US 101 North Comprehensive Corridor Plan

Caltrans District 4

February 2018

US 101 North

Comprehensive Corridor Plan

APPROVED BY:

2-5-18

BIJAN SARTIPI — Date
Disrfict/4 Director
California Department of Transportation

I accept this Comprehensive Corridor Plan for the US 101 North Corridor as a document informing the regional transportation planning process.

ACCEPTED BY:

2/14/18

STEVE HEMINGER — Date
Executive Director
Metropolitan Transportation Commission

ACCEPTED BY:

2/6/18

SUZANNE SMITH — Date
Executive Director
Sonoma County Transportation Authority

ACCEPTED BY:

2/6/18

DIANNE STEINHAUSER — 'Date
Executive Director
Transportation Authority of Marin

US 101 North
Comprehensive Corridor Plan

Approval Recommended by:

Jean C.R. Finney
Deputy District Director
Division of Transportation Planning and Local Assistance

Stephen Yokoi, AICP
Office Chief
System and Regional Planning

Kang Tang,
Branch Chief
System Planning North Bay and Peninsula

Acknowledgments:

Caltrans
Cesar Pujol, Senior Transportation Engineer
Josephine Hsai, Associate Transportation Planner
Michelle Matranga, Transportation Planner
Paul Svedersky, Associate Transportation Planner
Robert Bregoff, Associate Transportation Planner
Brian Johnson, Associate Transportation Planner

Sonoma County Transportation Authority
James R. Cameron, Director of Projects and Programming
Seana L. S. Gause, Senior Planner, Programming and Projects

Transportation Authority of Marin
Nick Nguyen, Principal Project Delivery Manager
Derek McGill, Planning Manager

Metropolitan Transportation Commission
Mike Kerns, Principal Transportation Engineer

TABLE OF CONTENTS

List of Figures

List of Tables

EXECUTIVE SUMMARY

INTRODUCTION

Comprehensive Corridor Plans

With the passage of Senate Bill (SB) 1 and the introduction of the Solutions for Congested Corridor Program (SCCP), Caltrans District 4 sees a unique opportunity to support the System Planning Program update and promote the legislatively required Comprehensive Corridor Plans (CCPs) as a critical component of the next generation of System Planning products. A CCP is recommended for the most congested State highway corridors within the District and includes a multimodal needs analysis for identifying improvement projects and strategies that help inform project programming and funding needs.

Caltrans updated its Mission, Vision and Goals in 2015, which shifted the focus from automobile-centric operations and capital expansion to multi-modal system management, operations and sustainability. The Caltrans Strategic Management Plan 2015-2020 (SMP) links strategic goals with corresponding performance measures that the Department is responsible for achieving.

Senate Bill 1 Overview and the Solutions for Congested Corridors Program

The Road and Repair Accountability Act of 2017, also known as SB 1, provides the first significant, stable, and on-going increase in State transportation funding in more than two decades. SB 1 presents a balance of new resources and reasonable reforms to ensure efficiency, accountability, and performance from each dollar invested to improve California's transportation system.

Among the multiple programs established by SB 1 is the Solutions for Congested Corridors Program (SCCP). This program provides $250 million a year on a competitive basis to Caltrans and regional agencies for projects designed to achieve a balanced set of transportation, environmental, and community access improvements within highly congested travel corridors throughout the State. Eligible projects should make specific performance improvements and must be part of a Comprehensive Corridor Plan designed to reduce congestion in highly-traveled corridors by providing more transportation choices for residents, commuters and visitors to the area while preserving the character of the local community and creating opportunities for neighborhood enhancement.

In order to mitigate increases in vehicle miles traveled (VMT), greenhouse gases and air pollution, highway capacity-increasing projects funded by the program are limited to managed lanes, such as high-occupancy vehicle lanes and other non-capacity increasing improvements such as auxiliary lanes, truck-climbing lanes and dedicated bicycle lanes. Projects may include improvements to State highways, local streets and roads, public transit facilities, bicycle and pedestrian facilities, and restoration or preservation work that protects critical local habitat or open space.

2011 US 101 North Corridor System Management Plan (CSMP)

In 2011, Caltrans District 4 developed a Corridor System Management Plan (CSMP) for the US 101 North Corridor (Corridor) from the Golden Gate Bridge at the San Francisco/Marin County line to the SR 128 Interchange in Sonoma County. The US 101 North CSMP examined the mobility of the freeway in a comprehensive manner based on a performance assessment.

Since the completion of the 2011 North CSMP, significant growth in vehicular traffic has occurred within the Corridor. A number of projects included in the 2011 CSMP have been completed. The Sonoma-Marin Area Rail Transit (SMART) started service in August 2017. Since 2011, there have also been additional highway, transit, and bicycle/pedestrian projects planned and proposed to accommodate growth in travel demand. In 2017, SB 1 legislation named US 101 and the SMART rail corridors in Marin and Sonoma Counties as an example of a congested corridor.

Caltrans in coordination with stakeholders along US 101 has determined that the US 101 North Corridor is an interregional priority for the region and a CCP should be developed to document changes from the CSMP, identify multimodal needs, and recommend multi-modal improvement projects. The US 101 N CCP extends the corridor limits north to the Sonoma/Mendocino County line to cover US 101 in its entirety in both counties. The US 101 North CCP serves as an update and supplement to the 2011 CSMP bringing a more multimodal approach to corridor analysis by evaluating the needs of all users.

Long-Term Corridor Planning

It is acknowledged among the stakeholders that one of the main goals for this CCP is to document funding needs consistent with the first round of SCCP in 2018 for shovel-ready projects in the Corridor. Therefore, the update is limited in scope and is primarily based on information, data, studies and reports that are already available. This CCP, however, will also address the longer-term planning needs of the Corridor, and will be revised and updated as needed.

Stakeholders

The Corridor Development Team (CDT) includes representatives from the following agencies:

- Caltrans
- Transportation Authority of Marin (TAM)
- Sonoma County Transportation Authority (SCTA)
- Metropolitan Transportation Commission (MTC)

The Congestion Management Agencies (CMAs) regularly coordinate with local jurisdictions and transit agencies to ensure local concerns are addressed and incorporated into the CCP.

GOALS, OBJECTIVES AND PERFORMANCE MEASURES

The goals of the US 101 North Comprehensive Corridor Plan (CCP) are to propose strategies to

- Provide a safe transportation system to all users within the Corridor;
- Reduce recurring freeway congestion and improve freeway efficiency in moving people
- Improve trip reliability within the Corridor;
- Support an accessible and inter-connected multimodal transportation system within the Corridor;
- Reduce pollutants and GHG emissions within the Corridor;
- Support economic prosperity; and
- Efficiently manage transportation assets within the Corridor to protect existing and future investment.

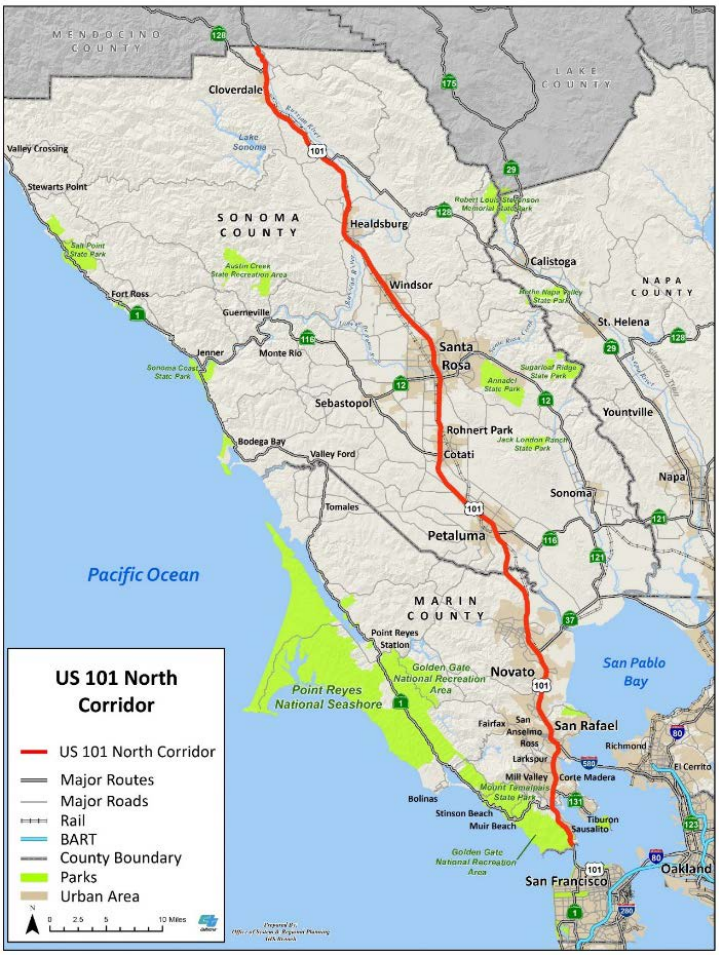
Based on corridor goals and objectives, a series of performance measures were developed collaboratively with State and local public agencies such as TAM and SCTA. Travel Model One was used to estimate future travel levels, and traffic analyses were conducted to determine the benefits of strategies based on those travel levels.

CORRIDOR OVERVIEW

The US 101 North Corridor is a north-south route starting at the middle of the Golden Gate Bridge in Marin County and ending at the Sonoma/Mendocino County line, north of the State Route (SR) 128 Interchange. The Corridor travels through Marin and Sonoma Counties and is approximately 83 miles in length.

US 101 North intersects State Routes 1, 37, 131 and Interstate 580 in Marin County and State Routes 12, 116, and 128 in Sonoma County.

US 101 is the principal freeway and the primary north-south freight route linking Sonoma and Marin Counties to San Francisco County to the south and Mendocino County to the north.



MULTIMODAL FACILITIES - EXISTING CONDITION AND NEEDS IDENTIFICATION

As a multimodal transportation corridor, the US 101 N Corridor serves the movement of people and goods in a variety of transportation modes. This chapter describes public transit services, Park-and-Ride facilities, the private commuter shuttle services, and bicycle and pedestrian facilities as critical transportation modes within the US 101 North Corridor.

Transit Services and Park-and-Ride

Transportation in the San Francisco Bay Area relies on a complex multimodal system consisting of roads, bridges, highways, rail, tunnels, airports, and bike and pedestrian paths. The Bay Area Rapid Transit (BART) is the primary regional transit operator. Its extensive train network connects San Francisco with the Peninsula and Eastbay cities and the international airports (San Francisco International Airport and Oakland International Airport). Marin County withdrew from participation in this rail system in 1962,

and therefore is not served by BART today. Consequently, greater reliance is placed on the US 101 highway, with transit agencies such as Golden Gate Transit, Marin Transit, and Sonoma County Transit filling the need for transit along the US 101 North Corridor.

Sonoma-Marin Area Rail Transit (SMART) is a new transportation option, offering passenger rail service in Sonoma and Marin Counties along the US 101 N Corridor. The initial 43 miles of rail corridor includes ten stations, from downtown San Rafael to the Sonoma County Airport. The entire system will include 70 miles of passenger rail service, connecting passengers with jobs, education centers, retail hubs and housing along the US 101 N Corridor, and a bicycle-pedestrian pathway, generally within or adjacent to the rail corridor, including a combination of Class I and Class II bicycle facilities.

Other transportation services near the Corridor include ferry and other mobility services. In addition, there are more than twenty Park-and-Ride lots near the US 101 Corridor that provide parking for drivers to join carpools or vanpools, or connect to public transit.

Bicycle and Pedestrian Facilities

Bicycle and pedestrian facilities are vital components of the multi-modal transportation network. Active transportation is integral to corridor planning, encompassing myriad benefits. Nearly every journey contains an aspect of active transportation. Due to mountainous topography of Marin and Sonoma Counties, the US 101 North corridor bicycle/pedestrian network is not always contiguous. Many bike and pedestrian projects have been implemented in the corridor due to support from local sales taxes and federal non-motorized transportation pilot program funding.

Transportation Systems Management and Operations (TSMO)

TSMO strategies include, but are not limited to, ramp metering, traffic signal synchronization, intelligent transportation systems/traffic operations systems (ITS/TOS), and managed lanes. Greater efficiency can often be achieved by operational improvements through ITS deployments.

Existing ITS infrastructure on the US 101 N Corridor includes ramp meters, Traffic Monitoring Stations (TMS), Close Circuit Television (CCTV), Changeable Message Signs (CMS), Variable Message Signs (VMS), Extinguishable Message Signs (EMS), and Highway Advisory Radio (HAR).

Freight Facilities

Freight movement is a vital component of the regional economy and transportation system. US 101 provides access for major interregional and regional freight movement in northern California. US 101 links with I-80, I-580, and I-880 (and I-5 via those routes), serving as the primary freight route through Marin and Sonoma Counties. It connects the San Francisco Bay Area to the Pacific Northwest via the California Counties of Mendocino, Humboldt, and Del Norte.

A portion of US 101 from I-580 to approximately six miles north of SR 116 is identified as a Primary Highway Freight System Route on the National Highway Freight Network under the Fixing America's Surface Transportation Act (FAST Act) for freight project investment.

The California Freight Mobility Plan (CFMP) identifies US 101 as a Major International Trade Highway Route. The CFMP states the following vision: "As the national gateway for international trade and domestic commerce, California enhances economic competitiveness by collaboratively developing and

operating an integrated, multimodal freight transportation system that provides safe, sustainable freight mobility. This system facilitates the reliable and efficient movement of freight and people while ensuring a prosperous economy, social equity, and human and environmental health."

FREEWAY PERFORMANCE

Corridor performance assessment is a quantitative or qualitative analysis of how a freeway corridor is functioning and begins with analyzing existing travel data. With an adequate traffic detection system in place, a corridor performance assessment serves to evaluate the existing system management practices and identify possible causes of performance problems. Modeling is then used to forecast future travel conditions along the corridor. To assess the impacts of a variety of operational strategies and investment scenarios, traffic analysis methods are used, allowing the corridor team to evaluate and recommend operational strategies, capital improvement projects, and opportunities to integrate transportation technology.

To assess the freeway performance of US 101 in Marin and Sonoma Counties, planners and engineers used a combination of sources including ramp metering reports, Caltrans Performance Measurement System (PeMs), and MTC's Travel Model One. Ramp metering reports were used to identify existing bottlenecks, and PeMs was used to measure freeway speeds and volumes. MTC's Travel Model One was used to provide a bigger picture of future freeway performance. Performance analysis included identifying the existing freeway bottlenecks, along with other corridor mobility performance measures such as:

- Vehicle Miles Traveled (VMT), which is a measurement of travel demand within a corridor
- Vehicle Hours Traveled (VHT), or total time for a corridor to process the VMT demand
- Vehicle Hours of Delay (VHD), which is a measure of how much additional VHT it took for the corridor to process the VMT demand, assuming nominal VHT is at 35 mile per hour (mph) speed
- Number of Incidents to determine any potential correlation between incidents and any mobility degradation resulting from increases in VMT, VHT, or VHD

RECOMMENDED STRATEGIES

A total of 89 projects were proposed by Caltrans, TAM, and SCTA, grouped into seven categories: High Occupancy Vehicle (HOV) lanes, Intelligent Transportation System (ITS) such as ramp metering, interchange modernization, Park-and-Ride construction, SMART rail train extension, and improvements to transit and bike/pedestrian facilities.

HOV Lanes

The Bay Area's HOV lane network delivers significant benefits in terms of increased person throughput, higher speeds, and travel time savings as compared to general purposed lanes.

The North Bay HOV network tends to be discontinuous, with significant gaps between sections. The proposed Marin Sonoma Narrow projects will mend the existing HOV lane gap within the US 101 North Corridor.

Ramp Metering

Ramp metering is an effective traffic management strategy to maintain an efficient freeway operation. Ramp queue detection to avoid backup onto local roads is included as part of the proposed ramp metering projects in Marin County.

Freeway Interchange Modernization

Many interchanges on US 101 were constructed in the 1950s, and ramps and intersecting local streets experience recurring traffic congestion throughout the day. Some interchanges may not meet Americans with Disabilities Act (ADA) standards and need modernizations in bike, pedestrian, and transit facilities. This CCP includes interchange modernization projects to improve local traffic circulation and regional traffic operation, improve multimodal access and connectivity, and improve overall safety of the facilities.

Transit Improvements

Transit and HOV lane improvements provide a great incentive for travelers to carpool or take transit by offering travel time savings and reliability, and represent a great opportunity to enhance existing transit services.

The US 101 corridor serves over 20,000 rides per day with regional and local bus service. Relocating the Bettini Transit Center, which serves 9,000 daily riders, is a high priority need to accommodate the SMART extension to Larkspur. This facility is the largest transit center in Marin County, and serves all transit operators in the county.

Enhancing Marin's Park-and-Ride facilities along US 101 can increase transit usage and support higher occupancy use of highways. Protecting facilities from sea level rise is a current challenge in locations such as the Manzanita Park-and-Ride.

SMART Extension

Traffic congestion along the US 101 North corridor has increased dramatically in the last decade and it is now ranked as one of the most congested freeways in the Bay Area. More than 80% of all North Bay commercial, residential, and educational facilities are located along the SMART corridor. SMART service located approximately adjacent to the US 101 Corridor provides a new alternative option for travel in the corridor. Future extensions and new stations for SMART include: Larkspur, which is scheduled to be completed in 2019; Windsor; Healdsburg; and Cloverdale.

Bike and Pedestrian Facility Improvements

For non-motorized travelers, US 101 is a major physical barrier to cross. By providing safe and accessible bike and pedestrian facilities along the Corridor, more trips can be made by bike and pedestrian modes. The CCP proposes projects that connect the existing and proposed bikeway and pedestrian networks and offer a more comfortable alternative for bicyclists and pedestrians crossing or riding parallel to US 101.

Project Evaluation and Project List

Longer-term proposed projects are evaluated against performance measures and rated as "Highly Positive Impact", "Medium Positive Impact", "Low Positive Impact", and "Negative Impact" to show how strongly the projects support the goals of the CCP. Project evaluation is a collaborative effort by Caltrans, TAM, and SCTA, done through the Corridor Development Team Meetings. Short term projects that could be implemented within five years are identified in the CCP, and current and future SHOPP projects are also included.

CHAPTER 1: INTRODUCTION

1.1 Comprehensive Corridor Plans

System Planning is the long-range Transportation Planning process for the California Department of Transportation (Caltrans). The System Planning process fulfills Caltrans statutory responsibility as owner/operator of the State Highway System (SHS) (Gov. Code §65086) by identifying deficiencies and proposing improvements to the SHS. Through System Planning, Caltrans focuses on developing System Planning products that address integrated multimodal transportation system needs and help advance Caltrans goals of safety and health, stewardship and efficiency, sustainability, livability and economy, system performance, and organizational excellence.

In response to the State Smart Transportation Initiative (2014)[1] and the subsequent Caltrans Improvement Program, Caltrans updated its Strategic Mission, Vision and Goals[2] and developed a Strategic Management Plan.[3] As part of the larger policy and institutional changes, a strategic effort was initiated to update the System Planning Program. The primary goal of the update is to redefine the role of System Planning within Caltrans and identify System Planning products that better serve the program. While the effort is still under development, the general consensus is that System Planning should play a larger role in identifying multimodal needs in the transportation system and influencing project nomination and selection, incorporate multimodal system management and operations into the System Planning process and products, and help implement the recommendations identified in the System Planning to Programming study (2017)[4] and the Planning for Operations effort currently underway.

With the passage of Senate Bill (SB) 1 and the introduction of the Solutions for Congested Corridor Program (SCCP), Trade Corridor Enhancement Program (TCEP), and Local Partnership Program (LPP). Caltrans District 4 sees a unique opportunity to support the System Planning Program update and promote the legislatively required Comprehensive Corridor Plans (CCPs) as a critical component of the next generation of System Planning products. CCPs are recommended for the most congested State highway corridors within the District, including a multimodal needs analysis and identifying improvement projects and strategies that would help inform project programming and funding needs.

[1] http://www.dot.ca.gov/CIP/docs/SSTIReport.pdf
[2] http://www.dot.ca.gov/mission.html
[3] http://www.dot.ca.gov/perf/library/pdf/Caltrans_Strategic_Mgmt_Plan_033015.pdf
[4] http://sites.kittelson.com/SP2P

Caltrans Policy Development

In response to the 2014 State Smart Transportation Initiative[5] and the subsequent Caltrans Improvement Program, Caltrans updated its Strategic Mission, Vision and Goals[6] and developed a Strategic Management Plan.[7] As part of the larger policy and institutional changes, a strategic effort was initiated to update the System Planning Program. The primary goal of the update is to redefine the role of System Planning within Caltrans and identify System Planning products that better serve the program.

In response to Caltrans updated Strategic Mission, Vision, and Goals, the Caltrans Strategic Management Plan 2015-2020 (SMP) was developed to link strategic goals with corresponding performance measures that the Department is responsible for achieving. The six strategic goal categories are safety and health, stewardship and efficiency, sustainability, livability and economy, system performance, and organizational excellence.

Caltrans also initiated the System Planning to Programming (SP2P) Study and commissioned a Planning for Operations (P4Ops) Charter Team in 2015. SP2P study objectives included identifying gaps and opportunities in the planning to programming process, and recommending strategies to achieve a more efficient and integrated process for reaching decisions and implementing transportation solutions. The Final Report, dated May 15, 2017, identified gaps and recommended strategies to enhance relevancy, to increase the value of System Planning products for programming decision makers, and to prepare for the future. The P4Ops Charter Team consists of statewide, multi-functional, multi-agency membership to identify key P4Ops issues and oversee the development of the P4Ops Strategic Work Plan. The objective of this effort is to institutionalize P4Ops in Caltrans culture, business practices, partnerships and planning processes. A Draft Strategic Work Plan was released on October 10, 2017. The short-term recommendations focus on developing a list of high-priority operational projects, while the medium and long-term recommendations focus on establishing a P4Ops framework.

Senate Bill 1 Programs - Solutions for Congested Corridors Program and Trade Corridor Enhancement Program[8]

The Road and Repair Accountability Act of 2017, also known as SB 1, provides the first significant, stable, and on-going increase in State transportation funding in more than two decades. SB 1 presents a balance of new resources and reasonable reforms to ensure efficiency, accountability, and performance from each dollar invested to improve California's transportation system.

Among the multiple programs established by SB 1 is the Solutions for Congested Corridors Program (SCCP). This program provides $250 million a year on a competitive basis to Caltrans and regional agencies for projects designed to achieve a balanced set of transportation, environmental, and community access improvements within highly congested travel corridors throughout the State. Eligible

[5] http://www.dot.ca.gov/CIP/docs/SSTIReport.pdf
[6] http://www.dot.ca.gov/mission.html
[7] http://www.dot.ca.gov/perf/library/pdf/Caltrans_Strategic_Mgmt_Plan_033015.pdf
[8] http://www.catc.ca.gov/programs/SB1.html

projects should make specific performance improvements and must be part of a Comprehensive Corridor Plan designed to reduce congestion in highly-traveled corridors by providing more transportation choices for residents, commuters and visitors to the area while preserving the character of the local community and creating opportunities for neighborhood enhancement.

In order to mitigate increases in vehicle miles traveled (VMT), greenhouse gases and air pollution, highway capacity-increasing projects funded by the program shall be limited to managed lanes, and non-capacity increasing improvements such as auxiliary lanes, truck-climbing lanes and dedicated bicycle lanes. Projects may include improvements to State highways, local streets and roads, public transit facilities, bicycle and pedestrian facilities, and restoration or preservation work that protects critical local habitat or open space. Project scoring includes the following criteria:

- Safety
- Congestion
- Accessibility
- Economic development, job creation and retention
- Furtherance of State and federal ambient air quality and greenhouse gas emissions reduction standards pursuant to Assembly Bill (AB) 32 and SB 375
- Efficient land use
- Matching funds
- Project deliverability

SB 1 also establishes the Trade Corridor Enhancement Account to fund infrastructure improvements on federally designated Trade Corridors of National and Regional Significance, on the Primary Freight Network, as identified in the California Freight Mobility Plan, and along other corridors that have a high volume of freight movement as determined by California Transportation Commission. The Trade Corridor Enhancement Program will receive $794 million from the Trade Corridor Enhancement Account, $535 million will be received from the federal National Highway Freight Program, and a one-time appropriation of $11 million will be received from the Budget Act of 2015 as amended by Assembly Bill 133.

The objective of the Local Partnership Program is to reward counties, cities, districts, and regional transportation agencies in which voters have approved fees or taxes solely dedicated to transportation improvements or that have enacted fees solely dedicated to transportation. This program intends to balance the need to direct increased revenue to the State's highest transportation needs while fairly distributing the economic impact of increased funding.

1.2 2011 US 101 North Corridor System Management Plan

In 2011, Caltrans District 4 developed a Corridor System Management Plan (CSMP)[9] for the United States (US) 101 North Corridor (Corridor) from the Golden Gate Bridge at the San Francisco/Marin County line to the SR 128 Interchange in Sonoma County. The US 101 North CSMP examines the mobility of the freeway in a comprehensive manner based on a performance assessment.

The CSMP provides both a description of the route as of 2010 as well as a future (2030) concept with congestion mitigation strategies including implementing Intelligent Transportation Systems (ITS), ramp metering, auxiliary lanes and High Occupancy Vehicle (HOV) lanes. A wide range of projects are included in the 2011 CSMP showing how the improved mobility from previous investments can be preserved within this Corridor.

Since the completion of the 2011 North CSMP, significant growth in vehicular traffic has occurred within the Corridor. A number of projects included in the 2011 CSMP have been completed. The Sonoma-Marin Area Rail Transit (SMART) started local commuter service in August 2017.[10] Since 2011, there have also been additional highway, transit, and bicycle/pedestrian projects planned and proposed to accommodate growth in travel demand. In 2017, SB 1 legislation named US 101 and the SMART rail corridor in Marin and Sonoma Counties as an example of a congested corridor.

Caltrans in coordination with stakeholders along US 101 has determined that the US 101 North Corridor is an interregional priority for the region and a CCP should be developed to document changes from the CSMP, in identifying multimodal needs, and recommending multimodal improvement projects. The US 101 N CCP extends the corridor limits north to the Sonoma/Mendocino County line to cover US 101 in its entirety in both counties. The US 101 North CCP serves as an update and supplement to the 2011 CSMP bringing a more multimodal approach to corridor analysis by evaluating the needs of all users.

Document Structure

The US 101 North CCP will include the following chapters.

- Executive Summary
- Chapter 1 - Introduction
- Chapter 2 - Corridor Goals, Objectives and Performance Metrics
- Chapter 3 - Corridor Overview
- Chapter 4 - Multimodal Facilities and Needs
- Chapter 5 - Freeway Performance
- Chapter 6 - Recommended Strategies
- Appendices

[9] http://d4web/tpa/SRP/files/csmp/US%20101%20North%20CSMP%20Final%20Document.pdf
[10] http://www.sonomamarintrain.org/node/120

Long-Term Corridor Planning

It is acknowledged among the stakeholders that one of the main goals for this CCP is to document funding needs consistent with the first round of SCCP in 2018 for shovel-ready projects in the Corridor. Therefore, the update is limited in scope and is primarily based on information, data, studies and reports that are already available. This CCP, however, will also address the longer-term planning needs of the Corridor, and will be revised and updated as needed.

1.3 Stakeholders

Current CCP development and its future updates are dependent upon close coordination and participation of major stakeholders along the Corridor. A Corridor Development Team (CDT) has been formed to provide strategic guidance throughout document development and to ensure the on-time delivery of the US 101 North CCP. The CDT includes representatives from the following agencies:

- Caltrans
- Transportation Authority of Marin (TAM)
- Sonoma County Transportation Authority (SCTA)

The Congestion Management Agencies (CMAs) regularly coordinate with local jurisdictions and transit agencies to ensure local concerns are addressed and incorporated into the CCP.

CHAPTER 2: GOALS, OBJECTIVES AND PERFORMANCE MEASURES

The goals, objectives and performance metrics for the US 101 North CCP were developed with input from the US 101 North Corridor Development Team (CDT) and represent a consensus that was reached through a collaborative process. Information from a variety of sources helped inform the development of this chapter. The most notable sources, among others, include:

- The Caltrans Strategic Management Plan 2015-2020
- Guidelines for the 2018 Solutions for Congested Corridors Program, California Transportation Commission (CTC) , October 30, 2017
- The US 101 North Corridor System Management Plan (CSMP), Caltrans, 2011
- Sonoma Comprehensive Transportation Plan (2016) and Countywide Bicycle and Pedestrian Master Plan (2014)
- Bicycle and pedestrian plans in Marin County (Various)
- TAM Congestion Management Program (2017)
- TAM Strategic Vision Plan (2017)

Table 2.1 lists the corridor goals and objectives. Based on corridor goals and objectives, a series of performance measures were developed collaboratively with State-and local public agencies such as TAM and SCTA. While existing sources contain data on a number of metrics, there is not sufficient data to report on every quantifiable performance metric due to time and resource constraints. This comprehensive list of metrics represents targets and measurements that can be carried into CCP updates in the future, helping illustrate how the corridor performance changes over time.

Travel Model One - the region's activity-based travel demand model was used to assess existing and future traffic conditions along the Corridor. Travel Model One analyzes daily travel patterns as a result of various transportation scenarios and their investments and land use patterns. The US 101 North CDT evaluated proposed transportation projects to determine how strongly the projects support the goals of the CCP. Projects are rated as "Highly Positive Impact", "Medium Positive Impact", "Low Positive Impact", and "Negative Impact". Please see Chapter 6 for a detailed description of the project evaluation process.

Table 2.1: Corridor Objectives and Performance Metrics

Goals	Objectives	Performance Metrics
1. Provide a safe transportation system to all users within the Corridor	Safety Improvement	Number of incidents within the Corridor
2. Reduce recurring freeway congestion and improve freeway efficiency in moving people	Reduce recurring delays on US 101 N	Personal Hours of Delay Travel time savings AM/PM Peak Period Vehicle Miles Traveled AM/PM Peak Period Vehicle Hours Traveled AM/PM Peak Period Congested Travel Time AM/PM Peak Period Vehicle Hours of Delay
	Improve productivity of US 101 Increase vehicle occupancy rate	
3. Improve trip reliability within the Corridor	Changes in travel time reliability	Planning Time Index
	Reduce non-recurring delays on US 101	Average number of incidents by type Major incident clearing time
	Improve transit on-time performance	Percentage of transit trips on-time Estimated travel time savings compared with current on-time performance
4. Support an accessible and interconnected multimodal transportation system within the Corridor	Improved access and connections to existing or future multimodal transportation hubs	Estimated travel time savings compared with current on-time performance
	Reduce gaps in the bicycle and pedestrian network	Percent of bicycle/pedestrian facility lane-miles as a share of total lane-miles by facility classification
5. Reduce pollutants and GHG emissions within the Corridor	Reduction in greenhouse gas emissions Reduce Vehicle Miles Traveled (VMT)	Total VMT VMT per capita
	Reduce criteria pollutants	Emissions of criteria pollutants, including carbon monoxide (CO), lead, nitrogen dioxide (NO2), ozone (O3), particulate matter (PM), and sulfur dioxide (SO2)
6. Support economic prosperity	Increase freight efficiency	Per capita delay on freight network
	Promote access to jobs	Share of jobs accessible in congested conditions
7. Efficiently manage transportation assets within US 101 to protect existing and future investment	Increase coverage of TOS elements, such as Ramp Metering, Vehicle Detection Sites, Closed-Circuit Television Cameras, and Changeable Message Signs.	Number of TOS elements installed and activated
	Ensure good TOS functionality	TOS elements downtime percentage Percentage of TOS elements inspected or maintained within the last five years

CHAPTER 3: CORRIDOR OVERVIEW

3.1 Corridor Description and Limits

The US 101 North Corridor is a north-south route starting at the middle of the Golden Gate Bridge in Marin County and ending at the Sonoma/Mendocino County line north of the State Route (SR) 128 Interchange. The Corridor travels through two counties and is approximately 83 miles in length. As there are no parallel highways and few parallel surface roads, US 101 is the main north-south arterial connecting communities throughout Marin and Sonoma Counties. US 101 North intersects State Routes 1, 37, 131 and Interstate 580 in Marin County and State Routes 12, 116, and 128 in Sonoma County. See Figure 3.1 for the location of the Corridor.

