Year Benefit	Expected Life (Years)	20-Year Adjusted Benefit
Bicycle Mode Shift Benefit	$ 8,267,947	20	$ 120,632,041

9.2.3 Monetized Transit Ridership Benefits

The recommended service frequency improvements and increases in transit ridership are associated with an annualized reduction in VMT. The estimated reduction in VMT associated with projected transit ridership increases was utilized as an input in the air quality analysis, where the reduction in emissions and pollutants correlated with the reduction in VMT was monetized. Air quality benefits, which include transit ridership VMT reduction, are presented in Table 9.7.

9.2.4 Monetized Vehicle Operations Benefits

Monetization was calculated for the amount of savings directly and indirectly benefiting society associated with delay and buffer time reduction along the corridor. This monetization has been annualized and is based on 208 weekdays over one year, and is reported for both the northbound and southbound directions for the AM and PM peak hours. According to daily traffic volume data along the Broadway Corridor (collected by Caltrans, September 2019), the PM peak hour usually occurs between 4:00 and 6:00 PM; however, traffic volume remains fairly constant between the hours of 11:00 AM and 6:00 PM, differing by less than 10% on average from the peak hour volume. As such, the intensity of traffic commonly associated with the PM peak hour occurs along the Broadway Corridor for approximately 2 to 7 hours.

Monetized benefits associated with delay and buffer time reduction were factored to include a conservative estimate of 3 hours of peak PM traffic volume. Figure 9.1 provides a graphical representation of hourly roadway volume data on the hour, average across nine count locations along the Broadway Corridor. Table 9.5 shows the monetized delay time reduction and Table 9.6 shows the monetize buffer time reduction benefit for a 20-year life cycle.

Figure 9.1 Broadway Corridor Daily Peak Periods

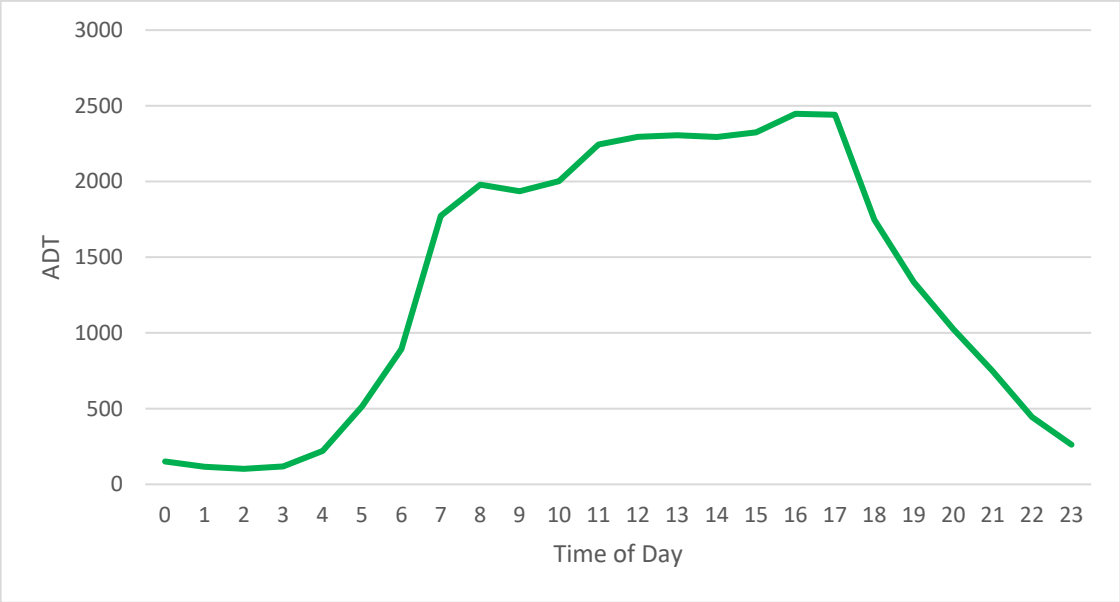


Table 9.5 Delay Time Reduction – Life Cycle Monetized Benefit

Scenario	Delay Reduction Benefit	
	Northbound	**Southbound**
AM Peak Hour	$728,913.13	$6,363,457.21
PM Peak Period*	$3,337,724.55	$30,459,827.02
Total	**$40,889,921.91**	

**PM Peak Period is assumed to be 3-hours*

Table 9.6 Buffer Time Reduction – Life Cycle Monetized Benefit

Scenario	Buffer Time Reduction Benefit	
	Northbound	**Southbound**
AM Peak Hour	$560,702.40	$4,657,509.11
PM Peak Period*	$3,275,914.84	$38,767,052.57
Total	**$47,261,178.92**	

**PM Peak Period is assumed to be 3-hours*

9.2.5 Monetized Air Quality Benefits

The recommended vehicle operations improvements are associated air quality benefits, where the reduction in emissions and pollutants was monetized. The result of this analysis is presented in Table 9.7.