US 101 is the principal freeway and the primary north-south freight route linking Sonoma and Marin Counties to San Francisco County to the south and Mendocino County to the north. When the Marin Sonoma Narrows Project is completed the corridor will have 55 miles of continuous carpool lanes both north and southbound.

3.2 Route Designations

Through suburban Sausalito, Corte Madera, San Rafael and Novato in Marin County, US 101 North is an eight-lane freeway. US 101 narrows from six to four lanes in northern Marin County. Traveling north through portions of southern and central Sonoma County, it is a six-lane freeway. US 101 narrows to four lanes as it passes through the small towns of Windsor, Healdsburg, and Cloverdale in northern Sonoma County. There are northbound and southbound High Occupancy Vehicle (HOV) lanes between SR 1 in Mill Valley and Atherton Avenue in Novato (Marin County), and from Petaluma Boulevard North in Petaluma to Old Redwood Highway in Windsor (Sonoma County). Upon completion of the Marin-Sonoma Narrows Project, the Corridor will have 55 miles of continuous northbound and southbound carpool lanes. See Table 3.1, for a list of corridor designations.

The US 101 North Corridor serves as the primary freight route through Marin and Sonoma Counties, providing access to other Bay Area freight corridors via I-580 and SR 37, and serves as a key access route to San Francisco and coastal Northern California. As part of the National Highway System (NHS) and a designated Surface Transportation Assistance Act (STAA) route,[11] large trucks are allowed to operate on US 101. The 2016 California Freight Mobility Plan[12] defines US 101 as a multimodal freight route, connecting several maritime ports and airport facilities, and paralleling rail. The Corridor's Freight System is described in Chapter 4.

[11] Surface Transportation Assistance Act (1982) allows large "STAA" trucks, to operate on routes that are part of the National Network. The Federal Highway Administration (FHWA) provides standards for STAA trucks based on the Code of Federal Regulations Title 23 Part 658.
[12] Caltrans California Freight Mobility Plan (2016)

US 101 is designated as a California Interregional Road System (IRRS) route. The IRRS defines a series of interregional State highway routes that provide access to and links between the State's economic centers, major recreation areas, and urban and rural regions.

The 2015 Interregional Transportation Strategic Plan (ITSP) identifies eleven Strategic Interregional Corridors statewide. US 101 is part of the San Jose/San Francisco Bay Area – North Coast Corridor. US 101 is also identified as a Priority Interregional Facility that is critical in supporting interregional transportation and expected to be the focus of Interregional Transportation Improvement Program (ITIP) investment in the future.[13]

[13] Caltrans five- year ITIP is prepared pursuant to Government Code 14526, Streets and Highways Code Section 164, and the California Transportation Commission's (CTC) State Transportation Improvement Program (STIP) Guidelines. See Caltrans Interregional Transportation Strategic Plan (2015): http://www.dot.ca.gov/hq/tpp/offices/omsp/system_planning/docs/Final_2015_ITSP.pdf

Table 3.1: US 101 North – Route Characteristics

National Highway System	Non-Interstate Strategic Highway Network (STRANET) Route
Scenic Highway	No, however a short portion of the route near SR 37 is eligible.
Interregional Road System	Yes
California Road System Functional Classification	Other Freeway or Expressway
Goods Movement Route	National Freight Network – Primary Route & Other Route, Multimodal Freight Route
Truck Designation	Primary Highway Freight System Route, through Marin County and the southern portion of Sonoma County, with the designation of "Terminal Access" [14] Surface Transportation Assistance Act (STAA) Route
Metropolitan Planning Organization/ Regional Transportation Planning Agency	Metropolitan Transportation Commission (MTC)
Local Agencies	Cities of Sausalito, Mill Valley, Corte Madera, Larkspur, San Rafael, Novato and unincorporated Marin County & cities of Petaluma, Cotati, Rohnert Park, Santa Rosa, Healdsburg, Windsor, Cloverdale and unincorporated Sonoma County
Congestion Management Agency/ County Transportation Agency	Marin Transportation Authority (TAM) and Sonoma County Transportation Authority (SCTA)
Air District	Bay Area Air Quality Management District & Northern Sonoma County Air Pollution Control District
Native American Tribes	Four federally-recognized tribes are located near the US 101 North Corridor in Sonoma County[15]
Terrain	Rolling and flat, with rugged terrain near the northern terminus in Sonoma County
Land Use	Urbanized and rural in Marin County, urbanized and rural in Sonoma County

[14] Terminal Access designated routes are "T" signed routes where STAA trucks may exit off the Interstate and travel onto State and local routes
[15] See Section 4.5 Environmental Considerations: Native American Tribal Government and Community, for additional information

Figure 3.1: US 101 North Corridor

3.3 Demographics and Land Use

The US 101 North Corridor traverses two counties and a variety of land uses that include national, State and regional parks, agricultural lands, cities and rural communities. The corridor terrain shifts between rolling hills and flatlands with several waterways. The arterial road network is discontinuous due to the topography; areas west and east of the Corridor have generally more rolling terrain, and San Pablo Bay is situated east of the Corridor through most of Marin County. The cities of Sausalito, San Rafael, Novato, Petaluma and Santa Rosa are the main urban centers along the Corridor.

Marin County

Land Use

In Marin County, US 101 travels through urban areas in Sausalito, Corte Madera, San Rafael and Novato. Most of Marin's communities are located primarily on Bay frontage adjacent to US 101, where the Corridor serves as the County's primary route for northbound and southbound trips. US 101 in Marin County also serves as a connection for northern counties to access regional job centers in Oakland and San Francisco.

With the San Pablo Bay located east, the San Francisco Bay along the south, and rolling terrain to the west, the arterial network has limited connectivity east-west and north-south. There is also limited access to a number of communities such as Sausalito, Mill Valley, Marin City, the Tiburon Peninsula, Bel Marin Keys, and others as right-of-way available for transportation infrastructure expansion is limited.[16]

Demographics

Marin is geographically the second smallest county in the Bay Area, after San Francisco County. It is the second least populated county, after Napa County, with a population of approximately 261,200. The population of Marin has remained relatively constant between 2010 and 2015.[17] Marin County is expected to absorb 1.3 percent of Bay Area housing growth and 2.7 percent of Bay Area job growth over the next 40 years.[18] Marin's employment base was 98,100 jobs in 2010, and has experienced high employment growth with over 13,500 jobs added between 2010 and 2015. Marin has a median income at $91,500 and average home value of $785,100.

[16] Transportation Authority of Marin County (TAM), Strategic Vision Plan, Draft Report (2017): https://www.tam.ca.gov/wp-content/uploads/2017/07/TAM-SVP-GettingAroundMarin_072617.pdf
[17] US Census Bureau American Community Survey, Five Year Estimates (2011-2015)
[18] Transportation Authority of Marin County (TAM), Strategic Vision Plan, Draft Report (2017)

Sonoma County

Land Use

At a length of 56 miles, US 101 traverses the cities, vineyards and rural lands of Sonoma County. It serves as the County's primary north-south highway linking to the County to Marin and San Francisco to the south and Mendocino to the north. Much of the US 101 Corridor was constructed as a rural highway in the 1950s and 1960s. Expansion of the freeway began over a decade ago and continues today.

Sonoma County stretches from the Pacific Ocean in the west to the Mayacamas Mountains in the east, and is geographically the largest county in the Bay Area. With rugged terrain to the east and west, population settlement patterns have largely followed geographic constraints, and most growth is centered in cities along the US 101 Corridor. The remainder of the County is generally rural, including vineyards and orchards. The Russian River flows through a large portion of the County, traveling south from Mendocino County toward the Pacific Ocean through West County. The northern terminus of the US 101 North Corridor is less developed, and passes through rugged terrain.

Demographics

Sonoma County covers a relatively large geographic area of over 1,750 square miles, with a population of just over 500,000 people.[19] Sonoma County population is predicted to grow by 20 percent (over 25 years) by 2040, while employment is predicted to grow by 34 percent.[20] Countywide travel is expected to increase by more than one-third because of the addition of population and jobs.

The County's median household income ($64,240) is slightly higher than the State's median income, but lower than any other county in the Bay Area.[21] Sonoma County households are smaller than the Bay Area average and the population density is approximately 307 people per square mile. Santa Rosa is the fifth most populous city in the San Francisco Bay Area[22]

3.4 Major Traffic Generators and Travel Mode Share

As the only major north-south route connecting San Francisco to Santa Rosa and the North Coast, US 101 serves local and regional traffic, linking commuters to major employment centers, supporting interregional travel and goods movement, and providing access to medical and educational institutions and recreational attractions.

[19] US Census 2010, 2016 estimate
[20] From 483,878 residents in 2010 to 574,031 in 2040. Employment growth is 192,010 in 2010 to 257,450 in 2040. Source: Sonoma County Transportation Authority (SCTA), Moving Forward 2040: Comprehensive Transportation Plan (2017).
[21] US Census 2010, 2016 estimate
[22] US Census 2010, 2016 estimate

Marin County

Traffic Generators

The majority of Marin County jobs are located in cities near the US 101 Corridor, with the highest numbers in San Rafael and Novato. Notable employment centers include: Downtown Novato, Hamilton Air Force Base Redevelopment Area, Terra Linda, Smith Ranch, Downtown San Rafael and southeastern San Rafael, as well as areas in Larkspur, Corte Madera and northern Sausalito.[23] Many educational and medical institutions are located along the Corridor, including the Golden Gate Baptist Theological Seminary, College of Marin and College of Marin's Indian Valley Campus, San Francisco Theological Seminary and Dominican University, as well as Marin General Hospital, Novato Community Hospital, and Kaiser Medical Center in San Rafael. An employment density map of this area is included in Appendix A.

Marin County shares with San Francisco one of the most heavily visited National Recreation Areas in the country, with approximately 15 million annual visitors to the Golden Gate National Recreation Area.[24] Additional recreational trip generators include Mt. Tamalpais State Park and National Monument, Point Reyes National Seashore, various State and regional parks, and State beaches. These areas are generally accessed through southern Marin County via US 101 and SR 1.

Travel Mode Share

As of 2015, approximately 79 percent of work trips in Marin County were made by car, ten percent by transit and five percent by biking or walking.[25] Ten percent of Marin residents worked from home. It is estimated that residents who work in the County drive approximately 17 miles per day and non-resident workers drive approximately 49 miles per day.[26] Meanwhile, the average Bay Area driver travels 15.3 miles per day. [27]

Transit is provided by an extensive network of express buses, local transit, and the newly operational commuter railway called Sonoma Marin Area Rail Transit (SMART), which generally parallels US 101 from Larkspur to Cloverdale. In conjunction with SMART, pedestrian and bicycle trails are also being constructed along the rail route. Transit is discussed in more detail in Chapter 4.

[23] Marin Transit, Short-Range Transit Plan (2016): http://www.marintransit.org/pdf/SRTP/2016-2025/2016-2025SRTP_FINAL.pdf
[24] National Park Service Statistics, Annual Park Ranking Report for Recreation Visits (2016): https://irma.nps.gov/Stats/SSRSReports/National%20Reports/Annual%20Park%20Ranking%20Report%20(1979%20-%20Last%20Calendar%20Year)
[25] Metropolitan Transportation Commission (MTC) Vital Signs, Commute Mode Choice – Marin
[26] Bay Area Air Quality Management District, Vehicle Miles by Jurisdiction (2015)
[27] Bay Area Air Quality Management District, Vehicle Miles by Jurisdiction (2015)

Sonoma County

Traffic Generators

In addition to employment centers in health care, education and social assistance, Sonoma County has a high-concentration of small businesses predominantly agriculture, tourism, and retail services which are dispersed throughout the County. The majority of Sonoma County residents work within the County (83 percent), while approximately 7.4 percent work in Marin County and 2.6 in San Francisco.[28] Meanwhile, the number of people who commute to the County continues to rise, with the majority of workers coming in from Marin County. The mean travel time for commuters is twenty-five minutes.[29] The recent North Bay wildfires, which destroyed approximately 6,600 structures in Sonoma County in October of 2017, are expected to impact these projections.

There are nine incorporated cities: Cloverdale, Cotati, Healdsburg, Petaluma, Rohnert Park, Santa Rosa, Sebastopol, Sonoma, and the Town of Windsor.[30] Seven of these cities are located along the US 101 Corridor. Major services, educational facilities, shopping centers, and approximately 75 percent of the total population are in these cities.[31] The fifth largest city in the Bay Area and county seat is Santa Rosa, which has a population of 173,071 (2015).[32] Major institutional trip generators include government offices, Sonoma State University in Rohnert Park, Santa Rosa Junior College, Charles M. Schulz–Sonoma County Airport in Santa Rosa, Petaluma Valley Hospital, Sutter Medical Center in Santa Rosa, Santa Rosa Memorial Hospital, Kaiser Medical Center in Santa Rosa, as well as industrial zones through Santa Rosa. Commercial and event destinations include the Sonoma County Fairgrounds in Santa Rosa, downtown Santa Rosa's regional mall, Petaluma's retail outlet mall, Graton Resort and River Rock Casino.

Traffic generators for travel and recreation are dispersed throughout the County. These include Sonoma County wineries, regional and State parks, historic towns, and resort areas such as Lake Sonoma and Guerneville along the Russian River. Sonoma is the largest producer of California wines, home to almost 60,000 acres of vineyards and more than 400 wineries. Within the County are 17 American Viticultural Areas.[33] The hospitality and tourism of Sonoma's wine industry comprises one out of ten jobs and provides almost $150 million in revenue for local and State governments.[34] Tourism is highest during weekends and summer months.

Travel Mode Share

Travel in Sonoma County is heavily oriented towards private vehicles, with a higher vehicle ownership rate than the Bay Area average and nearly 76 percent of commute trips made by people who drive

[28] US Census Bureau American Community Survey, 2009-2013 American Community Survey – Commuting Flows.
[29] US Census, 2011-2015 American Community Survey 5-Year Estimates (2015), Sonoma County: https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_15_5YR_S0801&prodType=table
[30] Sonoma County Transportation Agency (SCTA), Moving Forward 2040: Comprehensive Transportation Plan (2016)
[31] CA Department of Finance, 2015 Estimates
[32] CA Department of Finance, 2015 Estimates
[33] http://www.sonomacounty.com/destinations/wine-regions
[34] Sonoma County Economic Development Board, Sonoma County Indicators (2016): http://edb.sonoma-county.org/documents/sotc_2016/2016_Abridged_Indicators_Web_Draf_ADA.pdf

alone.[35] The County's dependency on personal vehicles for transportation is a result of dispersed land uses, an extensive road network, and the rural nature of much of the County. There are more road miles in Sonoma County than any other county in the Bay Area; fifty percent of the road miles are State highways. According to US Census estimates (2015), approximately 86 percent of commute trips were made by car, 1.9 percent by transit and 4.3 percent by walking or biking. Meanwhile, 6.5 percent of workers telecommuted. The remaining 1.3 percent of trips were made by other means.[36]

Sonoma County Transit provides local and intercity public transportation services in Sonoma County. The Sonoma-Marin Area Rail Transit (SMART) recently began passenger service from near the Charles M. Schulz–Sonoma County Airport to downtown San Rafael in August 2017. The Larkspur extension has been fully-funded. Construction will begin in 2017 and is expected to be completed in 2018. SMART service will be extended to Windsor, Healdsburg, and Cloverdale when funding becomes available. The rail extension is a potential candidate for SB 1 funding and is a high transportation priority for the North Bay. Transit is discussed in more detail in Chapter 4.

The Shift Sonoma County Low Carbon Transportation Action Plan, a collaboration between Sonoma County, the Sonoma County Transportation Authority (SCTA) and the Regional Climate Protection Authority (RCPA), offers solutions to reduce the County's greenhouse gas (GHG) emissions from transportation by half, while providing more mobility options to residents.[37] Building on the countywide Comprehensive Transportation Plan and Regional Climate Action Plan, Shift Sonoma explores barriers, opportunities, and actions to implement transportation demand management programs, shared mobility, and expand the use of electric vehicles. Since the Plan's implementation in Fall 2017, the County has introduced its first car-share program, and a countywide bike-share program is coming soon.

[35] US Census Bureau, 2011 - 2015, American Community Survey - Five Year Estimates
[36] US Census, 2011 - 2015 American Community Survey 5-Year Estimates (2015)
[37] http://scta.ca.gov/wp-content/uploads/2017/09/Shift-Sonoma-Plan_9-27-17-web.pdf

3.5 Plan Bay Area 2040

Plan Bay Area (PBA), the long-range transportation and land use strategy and Regional Transportation Plan (RTP) for the Bay Area, responds to Senate Bill 375 (2008), which requires each of the State's 18 metropolitan regions to develop a Sustainable Communities Strategy (SCS) to accommodate future population growth while reducing greenhouse gas emissions from cars and light trucks. In 2013, the Metropolitan Transportation Commission (MTC) produced the RTP with the Association of Bay Area Governments (ABAG) which is responsible for developing regional housing and employment forecasts. The Plan charts a course for reducing per capita greenhouse gas emissions through the promotion of more compact, mixed-use residential and commercial neighborhoods near transit. Plan Bay Area 2040 (2017), the strategic update, guides transportation investments and land-use decisions through 2040.

The regional forecast shows that between 2010 and 2040, the Bay Area is projected to grow from 3.4 million to 4.7 million jobs, while the population is projected to grow from 7.2 million to 9.5 million. As of 2015, almost half of the projected jobs have been added and nearly a quarter of the projected population growth has already occurred. During the same period, only 13 percent of projected household growth has occurred, due to financial conditions coming out of the Great Recession.[38]

There are over 30 projects and plans that have been incorporated into the RTP along the US 101 North Corridor.

Priority Development Areas

Building on the original plan (PBA 2013), PBA 2040 (2017) identifies 170 local *Priority Development Areas* (PDAs) as the focus for 78 percent of the Bay Area's household growth and 62 percent of its job growth occurring in PDAs. The Bay Area's biggest three cities and cities directly adjacent to the San Francisco Bay are projected to absorb most of the region's growth. Meanwhile inland, coastal and delta areas, such as Sonoma County and most areas of Marin County, will see comparatively less growth.

Marin County has for decades preserved its open space and managed growth through city-centered growth policies and focused development along the urbanized US 101 Corridor. There are two identified PDAs within the County (see Figure 3.3). The San Rafael Transit Center PDA, located in downtown San Rafael, provides residential, commercial and mixed use neighborhoods, and is served by both local and regional bus service, and passenger rail. The Marin County Unincorporated - US 101 PDA, consists of two distnict areas, Marin City, and a portion of the Cal Park Neighborhood near San Rafael. [39] Marin City, located south of SR 1 and within a half-mile of US 101, is predominantly residential with a high proportion of public and assisted housing, as well as other single and multi-family units. The Gateway Shopping Center, located adjacent to US 101 and at the entry to the community, houses numerous retail establishments serving Marin City and surrounding communities including restaurants, clothing stores, a drug store and other limited services. The Marin City public library also is located at the Gateway Shopping Center.

[38] MTC, Plan Bay Area 2040: Forecasting the Future (2017), https://mtc.ca.gov/sites/default/files/Final_Plan_Bay_Area_2040.pdf
[39] MTC Plan Bay Area 2040: PDAs and PCAs in Marin County (2017): http://www.planbayarea.org/sites/default/files/pdf/files/files10284.pdf

Sonoma County limits sprawl through voter-approved urban growth boundaries (UGBs), which have been in effect for decades. Local communities promote urban infill and encourage redevelopment in areas that can absorb higher densities through robust planning policies. As of 2016, Sonoma County jurisdictions have designated nineteen specific areas as priority locations for new development (twelve PDAs, six Rural Investment Areas (RIAs)[40], and one Employment Center). There are no PDAs designations within Unincorporated Sonoma County.[41]

Communities of Concern

Plan Bay Area also includes an Equity Analysis, which identifies *Communities of Concern*— areas with high concentrations of minorities, low-income individuals, Seniors above 75 years old, disabled, households without cars, persons with limited-English proficiency, single-parent households, and renters paying more than half of their household income to rent. Shown in Figures 3.2 and 3.3, Communities of Concern exist along the US 101 North Corridor in the southern unincorporated Marin County community of Marin City and eastern San Rafael in Marin County, and from Rohnert Park through northern Santa Rosa, along the Corridor in Sonoma County.[42]

Figure 3.2: Communities of Concern in Marin

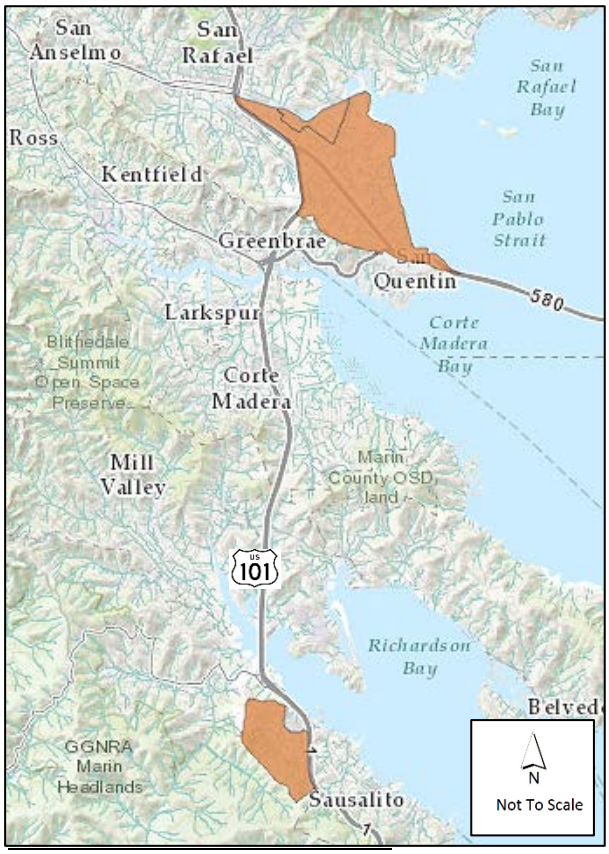
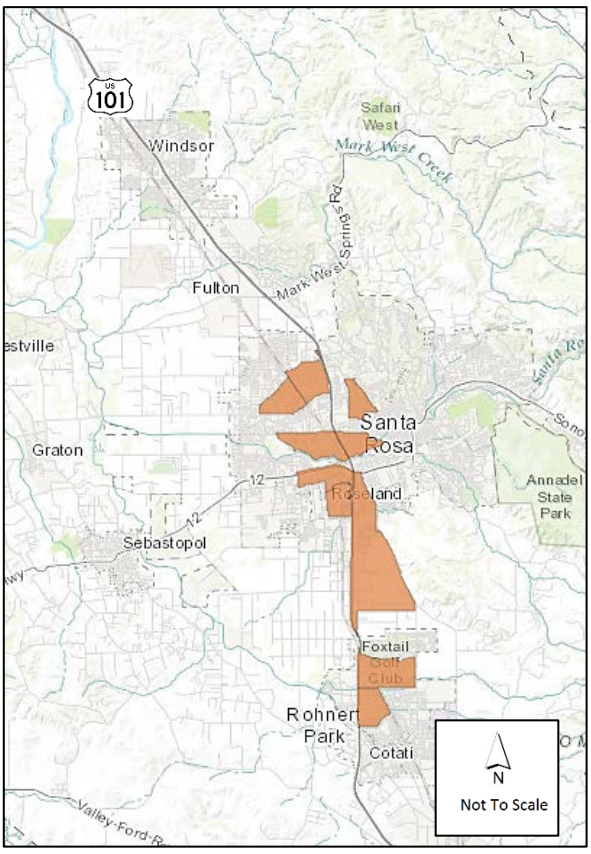


Figure 3.3: Communities of Concern in Sonoma



[40] RIAs are defined as centers and corridors of economic and community activity surrounded by agricultural, resource, or protected conservation lands. SCTA Moving Forward 2040.
[41] Sonoma County Transportation Agency (SCTA), Moving Forward 2040: Comprehensive Transportation Plan (2016)
[42] https://www.arcgis.com/home/item.html?id=7f9e8467c8e944869f2652cb2d0fdc8d#visualize

Priority Conservation Areas and Protected Lands

Plan Bay Area identifies one hundred regionally significant *Priority Conservation Areas* (PCAs) as lands in need of protection due to pressure from urban development. PCAs are identified through consensus by local jurisdictions and park/open space districts.

Marin County has the highest percentage of protected land within the Bay Area (almost 60 percent, according to the Bay Area Open Space Council). Marin County covers a geographic area of approximately 525 square miles, with nearly 400 square miles of identified Priority Conservation Areas. Approximately 225 square miles are publicly-owned protected areas, which include 195 miles of regional trails. There are 238 square miles of farmland; 130 square miles or approximately 55 percent of this farmland is protected.[43]

In Sonoma County, there are 870 square miles identified as Priority Conservation Areas, with 160 square miles that are publicly-accessible protected areas and 72 miles of regional trails. Sonoma County has 902 square miles of farmland; 179 square miles or approximately 20 percent of this farmland is protected.[44]

In 1990, Sonoma County residents created the Sonoma County Agricultural Preservation and Open Space District to permanently protect the greenbelts, scenic view sheds, farms and ranches and natural areas of Sonoma County. Sonoma County voters approved Measures A and C to create the District and enable a quarter-cent sales tax to fund District operations until 2011. The measure was renewed in 2006, ensuring the District will be funded through 2031.[45] Figures 3.4 and 3.5 show PDAs and PCAs within the US 101 North Corridor.

[43] Bay Area GreenPrint, Marin County: https://www.bayareagreenprint.org/report/
[44] Bay Area GreenPrint, Sonoma County: https://www.bayareagreenprint.org/report/
[45] Sonoma County Agricultural Preservation and Open Space District: http://www.sonomaopenspace.org/

Figure 3.4: Priority Development Areas and Priority Conservation Areas in Marin County

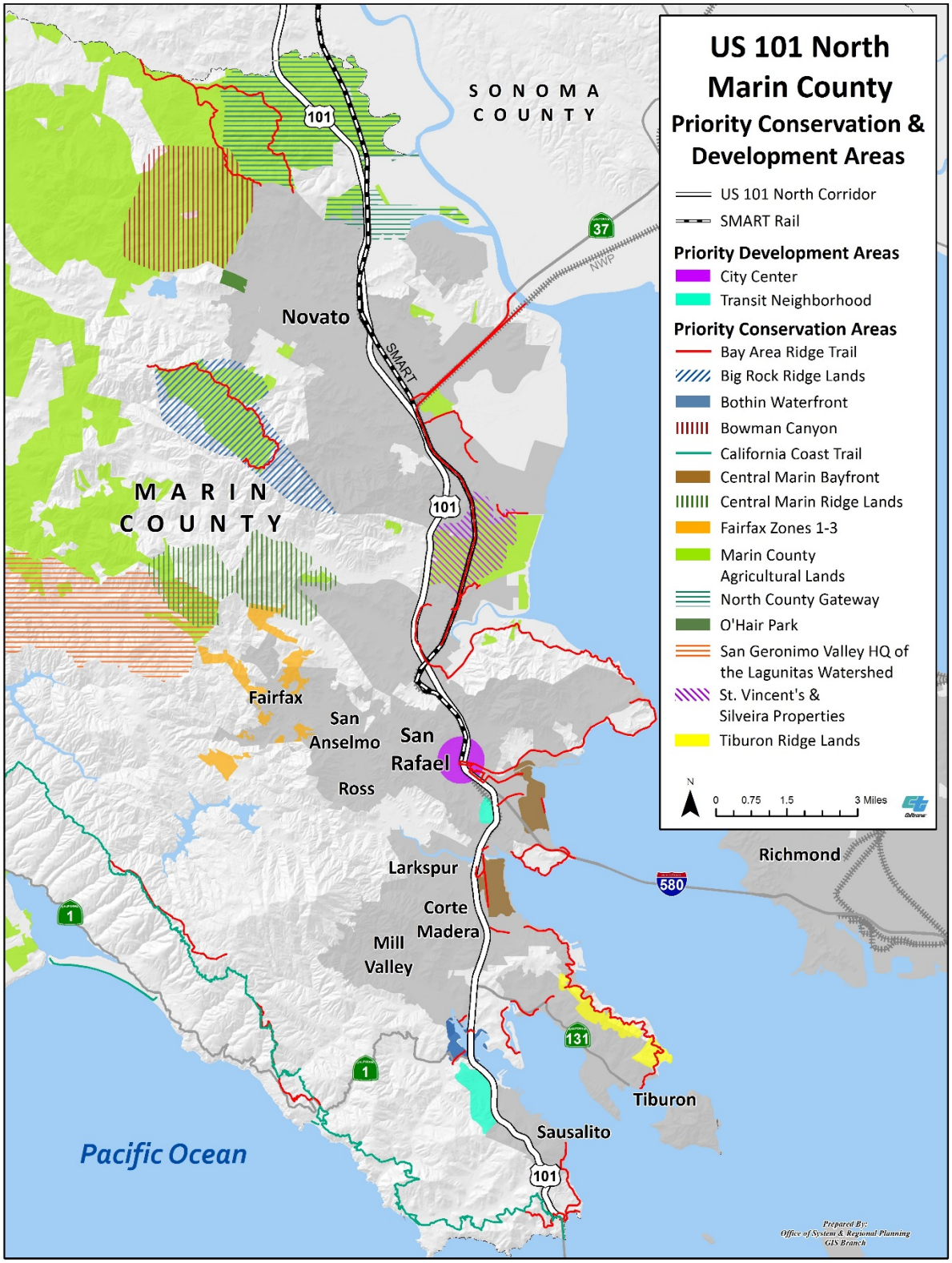
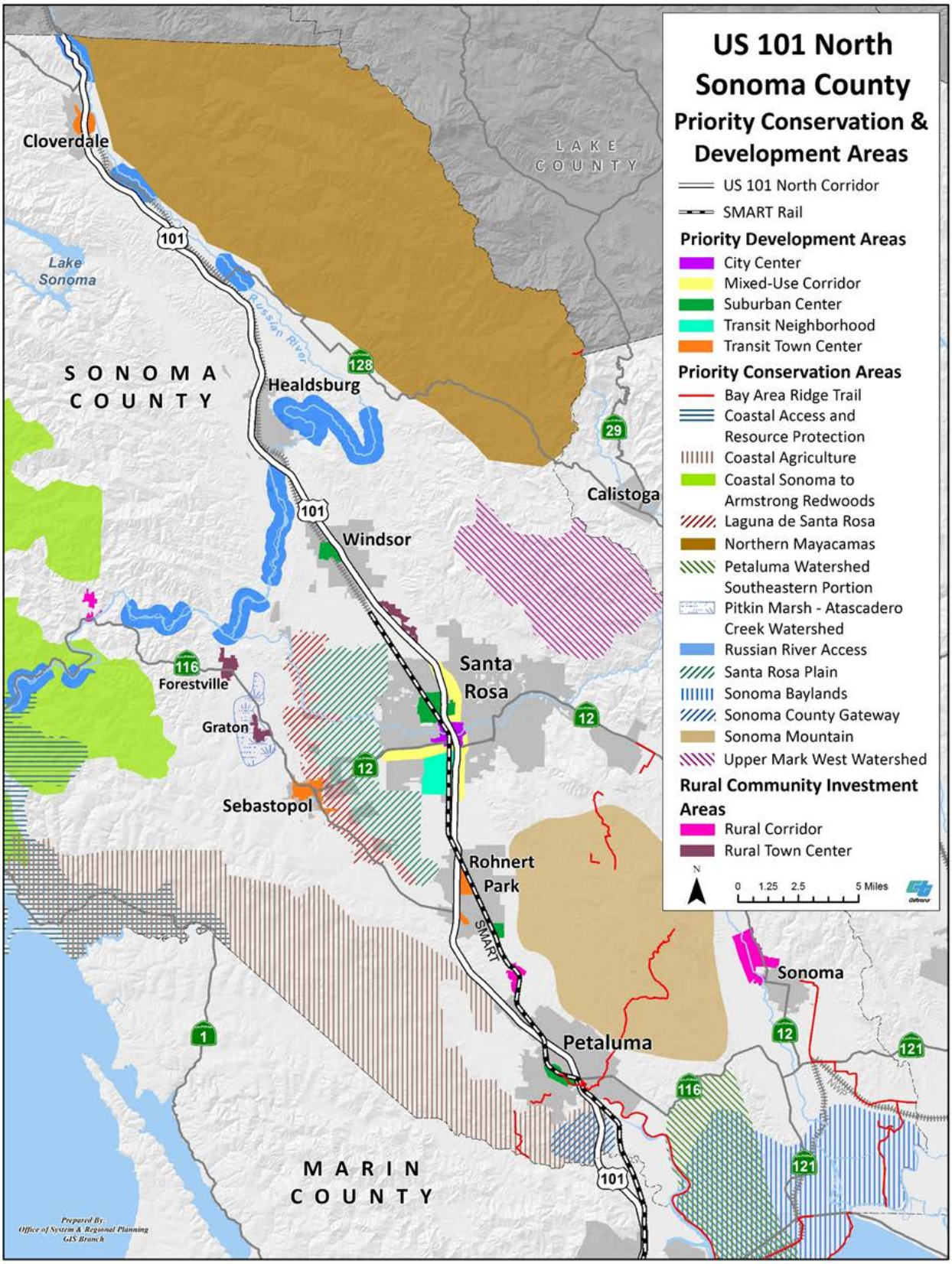


Figure 3.5: Priority Development Areas and Priority Conservation Areas in Sonoma County



3.6 Smart Mobility Framework

In response to the California Global Warming Solutions Act[46] and the Sustainable Communities and Climate Protection Act,[47] Caltrans introduced *Smart Mobility* to its Transportation Planning process by establishing the Smart Mobility Framework (SMF) in 2010.[48] Smart Mobility is a Planning tool that is built on six principles: Location Efficiency, Reliable Mobility, Health and Safety, Environmental Stewardship, Social Equity, and Robust Economy. The Location Efficiency principle identifies place types wherein implementation of specific transportation investments, along with planning and management strategies, will help improve location efficiency and achieve Smart Mobility benefits, including reduced Vehicle Miles Traveled (VMT) and Greenhouse Gas (GHG) emissions. Location efficient design supports convenient, non-motorized travel, and efficient vehicle trips at the neighborhood and area scale, and combines land use with a multi-modal transportation system to make destinations available through transit and High Occupant Vehicle (HOV) travel, and efficient vehicle trips at the regional scale. The following place types are a tool for general classification of towns, cities, and larger areas that can be used as the basis for making investment, planning, and management decisions to advance Smart Mobility:

1. Urban Centers
2. Close-in Compact Communities
3. Compact Communities
4. Suburban Communities
5. Rural and Agricultural Lands
6. Protected Lands
7. Special Use Areas

The use of place-based approaches to Planning and Design can help identify integrated transportation and land use planning activities as well as types of transportation projects and programs that may lead to increased location efficiency and yield Smart Mobility benefits. In Marin County, US 101 forms the urban spine. Situated within the periphery of the Bay Area's *Urban Center*, development along US 101 in Marin County largely consists of *Close-in Compact Communities*, with *Suburban Communities* located near the northern end. Sonoma County's developed areas are centered near US 101 as well, with a further distance from the Bay Area's *Urban Centers.* Towns and cities along the Corridor in Sonoma County vary between *Close-in Compact Communities*, *Compact Communities, Suburban Communities, and Rural Towns*. Meanwhile, the remaining areas of the County are rural and agricultural. Definitions of place types are shown in Table 3.2.

Table 3.2 also identifies the place types along the US 101 North Corridor and lists transportation priorities recommended by the SMF.

[46] AB 32, California Global Warming Solutions Act (2006): http://www.arb.ca.gov/cc/ab32/ab32.htm
[47] SB 375, Sustainable Communities and Climate Protection Act (2008): http://www.arb.ca.gov/cc/sb375/sb375.htm
[48] Smart Mobility 2010: A Call to Action for the New Decade, Caltrans, 2010.

Table 3.2: US 101 North Corridor Place Types

Place Type	Location	Likely Transportation Priorities
CLOSE-IN COMPACT COMMUNITIES Usually near *Urban Centers*; mostly residential - centered along arterials; transit primarily serves commute trips. Arterial corridors in these communities form the skeleton of the transportation system. **Close-In Compact *Centers:*** Small to medium sized downtowns, Transit Oriented Developments, institutions and centers of activity **Close-In Compact *Neighborhoods:*** Walkable, housing close to shops, services and public facilities. Good multi-modal connections to urban centers. Medium to high housing density, fine-grained street circulation with high comfort for pedestrians and bicyclists	***Centers:*** Downtown San Rafael and Downtown Santa Rosa ***Neighborhoods:*** Mill Valley, Corte Madera, Larkspur, Greenbrae, and Kentfield	• Reliability and efficiency measures to optimize street and freeway capacity • Street network connectivity • Extensive network of bike facilities • Continuous and high-amenity pedestrian facilities • Asset management of existing transportation facilities • HOV systems on freeways • High capacity transit stations that are accessible to all modes and have managed parking supply • High capacity commuter transit that links neighborhoods to employment centers • Local transit with excellent coverage • Complete Streets projects
COMPACT COMMUNITIES Historic cities/towns & newer places with strong presence of community design elements; outside metropolitan areas.	Petaluma and Downtown Novato	• Extensive bike network and bike share programs • High-amenity pedestrian facilities • Convenient multimodal and transit transfers • Design compatibility for all facilities • Re-investment of roadway facilities • Complete Streets
SUBURBAN COMMUNITIES Low integration of housing with jobs, retail/ services, low levels of transit service, abundant surface parking, poorly connected street networks & poor walking environment.	Greater Novato , Cotati, Rohnert Park, and Windsor	• Operational efficiency improvements to existing arterials & freeways • Connectivity improvements to shorten trip lengths & increase non-auto use • Complete Streets & Safe Routes to School investments • Access & speed management • Commuter transit & rideshare promotion • Park-and-ride lots
RURAL AND AGRICULTURAL LANDS Widely-spaced towns separated by farms, vineyards, orchards, or grazing lands; may include recreation & tourist destinations. **Rural *Towns:*** Provide a mix of housing, services and public institutions in compact form that serve surrounding areas. Vary in size from crossroads to towns offering a full range of services.	***Agricultural Lands:*** West County and North Novato , Unincorporated Areas ***Rural Towns:*** Sausalito , Healdsburg and Cloverdale	• Improve safety, connectivity and comfort of bicycle and pedestrian facilities • Demand-responsive transit to major destinations • Park-and-ride lots • Local and interregional network connectivity • Visitor-oriented transportation • Speed management
PROTECTED AREAS State & National Parks, Wildlife Refuges etc.	Marin Headlands, Corte Madera Marsh, Ignacio Valley and La Loma Olompali, Annadel and Shiloh Ranch	• Capacity & connectivity increases only when required • Bicycle & trail facilities where public access is permitted

3.7 Environmental Scan

The US North Corridor is primarily located within valleys and lowlands that are bounded to the west by the outer coastal range and to the east by the inner coastal range. The natural environment is remarkable for its variety and richness of resources. Natural communities include coastal wetlands, oak woodlands, riparian communities, mixed scrub and annual grasses. The area is home to many federal and State endangered and/or threatened species, such as the Saltmarsh Harvest Mouse, California Tiger Salamander, Red Legged Frog, Central California Coast Steelhead and North American Green Sturgeon. Surface body waters range from seasonal and perennial creeks to sloughs, wetlands, and rivers with tidal influences draining into major watersheds. Examples of surface body waters include the Russian River, Petaluma River, San Pablo Bay and San Francisco Bay.

The purpose of this section is to provide a brief summary of potential environmental factors that may require future analysis during the project development processes. However, this information may not represent all environmental considerations that exist within the corridor vicinity. Potential environmental issues along the Corridor area may include the presence of hazardous materials or facilities, habitats of threatened or potentially threatened species, as well as fragile wetlands. Additional maps show Tribal lands and areas prone to sea level rise inundation.

3.7.1 Geography

Contrasting with the densely populated City of San Francisco, southern Marin County (between Highway 1 and the Golden Gate Bridge) is largely in a natural state. Marin's southern peninsula is bounded by rocky cliffs and occasional beaches, and is part of the Golden Gate National Recreation Area. Evolving in a harsh coastal area, the vegetation is dominated by coastal scrub and coastal prairie, wetland habitat, and forest. Several forest types are found nearby including redwood and mixed evergreen forest, oak woodlands, and riparian forests. The area is home to a high floral diversity and is considered the center of the *California Floristic Province*.[49] As the Corridor moves north through Larkspur and San Rafael, it passes hills and valleys that are primarily urbanized, but include small patches of oak woodlands and narrow bands of freshwater. Moving north through Novato and across the Marin/Sonoma County line into Petaluma, the corridor area becomes less developed and is primarily dominated by coastal salt and brackish marshlands, with a broad plain west and north of the San Pablo Bay.

The area between Petaluma and Windsor in Sonoma County is a broad valley with a combination of urban centers, suburban neighborhoods, and rural areas, some of which are currently undergoing development. Natural plant communities along the Corridor include non-native grasslands, oak woodlands, freshwater marshes, and seasonal wetlands with vernal pools. The northern section of the Corridor from Windsor to Cloverdale is warmer and drier than the areas south, where natural

[49] The California Floristic Province is one of only five regions in the world with a Mediterranean climate of mild, wet winters and extended, dry summers. This climate encourages plants to adapt to long seasons without rain. The California Floristic Province is home to high floral diversity and unique assemblages rivaled only by the equatorial rainforests.
National Park Service, Golden Gate Recreation Area: https://www.nps.gov/goga/learn/nature/plants.htm

communities along the Corridor tend to be dry oak woodlands and scrub, with some areas of non-native grasslands.

3.7.2 Sea Level Rise

Sea level rise (SLR) is one of the best documented and widely accepted impacts of climate change. Observation of sea levels along the California coast and of global climate models, indicates that areas along the San Francisco Bay will experience rising sea levels of sixteen inches by mid-century (2050) and up to 55 inches by the end of this century.[50]

The effects of SLR and flooding are expected to increasingly impact transportation infrastructure in low-lying coastal areas, including bay front communities in Marin County as well as along the southern border of Sonoma County. Inundation of even small segments of the intermodal transportation system can render much larger portions impassable, disrupting connectivity and access to the wider transportation network.[51] Figure 3.6 reveals areas in which transportation assets and other facilities would be vulnerable to the overlapping risks of inundation and flood hazard by wave and tidal action. There are a few studies related to SLR in Marin and Sonoma Counties, including Caltrans Climate Change Vulnerability Assessment Report, the Marin County Vulnerability Assessment, and the Adapting to Rising Tides Program. Please see details in Appendix B.

3.7.3 Native American Tribes

The Pomo, Coast Miwok, and Wappo peoples were the earliest human settlers of Sonoma County. Artifacts found at Tolay Lake in southern Sonoma County date back as far as 4000 years,[52] while the Coast Miwok occupation of Olompali Historic State Park dates back even further. Most of the Native Americans belonged to the Pomo group and lived in Central and Western regions of Sonoma County and were linked by language and cultural expression.

Today there are six federally-recognized tribes within the Bay Area. Tribal Lands in Sonoma County include Cloverdale Rancheria, Dry Creek Rancheria, Lytton Rancheria, Stewarts Point Rancheria and Graton Rancheria. Figure 3.7 shows a map of tribal lands; Cloverdale Rancheria and Dry Creek Rancheria Band of Pomo Indians and Graton Federated Indians of Graton Rancheria are located within vicinity of the US 101 North Corridor.

It is critical that State and local governments collaborate with Tribal agencies during the Transportation Planning process.

---

[50] The Federal Emergency Management Agency (FEMA), the Pacific Institute, the California Bay Coastal Development Commission (BCDC) and the U.S. Geological Survey have prepared inundation maps for the San Mateo County shoreline.

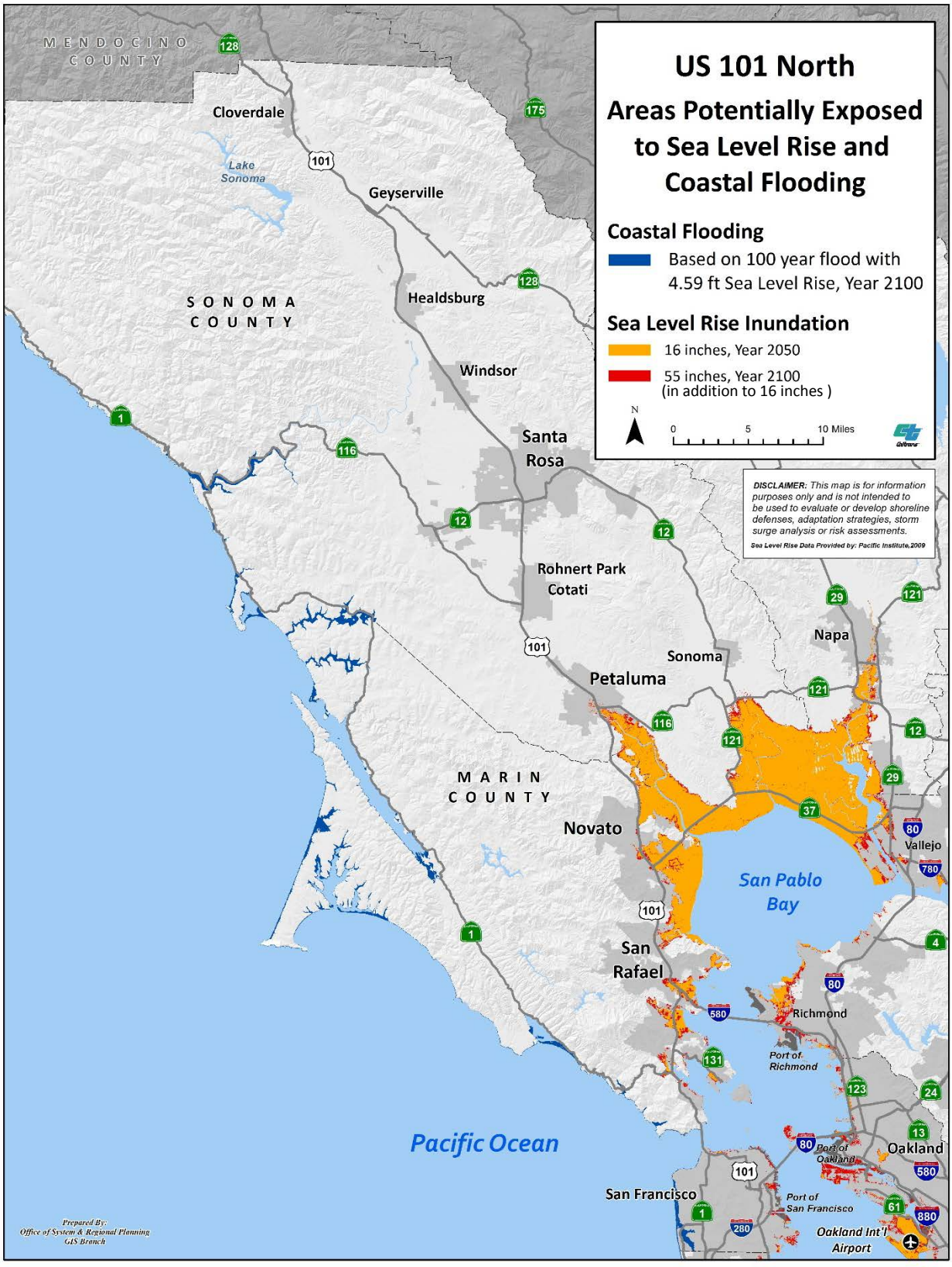
[51] *Guidance on Incorporating Sea Level Rise*, Caltrans Climate Change Workgroup, per California Ocean Protection Council Resolution of March 2011.

[52] Tolay Lake Park Natural and Cultural History, County of Sonoma Regional Parks Department (Archived 2008-02-03) https://web.archive.org/web/20080203214948/http://www.sonoma-county.org/parks/pk_tolay_history.htm

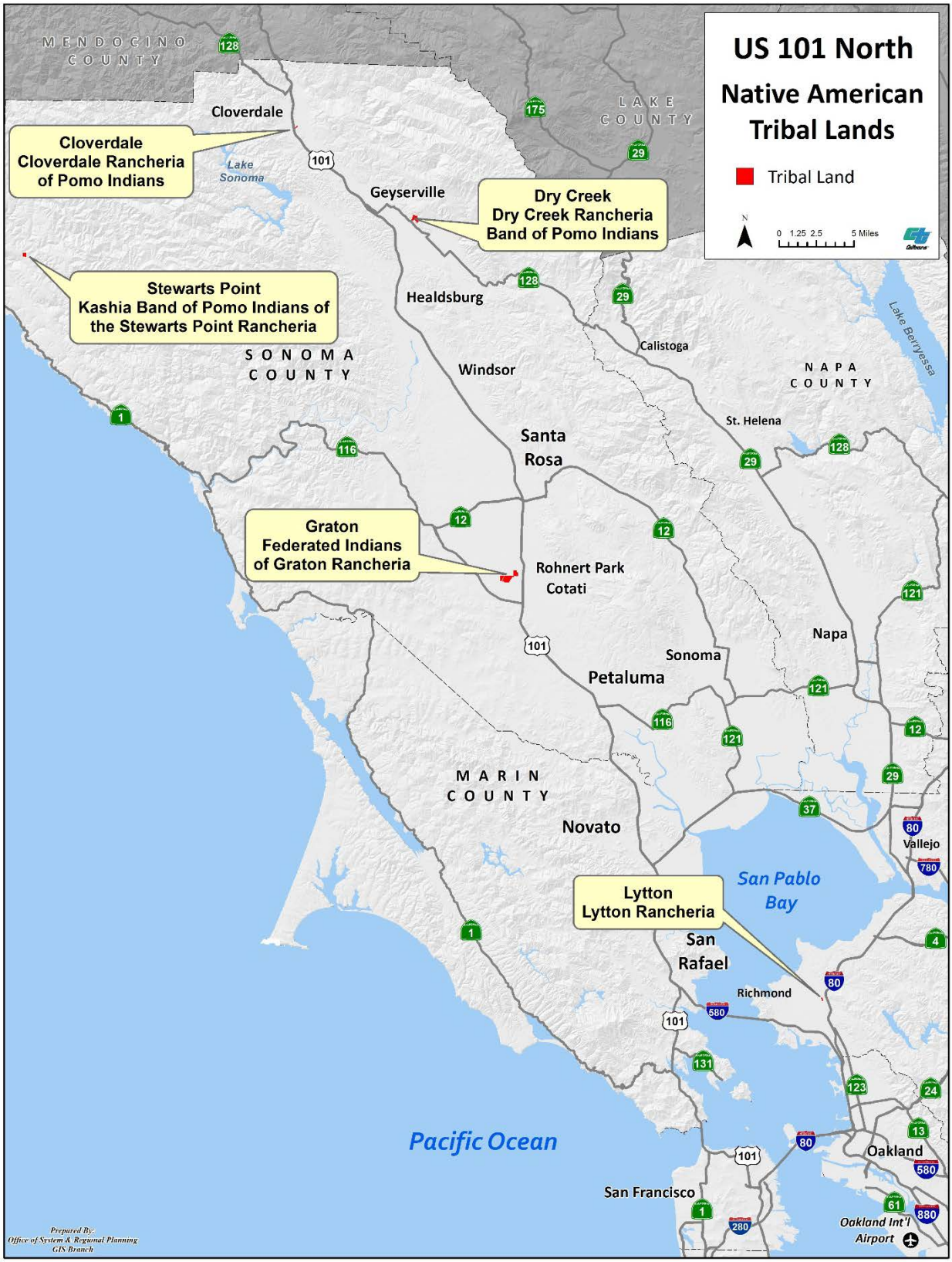
3.7.4 Historic and Cultural Resources

Typically a historic resource is defined as a building, a structure, or a district, that is determined to be significant based on federal criteria. Marin County has 44 federally-listed historic landmarks, while Sonoma County has about 190. The following are located within the US 101 North Corridor: Santa Rosa Depot Park on Wilson Street, Northwestern Pacific Railroad Station on Fourth Street in Santa Rosa, and the Warehouse on West Sixth Street in Santa Rosa.

Fiaure 3.6: Sea Level Rise and Coastal Inundation Areas



Fiaure 3.7: Federallv Recoanized Tribal Lands near the US 101 Corridor



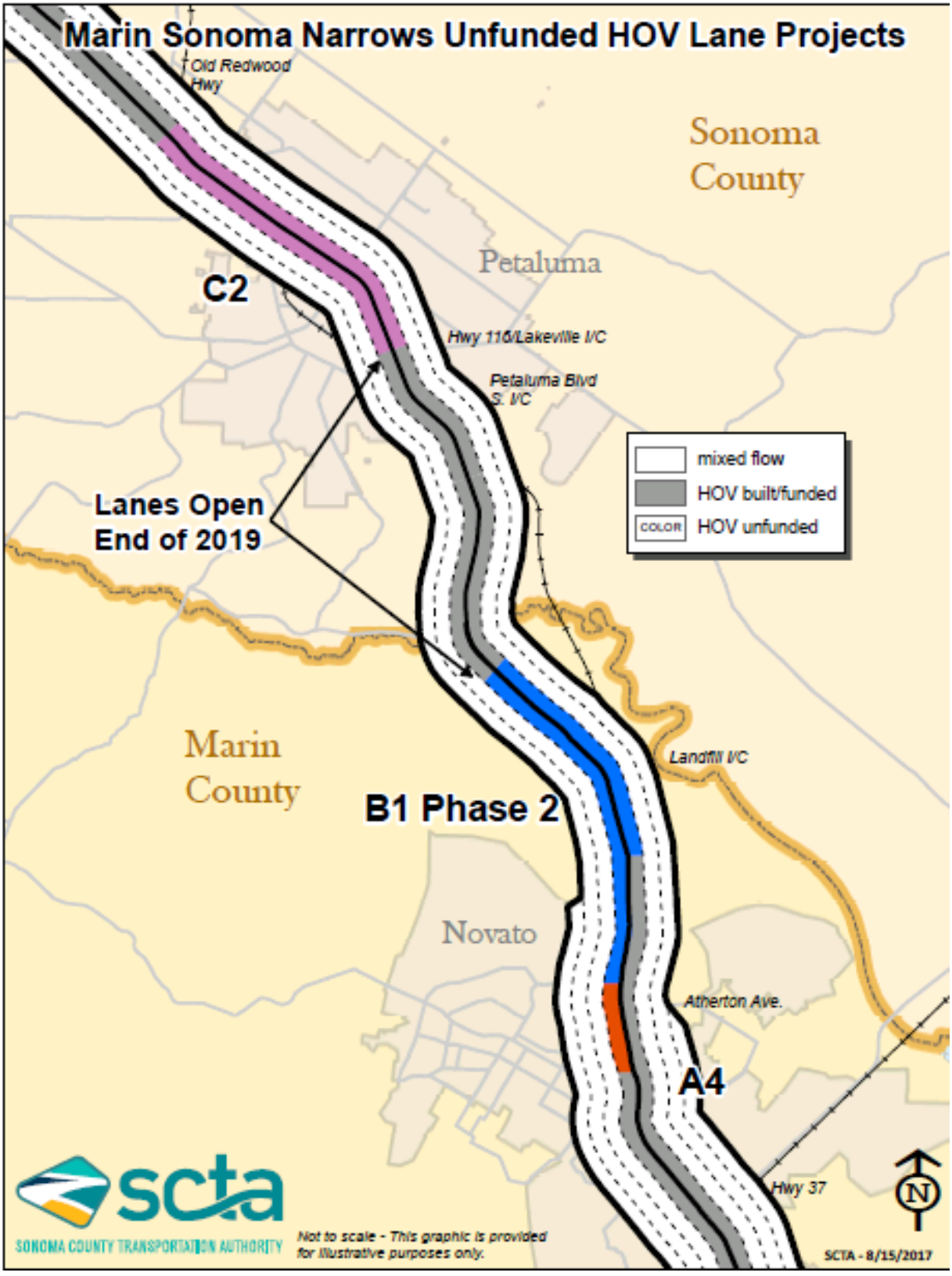
3.7.5 Mitigation Measures

The Draft Guidelines for the 2018 Solutions for Congested Corridors Program states that projects eligible for funding include direct mitigation of a transportation project or facility funded under the Congested Corridors Program, including restoration or protection of critical habitat and open space.

One major project this US 101 North Congested Corridor Plan includes is the unfunded portion of the US 101 Marin-Sonoma Narrows (MSN) High Occupancy Vehicle (HOV) Widening Project, see Figure 3.8. The MSN project includes roadway widening and realignment as well as new and upgraded interchanges and bridges. In 2012, Caltrans developed the US 101 MSN HOV Widening Project Mitigation and Monitoring Plan to document the mitigation plan for the MSN HOV Widening Project. Caltrans also purchased nine wetland credits from the Burdell Ranch Wetland Bank in 2010 to mitigate unavoidable impacts to wetlands as a result of the MSN project.

More environmental factors along US 101 N are discussed in Appendix C.

Figure 3.8: US 101 MSN HOV Widening Project (Unfunded Portion)



CHAPTER 4: MULTIMODAL FACILITIES - EXISTING CONDITIONS AND NEEDS IDENTIFICATION

As a multimodal transportation corridor, the US 101 N Corridor serves the movement of people and goods in a variety of transportation modes. This chapter describes public transit services, Park-and-Ride facilities, the private commuter shuttle services, and bicycle and pedestrian facilities as critical transportation modes within the US 101 North Corridor. It also identifies programmed, planned and in some cases proposed projects within the Corridor. In addition, the chapter summarizes the Transportation Systems Management and Operations (TSMO) strategies and equipment that are currently deployed within the Corridor and examines the networks and major trip generators for freight movement.

At the State level, Caltrans Deputy Directive DD-64-R2 requires Caltrans to provide for the needs of travelers of all ages and abilities in all planning, programming, design, construction, operations, and maintenance activities and products of the State highway system. DD-64-R2 also requires Caltrans develop integrated multimodal projects and facilitate bicycle, pedestrian, and transit travel by creating a network of "Complete Streets".[53] At the regional level, the Bay Area's Metropolitan Planning Organization, Metropolitan Transportation Commission (MTC), has developed policy and guidance on complete streets as well.

4.1 Transit Services and Park-and-Ride

Transportation in the San Francisco Bay Area relies on a complex multimodal system consisting of roads, bridges, highways, rail, tunnels, airports, and bike and pedestrian paths. The Bay Area Rapid Transit (BART) is the primary regional transit operator but does not provide service in Marin or Sonoma Counties. Its extensive train network connects San Francisco with Peninsula and East Bay cities and the international airports (the San Francisco International Airport and the Oakland International Airport). Transportation in Marin and Sonoma counties relies on US 101, with regional bus service provided by transit agencies such as Golden Gate Transit, and Sonoma County Transit. Local bus operators like Marin Transit and Santa Rosa CityBus also rely on US 101 for their services.

Sonoma-Marin Area Rail Transit (SMART) is a new transportation option, offering passenger rail service in Sonoma and Marin Counties along the US 101 N Corridor. The initial 43 miles of rail corridor includes ten stations, from downtown San Rafael to the Sonoma County Airport. The entire system will include 70 miles of passenger rail service, connecting passengers with jobs, education centers, retail hubs and housing along the US 101 N Corridor, and a bicycle-pedestrian pathway, generally within or adjacent to the rail corridor, including a combination of Class I and Class II bicycle facilities.[54]

Other transportation services near the Corridor include ferry and other mobility services such as private commuter shuttles and paratransit services. In addition, there are more than twenty Park-and-Ride lots

[53] http://www.dot.ca.gov/hq/tpp/offices/ocp/docs/dd_64_r2.pdf
[54] http://www.sonomamarintrain.org/

near the US 101 Corridor that provide parking for drivers to join carpools or vanpools, or connect to public transit. The following sections will discuss the transit services and Park-and-Ride facilities.

4.1.1 Rail Transit Services - SMART

In August of 2017, SMART began offering passenger rail service in Sonoma and Marin Counties, along an initial 43 miles of rail corridor with ten stations, from downtown San Rafael to the Sonoma County Airport. At build out, the rail service will include 15 stations and 70 miles of passenger rail from the Larkspur Ferry Terminal, with connecting service to San Francisco, and as far north as Cloverdale. The project also includes a bicycle-pedestrian pathway, generally within or adjacent to the rail corridor, with a combination of Class I and Class II bicycle facilities.[55]

SMART purchased the previously long-dormant publicly-owned right of way of the former Northwestern Pacific (NWP) Railroad line. The tracks are shared with freight rail, which have been active since 2011. SMART is currently constructing the southern extension of the passenger rail line to the Larkspur Ferry terminal station. The northern extension from its current terminus at the Sonoma County Airport will include segments to Windsor, Healdsburg and north to Cloverdale. There are two additional planned stations within the current operating segment, including Novato Downtown and Petaluma North.

An operations and maintenance facility for the entire line is located adjacent to the Sonoma County Airport station on Airport Boulevard, north of Santa Rosa. SMART uses “light” self-powered Diesel Multiple Unit (DMU) vehicles that comply with the latest federal Tier IV emissions standards, quieter and cleaner than conventional locomotive-hauled equipment.

SMART service currently focuses on passengers commuting to work with 17 round trips each weekday. Operations began with seven two-car train sets that carry up to 158 seated passengers, 160 standing passengers, and provide on-board storage of up to 24 bikes. Additional cars resulting in three-car train sets, in use for popular trips, increase seating capacity by 52 percent during the peak hour, or up to approximately 480 seated and standing passengers per train.

Southbound service begins at 4:19 A.M. with a final train at 6:49 P.M., while northbound service runs from 5:59 A.M. to 8:35 P.M. There are five round trips on weekends with the first train (southbound) departing at 10:13 A.M. and the final train (northbound) leaving at 8:50 P.M. The 43-mile initial operating segment takes one hour and seven minutes, traveling at an average of 38.5 miles per hour (62.0 km/h).

The SMART train is an important alternative to the car, which will provide the backbone of an integrated transportation system that optimizes mass transit, bike, and pedestrian travel.

[55] http://www.sonomamarintrain.org/

Figure 4.1: SMART Train Route ***Source: SMART, 2017***

4.1.2 Bus Transit Services

Several bus operators provide service within Sonoma and Marin County, each covering specific communities. Marin Transit provides local transit service, including fixed route, paratransit and dial-a-ride services in Marin County. Golden Gate Transit offers regional transit service and commuter routes to and from Marin County and San Francisco. Sonoma County Transit operates intercity and local routes throughout Sonoma County, including cities along the US 101 N Corridor, Sonoma Valley to the east, and the City of Sebastopol and Russian River areas to the west. Santa Rosa CityBus and Petaluma provide local transit service within the two largest cities in the County. The Mendocino Transit Authority provides inter-county service between Santa Rosa and Ukiah in Mendocino County, and to several communities along the Sonoma/Mendocino County coast. Napa Vine Transit has indicated interest in serving directly the SMART system and Marin Transit provides dial-a-ride services from West Marin into Petaluma. Table 4.1 summarizes the number of routes and buses by operator. Table 4.2 shows the transportation mode share by county.

Table 4.1 Bus Transit Services in Marin and Sonoma Counties, 2015

Operator	Number of Routes	Number of Buses in Fleet
Golden Gate Transit	6	180
Marin Transit	28	130[56]
Petaluma Transit	6	12
Santa Rosa CityBus	17	39
Sonoma County Transit	23	50
Mendocino Transit Authority	5	N/A

Table 4.2: Transportation Mode Share by County (2014)

	Marin County	Sonoma County
Automobile	75.2	85.4
Transit	10.4	2.1
Walk	2.9	3.8
Other	1.9	1.9
Telecommute	9.6	6.8

U.S. Census Bureau: American Community Survey Population Statistics

Golden Gate Bridge, Highway and Transportation District

Based in San Francisco, the Golden Gate Bridge, Highway and Transportation District operates the Golden Gate Bridge, and two public transit systems: Golden Gate Transit (GGT) buses and Golden Gate Ferry. The District provides commuter and regional bus service via US 101 to San Francisco. GGT provides regional fixed-route bus service in San Francisco, Marin and Sonoma Counties. Bus service is also available between San Rafael in central Marin and the El Cerrito del Norte and Richmond BART

[56] http://www.marintransit.org/pdf/SRTP/2016-2025/2016-2025SRTP_FINAL_D-Fleet.pdf

stations in western Contra Costa County via the Richmond-San Rafael Bridge. GGT also provides local bus service under a contract administered by Marin Transit.