Table 9.7 Air Quality – Monetized Benefit

Emissions Reduction	Average Annual	Total Over 20 Years
CO Emissions Saved	$1,756.56	$35,131.24
CO2 Emissions Saved	$202,466.74	$4,049,334.81
NOX Emissions Saved	$84,773.51	$1,695,470.26
PM10 + PM2.5 Emissions Saved	$6,198.36	$123,967.18
SOX Emissions Saved	$3,210.22	$64,204.44
VOC Emissions Saved	$1,835.55	$36,711.09
Total Monetized Reduction Benefit	**$300,240.95**	**$6,004,819.02**

9.3 Overall Benefit-Cost Summary

A summary of the quantitative benefits that were monetized for the Eureka BMCP Preferred Concept are presented in Table 9.8. The comprehensive benefit-cost for all improvements proposed within the study corridor are presented in Table 9.9. When monetized to a 20-year life cycle, the benefit-cost (or B/C) of the Preferred Concept is 2.75.

Table 9.8 Monetized Benefits Summary

Benefit Type	Annual Benefit	Life Cycle Benefit (20 Yrs.)
Safety - Crash Reduction	$10,591,556	$211,831,120
Bicycle Mode Shift *(Except Decreased Auto Use Benefit)*	$8,267,947	$120,632,041
Transit Ridership	*Included in Air Quality Benefit*	
Vehicle Delay Reduction	$2,802,536	$40,889,922
Vehicle Buffer Time Reduction	$3,239,213	$47,261,179
Air Quality / Emissions Benefit	$300,241	$6,004,819
Total	**$25,201,493**	**$426,619,081**

Table 9.9 Comprehensive Benefit-Cost Summary

Total Project Life Cycle Cost	Total Project Life Cycle Benefit
$155,380,000	$426,619,081
Total B/C	**2.75**

9.3.1 Segment Benefit-Cost Summary

The following provides a summary of the quantitative benefits that were monetized for the Eureka BMCP segments (southern, middle, and northern). Safety and bicycle mode shift benefits were calculated utilizing the methodologies described in previous sections of this chapter. Transit ridership benefits were estimated utilizing the approximate proportional share of total transit benefits for the Broadway corridor according to existing transit route lengths located within segment boundaries. Air quality benefits were calculated utilizing the SB 1 Emissions Calculator (or Cal-B/C) tool developed by the California Transportation Commission (CTC) based on vehicle miles traveled (VMT) reduction associated with bicycle mode shift and transit ridership per segment. Vehicle delay and buffer time reduction was calculated utilizing the approximate proportional share of total corridor operational benefits based on improvement costs associated with signal improvements and coordination per segment.

Segment benefit-cost ratios range from 2.03 to 4.75. *Note: The sum of segment-based life cycle benefits may differ from the total corridor project life cycle benefit due to differences in monetized emission reduction benefit calculations associated with the SB 1 Cal-B/C tool.*

Table 9.10 Eureka BMCP Segment Benefit-Cost Summary

Segment	Total Project Life Cycle Cost	Total Project Life Cycle Benefit
Southern Segment	$18,040,000	$85,757,579
	Total B/C	**4.75**
Middle Segment	$79,250,000	$160,761,505
	Total B/C	**2.03**
Northern Segment	$58,090,000	$180,362,246
	Total B/C	**3.10**

about GHD

GHD is one of the world's leading professional services companies operating in the global markets of water, energy and resources, environment, property and buildings, and transportation. We provide engineering, environmental, and construction services to private and public sector clients.

Todd Tregenza, AICP
Todd.Tregenza@ghd.com

Makinzie Clark
Makinzie.Clark@ghd.com

www.ghd.com