Marin County Transit District (Marin Transit)

Marin Transit provides local transit services in Marin County including local fixed route services, supplemental school services, rural service, and paratransit service. Marin transit contracts with Golden Gate Transit, Marin Airporter, MV Transportation, and Whistlestop Transportation to provide services, and coordinates senior and mobility services within the County through Marin Access. [57]

Sonoma County Transit

Sonoma County Transit offers connections to local transit services provided by Santa Rosa CityBus and Petaluma Transit. Sonoma County Transit provides links to Mendocino Transit Authority (MTA) for service to the Sonoma/Mendocino County coast and Golden Gate Transit for regional service to Marin and San Francisco Counties. Sonoma County Transit also operates express buses from Santa Rosa to Petaluma and Cloverdale as well as between the Sonoma and San Rafael.

Petaluma Transit

Petaluma Transit provides local service in Petaluma and connections to Sonoma County Transit and Golden Gate Transit and SMART for intercity trips.

Santa Rosa CityBus

Santa Rosa CityBus provides fixed-route service within the City limits, with most buses operating in loop routes. There are eighteen fixed routes with wheelchair accessible, low-floor buses, which can accommodate up to two bikes on the bike rack attached to the front of each bus. The CityBus route structure is designed around a timed-transfer method of providing service. Buses serving different routes arrive and depart at the downtown Transit Mall and other designated transfer locations.[58]

Mendocino Transit Authority

Mendocino Transit Authority (MTA) provides public transit services for Mendocino County with a service area of 2,800 square miles and a population of 90,000. MTA provides a diverse system of long distance, commute, and local fixed routes, plus two dial-a-rides and one Flex Route. Currently MTA operates twelve fixed bus routes, connecting the Mendocino Coast, the inland valleys, towns and communities to Ukiah, the County seat. Two routes connect most of Mendocino County with the City of Santa Rosa in Sonoma County, where passengers can make connections for travel to the Bay Area.

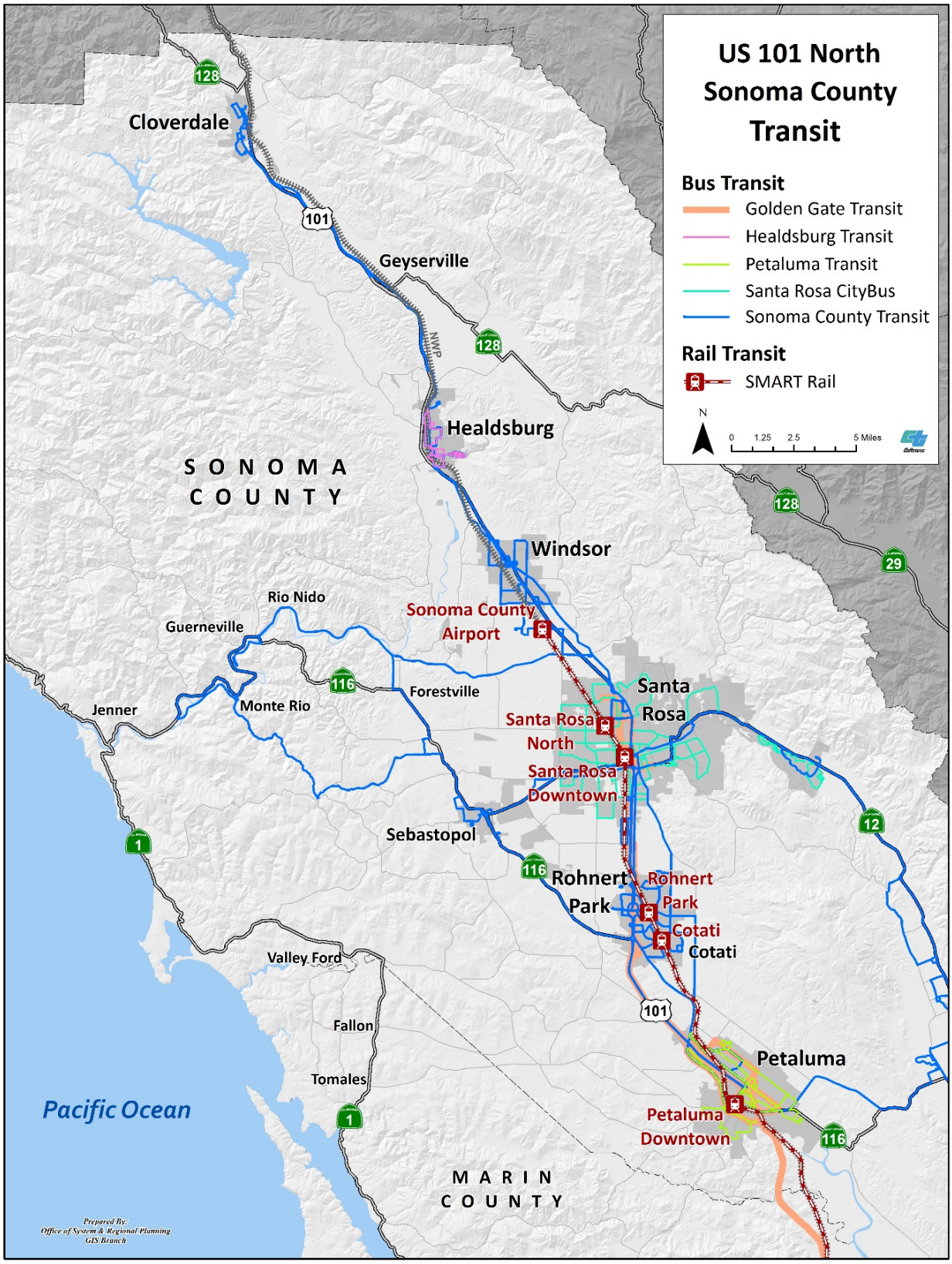
MTA provides daily connections in Santa Rosa with Sonoma County Transit, Santa Rosa City Bus, AMTRAK, and Golden Gate Transit for regional services to Marin and San Francisco. MTA also provides daily connections with the Sonoma County Airport Express at the Sonoma County Airport for services to and from Bay Area airports. Transit services in the US 101 North Corridor are illustrated in the Marin County and Sonoma County transit maps below.

---

[57] http://www.marintransit.org/index.html
[58] http://sctransit.com/

Figure 4.2: Transit services in the US 101 North Corridor – Marin County

Figure 4.3: Transit services in the US 101 North Corridor – Sonoma County



Express Bus Services

Golden Gate Transit operates express bus services along the US 101 Corridor in Sonoma and Marin Counties, continuing service on to San Francisco. Sonoma County Transit provides express bus services in Sonoma County. The commuter buses are distinguished by limited stops, as compared to "basic trunk line" service. Tables 4.3 and 4.4 summarize the express bus routes:

Table 4.3: Golden Gate Transit Commuter Buses

Route	From	To
2	Sausalito	SF Financial District
4	Mill Valley	SF Financial District
8	Tiburon	SF Financial District
18	College of Marin	SF Financial District
24	Fairfax	SF Financial District
25	Fairfax	Larkspur Ferry
27	San Anselmo	SF Financial District
38	Terra Linda	SF Financial District
40/42	San Rafael	El Cerrito Del Norte BART Station
44	Lucas Valley	SF Financial District
54	Novato/San Martin	SF Financial District
56	San Martin	SF Financial District
70	Novato	San Rafael
72/72X	Santa Rosa	SF Financial District
74	Santa Rosa	SF Financial District
76	East Petaluma	SF Financial District
92	Marin City	SF Financial District
93	Golden Gate Bridge Toll Plaza	SF Financial District
97	Larkspur Ferry Terminal	SF Financial District
101X	Santa Rosa	SF Financial District

Source: goldengatetransit.org 2017

Table 4.4: Sonoma County Transit Express Bus Routes

Route	From	To
48	Santa Rosa	Rohnert Park, Cotati, Petaluma
56	Santa Rosa	Windsor, Healdsburg, Cloverdale
60	Santa Rosa	Windsor, Cloverdale

Source: sctransit.com 2017

4.1.3 Ferry Service

Along the US 101 North Corridor, the private service Blue and Gold Fleet and the public service Golden Gate Ferries provide ferry service between San Francisco and Sausalito, Tiburon, and Larkspur. Modern high-speed ferryboats are used in both of these water commute systems.

Golden Gate Ferry operates frequent ferry service between San Francisco and Larkspur in central Marin County, and between San Francisco and Sausalito and Tiburon in southern Marin County. Extra service is also offered from Larkspur to AT&T Park for Giants home games and other sporting and music events. [59]

In September 2017 Golden Gate Transit began operating Route 31, the *Wave* shuttle, between the San Rafael Transit Center and Larkspur Ferry Terminal – connecting SMART trains with Golden Gate Ferries. This free shuttle runs daily, connecting seven trips in each direction on weekdays and three trips in each direction on weekends. Route 31 trips are timed to SMART and Golden Gate Ferry schedules, not to bus schedules at the San Rafael Transit Center.

The largest ferry system on San Francisco Bay today is operated by the Blue and Gold Fleet, which connects San Francisco with North Bay destinations of Sausalito, Tiburon, and more remotely, Vallejo. Blue and Gold Fleet also provides ferry and water excursion services on San Francisco Bay. In addition to sightseeing cruises, Blue and Gold Fleet also provides regular ferry service to Sausalito, Tiburon and Angel Island. Since 2011, Blue and Gold Fleet began operating ferry service from Alameda/Oakland, Vallejo, Harbor Bay and South San Francisco. [60]

4.1.4 Transit Hubs

There are several transit hubs in the Corridor providing connection points for the transit services. The Santa Rosa Downtown Transit Mall is the largest in Sonoma County and is estimated to serve thirty routes and over 10,000 passengers daily. The Santa Rosa Transit Mall feeds into the Santa Rosa Avenue/Mendocino Avenue corridor, which has the highest ridership in the County, providing roughly 7,000 trips a day, between CityBus, Sonoma County Transit and Golden Gate Transit. Transit Hubs in Marin County include the Bettini Transit Center in downtown San Rafael which serves 9,000 passengers daily.

Bus operators in Sonoma County have been working with SMART to coordinate bus connectivity to SMART rail stations. SMART Station Area Plans are being conducted with local jurisdictions, in cooperation with MTC and SMART, to evaluate land uses and infrastructure. Additional transit hubs have been constructed at or adjacent to several of the future SMART stations. Some of the facilities also serve as park-and-ride lots. These transit hubs include:

- San Rafael Bettini Transit center — Serves SMART, Golden Gate Transit, Marin transit, private airport services, and taxis, and has a Caltrans Park-and-Ride. Completed in 2016.
- Marin Civic Center SMART — Served by Marin Transit. Completed in 2016.

[59] http://goldengatetransit.org/
[60] https://www.blueandgoldfleet.com

- Petaluma Transit Mall — Transfer hub for Petaluma Transit, Sonoma County Transit, and Golden Gate Transit. The downtown Petaluma SMART station is located just east of the Transit Mall. Completed in 2005.
- Cotati Depot — Transfer hub for Sonoma County Transit and Park-and-Ride lot. Completed in 2015.
- Windsor Depot — Transfer hub for Sonoma County Transit (including feeder bus routes to SMART). Completed in 2007.
- Healdsburg Historic Depot — Transfer hub for Sonoma County Transit (including feeder bus routes to SMART) and Park-and-Ride lot. Construction began in 2015.
- Cloverdale Depot — Transfer hub for Sonoma County Transit (including feeder bus routes to SMART), feeder bus route to Amtrak, and Park-and-Ride lot. Completed in 1998.

4.1.5 Park-and-Ride Lots

There are several existing Park-and-Ride facilities along the Corridor. Their location, size, and usage are summarized in Table 4.5 and Figure 4.4.

Table 4.5: Park-and-Ride Lots along US 101 in North Marin and Sonoma Counties

Lot	County	Ro	P.M.	City/Location	Owner	Space	Usage	Transit Agency
1	Marin	101	1.5	Sausalito/Spencer Ave. & Monte Mar Dr.	Caltrans	48	306%	GGT
2	Marin	131	3.8	West of Tiburon Blvd at Lyford Drive	Caltrans	50	N/A	
3	Marin	101	4.1	Marin City/Manzanita, US 101 and SR 1	Caltrans	303	55%	GGT, Marin Transit
4	Marin	101	4.8	Mill Valley/De Silva & Redwood Hwy front	Caltrans	59	88%	GGT, Marin Transit
5	Marin	101	8.6	Greenbrae/Sir Francis Drake Blvd.	GGT	50	N/A	GGT
6	Marin	101	10.8	San Rafael/Hetherton St. & 4th St. & 5th St. (3 lots)	Caltrans	160	95%	GGT, SCT, SMART
7	Marin	101	11.2	San Rafael/Irwin St. & Mission Ave.	GGT	31	N/A	GGT SCT
8	Marin	101	12.2	San Rafael/Lincoln Ave & Prospect Dr.	Caltrans	42	57%	GGT
9	Marin	101	14.7	San Rafael/Smith Ranch Rd.	Caltrans	186	105%	GGT, Marin Transit
10	Marin	101	16.6	Novato/Alameda del Prado & Nave Dr.	Caltrans	100	100%	GGT, Marin Transit
11	Marin	101	20.2	Novato/Rowland Blvd.	Caltrans	240	38%	GGT
12	Marin	37	13.8	N of SR 37 at Atherton Ave/Glen Rd.	Caltrans	30	N/A	
13	Marin	101	22.0	Novato/Atherton Ave.	Caltrans	58	98%	GGT
14	Sonoma	101	2.9	Petaluma/S. Petaluma Blvd. & US 101	Caltrans	36	86%	GGT
15	Sonoma	101	3.6	Petaluma/Lakeville St. & SR 116	Caltrans	134	96%	GGT
16	Sonoma	101	4.7	Petaluma/Washington St. & Payran St.	SCT	600	N/A	GGT, SCT, Petaluma
17	Sonoma	101	12.7	Cotati/SR 116 & St. Joseph Way	Caltrans	166	6%	GGT
18	Sonoma	101	12.7	Cotati/Redwood Dr. & SR 116	SCT	76	N/A	GGT, SCT, Solano County Transit
19	Sonoma	101	13.8	Rohnert Park/US 101 & Rohnert Park Expy.	Caltrans	316	69%	GGT, SCT
20	Sonoma	101	14.9	Rohnert Park/Roberts Lake Rd. & Golf Links Dr.	Caltrans	169	77%	GGT
21	Sonoma	12	16.3	Under SR 12, W of Brookwood Ave, N of Bennett Valley Rd.	Caltrans	179	60%	GGT, City Bus
22	Sonoma	101	22.5	Santa Rosa/Piner Rd. & Industrial Way	SCT	209	N/A	GGT, Santa Rosa City
23	Sonoma	101	24.8	Fulton/River Rd. & US 101	SCT	31	N/A	SCT
24	Sonoma	101	31.3	Windsor/Old Redwood Hwy &US 101 SB onramp	SCT	41	N/A	SCT
25	Sonoma	101	33.4	Healdsburg/Grant Ave & Healdsburg Ave.	SCT	66	N/A	SCT
26	Sonoma	101	43.3	Geyserville/SR 128 & Remmell St.	SCT	36	N/A	SCT
27	Sonoma	101	47.8	Cloverdale/Asti Rd. & Citrus Fair Dr.	SCT	87	N/A	SCT

SCT = Sonoma County Transit GGT=Golden Gate Transit *Source: 511.org & Caltrans Park & Ride Lot Usage 2016*

4.1.6 Transit Bus Pads on US 101 Ramps

In addition to the Park-and-Ride lots, Golden Gate Transit, Marin Transit, and Sonoma County Transit make use of "bus pads" so that buses can serve intermediate stops along the Corridor without leaving the freeway. Though relatively inexpensive to build, the bus pad has a number of downsides. For example, passengers have to wait at the edge of a freeway, transfers can be difficult, and some pads require a long walk from the freeway to surface streets. The following table summarizes the bus pads on US 101 N.

Table 4.6: Transit Bus Pads on US 101 N

County	Location	City/Neighborhood	Transit Operator
Marin	Spencer Avenue	Sausalito	Golden Gate Transit
	Seminary Drive	Mills Valley	Golden Gate Transit
	Tiburon Wye	Mills Valley	Golden Gate Transit
	Paradise Drive	Corte Madera	Golden Gate Transit
	Lucky Drive	Larkspur	Golden Gate Transit
	N. San Pedro Road	San Rafael	Golden Gate Transit
	Terra Linda/ Freitas Parkway	San Rafael	Golden Gate Transit
	Lucas Valley Road/Smith Ranch Road	San Rafael	Golden Gate Transit
	Marinwood	San Rafael	Golden Gate Transit
	Tamalpais Drive	Corte Madera	Marin Transit
	Alameda del Prado	Novato	Golden Gate Transit
	Ignacio Boulevard	Novato	Golden Gate Transit/ Marin Transit
	Rowland Boulevard	Novato	Golden Gate Transit/ Marin Transit
	DeLong Avenue	Novato	Golden Gate Transit/ Marin Transit
Sonoma	Rohnert Park Expressway	Rohnert Park	Golden Gate Transit/ Sonoma County Transit

Source: 511.org

4.1.7 Other Mobility Services

Both Marin and Sonoma Counties provide a range of mobility services to meet the wide range of mobility needs in the corridor. Volunteer driver programs also help meet the transportation needs of disabled and Senior residents in Sonoma and Marin Counties. Volunteers currently provide rides for medical and social service appointments to seniors, visually challenged Seniors, and others who are unable to use local public transportation.

The Sonoma County Area Agency on Aging and Marin Transit in Marin County currently manage several mobility programs that support the expansion of Senior and mobility-impaired services including catch-a-ride and taxi voucher programs, paratransit services, ADA services and volunteer driver programs. Both Sonoma and Marin Counties provide mobility management services including coordination of volunteer driver programs, ride training, travel navigators, and coordination of health care transportation.

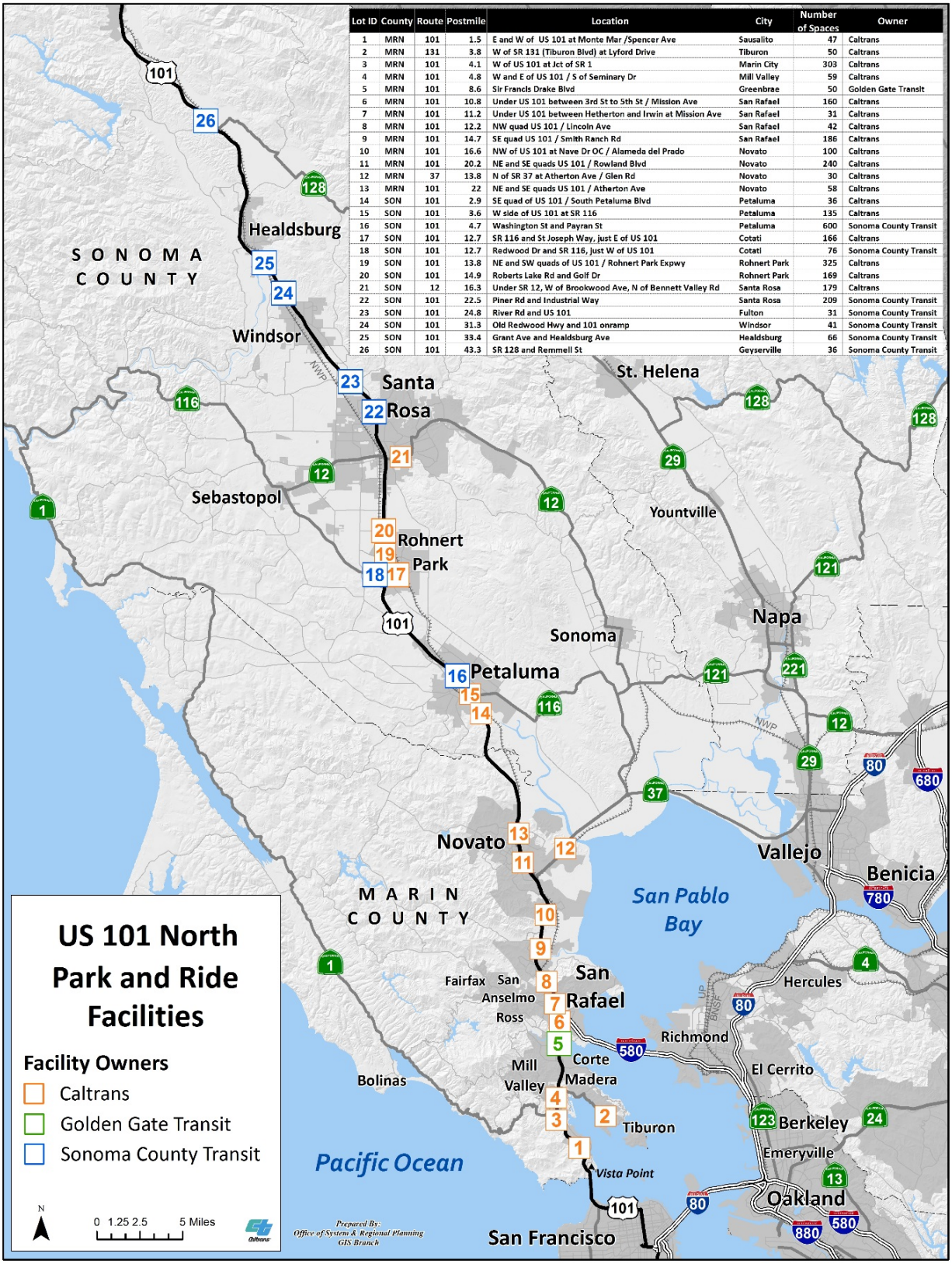
4.2 Private Commuter Shuttle Services

Private Commuter Shuttles (Shuttle) are the private sector's response to increased spatial mismatch between housing and jobs in the Bay Area. They have been in operation since 2004 in San Francisco.[61] A Shuttle operator essentially provides direct private transit service from one location, to an employer's company campus. The primary mission of companies that provide Shuttle service for their employees, is to locate high-density clusters of where employees live, then provide a shuttle to those areas and transport employees in and out of work for the day. That means that the origins and the routes of Shuttle trips can change with the location of the employees. The Shuttles are typically owned and operated in a variety of ways, including private charter bus companies in contract with a sole employer, buses owned by the employer directly, or by third parties serving multiple employers.

The Shuttle services have been successful and have seen a lot of growth in the Bay Area. In 2014, the combined 35 Shuttle operators reached 25 million Vehicle Miles Traveled (VMT), an increase from 16 million VMT just two years prior. There are only eleven shuttle round trips from or to Marin and Sonoma Counties, less than two percent of the regional total. Private shuttle services in Marin and Sonoma Counties have the potential to grow while lessening freeway traffic congestion related to employment growth.

[61] *Policy Analysis Memo to County of San Francisco Board of Supervisors*, March 2014.

Figure 4.4: US 101 N Park-and-Ride Facilities



Lot ID	County	Route	Postmile	Location	City	Number of Spaces	Owner
1	MRN	101	1.5	E and W of US 101 at Monte Mar /Spencer Ave	Sausalito	47	Caltrans
2	MRN	131	3.8	W of SR 131 (Tiburon Blvd) at Lyford Drive	Tiburon	50	Caltrans
3	MRN	101	4.1	W of US 101 at Jct of SR 1	Marin City	303	Caltrans
4	MRN	101	4.8	W and E of US 101 / S of Seminary Dr	Mill Valley	59	Caltrans
5	MRN	101	8.6	Sir Francis Drake Blvd	Greenbrae	50	Golden Gate Transit
6	MRN	101	10.8	Under US 101 between 3rd St to 5th St / Mission Ave	San Rafael	160	Caltrans
7	MRN	101	11.2	Under US 101 between Hetherton and Irwin at Mission Ave	San Rafael	31	Caltrans
8	MRN	101	12.2	NW quad US 101 / Lincoln Ave	San Rafael	42	Caltrans
9	MRN	101	14.7	SE quad US 101 / Smith Ranch Rd	San Rafael	186	Caltrans
10	MRN	101	16.6	NW of US 101 at Nave Dr OC / Alameda del Prado	Novato	100	Caltrans
11	MRN	101	20.2	NE and SE quads US 101 / Rowland Blvd	Novato	240	Caltrans
12	MRN	37	13.8	N of SR 37 at Atherton Ave / Glen Rd	Novato	30	Caltrans
13	MRN	101	22	NE and SE quads US 101 / Atherton Ave	Novato	58	Caltrans
14	SON	101	2.9	SE quad of US 101 / South Petaluma Blvd	Petaluma	36	Caltrans
15	SON	101	3.6	W side of US 101 at SR 116	Petaluma	135	Caltrans
16	SON	101	4.7	Washington St and Payran St	Petaluma	600	Sonoma County Transit
17	SON	101	12.7	SR 116 and St Joseph Way, just E of US 101	Cotati	166	Caltrans
18	SON	101	12.7	Redwood Dr and SR 116, just W of US 101	Cotati	76	Sonoma County Transit
19	SON	101	13.8	NE and SW quads of US 101 / Rohnert Park Expwy	Rohnert Park	325	Caltrans
20	SON	101	14.9	Roberts Lake Rd and Golf Dr	Rohnert Park	169	Caltrans
21	SON	12	16.3	Under SR 12, W of Brookwood Ave, N of Bennett Valley Rd	Santa Rosa	179	Caltrans
22	SON	101	22.5	Piner Rd and Industrial Way	Santa Rosa	209	Sonoma County Transit
23	SON	101	24.8	River Rd and US 101	Fulton	31	Sonoma County Transit
24	SON	101	31.3	Old Redwood Hwy and 101 onramp	Windsor	41	Sonoma County Transit
25	SON	101	33.4	Grant Ave and Healdsburg Ave	Healdsburg	66	Sonoma County Transit
26	SON	101	43.3	SR 128 and Remmell St	Geyserville	36	Sonoma County Transit

4.3 Bicycle and Pedestrian Facilities

Bicycle and pedestrian facilities are vital components of a multimodal transportation network. Active transportation is integral to corridor planning, encompassing a myriad of benefits. Nearly every journey contains an aspect of active transportation. Due to the generally mountainous topography of Marin and Sonoma Counties, the US 101 North Corridor bicycle/pedestrian network is not always contiguous. This section examines the active transportation network parallel to US 101, identifies the needs of bicyclists and pedestrians, and proposes improvements along the Corridor.

4.3.1 Policy Overview: Local Plans

In addition to the State and regional policies on Complete Streets, Sonoma County and cities in Marin County have adopted their own bicycle and pedestrian plans, outlining the policy goals as well as identifying bicycle and pedestrian needs within each jurisdiction.

The Transportation Authority of Marin (TAM)[62] works with the County and cities to create a cohesive, accessible and safer network for bicyclists and pedestrians. Bicycle and pedestrian plans for each city and unincorporated Marin County guide the development of connected bicycle and pedestrian networks.[63] TAM is facilitating a coordinated update of bicycle and pedestrian master plans, and the process is expected to be completed in 2017.[64]

WalkBikeMarin[65] is an initiative by the County of Marin to help make Marin County more healthy, livable, and environmentally sustainable by encouraging walking and bicycling as everyday transportation. This initiative was catalyzed by a $25 million federal grant to fund the Non-motorized Transportation Pilot Program (NTPP). The goal of the WalkBikeMarin website is to provide information about all the County's bicycle and pedestrian projects and programs in one place.

The Sonoma County Transportation Authority (SCTA) updated its *Countywide Bicycle and Pedestrian Master Plan*[66] *in* 2014. The goal of the plan is to develop and maintain a comprehensive countywide bicycle and pedestrian transportation system, which includes projects, programs, and policies that work together to provide safe and efficient transportation opportunities for bicyclists and pedestrians.

SCTA staff routinely updates the Countywide Bicycle and Pedestrian Master Plan and online maps with new locally-approved bicycle and pedestrian projects. SCTA staff has been coordinating with Caltrans and the County Bicycle and Pedestrian Advisory Committee on the District 4 Bicycle Plan, which focuses on bicycle network gaps and barriers around the State Highway System. A review of policy goals is scheduled to begin this year, for adoption in 2019.

---

[62] https://www.tam.ca.gov/overview/
[63] https://www.tam.ca.gov/planning/bicycle-pedestrian-plans-2/
[64] http://www.walkbikemarin.org/
[65] http://www.walkbikemarin.org/
[66] https://scta.ca.gov/wp-content/uploads/2016/07/BikePedPlanUpdate2014_final.pdf

4.3.2 North-South Greenway, SMART Multi-Use Trail, and MSN Multi-Use Path

The envisioned North-South Greenway is a 25-mile bicycle and pedestrian corridor which starts at the Golden Gate Bridge and connects Sausalito, Mill Valley, Corte Madera, Larkspur, San Rafael, Novato, and Sonoma County, generally following the old Northwestern Pacific (NWP) railroad alignment. [67] With the opening of Cal Park Tunnel, the Lincoln Hill Pathway and the Enfrente Pathway, the SMART pathway project and other projects, the North-South Greenway has come to fruition, but gaps exist.

As part of the North-South Greenway project, TAM is partnering with Marin County, Caltrans, the City of Larkspur, the Town of Corte Madera, and MTC to close a gap between the Central Marin Ferry Connector and the existing multi-use paths at the intersection of Old Redwood Highway and Wornum Drive.[68] The recently completed Central Marin Ferry Connector Project provided bicycle and pedestrian access across Sir Francis Drake Boulevard in Larkspur.[69]

The SMART rail system, when complete, will carry passengers from San Rafael and the Larkspur Ferry to Cloverdale, a seventy-mile trip. The SMART trains have space for twenty bicycles aboard the trains, thereby further supporting the bike-to-transit combination. The bicycle could become an important link with SMART in its ability to complete the first and last mile of the commute. [70] The entire SMART rail system will also have a Class I facility alongside the tracks, roughly parallel to US 101. The SMART multi-use trail maps are shown in Appendix G.

The Marin-Sonoma Narrows Project includes a continuous bike/pedestrian pathway along San Antonio Creek, connecting San Antonio frontage road with Petaluma Boulevard.

4.3.3 Planned Improvements

Planned improvements to bicycle and pedestrian facilities are from a variety of sources, including:

- Projects identified in county and city bicycle and pedestrian plans;
- An updated project list from each CMA as part of the US 101 N CCP development;
- Caltrans District 4 Bicycle Plan (on-going), and
- Bicycle and pedestrian needs along the Corridor identified by Caltrans District Planners.

[67] http://www.walkbikemarin.org/documents/BMP/FinalAdopted08/Plan.pdf
[68] http://www.nsgreenwaygapclosure.com/
[69] https://www.tam.ca.gov/projects-programs/central-marin-ferry-connection/
[70] https://scta.ca.gov/wp-content/uploads/2016/07/BikePedPlanUpdate2014_final.pdf

Obstacles to a continuous pedestrian and bicycle network exist near US 101 N on and off-ramps. The following strategies [71,72] should be considered to ensure safety and provide connections for multi-modal travel:

- Reconstruct ramps to intersect crossroads at ninety-degree angles with as short a crossing distance as possible and installing stop or signal control.
- Lower vehicle speeds at intersections and interchange ramps.
- Locate crosswalks where speeds are lowest and visibility is highest.
- Shorten crosswalk distances.
- Stripe high-visibility crosswalks at all intersections and ramps so bicyclists can travel straight across.
- Provide appropriate bicycle facilities (Class II, III, IV, or sharrows) on streets through intersections and interchanges.
- Bicycle lanes should generally be to the left of dedicated right-turn lanes
- Provide signage, yield lines, crosswalks, or pedestrian-actuated beacons at intersections and interchange ramps.
- Provide sidewalks on both sides of overcrossings.
- Construct single, rather than dual, right-turn only lanes.
- If dual right-turn only lanes are required, channelize and split into two separate movements.
- For ramp crossings, add pedestrian signals coordinated with adjacent traffic signals.
- Install pedestrian signal push buttons.
- Where possible, provide six-foot wide (minimum) sidewalks and eight-foot wide (minimum) striped shoulders on both sides of the roadway
- Provide “no right-turn on red” signs or signals where there are two right-turn lanes
- Add buffers to bike lanes

The bicycle and pedestrian projects are included in Tables 6.4 through 6.8 in Chapter 6 Recommended Strategies.

[71] Complete Intersections: A guide to reconstruct intersections and interchanges for bicyclists and pedestrians (Caltrans, 2010) https://altaplanning.com/wp-content/uploads/Complete-Intersections-A-Guide-to-Reconstructing-Intersections-and-Interchanges-for-Bicyclists-and-Pedestrians.pdf

[72] http://www.divergingdiamond.com/

4.4 Transportation Systems Management and Operations (TSMO)

Caltrans is committed to effective TSMO to optimize the performance of California's transportation systems for all users and modes of travel. Successful TSMO requires proactive integration of the transportation systems to efficiently move people and goods along highly congested urban corridors. Examples of TSMO strategies include, but are not limited to, ramp metering, traffic signal synchronization, Intelligent Transportation Systems/Traffic Operations Systems (ITS/TOS), and managed lanes. Efficiency can often be achieved by operational improvements through ITS deployments. These include four types of traffic management for improving throughput:

- System management for recurring localized congestion (ramp metering, managed lanes, traveler information, dynamic speed limits, traffic signal and transit priority, parking management systems and automated vehicles).
- Incident management for non-recurrent congestion (detection-verification-response, Closed-Circuit Television (CCTV), Changeable Message Signs (CMS), Highway Advisory Radio (HAR), weather detection, traveler information system).
- Event management for emergencies, disasters and other occurrences (through system monitoring, evacuation management, route selection).
- Asset Management for managing existing infrastructure and other assets to deliver an agreed standard of service. One of the first steps in the efficient management of the transportation system will be the completion and implementation of a Transportation Asset Management Plan.

As TSMO strategies are developed and implemented, additional ITS/TOS elements within the corridor are often required. Caltrans Strategic Management Plan 2015–2020 has a Strategic Objective to "effectively manage transportation assets by implementing the asset management plan and embracing a fix-it-first philosophy." The plan specifies a target of maintaining 90 percent or better ITS/TOS element health by 2020. Operations and maintenance (O&M) resources are essential to achieve this fix-it first target. As more ITS/TOS elements are implemented, O&M resource needs will continue to grow.

Existing ITS infrastructure on the US 101 N Corridor includes ramp meters, Traffic Monitoring Station (TMS), CCTV, CMS, Variable Message Sign (VMS), Extinguishable Message Sign (EMS), and HAR.

Figures 4.5 through 4.8 illustrates the TOS elements along the US 101 N Corridor. Detailed TOS and Ramp Metering information is in Appendix D. Caltrans District 4 has established informal guidelines for positioning TOS elements along a freeway corridor, shown in Appendix D.

Figure 4.5: US-101 North Corridor Traffic Monitoring Stations (TMS) – Marin County

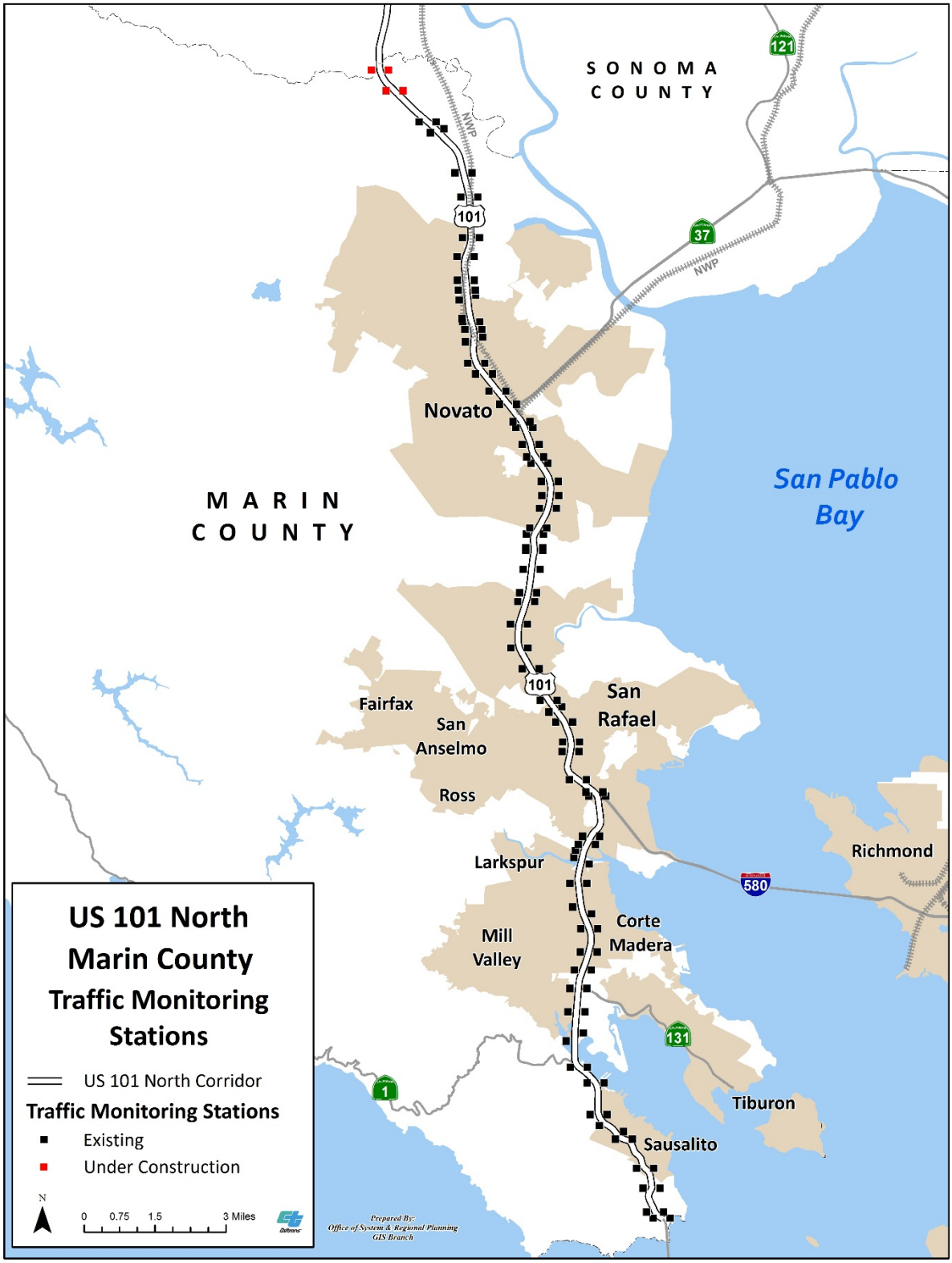


Figure 4.6: US-101 North Corridor Traffic Monitoring Stations (TMS) - Sonoma County

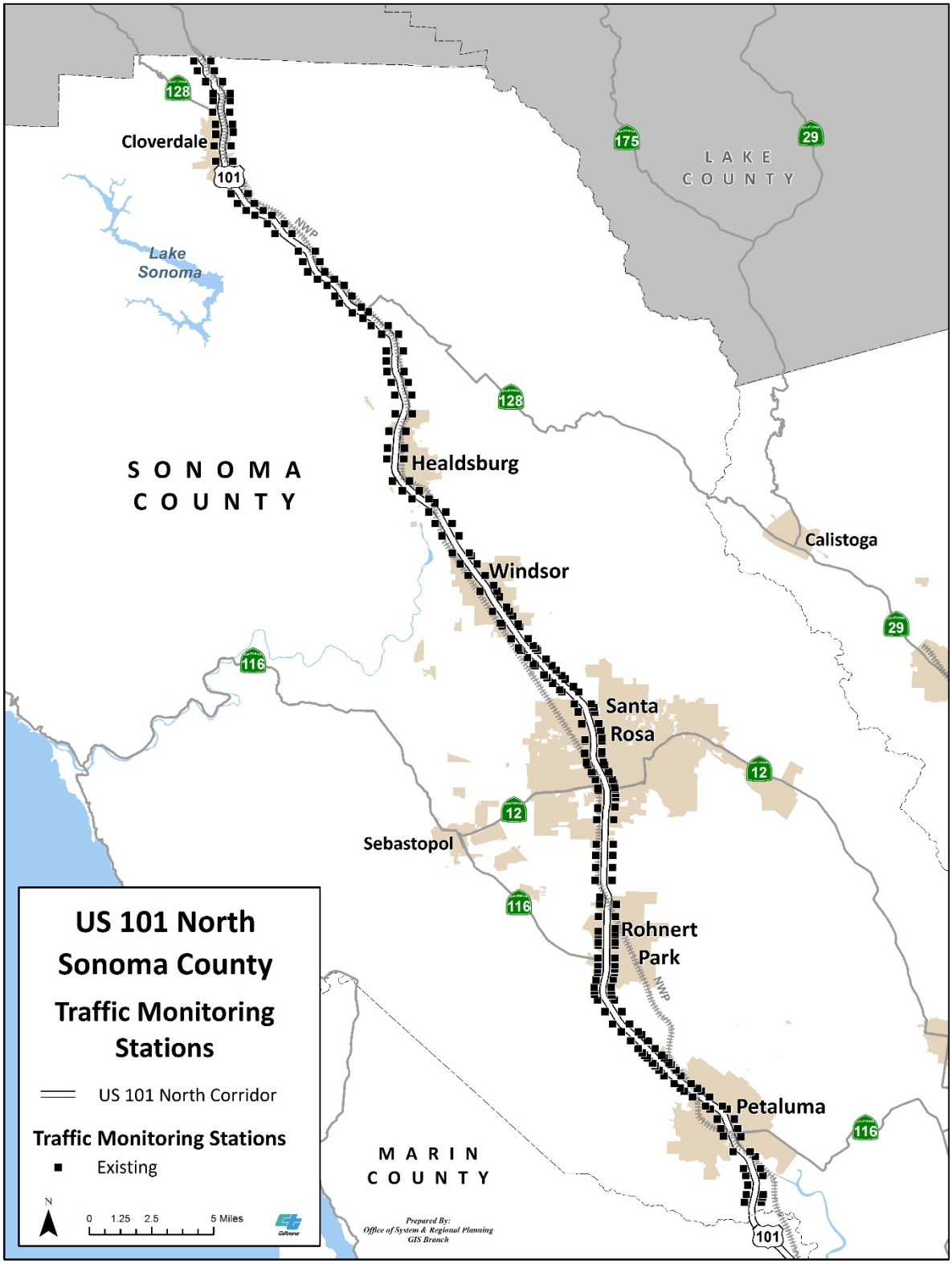


Figure 4.7: US 101 North TOS in Marin County

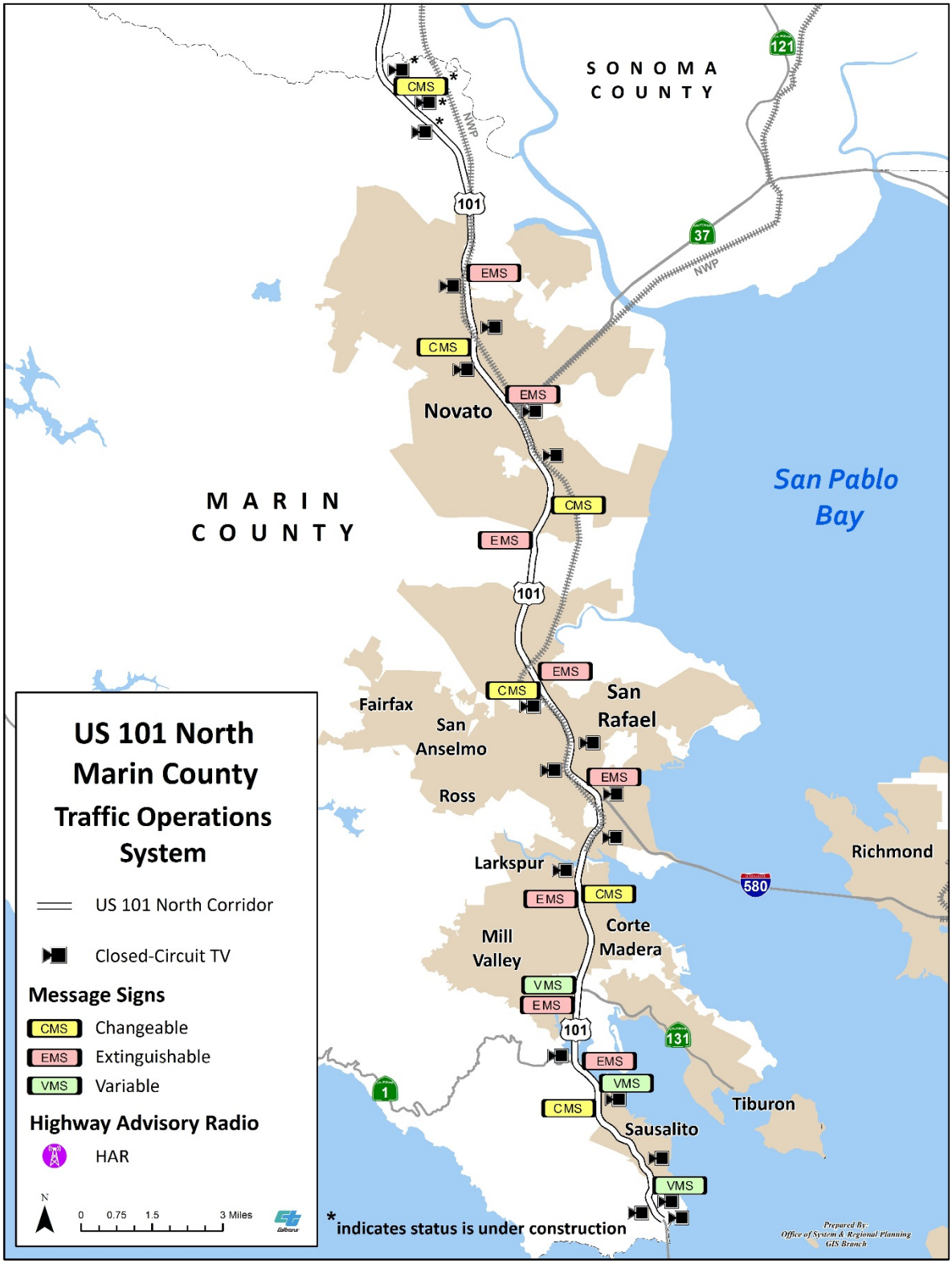
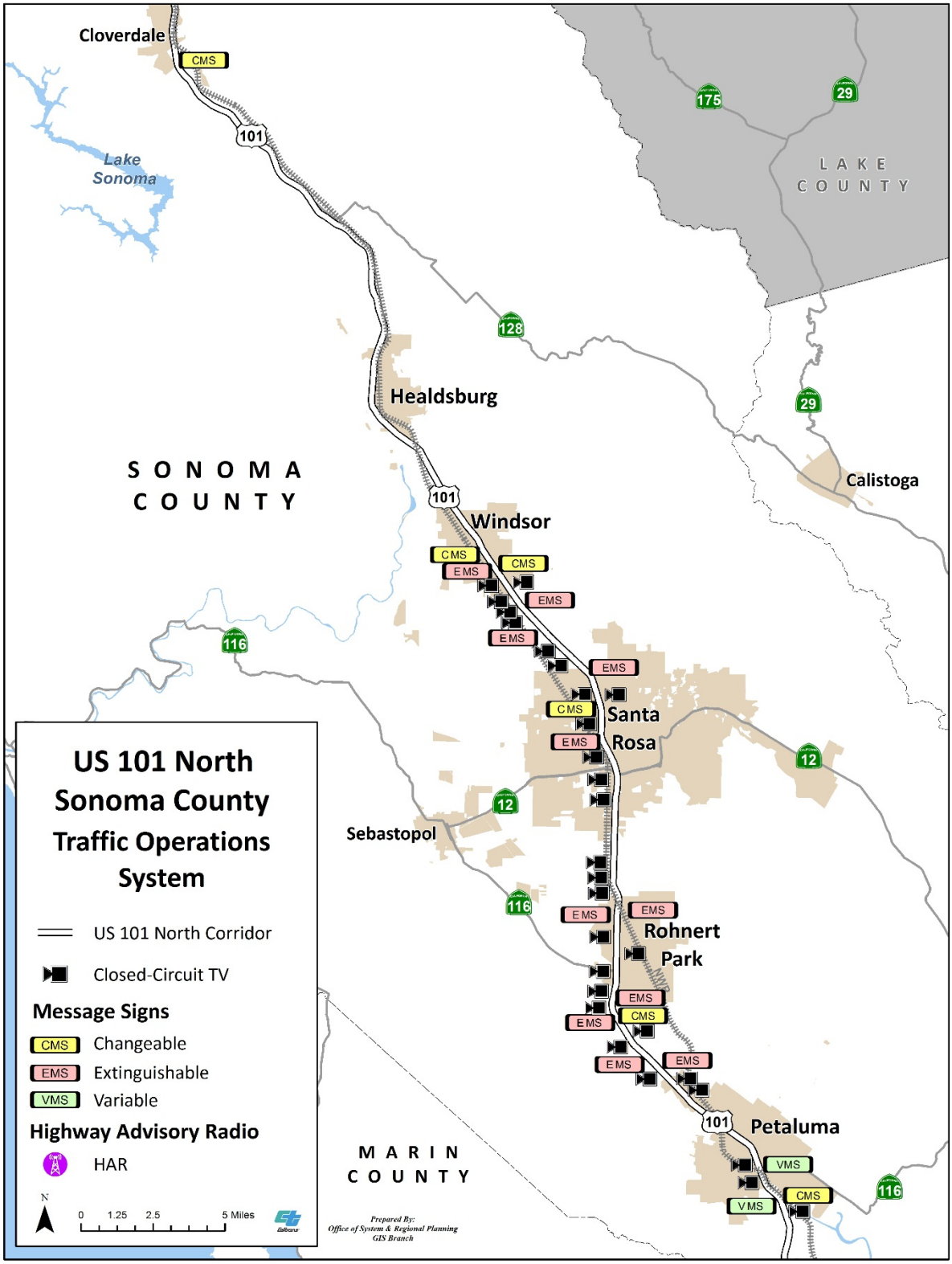


Figure 4.8: US 101 North TOS in Sonoma County



4.5 Freight Facilities

4.5.1 US 101 N Corridor Freight Overview

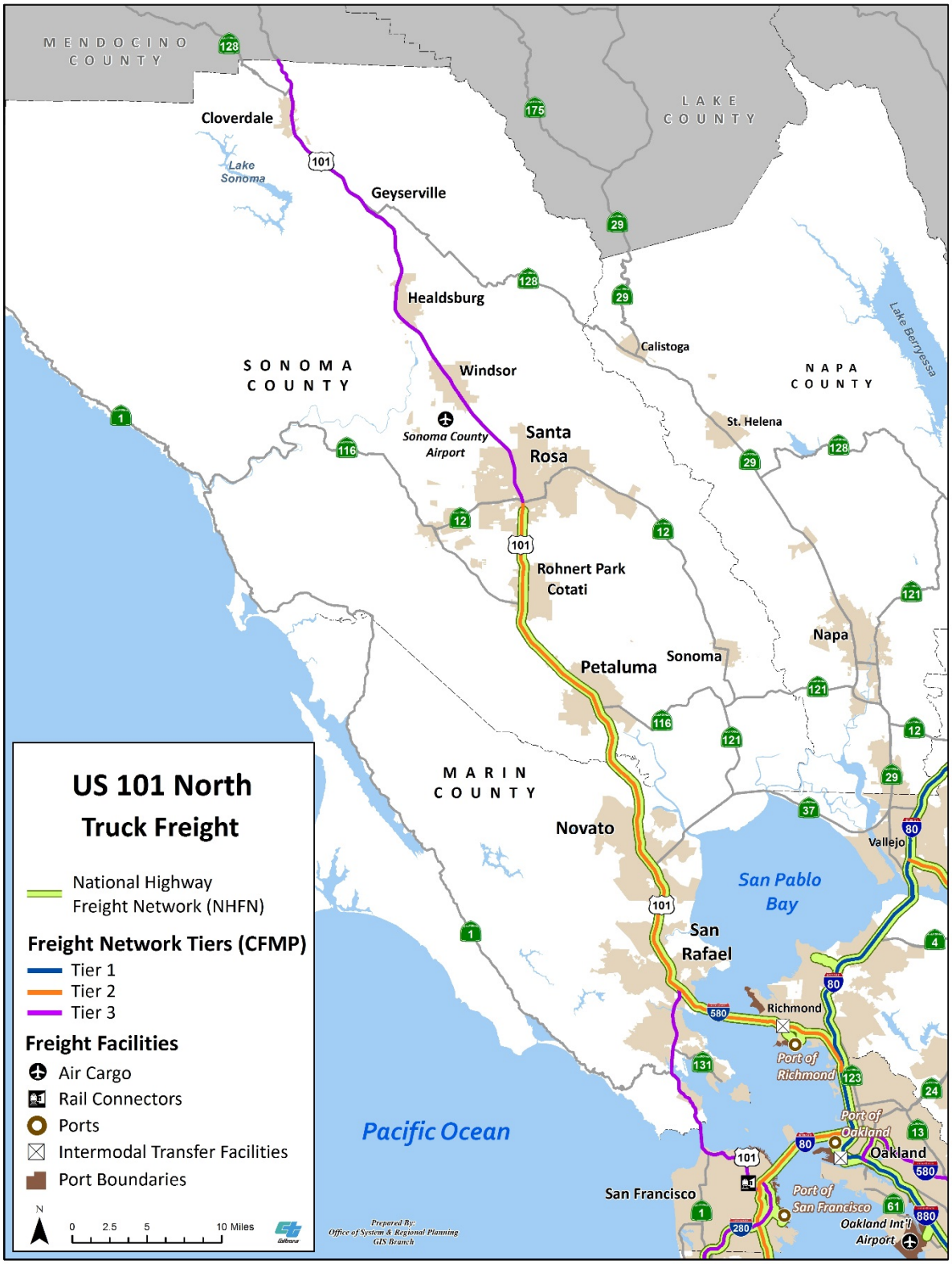
Freight movement refers to the transport and delivery of products and services from their origin to their destination. The goods movement supply chain is a vital component of the world economy and is reliant upon surface, air and maritime transportation systems and networks. The US 101 Corridor is a key component of this system and provides direct access to major interregional and regional freight corridors throughout California. In the San Francisco Bay Area, US 101 connects with major federal Interstate corridors including I-80, I-580, I-680, I-880 and I-5 (via the I-238/I-580 Corridor) and serves as the primary freight route through Marin and Sonoma Counties. The US 101 N Corridor also connects the San Francisco Bay Area to Oregon and the Pacific Northwest via the California counties of Mendocino, Humboldt, and Del Norte. A portion of US 101 from I-580 in Marin County to SR 12 in Sonoma County, a distance of more than 30 miles, is congressionally adopted as a Primary Highway Freight System Route[73] as part of the National Highway Freight Network. US 101 is also a nationally designated Surface Transportation Assistance Act of 1982 (STAA) – Terminal Access Route allowing Interstate "STAA" trucks, characterized as longer and heavier trucks, to travel along the route. The STAA Network consists of National Network, Terminal Access and Service Access routes.

The California Freight Mobility Plan (CFMP), which serves as the State's long range freight policy and planning document, describes US 101 as a Major International Trade Highway Route and the portion of the highway between the US 101/I-580 Interchange in San Rafael and the US 101/SR 12 Interchange in Santa Rosa is classified as Tier 2, while the rest of the route in southern Marin and northern Sonoma Counties is classified as Tier 3. To help focus transportation investments on the greatest needs, the CFMP categorizes the State's designated freight highway network into three tiers, with Tier 1 being the highest priority and Tier 3, while still critical to freight movement and needing investment, having the relatively lowest freight network priority. However, all three tiers are of higher priority for freight funding than the much larger balance of the transportation system. Tier 1 represents highways having the highest truck volumes and providing essential connectivity to and between key freight gateways and regions.[74]

Regionally, freight facilities along the US 101 N Corridor are discussed in the 2016 San Francisco Bay Area Goods Movement Plan by MTC. The corridor area is also currently being included as part of the Northern California Mega-Region Study to understand regional freight movement clusters and their needs, transportation and land use challenges and opportunities, freight movement workforce training challenges and opportunities, and the identification of critical focus areas along with strategies and an

[73] https://ops.fhwa.dot.gov/freight/infrastructure/ismt/state_maps/states/california.htm
[74] http://www.dot.ca.gov/hq/tpp/offices/ogm/cfmp.html

Figure 4.9: US 101 North Freight Network



implementation plan.[75] Together these reports will serve as the long-range regional goods movement and industry plans for the San Francisco Bay Area and will help shape future freight policies at State and national levels.

4.5.2 Freight Generators

The US 101 N Corridor is located within the San Francisco Bay Area which includes major manufacturing industries such as biotechnology, electronic and precision instruments, wine related agriculture and production, petroleum refining and chemical production. Major freight traffic generators include the San Francisco International Airport, the Port of Oakland and Oakland International Airport, corporate campuses in San Mateo and Santa Clara Counties, and agricultural and wine production in Sonoma and Napa Counties. The wineries are increasingly taking advantage of intermodal rail services to move large shipments of equipment and supplies. The Sonoma-Marin Area Rail Transit (SMART) corridor parallels US 101 and shares trackage with the Northwestern Pacific Railroad (NWP). Local truck routes also feed into US 101, SR 12, SR 37, and I-580 corridors, and the NWP which are the main travel networks for freight distribution in Marin and Sonoma Counties. The Marin-Sonoma Narrows project on US 101 is identified as one of the "highest priority freight route" projects in MTC's 2016 San Francisco Bay Area Goods Movement Plan.

In general, Marin and Sonoma Counties are concentrated with ranches, dairies, farms, and vineyards, mainly northwest of Marin County[76] and scattered throughout Sonoma County. [77] SR 12 and SR 37 help provide connections to the I-80 Corridor from Sebastopol, Santa Rosa, the Sonoma Valley, and Napa County to the rest of the State.[78] SR 37 and I-580 constitutes two major regional east-west vehicular transportation corridors in the North Bay, connecting I-80 and US 101. I-580 also provides a direct link to the Port of Richmond and the BNSF Richmond railyard[79] and major freight logistics and distribution center hubs in the Central Valley.

Lastly, the M-580 Marine Highway corridor has the potential to support a container-on-barge transport service between the Ports of Oakland and Stockton in an effort to reduce the number of truck trips and emissions along the I-580 and I-80 Corridors between the San Francisco Bay Area and the Central Valley. The focus of this container-on-barge effort is to support the transfer of consumer goods and agricultural products, stimulate economic opportunities and generate jobs between the Ports of Oakland and Stockton. [80] Additional information on adjacent freight networks to the US 101 N Corridor is provided in the following table.

---

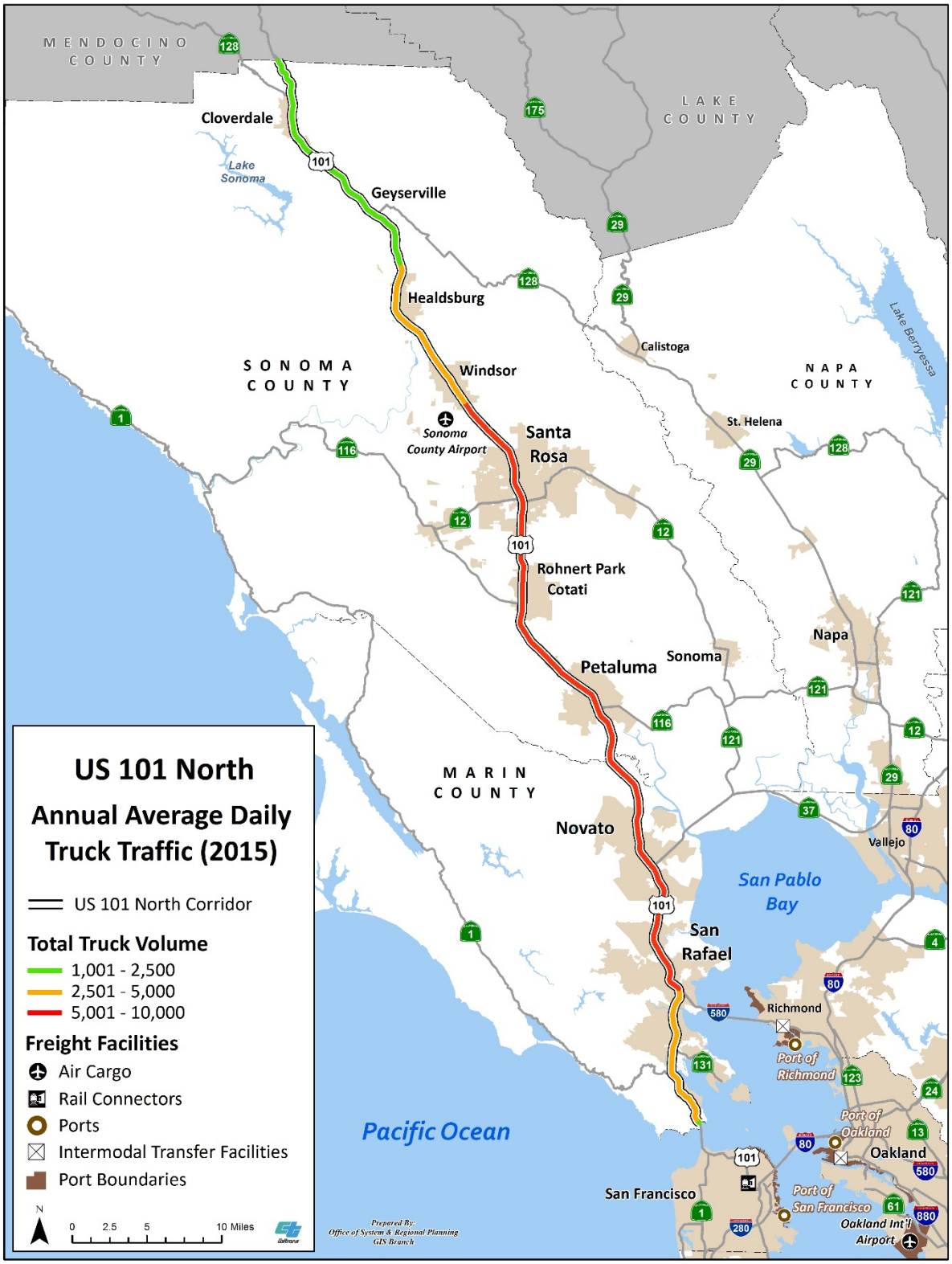
[75] http://mtc.ca.gov/our-work/plans-projects/economic-vitality/northern-california-mega-region-goods-movement-study
[76] http://www.malt.org/MALT-map
[77] http://www.sonomaopenspace.org/lands/
[78] http://scta.ca.gov/wp-content/uploads/2016/09/CTP16_090616.pdf
[79] https://www.bnsf.com/ship-with-bnsf/maps-and-shipping-locations/pdf/div_ca.pdf
[80] http://www.portofstockton.com/the-port-of-stockton-issues-a-request-for-proposal-rfp-for-a-terminal-operations-and-facilities-manager

Table 4.7: Freight Network along the US 101 N Corridor

Counties in Bay Area	Corridor	Other Key Corridor Element	Functions of the Corridor	Corridor Description
Sonoma, Napa, Solano, Marin	SR 12/ SR 37	• SMART Rail shares trackage with NWP	Interregional	Helps connect North Bay to the Port of Oakland, San Joaquin Valley and rest of the region.
Contra Costa, Alameda, Marin	I-580/ SR 238 (Altamont Corridor)	• M-580 Marine Highway (Port of Oakland to Port of Stockton) • Port of Richmond (including Richmond Pacific Rail) • BNSF Rail Yard	Interregional	Primary truck corridor connecting the Bay Area to the rest of the U.S. to the continental US secondary freight rail line that is expected to grow increasingly important with expansion of rail terminal at the Oakland Army Base.
San Francisco, Marin, Sonoma	US 101	• SFO • Port of San Francisco (including San Francisco Bay Railroad) • SMART sharing tracks with NWP in MRN and SON	Global Gateway, Interregional, Intraregional	Major goods movement corridor serving the Peninsula. Also connects agriculture shippers in North Bay (Sonoma), Central Coast and North Coast with markets in Bay Area. Primary access to SFO.

Source: San Francisco Bay Area Goods Movement Plan (2016) MTC

Figure 4.10: US 101 North - Annual Average Daily Truck Traffic (2015)



4.5.3 Rail Freight

Rail freight transportation services near the US 101 N Corridor are currently operated by two railroad systems: the Northwestern Pacific Railroad (NWP) and the SMART rail line. The NWP is a member of the California Short Line Railroad Association[81] carrying building materials, animal feed, poultry, wine and other commodities[82], according to the North Coast Railroad Authority (NCRA). The NWP could be used to replace trucks for hauling Sonoma County's garbage to out-of-county landfills. Currently, the NWP provides services from Schellville to Windsor in Sonoma County and connects to the national rail network in Lombard (Napa County) with the California Northern Railroad[83]. Figure 4.11 displays the operating portions of the NWP along the US 101 N Corridor.

In 2011, the NCRA began limited freight service on the SMART rail line after an agreement coordinating construction and operations was reached with SMART. Since 2016, freight trains share the rail line with SMART outside of SMART's primary operating hours (6–10 A.M. and 4–7 P.M), to avoid conflicts with faster passenger trains on the single-track line. The NWP utilizes joint trackage with SMART trains from Ignacio to Windsor, and freight service could be extended to Willits and eventually to Eureka.[84]

US 101 is the primary route that would benefit from the diversion of freight movement from truck to rail. The NCRA's Draft Environmental Impact Report (2009) for resuming operations on the Russian River Division of the Northwestern Pacific Railroad estimates that up to 400 truck trips per day could be removed in the loaded direction between Novato and Santa Rosa, 340 per day between Santa Rosa and Redwood Valley (near Ukiah).[85] This is beneficial to the North Bay's transportation system for congestion relief, reduced roadway surface degradation, and emission reduction.[86]

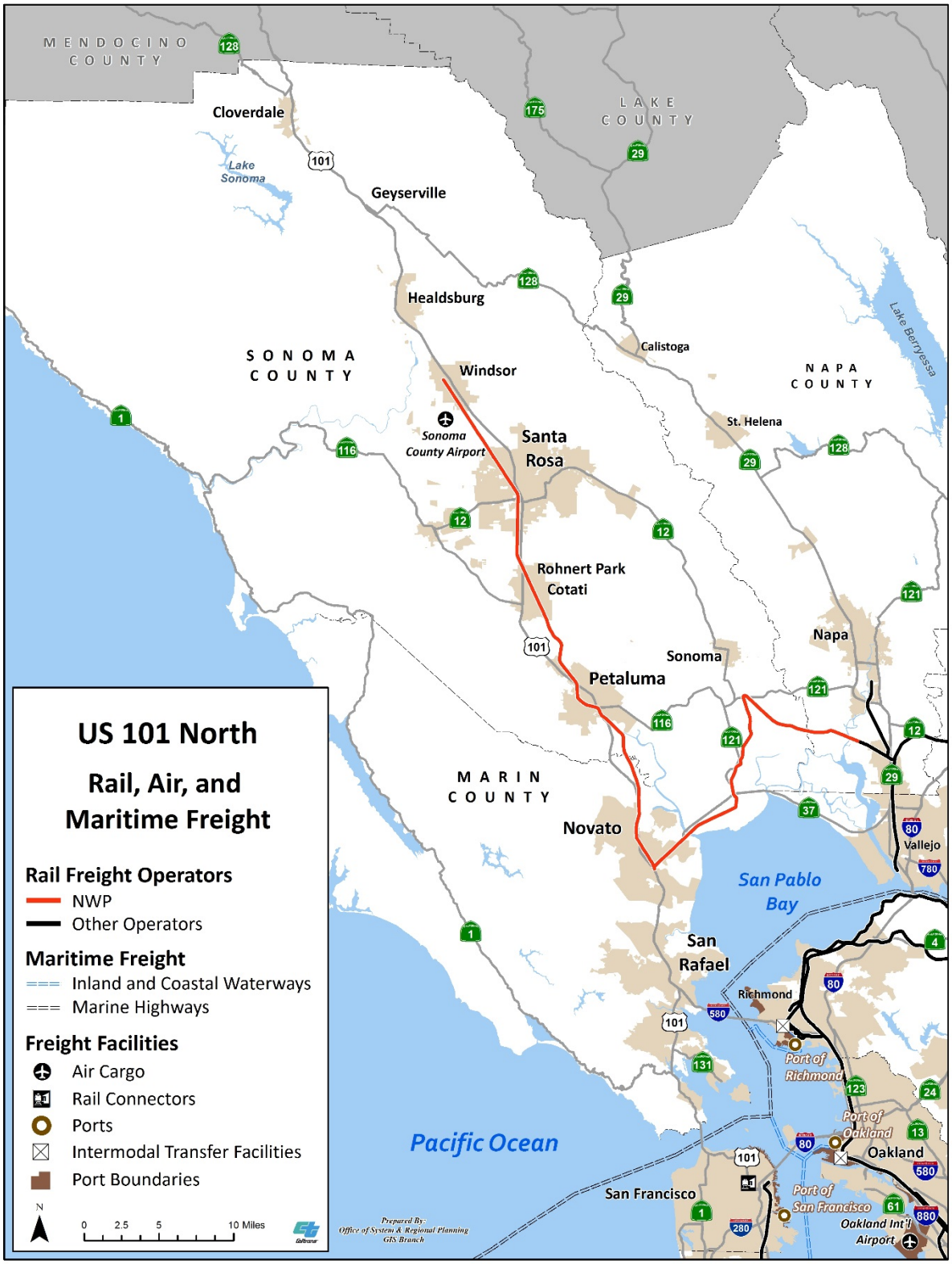
4.5.4 Other Freight Corridors connecting US 101 N

Key interregional and intraregional truck corridors connecting US 101 N include I-580, SR 12, and SR 37. Figure 4.11 identifies these routes as well as freight facilities such as railroads, airports, and ports. I-580 is identified as a Primary Highway Freight System in the NHFS and a Tier 2 priority freight investment in the CFMP. US 101 North, SR 12, SR 116, and SR 37 are Terminal Access (STAA) routes and I-580 is a National Network (STAA) route where California Legal Trucks are permitted. SR 12 links Sebastopol, Santa Rosa, the Sonoma Valley, and Napa County. It also provides an important connection to I-80, a major freight corridor in the Bay Area and State. Within Santa Rosa, between Fulton Road on the west to Farmers Lane on the east, SR 12 is developed to freeway standard. The two lane sections in Sebastopol and in the Sonoma Valley are heavily congested on both weekdays and weekends. The AADT for truck traffic is approximately 5,000 to 8,000 between Windsor and I-580 as shown in Figure 4.10.

---

[81] http://www.cslra.org/?page_id=49
[82] http://nwprailroad.com/customers-we-serve/
[83] https://www.gwrr.com/customers/freight-rail-service#north-america, http://nwprailroad.com/wp-content/uploads/2015/08/news-05.jpg
[84] http://www.northcoastrailroad.org/Acrobat/Freight_Trains_Return_to_Sonoma_County.pdf
[85] http://www.northcoastrailroad.org/DEIR_11_09.htm
[86] http://scta.ca.gov/planning/comprehensive-transportation-plan/

Figure 4.11: US 101 North - Rail, Air, and Maritime Freight



4.5.5 Trends in Freight Movement

As highways, railways, and airports reach capacity, technological and land use strategies are being considered to address efficiency and demand management. Market trends such as e-commerce have increased the need for last-mile delivery, which poses increasing demand on delivery trucks and parking in urban areas. Freight intelligent transportation systems (ITS) and "connected" vehicles are currently being tested around the nation. Connected vehicles and ITS technologies to communicate between vehicles and transportation systems, allowing for safety and efficiency improvements such as navigation, platooning, and advanced communications continue to be researched by both the public and private sectors and researchers are experimenting with further development of automated freight systems.[87]

Approximately eight percent of all Sonoma County Vehicle Miles Traveled (VMT) can be attributed to truck traffic. SCTA's CTP Policy Assessment on policy impacts showed that truck traffic could be reduced by fifty percent by shifting freight onto other modes such as rail, increasing packing efficiency and load sizes, implementing smart vehicle technologies in larger vehicles, improving distribution networks, improving delivery routing, and increasing the digital delivery of goods and services.[88]

4.5.7 Freight Needs along US 101 N

US 101 N and connecting roads function as the farm-to-market goods movement network system that serve the region's wineries and food producers, including the growing organic farm sector. Modal conflicts (between the movements of trucks and commuter traffic) continue to exist on these roads. Both highway and railroad corridors provide for shared-use between passenger transport and goods movement. While trucks generally avoid peak periods, increasing demands for on-time delivery of goods have become increasingly difficult for freight service providers to avoid the peak period. The San Francisco Bay Area Goods Movement Plan (2016) identifies the US 101 Marin Sonoma Narrows project as a high priority opportunity to addresses needs, deficiencies and gaps in the region's goods movement system.

[87] San Francisco Bay Area Goods Movement Plan, MTC, 2016

[88] http://scta.ca.gov/wp-content/uploads/2016/09/CTP16_090616.pdf

CHAPTER 5: FREEWAY PERFORMANCE

Corridor performance assessment is a quantitative and/or qualitative analysis of how a freeway corridor is functioning and begins with analyzing existing travel data. With an adequate traffic detection system in place, a corridor performance assessment serves to evaluate the existing system management practices and identify possible causes of performance problems. Modeling is then used to forecast future travel conditions along the corridor. To assess the impacts of a variety of operational strategies and investment scenarios, traffic analysis methods are used, allowing the corridor team to evaluate and recommend operational strategies, capital improvement projects, and opportunities to integrate transportation technology.

To assess the freeway performance of US 101 in Marin and Sonoma Counties, planners and engineers used a combination of sources including ramp metering reports, Caltrans Performance Measurement System (PeMs) analysis, and MTC's Travel Model One. The ramp metering reports were used to identify existing bottlenecks, and PeMs was used to measure freeway speeds and volumes. MTC's Travel Model One was utilized to provide a bigger picture of future freeway performance. Performance analysis includes identifying the existing freeway bottlenecks, along with other corridor mobility performance measures such as:

- Vehicle Miles Traveled (VMT), which is a measurement of travel demand within a corridor
- Vehicle Hours Traveled (VHT), or total time for a corridor to process the VMT demand
- Vehicle Hours of Delay (VHD), which is a measure of how much additional VHT it took for the corridor to process the VMT demand, assuming nominal VHT is at 35 mile per hour (mph) speed
- Number of Incidents to determine any potential correlation between incidents and any mobility degradation resulting from increases in VMT, VHT, or VHD

5.1 Existing Conditions

5.1.1 Marin Sonoma Narrows

Most traffic congestion in Marin and Sonoma Counties is concentrated on US 101 and along major arterials. One of the highest levels of congestion occurs at Marin Sonoma Narrows, which is a section of US 101 between north of Novato and Petaluma where the number of lanes drops from four to two, causing significant delays. Recurrent congestion on US 101 within the MSN limits typically occurs southbound (two hours) in the morning and northbound (four hours) in the afternoon as shown in Tables 5.1 and 5.2. Speeds of lower than 35 mile per hour (mph) are considered congested conditions. Northbound US 101 between San Antonio Road and Washington Street, the speeds are mostly below 35 mph from 3 pm to 5:30 pm. Similarly, in the southbound direction from 5:45 am to 7 am, traffic speeds between Petaluma Boulevard and Washington Street are as low as 8 mph.

Table 5.1: Speeds along NB US 101 (PM, mile per hour)

Street Name	Miles	2:00 pm	2:15 pm	2:30 pm	2:45 pm	3:00 pm	3:15 pm	3:30 pm	3:45 pm	4:00 pm	4:15 pm	4:30 pm	4:45 pm	5:00 pm	5:15 pm	5:30 pm	5:45 pm	6:00 pm	6:15 pm	6:30 pm
Sierra Ave	0.23	72	65	67	65	64	64	63	64	62	64	65	61	65	65	68	64	67	64	69
Sierra Ave	1.10	71	65	65	65	65	63	66	66	68	67	65	62	66	65	66	66	66	67	70
Railroad Ave	1.84	67	63	62	64	63	61	64	62	62	63	63	60	62	64	66	66	65	66	68
Pepper Rd	1.06	67	64	64	63	62	62	64	63	61	63	63	63	64	61	54	68	64	64	67
Old Redwood Hwy	0.27	68	63	63	63	62	62	62	67	65	64	61	64	63	61	47	67	64	65	67
Old Redwood Hwy	2.72	64	60	55	47	48	45	46	45	46	47	46	46	44	49	53	45	38	41	53
Washington St	0.16	62	57	45	32	26	24	26	29	24	27	27	29	29	31	41	33	28	31	58
Washington St	0.75	62	57	46	27	22	21	20	25	22	23	23	23	25	26	34	44	35	33	61
Ca-116	0.19	63	58	54	20	19	20	16	22	18	19	20	18	22	21	33	51	58	45	65
Ca-116	0.78	59	55	46	24	19	23	16	24	19	22	25	23	23	21	30	50	60	60	61
Petaluma Blvd	0.60	61	60	56	40	18	25	15	22	20	21	21	27	22	23	29	54	62	66	65
Petaluma Blvd	3.02	59	58	58	58	39	30	27	21	32	31	30	33	35	34	29	34	46	64	64
San Antonio Rd	4.52	51	43	33	38	44	36	28	24	19	20	25	24	24	28	35	48	63	66	60
Atherton Ave	0.47	69	68	69	70	69	71	69	66	64	52	63	65	71	72	70	68	73	71	71
Atherton Ave	0.39	71	71	71	71	70	71	69	72	69	68	67	67	72	73	72	66	73	73	69

Source: INRIX data (May 2017)

Table 5.2: Speeds along SB US 101 (AM, mile per hour)

Street Name	Miles	5:00 am	5:15 am	5:30 am	5:45 am	6:00 am	6:15 am	6:30 am	6:45 am	7:00 am	7:15 am	7:30 am	7:45 am	8:00 am	8:15 am	8:30 am	8:45 am
Sierra Ave	0.47	67	65	70	72	68	67	66	74	67	63	62	64	64	59	60	63
Sierra Ave	0.21	65	65	70	72	69	67	66	74	68	64	63	63	64	62	61	63
Railroad Ave	1.13	66	67	71	72	70	67	67	72	70	65	64	63	65	63	61	65
Pepper Rd	1.85	67	65	69	72	67	69	69	65	70	67	65	63	67	66	61	64
Old Redwood Hwy	1.03	67	69	67	71	69	69	65	64	69	68	65	64	68	65	63	65
Old Redwood Hwy	0.27	67	66	62	57	64	68	64	63	68	66	62	65	66	64	61	65
Washington St	2.65	63	62	57	42	38	31	29	42	63	64	62	62	62	62	59	60
Washington St	0.39	62	63	58	38	23	10	16	17	46	64	61	61	59	60	58	60
Ca-116	0.55	63	63	55	26	16	8	13	10	39	67	64	61	60	62	46	60
Ca-116	0.22	66	63	54	22	12	8	11	10	28	65	69	64	64	66	61	62
Petaluma Blvd	0.83	65	60	55	29	15	12	13	16	25	54	61	65	63	63	60	57
Petaluma Blvd	0.63	66	62	58	31	16	16	17	25	21	22	64	66	63	62	64	61
San Antonio Rd	3.00	64	61	54	45	39	42	44	46	45	41	54	63	60	59	60	58
Atherton Ave	4.49	70	66	64	64	66	68	65	64	64	65	66	67	67	62	64	63
Atherton Ave	0.48	71	68	67	67	68	71	69	68	69	67	69	69	71	63	71	64

Source: INRIX data (May 2017)

5.1.2 Existing Bottlenecks

US 101 in Marin County

In Marin County, bottlenecks develop and associated congestion occurs along the US 101 Corridor in the southbound direction during the AM peak period, 6:00 AM to 10:00 AM, and in the northbound direction during the PM peak period, 3:00 PM to 7:00 PM[89].

The following bottlenecks and queues are observed in Marin County on US 101 **southbound**, during the **AM** peak period:

- From the Ignacio Boulevard on-ramp to Alameda Del Prado off-ramp. Queues from this bottleneck combine with queues from downstream bottlenecks and extend as far north as the Rowland Boulevard interchange during the peak; this applies to the following three locations as well.
- Lucas Valley Road on-ramp to Manuel T. Freitas Parkway off-ramp. This bottleneck combines with the downstream bottleneck and queues during the peak. The queue typically extends to overlap with the Ignacio bottleneck.
- Manuel T. Freitas Parkway on-ramp to San Pedro Road off-ramp. This bottleneck combines with the downstream bottleneck and queues during the peak. Queue typically extends to overlap with the Lucas Valley Road bottleneck and the Ignacio bottleneck.
- San Pedro Road on-ramp to Lincoln Avenue off-ramp. The bottleneck is a result of insufficient capacity associated with a lane drop at Lincoln off-ramp. Queue typically extends to overlap with the Manual Freitas Parkway bottleneck.
- Lincoln Avenue on-ramp to Mission Avenue off-ramp. Queues extend through upstream bottlenecks as far north as the Rowland Boulevard Interchange, overlapping with the San Pedro Road bottleneck.
- Downtown San Rafael off ramp – back up here is regular and extends past Lincoln to San Pedro Road. Limited on-street capacity and short blocks on local roads, along with SMART service operations limit system recovery time.
- Francisco Boulevard on-ramp to Sir Francis Drake Boulevard off-ramp. There is sporadic congestion associated with high on-ramp volumes. Queues occasionally extend to north of the I-580 connector ramp.
- Sir Francis Drake Boulevard on-ramp to Madera Boulevard off-ramp. Surges of high on-ramp traffic volume results in sporadic queues in this area. Queues occasionally extend to north of the Sir Francis Drake Boulevard off-ramp.
- In addition to freeway bottlenecks, a lack of on-ramp storage affects local streets at:
    - The Route 37 on-ramp: longest queues are observed extending beyond the US 101 overcrossing bridge.
    - Sir Francis Drake Boulevard on-ramp: longest queues are observed extending onto Sir Francis Drake Boulevard.

[89] Marin US 101 Ramp Metering Feasibility Study, March 26, 2013 by Kittelson & Associates, Inc.

- Second Street on-ramp: queues exist, and extend into downtown San Rafael at Hetherton Street and Second Street.

The following bottlenecks and queues are observed on Marin US 101 **northbound**, during the **PM** peak period:

- Tamalpais Drive on-ramp to Sir Francis Drake off-ramp. Queue typically extends to south of the SR 1 Interchange.
- San Pedro Road on-ramp to Manuel T. Freitas Parkway off-ramp (lane drop). This bottleneck becomes sporadically embedded in queues from the downstream bottleneck at Lucas Valley Road, which extend to south of the Lincoln Avenue Interchange.
- Lucas Valley Road diagonal on-ramp to Miller Creek Road off-ramp. There is sporadic congestion due to insufficient capacity, primarily associated with lane drop at Miller Creek off-ramp. The queue occasionally extends through the San Pedro Road on-ramp to Manuel T. Freitas off-ramp bottleneck as far south as the Lincoln Avenue interchange.
- Lane drop north of Atherton Avenue. Bottleneck occurs as a result of lane drop and insufficient capacity. Queue typically extends to south of the Atherton Interchange. Note that north of the lane reduction area (over the two-lane section), freeway typically operates at capacity with sporadic queues towards the Marin-Sonoma County Line.
- I-580 on-ramp to Second Street/Central San Rafael off-ramp. Bottleneck is caused primarily by intersection spillback from local roads, and excessive weaving activities between I-580 on-ramp and 2nd Street off-ramp. Queue typically extends to south of the I-580 on-ramp.
- In addition to freeway bottlenecks, a lack of on-ramp storage affects local streets at:
  - Blithedale Avenue/Tiburon Boulevard loop on-ramp: longest queues are observed extended beyond the loop ramp onto Tiburon Boulevard.
  - Mission Street/Central San Rafael on-ramp: longest queues are observed extended beyond the on-ramp and onto Mission Street.

Figures 5.1 and 5.2 show the May 2017 speed contours of US 101 in Marin County from the Golden Gate Bridge to the Marin-Sonoma county line.

Figure 5.1: INRIX May 2017 Speed Contours US 101 Southbound in Marin County

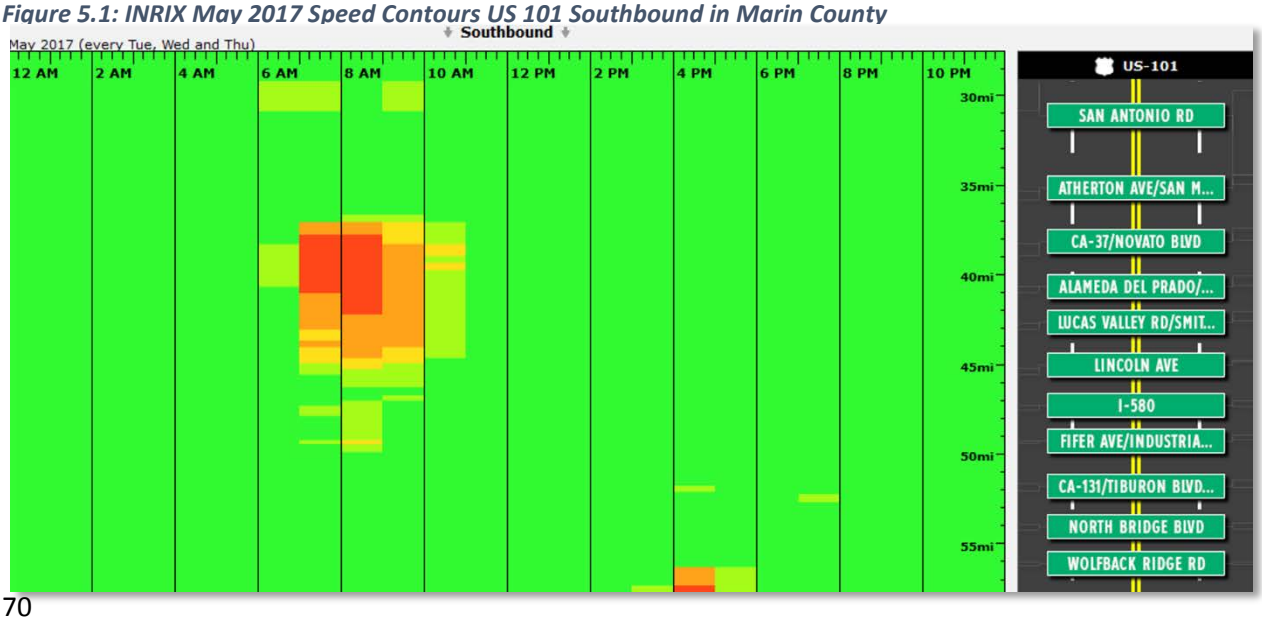
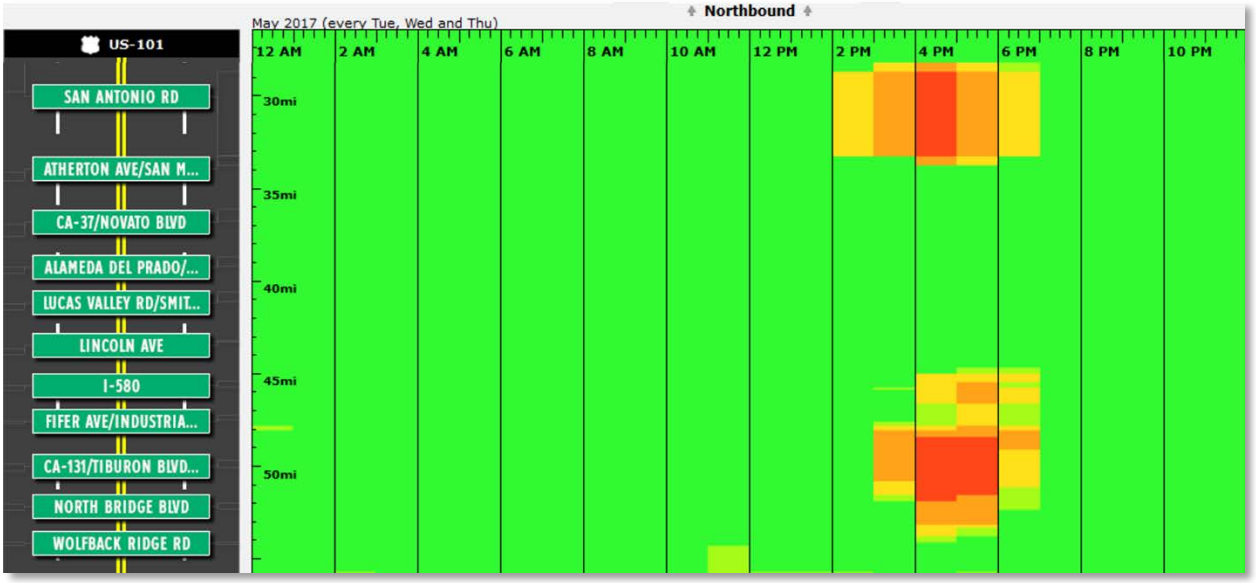


Figure 5.2: INRIX May 2017 Speed Contours US 101 Northbound in Marin County



US 101 in Sonoma County[90]

The following bottlenecks and queues are observed on Sonoma US 101 **northbound**:

- A. Between the SR 12 on-ramp and the College Avenue off-ramp. During the AM peak period, queues from this bottleneck often extend through the upstream bottleneck location, described below (bottleneck B), to beyond the Golf Course Drive off-ramp. During the PM peak period, queues sporadically extend to the upstream bottleneck, described below (bottleneck B). Note that there are two consecutive on-ramps within this section (on-ramps from SR 12 and from Sixth Street), while the bottleneck typically occurs at the SR 12 on-ramp, it occasionally shifts to the Sixth Street on-ramp.
- B. Between the Yolanda Avenue on-ramp and the Baker Avenue off-ramp. During the AM peak period, this bottleneck often becomes embedded in queues from the downstream bottleneck, discussed above, and sporadic congestion occurs from the bottleneck to Golf Course Drive. During the PM peak period, queues from this bottleneck extend past Todd Road.

On US 101 **southbound**, the following bottlenecks are observed:

- C. Between the Hearn Avenue on-ramp and the Todd Road off-ramp. During the AM peak period, queues from this bottleneck sporadically extend as far north as Hearn Avenue. No bottleneck is identified at this location during the PM peak period.

[90] Kittleson and Associates, Sonoma County Ramp Metering Implemental Plan, 2014. Study limits: US 101 NB, from the Gravenstein Highway (SR 116 West) Interchange to the Shiloh Road Interchange; US 101 SB, from the Arata Lane Interchange to the Pepper Road Interchange.

- D. Between the SR 12 on-ramp and the Baker Avenue off-ramp. During the AM peak period, queues from this bottleneck extend north, beyond the Downtown off-ramp. During the PM peak period, queues from this bottleneck extend through the upstream bottleneck, described below (bottleneck E), to beyond Hopper Avenue.
- E. Between the College Avenue on-ramp and the downtown Santa Rosa off-ramp. No bottleneck is identified at this location during the AM peak period. During the PM peak period, this bottleneck becomes embedded in queues from the downstream bottleneck, discussed above.
- F. Between the Guerneville Road off-ramp and the Guerneville Road on-ramp. During the AM peak period, queues from this bottleneck sporadically extend through the upstream bottleneck, described below, to beyond River Road.

G. Between the River Road on-ramp and the Hopper Avenue off-ramp. During the AM peak period, this bottleneck is sporadic and sometimes becomes embedded in queues from the downstream bottleneck, discussed above.

Figures 5.1 and 5.2 show the May 2017 speed contours of US 101 in Sonoma County from Marin/Sonoma County Line to Mark West Springs Road.

Figure 5.3: INRIX May 2017 Speed Contours US 101 Southbound in Sonoma County between Marin/Sonoma County Line and Mark West Springs

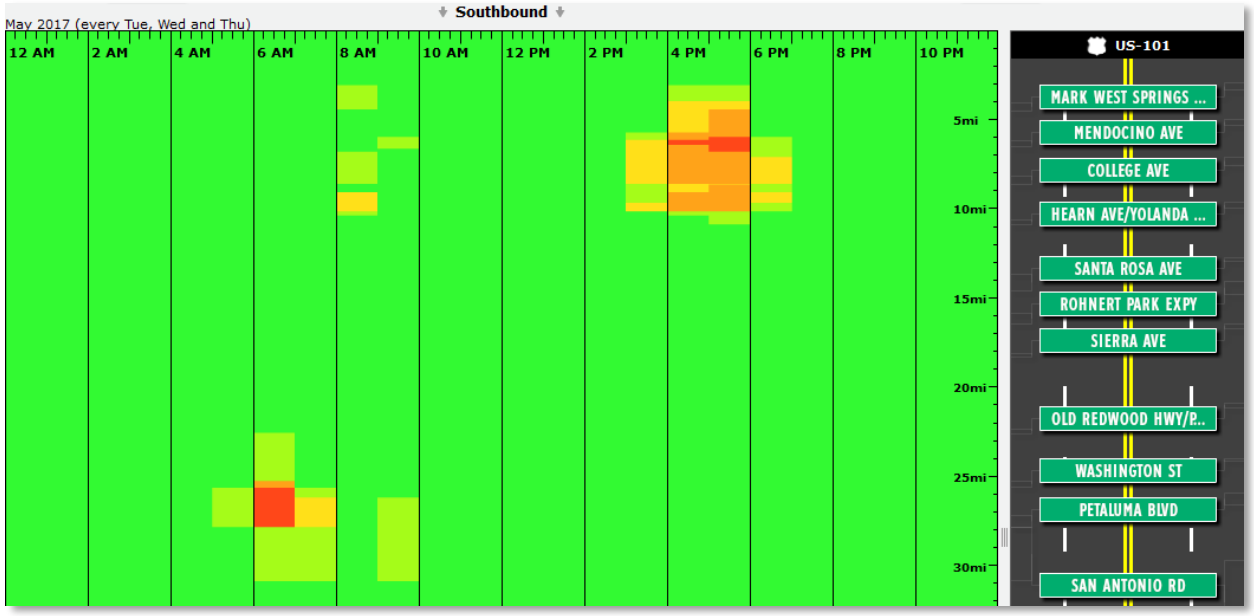
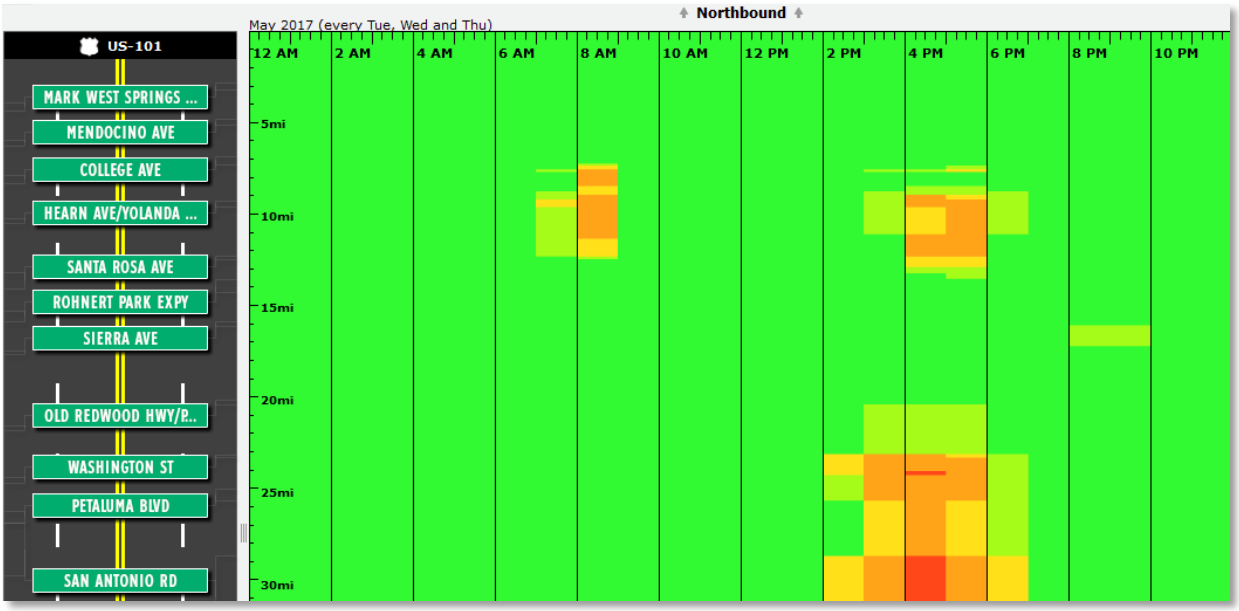


Figure 5.4: INRIX May 2017 Speed Contours US 101 Northbound in Sonoma County between Marin/Sonoma County Line and Mark West Springs



5.1.3 Existing Corridor Mobility Performance Measures

While bottlenecks and associated queuing describe typical/recurring traffic operating conditions at *specific* locations in a corridor where the vehicular demand exceeds the freeway capacity and causes congestion, corridor-wide mobility performance measures such as VMT, VHD and VHT can be used to assess operating conditions for the *entire corridor*. To assess changes in the performance measures and number of incidents over time, PeMs was used to create plots of incidents vs Vehicle Hours of Delay (VHD), Vehicle Miles Traveled (VMT), and Vehicle Hours Traveled (VHT) – see Appendix E, Figures 1 through 12. These plots were created for the northbound and southbound directions on US 101 in Marin and Sonoma Counties. The time frame selected is from January 2014 to August 2017 and the data is aggregated at a monthly granularity.

US 101 Northbound and Southbound in Marin County.

- The impacts of accidents on VHD on a monthly basis likely indicates that monthly changes in delay are more associated with fluctuations in traffic demand than incidents. Ramp meter can aid in leveling out the monthly spikes and dips in VHD by reducing incidents and controlling traffic demand for the freeway, but there other factors involved with this.
- VMT and VHT show a steady rise from January 2014 to July 2017, a pattern that is likely reflective of a steady rise in corridor traffic demand. See Appendix E.
- The number of incidents starts rising from Fall 2014 through July 2017. There are transportation studies that indicate that the number of incidents may increase with congestion or increased VHD. However, the incidents on Marin 101 correlate better with the increased travel demand for the corridor. Incidents may not be directly related to congestion.

- There are reliability challenges on US 101 in Marin which are likely related to day-to-day fluctuations in delay.

US 101 Northbound and Southbound 101 in Sonoma County

- Northbound VHD decreased noticeably after ramp metering was implemented in September/October 2014. Note that unlike the significant monthly variability in Marin 101 VHD, ramp metering has resulted in a relatively flat VHD plot and reliable travel on Sonoma 101, from about January 2015 to July 2016. After July 2016, the steady increase in corridor traffic demand has caused the monthly VHD to increase significantly.
- Southbound VHD also decreased after ramp meter implementation, and while not as flat as the northbound VHD, the southbound corridor monthly VHD indicates reliable travel times within the Sonoma 101 corridor. Southbound corridor VHD also show a significant increase after July 2016.
- While VMT and VHT experience seasonal variability, both of these performance measures show a steady rise from January 2015 to July 2017.
- The number of incidents shows a rise from Fall 2015 to Summer 2017. While there are transportation studies that indicate that the number of incidents may increase with congestion or increased VHD, for now the incidents on Marin 101 still correlate better with the increase in travel demand. It suggests incidents may not be directly related to congestion and but more related to increase in VMT.
- Similar to US 101 in Marin, the number of incidents on US 101 in Sonoma County also started rising from Fall 2015 through Summer 2017. And similar to Marin US 101 in Marin County, incidents on US 101 in Sonoma County correlate better with the increase in travel demand rather than with congestion.

5.1.4 Observations on Ramp Metering

A ramp metering study in 2013 evaluated traffic conditions before and after the implementation of ramp metering on US 101 in Sonoma. The limits of the study corridor were from Old Redwood Highway in Petaluma to Arata Lane in Windsor. Ramp metering was implemented within a subset of the study corridor as described below:

- US 101 northbound: from the Gravenstein Highway (SR 116 West) interchange to the Shiloh Road interchange, PM 12.868 to PM 27.649 (approximately 15 miles). A total of 17 ramps were metered.

- US 101 southbound: from the Arata Lane interchange to the Pepper Road interchange, PM 30.5 to PM 8.871 (approximately 22 miles). A total of 25 ramps were metered.

Ramp metering was implemented on US 101 in Sonoma County between September and October 2014. Ramp metering plans were developed and fine-tuned in the field to manage vehicle entry onto the freeway without negatively affecting traffic operations on local streets. After ramp metering was implemented, corridor travel times decreased for all time periods surveyed, with the maximum travel time changes by direction and peak period as follows:

- In the northbound direction, travel times in the AM peak period decreased by up to 2.0 minutes (or ten percent).
- In the southbound direction, travel times in the AM peak period decreased by up to 2.1 minutes (or eight percent).
- In the northbound direction, travel times in the PM peak period decreased by up to 3.1 minutes (or twelve percent).
- In the southbound direction, travel times in the PM peak period decreased by up to 4.8 minutes (or 16 percent).

Ramp metering is also a proposed strategy for US 101 in Marin.* The Marin US 101 Ramp Metering Feasibility Study, March 26, 2013 assessed the implementation of northbound ramp metering at the following eight on-ramps: Bridgeway - SR 1/Pohono Street, Redwood Highway/Seminary, Blithedale Avenue Loop, Tiburon Boulevard Diagonal, Tamalpais Drive Loop, Tamalpais Drive Diagonal, and Sir Francis Drake Boulevard.

Five on-ramps would require widening as part of the capital improvement projects necessary for implementing ramp metering:

- Bridgeway On-Ramp, existing one Mixed-flow lane widened to two mixed-flow lanes
- Blithedale Avenue.
- Loop On-Ramp, existing one Mixed-flow lane widened to two mixed-flow lanes
- Tiburon Boulevard. Diagonal On-Ramp, existing one Mixed-flow lane widened to two Mixed-flow lanes plus one HOV lane
- Tamalpais Drive Diagonal On-Ramp, existing one mixed-flow widened to one Mixed-flow plus one HOV lanes
- Sir Francis Drake Boulevard. On-Ramp, existing two mixed-flow lanes widened to two Mixed-flow lanes plus one HOV lane

After widening the on-ramps and implementing ramp metering, the Marin 101 Feasibility Study predicts the following travel time improvements from Marin City off-ramp to Bellam Blvd/I-580 off-ramp (6.44 miles):

Table 5.2: Travel Time Comparison with and without Ramp Metering

Analysis Time Period	Without Ramp Metering	With Ramp Metering	Difference	
	Minutes	Minutes	Minutes	Percent
4:00 - 5:00 PM	11.0	9.2	-1.8	-16%
5:00 - 6:00 PM	17.3	13.1	-4.2	-24%

Source: FREQ model, which is a freeway operations analysis tool developed by the University of California, Berkeley.

* Note: US 101 Ramp Metering project in Marin County is being designed by Caltrans for Ready To List (RTL) in 2018.

5.2 Travel Forecasting Models

Travel forecasting models are long-range Transportation Planning tools that help estimate travel behavior and travel demand in the future. Factors such as population, housing, the economy, and transit options are normally considered in models. Travel forecasting models can provide quantifiable data for transportation investments and decision-making. The follow section uses Travel Model One, MTC's regional travel demand model, to assess the performance of US 101 in 2015 and 2040. To better evaluate freeway performance and inform policy decision and the public, US 101 is divided into six segments based on the existing conditions of the freeway. Route segments from south to north are shown below:

1. Marin/San Francisco County line to I-580
2. I-580 to SR 37
3. SR 37 to Marin/Sonoma County line
4. Marin/Sonoma County line to Old Redwood Highway in northern Petaluma
5. Old Redwood Highway to Windsor River Road
6. Windsor River Road to the Sonoma/Mendocino County line just north of Cloverdale.

The baseline 2015 performance of US 101 N in Marin and Sonoma Counties during the AM peak (6:00 AM to 10:00 AM) and PM peak (3:00 PM and 7:00 PM) periods is shown in Appendix F. As described in Section 5.1, traffic conditions vary within each segment, and there are recurring traffic congestion areas on US 101 known as bottlenecks.

MTC's 2040 travel forecast model includes the following projects in Marin and Sonoma Counties: Sonoma County Service Bus Frequency Improvements, US 101 Marin Sonoma Narrows (MSN) HOV Lanes- Phase 2, Golden Gate Transit Frequency Improvements, and SMART - Phase 3 from Santa Rosa Airport to Cloverdale. According to Plan Bay Area 2040 Performance Assessment Report, SMART Phase 3 project analysis is performed for a typical weekday, but many of the project's benefits will be accrued on weekends due to recreational use and tourism. SMART will feature two-car trains powered by clean diesel engines reaching a top speed of 79 mph. Overall in 2040, the freeway will accumulate about 16,600 vehicle-hours of combined delay during AM and PM peak hours, an increase of 35 percent over the period 2015 to 2040. However, increase in vehicle miles traveled from 2015 to 2040 is moderate, about twelve percent. Detailed travel forecast data could be found in Appendix F.

In conclusion, even with the MSN and SMART projects, there will be significant congestion remaining in the Corridor. Either major additional capacity improvements, a major demand management program involving significant demand reduction, or significantly increased tolerance of high congestion levels in the corridor will be required. Freeway demand reduction could be achieved through multimodal improvements such as Park-and-Ride improvements, multi-use paths, bike/pedestrian crossings, and better transit services. ITS including ramp metering and interchange improvements to improve safety and freeway operations could also help reduce delays.

CHAPTER 6: RECOMMENDED STRATEGIES

This Comprehensive Corridor Plan (CCP) serves as a partial strategic update to the 2011 US 101 N Corridor System Management Plan (CSMP). While the 2011 CSMP was primarily concentrated around freeway capacity enhancement, the CCP today evaluates the multimodal facilities along the Corridor, and proposes a variety of strategies/projects to address the needs, deficiencies, and gaps in the US 101 N Corridor. This section presents the key findings and recommendations for the US 101 N Corridor.

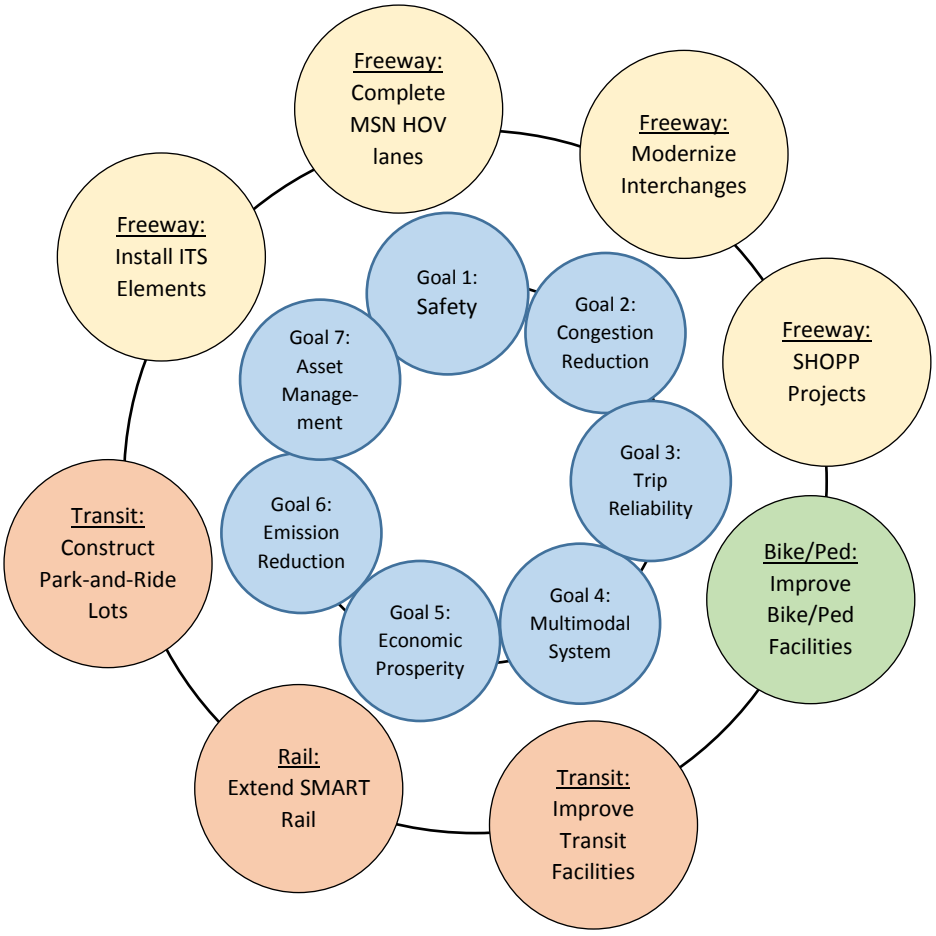
6.1 Introduction to Recommended Strategies

The US 101 N Corridor is unique in character, linking rural and urbanized areas in Marin and Sonoma Counties with the major metropolitan center of San Francisco. US 101 serves as the backbone for Marin and Sonoma Counties, connecting local communities to work, school, services, and recreation. US 101 is also a regional connection serving as a multi-modal route for carpools, regional transit services, auto trips, and trucking. SMART trains and multiple bicycle and pedestrian paths run parallel to the Corridor. The severe congestion, the limited right-of-way, the mixture of local and regional demands, and the multi-modal nature both on US 101 and the surrounding areas make it a good candidate for conducting a comprehensive corridor study.

In order for this critical route to remain effective and efficient in the movement of people and goods, Caltrans, TAM, and SCTA worked together to develop a performance-based, systems approach for improving the US 101 N Corridor in Marin and Sonoma Counties. Figure 6.1 is an illustration of the performance based systems approach for Corridor improvement. Seven goals of the CCP are at the core of this system approach, and projects and strategies were developed to work as an integrated system to address the mobility needs and facilitate the movement of residents, workers, and visitors.

Based on analyses in previous chapters, a total of 89 projects are proposed by Caltrans, TAM, and SCTA. Proposed projects are grouped into seven categories: Managed Lanes (including High Occupancy Vehicle Lanes), Intelligent Transportation System (ITS) such as ramp metering, interchange modernization, construction of Park-and-Ride lots, SMART rail train extension, and improvements to transit and bike/pedestrian facilities. To provide a comprehensive picture of future improvements along the Corridor, future State Highway Operations and Protection Program (SHOPP) projects are also included in the discussion.

Figure 6.1: Illustration of the Performance Based Systems Approach to Improve US 101 N Corridor



6.2 Rational for Proposed Projects

Managed Lanes

The Bay Area's managed lane network delivers significant benefits in terms of increased person throughput, higher speeds, and travel time savings as compared to general purpose lanes.

According to the Draft *Bay Area Managed Lanes Implementation Plan* (MLIP)[91], the North Bay High Occupancy Vehicle network tends to be discontinuous, with significant gaps between sections. The proposed MSN projects will mend the existing HOV lane gap within the US 101 North Corridor.

[91] *Bay Area Managed Lanes Implementation Plan* is currently being drafted by MTC and will be part of Caltrans' statewide *Managed Lanes Master Plan* measures the reliability, consistency and throughput of managed lanes in the Bay Area and recommends strategies to improve these measures.

Vehicle occupancy counts taken at locations along US 101 North indicate that the number of vehicles in the HOV lane are less than the number of vehicles per lane in the General Purpose (GP) lanes. With the exception of a few places in Sonoma County, the vast majority of locations surveyed illustrate that the estimated number of passengers in the HOV lane exceeds that of the GP lanes. This indicates that the managed lanes are successful at increasing person throughput.

In addition to person throughput, the efficiency of managed lanes is measured by their ability to deliver higher speeds than that of the adjacent GP lanes. When a managed lane corridor is congested, vehicles in the HOV or Express Lanes should be moving faster than vehicles in the GP lanes, otherwise there is little incentive in time savings or reliability for commuters to form carpools or take transit. In congested parts of Marin and Sonoma Counties, speeds in the HOV lane on US 101 are frequently under 45 mile per hour (mph) and less than 5 mph faster than speeds in the adjacent GP lanes. Should degradation continue to persist in these areas, increased enforcement, changes to hours of operation, and lane access conversions, or increase in occupancy requirements to 3+ may provide potential solutions. In Sonoma County, parts of the HOV lanes are underutilized and express lanes could provide a means of improving use.

The Marin-Sonoma Narrows is a section of US 101 that narrows from four lanes to two lanes in the northbound direction (north of Novato) and southbound direction (through Petaluma), causing significant delays. The addition of the HOV lane will increase person-throughput commensurate with the goals of MTC's Managed Lanes Implementation Program, and reduce operation delays for Golden Gate Transit Regional Bus services. This project is a significant priority of the business community in Marin and Sonoma Counties and is a top priority for the Transportation Authority of Marin and the Sonoma County Transportation Authority.[92]

Freeway Interchange Modernization

Many interchanges on US 101 were constructed in the 1950s, and ramps and intersecting local streets experience recurring traffic congestion throughout the day. Some interchanges have minimum sidewalk and bikeway facilities, but serve bus stops. Other interchanges have "hook" ramps that connect with local roads for short distances (less than 500 feet), creating high turning traffic volume at nearby intersections. While overcrossings may not meet the minimum vertical clearance required for structures over a freeway, curb ramps at some interchanges may not meet Americans with Disabilities Act (ADA) standards. As a result, this CCP includes interchange modernization projects to improve local traffic circulation and regional traffic operation, improve multimodal access and connectivity, and improve overall safety of the facilities.

Interchange modernization[93] can also serve as multimodal improvements that enhance communities and connect users of all modes. US 101 N bisects many communities, limiting bike and pedestrian connections across communities and to regional bus stops located on the highway. Improvements are recommended at the following highway interchange facilities in Marin County: Tiburon Boulevard / East

[92] https://www.tam.ca.gov/wp-content/uploads/2017/07/TAM-SVP-GettingAroundMarin_072617.pdf
[93] https://www.tam.ca.gov/wp-content/uploads/2017/07/TAM-SVP-GettingAroundMarin_072617.pdf

Blithedale Avenue, Tamalpais Drive, Merrydale Avenue, Freitas Parkway, and Lucas Valley Road; and may include Hearn Avenue, Hopper/Old Redwood Highway, Dry Creek Road, and others in Sonoma County.

Other proposed strategies include completing the direct connector between northbound US 101 and eastbound I-580, which will reduce travel impacts for residents and workers on the local roadway system in Larkspur and San Rafael, as well as substantially improve operations on the highway. [94] A direct connector from westbound I-580 to southbound US 101 is a strategy that could improve traffic conditions on Sir Francis Drake Boulevard in Marin.

In Sonoma County, a southbound bottleneck routinely develops in between SR 12 and Baker Avenue, and results in congestion on southbound US 101. Widening the overcrossing at Baker Avenue would eliminate the need for the lane drop north of the overcrossing and allow for an auxiliary lane in this section, improving traffic conditions approaching the bottleneck. The westbound I-580 to southbound US 101 direct connector and Baker Avenue overcrossing projects are not included in the proposed project list of this CCP since they are not listed in the current Regional Transportation Plan (Plan Bay Area 2040), but could be included in the future.

Ramp Metering

Ramp metering is an effective traffic management strategy to maintain an efficient freeway system, and protect the investment made in constructing freeways by keeping them operating at or near capacity.[95] Ramp metering can improve traffic flow on highways and reduce travel times by facilitating vehicle merging and reducing the bunching of vehicles loading onto the highway. Advance detection to avoid backup onto local roads is included as part of the proposed ramp metering projects in Marin County.

Transit Improvements

One strategy to maximize the person throughput of the regional freeway network is to increase the number of persons carried rather than vehicles. HOV lanes increase person throughput while decreasing per capita vehicle miles traveled, resulting in lower emissions than mixed-flow lanes. Managed lanes provide a great incentive for travelers to carpool or take transit by offering travel time savings and reliability, and represent a great opportunity to enhance existing transit services.

Regional and local bus services have a substantial impact on the person throughput of the freeway. In Marin, approximately 500 transit trips a day occur on US 101, with passenger loads estimated at over 20,000 rides a day.

Relocating the Bettini Transit Center, which serves 9,000 daily riders, is a high priority need to accommodate the SMART extension to Larkspur. This facility is the largest transit center in Marin County, and serves all transit operators in the county.

[94] https://www.tam.ca.gov/wp-content/uploads/2017/07/TAM-SVP-GettingAroundMarin_072617.pdf
[95] Caltrans Deputy Directive 35 R-1,

Enhancing Marin's Park-and-Ride facilities along US 101 can increase transit usage and support higher occupancy use of highways. Protecting facilities from sea level rise is a current challenge in locations such as the Manzanita Park-and-Ride.

Transit capital projects that provide a travel time savings can also attract "choice riders" that would otherwise choose to drive alone. These improvements can include bus-on-shoulder facilities in northern Marin. Bus-on-shoulder facilities have the potential to help manage demand on highways and provide travel time reductions for commuters. The Transportation Authority of Marin is considering a Bus-on-Shoulder pilot project which can take advantage of existing regional bus stops on the highway, providing additional travel time benefits that attract additional riders. [96]

SMART Extension[97]

With the initial operating segment of the SMART passenger rail service operating in 2017, SMART provides an alternative for travelers in the US 101 N Corridor. Completing the full buildout of the SMART system will promote ridership, reducing demand on US 101. Future extensions for the SMART Corridor include: a southern terminus in Larkspur which is scheduled to be completed in 2019 and extensions to Windsor, Healdsburg, and Cloverdale.

Bike and Pedestrian Facility Improvements

For non-motorized travelers, US 101 is a major physical barrier to cross. By providing safe and accessible bike and pedestrian facilities along the Corridor, more trips can be made by bike and pedestrian modes. The CCP proposes projects that connect the existing and proposed bikeway and pedestrian networks and offer a more comfortable alternative for bicyclists and pedestrians crossing US 101. In addition, supporting existing transit services through multimodal access to transit is another key strategy to provide easy and safe access. Increasing first and last-mile connectivity to SMART and regional transit services can encourage 'green commutes'. [98]

State Highway Operations and Protection Program

The State Highway Operations and Protection Program (SHOPP) is a four-year program that is updated every two years. It is Caltrans' primary tool to implement the *fix-it-first* approach to the State Highway System. Within each SHOPP cycle, priorities are evaluated to match funding and the goals established in the Caltrans Strategic Management Plan, such as Safety, Sustainability, Livability, Economy and Performance.

In accordance with Streets and Highways Code Section 164.6, Caltrans also prepares a ten-year state rehabilitation plan every two years that identifies the rehabilitation and reconstruction needs of all highways and bridges on the State Highway System, known as the Ten-Year SHOPP Plan. For the 2017 cycle, a State Highway System Management Plan (SHSMP) has been developed as a new integrated management plan that fulfills the Streets and Highway Code requirements for the Ten-Year SHOPP Plan

[96] https://www.tam.ca.gov/wp-content/uploads/2017/07/TAM-SVP-GettingAroundMarin_072617.pdf
[97] http://sonomamarintrain.org/about-district
[98] https://www.tam.ca.gov/wp-content/uploads/2017/07/TAM-SVP-GettingAroundMarin_072617.pdf

and incorporates the Five-Year Maintenance Plan. The SHSMP also helps fulfill the requirement for Caltrans to develop a robust Asset Management Plan, as outlined in Senate Bill (SB) 486. Among other changes, the SHSMP integrates the maintenance, rehabilitation and operation into a single management plan, introduces new national performance measures for pavement and bridges as required by federal law and presents performance targets approved under provisions of SB 486.[99]

6.3 Project Evaluation

All proposed projects were evaluated against performance measures (as described in Chapter 2) and rated as "highly positive impact," "medium positive impact," "low positive impact," and "negative impact" to show how the projects support the goals of the CCP. Project evaluation was a collaborative effort by Caltrans, TAM, and SCTA, done through the Corridor Development (CDT) team meetings. Table 6.1 below illustrates the rating criteria.

Table 6.1: Rating Criteria

CCP Goals	Rating Criteria
Goal 1: Improve safety	How does the proposed project increase safety for motorized and non-motorized users?
Goal 2: Reduce congestion and improve efficiency	How will the proposed project address congestion?
Goal 3: Improve trip reliability	Are there any improvements that help increase trip reliability?
Goal 4: Support an accessible and inter-connected multimodal system	How will the proposed project improve accessibility for people that travel the Corridor?
Goal 5: Reduce pollutants and GHG emissions	How will the proposed project reduce greenhouse gas emissions and criteria pollutants, and advance the State's air quality and climate goals?
Goal 6: Support economy	How does the proposed project support economic development and access to employment? How does the proposed project improve regional competitiveness?
Goal 7: Improve asset management	How will the project support a strategic process of operating, maintaining, and improving physical assets that will achieve and sustain a desired state of good repair over the lifecycle of the assets at minimum practicable cost?

Proposed projects are grouped into seven categories: Managed lanes, Intelligent Transportation System (ITS) such as ramp metering, interchange modernization, Park-and-Ride construction, SMART rail train

[99] http://www.catc.ca.gov/programs/SHOPP/2017_State_Highway_System_Management_Plan.pdf

extension, and improvements to transit and bike/pedestrian facilities. Projects of the same category generally have the similar ratings, but they may receive different ratings due to distinct attributes (such as geographic location, how heavily the project is used by the public, and contribution to local economy). For instance, the Marin-Sonoma Narrows projects all receive high ratings for the seven corridor goals since these projects improve travel safety, reduce congestion and GHG emissions, support the economy, improve multimodal connections, and increase trip reliability. They are high priority for investment in Marin and Sonoma Counties. Interchange improvement projects generally receive medium to high ratings on "safety", depending on the extent of the safety components of the projects. Similarly, such projects are normally rated medium to high on "supporting multimodal system", based on how multimodal enhancement will be provided at the interchanges. On the other hand, ratings of interchange projects on "emission reduction" are mostly low due to the capacity-increasing nature of those projects. With regard to "Asset Management," ratings are mostly high for interchange modernization projects since these projects would normally install ramp meters and improve signal coordination.

Tables 6.2 through 6.8 provide project listings, grouped by improvement type with performance ratings. Among these projects, short-term projects are identified based on the current status of the projects, and are listed in Table 6.9. Short-term projects are defined as projects which could be implemented within five years. Table 6.10 lists projects in the adopted 2016 SHOPP program and the draft 2018 SHOPP Program as well as other planned projects for future SHOPP cycles. Since SHOPP projects are not proposed by this CCP, they are not rated in the plan, however they help provide a more complete picture of corridor improvements.

Please note that Tables 6.4 through 6.8 are proposed bike and pedestrian projects. Many of those projects are from the draft District 4 Bike Plan or proposed by Caltrans System Planning, and will need to be studied further for feasibility prior to nomination.

Table 6.2: Transit and Park-and-Ride Projects

ID	County Post Mile (approx.)	Location	Project Name	Project Justification	Goal						
					1	2	3	4	5	6	7
1	MRN 2.5	Sausalito	Park & Ride Lot improvement - Rodeo Ave	Growing congestion on US 101 through Marin County necessitates freeway performance initiatives to improve park & ride lot utilization. Project would improve pavement conditions, address overflow parking, Meet ADA requirements, improve path of travel and lighting.	M	H	L	H	H	M	H
2	MRN 4.3	Mill Valley	Park & Ride Lot improvement for flood and sea level rise mitigation - Manzanita	Growing congestion on US 101 through Marin County necessitates freeway performance initiatives and sea level rise adaptation to improve park & ride lot utilization. Project would address chronic flooding conditions, improve pavement, ADA, lighting and path of travel.	H	H	M	H	H	M	H
3	MRN 11	San Rafael	Bettini Transit Center - permanent relocation	Continuation of SMART to southern terminus in Larkspur bisects the current transit facility. Growing congestion on US 101 through Marin County necessitates enhancements to multi-modal and public transit options, and providing seamless connectivity across modes in a central facility would be addressed by this project.	L	M	M	H	H	H	H
4	MRN 14.7	San Rafael	Park & Ride Lot improvement for faster regional transit service - Smith Ranch Rd	Growing congestion on US 101 through Marin County necessitates freeway performance initiatives to improve public transit options. This project would allow for transit vehicles to enter and exit the Smith Ranch Road Park-and-Ride, reduce transit travel times, and provide direct connection for Park-and-Ride users. The project would improve path of travel for transit routing and pedestrians, and improve pavement conditions and lighting.	L	H	M	H	H	M	H
5	MRN 20.2	Novato	Park & Ride Lot improvement for faster regional transit service - Rowland Ave	Growing congestion on US 101 through Marin County necessitates freeway performance initiatives to improve public transit options. Project would provide direct connectivity for Park-and-Ride users to transit, and improve path of travel.	L	H	M	H	H	M	H
6	MRN Various	Marin County-wide	Bus on Shoulder	Growing congestion on US 101 through Marin County necessitates freeway performance initiatives to improve public transit options. The proposed project would reduce transit travel times during congested peak periods, and connect existing highway transit stops for local and regional bus services. Path of travel and pavement conditions would be improved as part of this project.	L	H	H	H	H	H	H
7	MRN 15.5-19.6	Santa Rosa	Rapid Bus route:	Mendocino Avenue-Santa Rosa Avenue corridor parallel to US 101. Project includes ITS infrastructure expansion, and two Rapid Bus Routes. It will benefit alternative modes travel, and contribute to GHG emissions reductions	M	H	H	H	H	L	L
8	SON 26.3-29.4	SMART	SMART Extension	Extend Passenger Rail Service from Airport Blvd to Windsor. It will encourage increased use of active modes of transportation, and contribute to GHG emissions reductions.	M	H	H	H	H	M	H
9	SON 29.4-34.5	SMART	SMART Extension	Extend Passenger Rail Service from Windsor to Healdsburg. It will encourage increased use of active modes of transportation, and contribute to GHG emissions reductions.	M	H	H	H	H	M	H
10	SON 34.9-51.6	SMART	SM ART Extension	Extend Passenger Rail Service from Healdsburg to Cloverdale. It will encourage increased use of active modes of transportation, and contribute to GHG emissions reductions.	M	H	H	H	H	M	H

Legend: Goal 1 = Improve safety Goal 2 = Reduce congestion and improve efficiency Goal 3 = Improve trip reliability Goal 4 = Support an accessible and inter-connected multimodal system Goal 5 Reduce pollutants and GHG emissions Goal 6 Support economy Goal 7 Improve asset management
H = Highly Positive Impact, M = Medium Positive Impact, L = Low Positive Impact, N = Negative Impact

Table 6.3: Freeway Projects

ID	County Post Mile (approx.)	Location	Project Name	Project Justification	Goal						
					1	2	3	4	5	6	7
1	MRN 5.7	Mill Valley	East Blithedale/Tiburon Interchange	Recent traffic counts show that each weekday about 80,000 vehicles traverse the interchange's approach roadways of East Blithedale Avenue, Tiburon Boulevard, and Redwood Highway Frontage Road. Traffic congestion occurs during peak hours queuing up traffic on local roads. Northbound US 101 suffers from recurring congestion, further constraining throughput along the interchange's roadways. Vehicle collisions, with some involving pedestrians or bicyclists, have occurred along the arterial roadways, and conflict potential is exacerbated during congested periods. Project would address path of travel to regional bus stops located on the highway facility, where transit users currently cross high speed on-off ramps in unmarked crossings to access stops.	H	M	M	H	L	H	H
2	MRN 7.4	Corte Madera	Tamalpais Drive Interchange - modernize NB aux lane	Eastbound and westbound traffic often experience congestion along the Paradise Drive/Tamalpais Drive overcrossing (OC), particularly during the weekday late afternoon/ early evening peak period. Northbound US 101 faces heavy congestion for a number of hours during the late afternoon and early evening. Traffic backs up along both of the interchange's northbound on-ramps, and extends along Paradise Drive and Tamalpais Drive. A number of vehicle collisions have occurred along the OC's approaches to the signalized ramp intersections due to back-ups and limited sight distance. ADA and path of travel for pedestrians accessing regional bus stops located on the highway would be addressed in this project.	M	M	H	H	L	H	H
3	MRN 8.6	Larkspur	East Sir Francis Drake (SFD) Blvd Interchange - SFD Lane drop	Growing congestion on US 101 through Marin County necessitates freeway operation improvements to reduce travel times and emissions.	M	M	H	M	L	H	M
4	MRN 10	San Rafael / Larkspur	NB Highway 101 - EB Highway 580 direct connector	As the only non-high speed freeway connector to a toll bridge in the Bay Area, PM period congestion on US 101 throughout southern Marin County results from heavy queues on the highway mainline for users of I-580, the Richmond-San Rafael Bridge. Currently vehicles must exit the highway (US 101) and use local roads to connect to eastbound I-580, resulting in delays to the highway mainline in Marin County. Growing congestion on US 101 through Marin County necessitates freeway operational improvements to reduce travel times and emissions.	H	H	H	L	M	H	H
5	MRN 10	San Rafael	Bellam Blvd off-ramp intersection improvement	In order to improve access to the Richmond -San Rafael Bridge and I-580 to address PM peak congestion, traffic must exit and re-enter the freeway using local streets on Bellam Boulevard. Widening and reconfiguration of Bellam boulevard would improve access and congestion levels resulting from backups at this intersection. Growing congestion on US 101 through Marin County necessitates freeway operation improvements to reduce travel times and emissions.	H	H	H	L	M	H	H

ID	County Post Mile (approx.)	Location	Project Name	Project Justification	Goal						
					1	2	3	4	5	6	7
6	MRN 11.2	San Rafael	San Rafael On-ramp at 2nd and Heatherton Interchange - 2 lane SB on-ramp	The southbound on-ramp serves heavy traffic volumes from both southbound Hetherton Street and eastbound 2nd Street, providing freeway access to commuters from the employment center of San Rafael and the communities of San Anselmo and Fairfax. During peak periods traffic backs up along both roadways due to congestion along the southbound on-ramp, extending several blocks from the intersection, causing congestion along other Central San Rafael roadways. Traffic using the northbound off-ramp often waits through multiple signal cycles at the 2nd Street/Irwin Street intersection, resulting in long delays and back-ups along the off-ramp. Irwin Street north of 2nd Street experiences recurring congestion due to its heavy traffic demands, and high volumes on the intersecting cross-streets.	M	H	H	M	M	H	H
7	MRN 12.7	San Rafael	Merrydale Road and North San Pedro Interchange - modernize	Several ramps experience recurring traffic congestion due to high vehicular demands and their original unique geometry. For example, the ramps from and to southbound US 101 are short and have tight curves, resulting in back-ups both along southbound US 101 and on Merrydale Road. The on-ramp joins US 101 on an uphill grade, resulting in vehicle speed differentials at the merge point. A substantial amount of traffic exiting the northbound off-ramp is destined for the Civic Center, requiring motorists to cross a traffic lane in a short distance, contributing to congestion along North San Pedro Road. In addition, the North San Pedro Road/Merrydale Road intersection often experiences congestion. The project would signalize intersections to the highway, provide separated turn lanes in both directions on Merrydale, add bike and pedestrian facilities and improve pavement conditions.	M	M	M	M	L	M	H
8	MRN 13.7	San Rafael	Manual T. Freitas Parkway Interchange - modernize	During peak traffic periods, traffic often backs up along the southbound on-ramp, impacting traffic operations along eastbound Manuel T. Freitas Parkway, including through the Del Presidio Boulevard and Northgate Drive intersections. Multiple roadway and ramp approaches intersect on the east side of the interchange, with many uncontrolled traffic movements at the northbound ramps, on the parkway, and along Redwood Highway/Civic Center Drive. Motorists traversing the complex often appear confused. Traffic levels through the interchange area are expected to increase in the future as land use changes occur. The project would separate and signalize uncontrolled movements and add bike and ped improvements.	M	M	M	M	L	M	H
9	MRN 14.7	San Rafael	Lucas Valley – Smith Ranch Road Interchange - modernize	The limited capacity along Lucas Valley Road west of Smith Ranch Road, including under US 101 and west past Los Gamos Drive, contributes to traffic congestion during peak commute periods. The interchange's short and tightly curved southbound off-ramp routinely experiences back-ups toward the highway's mainline, and provides limited driver sight distance. During peak periods the southbound on-ramp serves heavy traffic volumes. Traffic levels through the interchange area are expected to increase in the future as land use changes occur. Flooding occurs under US 101 and limited bike and ped connections occur for transit users to access bus stops and Park- and- Ride facilities.	M	M	M	M	L	L	H
10	MRN Various	Marin County-wide	Ramp metering - NB US 101 southern Marin	Growing congestion on US 101 through Marin County necessitates freeway performance initiatives to improve travel times and reduce emissions	H	H	H	L	H	H	H
11	MRN Various	Marin County-wide	Ramp metering - All of US 101 in Marin	Growing congestion on US 101 through Marin County necessitates freeway performance initiatives to improve travel times and reduce emissions	H	H	H	L	H	H	H

ID	County Post Mile (approx.)	Location	Project Name	Project Justification	Goal						
					1	2	3	4	5	6	7
12	MRN 20.9-23	Between Novato and County Line	MSN - Segment A4 - Construct HOV lanes	US 101 is the principal route in the coastal northwest between the San Francisco Bay Area and Oregon, and the only continuous north/south route through Marin and Sonoma Counties. Over the past 15 years, recreational expansion, commercial, and population growth in Sonoma and Marin counties have led to significant traffic increases along the US 101 Corridor. The Marin-Sonoma Narrows is a section of US101 that narrows from four lanes to two lanes in the northbound direction (north of Novato) and southbound direction (through Petaluma), causing significant delays. The addition of the HOV lane will increase person-throughput and reduce operation delays for Golden Gate Transit Regional Bus services. This project is a significant priority of the business community in Marin and Sonoma Counties and is a top priority for the Sonoma County Transportation Authority. To deliver this project, the Transportation Authority of Marin (TAM), Sonoma County Transportation Authority (SCTA) and Caltrans have initiated a strategy of dividing the 17-mile project into a series of contracts and are building the project in phases.	H	H	H	H	H	H	H
13	MRN 23-26.5	Between Novato and County Line	MSN - Segment B1 Phase 2 - Construct HOV lanes		H	H	H	H	H	H	H
14	MRN 26.5-27.6	Between Novato and County Line	MSN - Segment B5 - Construct road and bike lanes		H	H	H	H	H	H	H
15	MRN 27	Between Novato and County Line	MSN - Segment B6 - Bridge replacement		H	H	H	H	H	H	H
16	MRN 20.9-27.6	Between Novato and County Line	MSN - Segment L1B - Plant mitigation for MSN		H	H	H	H	H	H	H
17	SON 4.0-7.3	From SR 116 junction to 0.3 mile north of Corona Rd	MSN - C2 Segment - Construct HOV lanes and soundwalls		H	H	H	H	H	H	H
18	SON/ MRN Various	Between Novato and Petaluma	Turn on Ramp Metering from Highway 37 to Old Redwood highway.	Ramp metering can improve traffic flow on highways and reduce travel times by reducing the bunching of vehicles loading onto the highway. Ramp Metering Equipment has been installed but not yet activated.	H	H	H	H	H	H	H
19	SON Various	Petaluma - Windsor	Corridor Landscaping - Visual Mitigation following HOV lane completion	To mitigate visual impacts of the MSN project, plant one tree for each tree removed by the project where feasible.	L	L	L	L	M	L	M
20	SON 10.7	Between Petaluma and Cotati	Railroad Ave Interchange - Add SB on ramp and Consider NB on and SB off	It is currently a partial interchange with only a NB off -ramp. Measure M - Local Streets Project funds is currently available with a 50 percent match requirement.	M	M	M	L	L	M	M

ID	County Post Mile (approx.)	Location	Project Name	Project Justification	Goal						
					1	2	3	4	5	6	7
21	SON 18.5	Santa Rosa	US Highway 101/Hearn Avenue Interchange - Widen O/C, Improve I/C	The existing Hearn Avenue interchange is unable to accommodate current and future traffic volumes resulting in congestion. This congestion and traffic queues adversely impact Hearn Avenue, the interchange, and mainline Highway 101 operations. The proposed project will reduce congestion and queue lengths by adding two lanes (resulting in two travel lanes in each direction) and improving the on-ramps and off- ramps. The project will also provide Class II bicycle lanes and sidewalks on both sides of the new structure. The project design and right of way is fully funded and expected to be completed in May 2019. There are approximately $3.4 M of Measure M funds for the Construction phase. • Improve local traffic circulation and regional traffic operations • Improve multimodal access, connectivity and operations • Improve overall safety of the facility	H	M	M	H	L	H	H
22	SON 22.8	Santa Rosa	Mendocino Ave/Hopper Interchange - Improve Interchange	There is significant traffic congestion and operational issues in northwest Santa Rosa near US 101 freeway interchange where Mendocino Avenue transitions to Old Redwood Highway. Potential long-term improvements could include major freeway interchange modifications, such as combining the existing split on/off ramps at Hopper Avenue and the on/off ramps at Mendocino Avenue into a full interchange. A very preliminary assessment was completed in April 2010. The next phase for this project would be completing the Project Initiation Document (PID).	M	M	H	M	L	M	H
23	SON 24.9	Between Santa Rosa and Windsor	River Road Interchange - Widen O/C, Improve I/C	Improve local traffic circulation, Improve multimodal access, connectivity and operations. The existing River Road interchange is unable to accommodate current and future traffic volumes.	M	M	M	M	L	M	H
24	SON 27.6	Windsor	Shiloh Road Interchange - Upgrade Interchange	Reconstruct the Shiloh Road/US 101 interchange to provide two lanes in each direction. It is anticipated that the existing OC will be replaced and ramps reconfigured. It is expected that 60 percent of project costs will come from federal, State, or regional funds.	M	M	M	M	L	M	H
25	SON 30.7	Windsor	Arata Lane Interchange - Operational Improvement	Construction of the Northbound on-ramp to US 101 will complete the Arata Lane interchange with US 101. This project also includes the relocation of a portion of Los Amigos Road north of Arata Lane. Rights of way have been obtained in prior phases.	M	M	M	M	L	M	M
26	SON 36.3	Healdsburg	Dry Creek Road Interchange - Improve I/C (interconnected signals or roundabout couplet)	SB off-ramp intersection operates unacceptably at LOS F during both morning and evening peak periods. SB off-ramp traffic frequently backs up on to shoulder on mainline.	H	M	M	L	L	M	M

Legend: Goal 1 = Improve safety Goal 2 = Reduce congestion and improve efficiency Goal 3 = Improve trip reliability Goal 4 = Support an accessible and inter-connected multimodal system Goal 5 Reduce pollutants and GHG emissions Goal 6 Support economy Goal 7 Improve asset management

H = Highly Positive Impact, M = Medium Positive Impact, L = Low Positive Impact, N = Negative Impact

Table 6.4: Proposed Bike and Pedestrian Projects – Crosswalks

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
1	SON	37	Chiquita Rd., Healdsburg	Ped improvements	Add crosswalks, sidewalks.	CT-System Planning	H	L	L	H	M	L	L
2	SON	38.6	Lytton Springs, Healdsburg	Ped/bike improvements	Add crosswalks, shorten crossing distances, control turns.	CT-System Planning	H	L	L	H	M	L	L
3	SON	50.4	Cloverdale Blvd., Cloverdale	Ped/bike improvements	Add crosswalks, shorten crossing distances, control turns.	CT-System Planning	H	L	L	H	M	L	L
4	SON	51.6	Citrus Fair Dr., Cloverdale	Ped/bike improvements	Adjacent to SMART Station. Main pedestrian/bike access from Downtown Cloverdale. Improve pedestrian realm, control turns, high visibility crosswalks.	CT-System Planning	H	L	L	H	M	L	L
5	SON	54.2	N. Redwood Hwy, Cloverdale	Ped/bike improvements	Add crosswalks, shorten crossing distances, control turns.	CT-System Planning	H	L	L	H	M	L	L

Legend: Goal 1 = Improve safety Goal 2 = Reduce congestion and improve efficiency Goal 3 = Improve trip reliability Goal 4 = Support an accessible and inter-connected multimodal system Goal 5 Reduce pollutants and GHG emissions Goal 6 Support economy Goal 7 Improve asset management
H = Highly Positive Impact, M = Medium Positive Impact, L = Low Positive Impact, N = Negative Impact

Table 6.5: Proposed Bike and Pedestrian Projects – Multi Use Path

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
1	MRN	Var	2nd St to Anderson, San Rafael	SMART Multi Use Path (MUP) ROW	MUP/2nd St to Anderson	TAM	H	M	M	H	H	L	L
2	MRN	Var	Various Locations	North/South Greenway MUP	Close gaps on North/South Greenway MUP	TAM	H	M	M	H	H	L	L
3	MRN	8	Wornum Dr., Greenbrae	Multi-use path	Wornum undercrossing - Class I MUP and safe connection to existing Bay Trail bayside of Redwood, safe connection to Sandra Marker Trail. New MUP between undercrossing and Sandra Marker Trail needed. The Bay Trail and the Sandra Marker Trail are two major non-motorized transportation facilities in Corte Madera/Larkspur that would be seamlessly connected with the construction of a new MUP under the freeway at Wornum Drive.	Bay Trail	H	M	M	H	H	L	L
4	SON	0.1	MSN	MUP	Marin-Sonoma Narrows trail proposed in SCTA bike plan.	SCTA	H	M	M	H	H	L	L
5	SON	3.3	Petaluma River Bridge., Petaluma	New separated crossing	Install new Class I trail under the US 101 Petaluma River Bridge on the north side of the river. This will connect the Riverfront Development to the west (under construction) to the Petaluma Marina to the east. This will connect downtown Petaluma, including the new SMART rail station to the south east portion of Petaluma, including the bay area rim trail.	City of Petalu-ma	H	M	M	H	H	L	L
6	SON	3.3-12.5	Petaluma	Petaluma – Sebastopol Multi Use Path	Provides connections across critical barriers in NW/SE corridor for alternative modes.	SCTA	H	M	M	H	H	L	L
7	SON	3.3-12.5	Hwy 116, Petaluma	Petaluma – Sebastopol Multi Use Path	Provides connections across critical barriers in NW/SE corridor for alternative modes.	SCTA	H	M	M	H	H	L	L
8	SON	5.8-R51	Petaluma to Cloverdale	SMART Multi-Use Path	Provides connection between Petaluma and Cloverdale	SCTA	H	M	M	H	H	L	L

Legend: Goal 1 = Improve safety Goal 2 = Reduce congestion and improve efficiency Goal 3 = Improve trip reliability Goal 4 = Support an accessible and inter-connected multimodal system Goal 5 Reduce pollutants and GHG emissions Goal 6 Support economy Goal 7 Improve asset management
H = Highly Positive Impact, M = Medium Positive Impact, L = Low Positive Impact, N = Negative Impact

Table 6.6: Proposed Bike and Pedestrian Projects – Bike Lanes

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
1	MRN	2.5	Rodeo Ave. Sausalito	Bike Lanes	Rodeo Ave.	Marin County BPMP	H	M	M	H	H	L	L
2	MRN	4.6	Redwood Hwy (Strawberry Frontage Rd) Mill Valley & Marin County	Bike Lanes	Provide bike lanes on Redwood Highway Frontage Road east side of freeway. Existing bike/ped grade separated crossing near on/off ramps.	Marin County BPMP	H	M	M	H	H	L	L
3	MRN	8.1	Wornum Dr., Greenbrae	Bike Lanes	Widen existing Class I path on south side of Wornum Drive.	Draft D4 Bike Plan	H	M	M	H	H	L	L
4	MRN	22	Atherton Ave., Novato	Bike Lanes	Atherton Ave overpass, Novato.	Marin County BPMP	H	M	M	H	H	L	L
5	SON	34.9	Mill St, Westside Road, Healdsburg	Bike Lanes	Mill St.	SCTA bike plan	H	M	M	H	M	M	H
6	SON	36.3	Dry Creek Rd., Healdsburg	Bike Lanes	Dry Creek Rd.	SCTA bike plan	H	M	M	H	M	M	H

Legend: Goal 1 = Improve safety Goal 2 = Reduce congestion and improve efficiency Goal 3 = Improve trip reliability Goal 4 = Support an accessible and inter-connected multimodal system Goal 5 Reduce pollutants and GHG emissions Goal 6 Support economy Goal 7 Improve asset management
H = Highly Positive Impact, M = Medium Positive Impact, L = Low Positive Impact, N = Negative Impact

Table 6.7: Proposed Bike and Pedestrian Projects – Overcrossings/Undercrossings

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
1	SON	13.1	Redwood Dr., Rohnert Park	New separated crossing	Two nearby existing and planned creek trails stop at US 101. Provide separated crossing at least at one of them.	Draft D4 Bike Plan	H	M	M	H	H	L	L
2	SON	17.6	Bellevue Creek Trail, Santa Rosa	New separated crossing	The proposed Bellevue Creek Trail provides an east-west connection starting at Petaluma Hill Road and continues west to the proposed Laguna de Santa Rosa Trail. An overhead crossing of Hwy 101 is needed. The Bellevue Creek Trail will provide connections to bike lanes on Petaluma Hill Road, on Stony Point Road, and the SMART Trail.	Sonoma County Parks	H	M	M	H	H	L	L
3	SON	21	Santa Rosa Jr. College area, Santa Rosa	New separated crossing	City of Santa Rosa completed a Project Study Report in 2016. The project will: • Provide a continuous path to improve bicycle and pedestrian east – west connectivity across US 101 in the northern half of the City of Santa Rosa and connect the existing and proposed bikeway and pedestrian networks; • Offer a more comfortable alternative for bicyclists and pedestrians crossing US 101 compared to existing roadway crossings; • Provide an alternative travel route for non-motorized travelers to increase travel mode flexibility and encourage a mode shift away from motorized vehicle travel.	City of Santa Rosa; SCTA	H	M	M	H	H	L	L
4	SON	26.1	Mark West Creek Trail, Santa Rosa	New separated crossing	The proposed Mark West Creek Trail provides an east-west connection from Old Redwood Highway to the Santa Rosa Airport. The trail follows the Mark West Creek corridor and will need to cross below the Airport Boulevard off-ramp and US 101.	Sonoma County Parks	H	M	M	H	H	L	L

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
5	SON	29.4	Old Redwood Hwy, Windsor	New separated crossing	Central Windsor at Old Redwood Highway (ORH). The existing underpass along ORH does not have sufficient width for compliant bike lanes and shared-use pathways. The existing northbound on-ramp is not signalized and poses impediments for safe crossing for pedestrian and bicycles. Public outreach indicates a great need to improve this existing underpass and to add a vehicle free pedestrian and bicycle crossing either over or under US 101. This central Windsor location has the highest daily traffic counts in the Town and requires safe pedestrian and bicycle access to the downtown. This area connects Class II trails on ORH and Conde Lane and to Class III trails on Windsor River Road. In the central area, these Class II trails connect to existing and proposed Class I Windsor Creek trails. The Windsor River Road Class III trail connects to SMART path.	Town of Windsor; SCTA	H	M	M	H	H	L	L

Legend: Goal 1 = Improve safety Goal 2 = Reduce congestion and improve efficiency Goal 3 = Improve trip reliability Goal 4 = Support an accessible and inter-connected multimodal system Goal 5 Reduce pollutants and GHG emissions Goal 6 Support economy Goal 7 Improve asset management
H = Highly Positive Impact, M = Medium Positive Impact, L = Low Positive Impact, N = Negative Impact

Table 6.8: Proposed Bike and Pedestrian Projects – Interchanges

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
1	MRN	0	TBD	Corridor Improvement-Class I	Class I MUP and safety improvements at US 101 off-ramps.	Bay Trail	H	M	M	H	M	M	H
2	MRN	0.3	Alexander Ave Sausalito	Minor interchange improvements	In conjunction with planned Class II, provide high visibility treatments at intersections with ramps, including green markings and/or signage.	Marin County BPMP	H	M	M	H	M	M	H
3	MRN	5.8	Tiburon Blvd., Marin County (Mill Valley)	Interchange reconstruction - full reconstruction	Class II bike lanes on Tiburon Boulevard and on Redwood Highway Frontage Road. Recommend reconfiguring interchange to diamond, eliminating high speed ramp entries. Prioritize bicycles along Blithedale Ave/Tiburon Boulevard, as this is the only route across US 101 for some distance in either direction	Marin BPMP/Draft D4 Bike Plan	H	M	M	H	M	M	H
4	MRN	11.1	Mission Ave., San Rafael	Minor interchange improvements	Add signage and striping.	Marin County BPMP	H	M	M	H	M	M	H
5	MRN	12.7	N. San Pedro Road, San Rafael	Intersection improvements	Square off ramps, improve pedestrian access to bus pads, add crosswalks, and improve landscaping.	CT-System Planning	H	M	M	H	M	M	H
6	MRN	13.7	Freitas Pkwy, San Rafael	Minor interchange improvements	Planned Class IV on Manuel Freitas Parkway overpass.	Marin County BPMP	H	M	M	H	M	M	H
7	MRN	14.7	Lucas Valley Road, San Rafael	Minor interchange improvements	Consider reconfiguring ramps to eliminate high-speed entry and exit (square up).	Marin County BPMP	H	M	M	H	M	M	H
8	MRN	15.6	Miller Creek OP, San Rafael/Marin County	Interchange improvements	Consider squaring off ramps.	CT-System Planning	H	M	M	H	M	M	H
9	MRN	16.7	Nave Dr., Novato	Interchange improvements	Consider squaring off ramps.	CT-System Planning	H	M	M	H	M	M	H

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
10	MRN	21.1	DeLong Ave, Novato	Interchange improvements,	Consider squaring off ramps and shortening turn radii.	CT-System Planning	H	M	M	H	M	M	H
11	SON	3.7	Lakeville Rd. (SR116) Petaluma	Ped improvements	Improve pedestrian access and safety. Consider smaller radii turns and adding bus pad & Park-and-Ride access. It will connect to SMART path.	CT-System Planning	H	M	M	H	M	M	H
12	SON	7.7	Old Redwood Hwy., Petaluma	Interchange reconstruction - ramps only	Minor ramp reconfiguration to square up off-ramps and on-ramps. Remove slip lanes in Petaluma. Will connect to existing Class II on Old Redwood Hwy.	SCTA Bike Plan	H	M	M	H	M	M	H
13	SON	12	W. Sierra Ave., Cotati	Minor interchange improvements	W Sierra Ave is an existing Class II bikeway. Reduce curb radii and square up the existing ramps where they meet with W Sierra Ave to shorten crossing distance for bicyclists. Add stop sign on Sierra Ave at ramp entrances to eliminate free right movement.	Draft D4 Bike Plan	H	M	M	H	M	M	H
14	SON	12.7	Gravenstein Hwy (SR116), Redwood Dr. Cotati	Minor interchange improvements	Existing bike lanes through the interchange area and connection to facility on Redwood Dr. and Redwood Hwy. Reduce curb radii of off- and on-ramps.	Draft D4 Bike Plan	H	M	M	H	M	M	H
15	SON	13.9	Rohnert Pk. Expy., Rohnert Park	Interchange reconstruction - ramps only	Existing bike lanes on Rohnert Park Expressway. Minor ramp reconfiguration to square up the ramps and reduce conflicts with bicyclists.	SCTA Bike Plan	H	M	M	H	M	M	H
16	SON	15	Commerce Blvd., Rohnert Park	Minor interchange improvements	Improve crossings of ramps and Commerce Blvd (which connects to the US 101 ramp). Consider Class II buffered if possible. Consider bicycle signal for some crossings to avoid high-speed turning movements.	Draft D4 Bike Plan	H	M	M	H	M	M	H
17	SON	16.6	Todd Rd, Santa Rosa	Minor interchange improvements	No room for bike lanes on current bridge. May need to replace bridge, provide separate bike/ped facility, or have shared accommodation on the bridge. Striping approaching the bridge should help.	Draft D4 Bike Plan	H	M	M	H	M	M	H
18	SON	18.5	Hearn Ave-Steele Ln., Santa Rosa	Minor interchange improvements	Existing bike lanes in vicinity of interchange. Significant traffic, multiple turn lanes. Bike signal may be needed as part of improvement.	Draft D4 Bike Plan	H	M	M	H	M	M	H
19	SON	18.5	Hearn Ave., Santa Rosa	Minor interchange improvements	Signage and striping. Hearn Ave is a bike facility with significant gaps over US 101.	SCTA Bike Plan	H	M	M	H	M	M	H
20	SON	18.9	Colgan Creek Trail, Santa Rosa	Interchange reconstruction - full reconstruction	Connect proposed Colgan Creek trail to bike lanes. Interchange is offset with numerous conflicts. Suggest reconstructing interchange to provide separate bike/ped overcrossing. Consistent with SCTA Bike Plan	SCTA Bike Plan	H	M	M	H	M	M	H

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
21	SON	20.1	3rd St (Santa Rosa)	Minor interchange improvements	Signage and striping. 3rd Street has existing bike lanes.	Draft D4 Bike Plan	H	M	M	H	M	M	H
22	SON	20.8	College Ave., Santa Rosa	Minor interchange improvements	Signage and striping.	City of Santa Rosa	H	M	M	H	M	M	H
23	SON	22.5	Industrial Dr. - Bicentennial Way, Santa Rosa	Interchange reconstruction - ramps only	Replace free flow off-ramps from 101 NB with single, signalized crossing. Potentially signalize 101 SB on ramps	Draft D4 Bike Plan	H	M	M	H	M	M	H
24	SON	22.8	Mendocino Ave, Santa Rosa	Interchange improvements	Consider squaring off ramps, shortening ped crossings, adding pedestrian refuges, shortening Right turn radii.	CT-System Planning	H	M	M	H	M	M	H
25	SON	24.9	River Rd/MWS Rd, Fulton	Interchange reconstruction - ramps only	River Rd/Mark West Springs Rd proposed bike lanes in SCTA bike plan.	SCTA Bike Plan	H	M	M	H	M	M	H
26	SON	25.9	Fulton Rd., Fulton	Interchange improvements	Consider squaring up ramps, and adding crosswalks.	CT-System Planning	H	M	M	H	M	M	H
27	SON	26.3	Airport Blvd, Santa Rosa	Interchange improvements	Consider squaring up ramps and adding crosswalks.	CT-System Planning	H	M	M	H	M	M	H
28	SON	27.6	Shiloh Rd., Larkfield-Wikiup	Intersection Improvement at controlled intersection	Shiloh Road has a high volume of industrial traffic. The Shiloh Road overpass requires two lanes in each direction and US 101 ramp reconfiguration and upgraded signalization. The lane improvements will improve bicycle and pedestrian connectivity and safety.	Town of Windsor; SCTA Bike Plan	H	M	M	H	M	M	H

ID	County	Post Miles (approx.)	Location	Proposed Improvement Type	Project Description/Justification	Source	Goal						
							1	2	3	4	5	6	7
29	SON	30.7	Arata Lane, Windsor	Minor interchange improvements	The project proposes to reconstruct the US 101 overpass for widening of Arata Lane. Improvements will also realign Los Amigos Road, add a northbound on-ramp, widen Arata Lane to include signal modifications to add pedestrian crossings at existing off-ramp and proposed on-ramp, and add enhanced crosswalks or crossing signs/markings at Los Amigos Road/Arata Lane. Improve existing Class II bike lanes. There are additional sidewalk gap closures required at this location. Connects to Class II trails on Old Redwood Highway (ORH) and Los Amigos Road. Immediately to the north, ORH connects to a Class II trail on Starr Road which leads to a K-8 school. Immediately to the south, ORH connects to proposed Class III trails.	Town of Windsor; SCTA Bike Plan	H	M	M	H	M	M	H

Legend: Goal 1 = Improve safety Goal 2 = Reduce congestion and improve efficiency Goal 3 = Improve trip reliability Goal 4 = Support an accessible and inter-connected multimodal system Goal 5 Reduce pollutants and GHG emissions Goal 6 Support economy Goal 7 Improve asset management
H = Highly Positive Impact, M = Medium Positive Impact, L = Low Positive Impact, N = Negative Impact

Table 6.9: Short -Term Projects

County	Project Name	PID Approval/ Environmental Start (Month/Year)	Environmental Complete (Month/Year)	Design Complete (Month/Year)	Construction Complete (Month/Year)	Total Project Cost (in millions)	Funding Needed (in millions)
Marin	East Sir Francis Drake Blvd Interchange - SFD Lane drop	Complete	Dec-16	Mar-17	Mar-18	$3.5	n/a
Marin	Bellam Blvd off-ramp intersection improvement	Complete	Mar-18	Aug-18	Oct-19	$5	n/a
Marin	Ramp metering - NB 101 Southern Marin	Complete	Complete	Mar-18	Dec-19	n/a	n/a
Marin	MSN - Segment A4 - Construct HOV lanes	Dec-01	Oct-09	Dec-18	Dec-21	$30	$30
Marin	MSN- Segment B1 Phase 2 - Construct HOV lanes	Dec-01	Oct-09	Dec-18	Dec-21	$76	$76
Marin	MSN - Segment B5 - Construct road and bike lanes	Dec-01	Oct-09	Jun-19	Dec-21	$3	$3
Marin	MSN - Segment B6 - Bridge replacement	Dec-01	Oct-09	Jun-18	Dec-19	$7	n/a
Marin	MSN - Segment L1B - Plant mitigation for MSN	Dec-01	Oct-09	Jun-19	Dec-21	$1	$1
Sonoma/ Marin	MSN - C2 Segment - Construct HOV lanes and soundwalls	Dec-01	Oct-09	Dec-18	Dec-22	$ 121	$85 Construction Only
Sonoma	US Highway 101/Hearn Avenue interchange - Widen O/C, Improve I/C	Jan-13	Dec-16	May-19	Dec-21	$31	$20.4 for Construction Only
Sonoma	Hwy 101 Bike and Ped Overcrossing near SRJC - Connector Over Highway 101 in vicinity of N. SR Station Area/JC	Aug-17	Dec-18	Jun-20	Dec-22	$17	$14.5

Table 6.10: SHOPP projects

ID	County	Route	Postmile (approximate)	EA	Activity Category	Description	Source*
1	Marin	1	0.0/0.8	2G690	Americans with Disability Act Pedestrian Infrastructure	In Almonte, near US 101 off-ramp to SR 1; also from Coyote Creek to Flamingo Road. Upgrade pedestrian facilities.	2016 SHOPP, 2018 SHOPP
2	Marin	1	0/0.3		Major Damage	In Marin County, at Manzanita, at the US 101 Separation, raise highway profile grade	2017-18,18-19 PID Work Plan 2017 Ten-Year SHOPP Plan
3	Marin	1	0/17		Pavement	From Manzanita to Bolinas Road	2017 Ten-Year SHOPP Plan
4	Marin	1	n/a		Mobility	In Almonte, near US 101 off-ramp to SR 1; also from Coyote Creek to Flamingo Road. Upgrade pedestrian facilities.	2017 Ten-Year SHOPP Plan
5	Marin	37	11.2/13.7		Sustainability/ Stormwater	US 101 to Atherton Ave UC, Novato Creek 27-0011R & 27-0011L	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
6	Marin	37	R11.7/12.0	4K330	Major Damage Restoration	In and near Novato, from US 101 to Novato Creek Bridge. Stabilize embankment slipout, install drainage system, construct concrete barrier, and repair flooded and saturated roadway.	2016 SHOPP
7	Marin	101	0.0/4.0	3G210	Americans with Disability Act New Curb Ramps	In and near Sausalito, Corte Madera, and Larkspur at various locations; also, in Tiburon on Route 131 (PM 4.0 to 4.392) at various locations. Upgrade curb ramps, driveways and sidewalks.	2016 SHOPP
8	Marin	101	0/18		Pavement	Golden Gate Bridge to Ignacio Blvd	2017 Ten-Year SHOPP Plan
9	Marin	101	0/27.6		Mobility	US 101 in Marin (PM 0/27.6) and I-580 in Marin (PM4/10.5). Install Fiber Communications.	2017 Ten-Year SHOPP Plan
10	Marin	101	0.2	4J420	Permanent Restoration	Near Sausalito, at 0.1 mile south of Alexander Avenue. Restore damaged drainage systems.	2016 SHOPP, 2018 SHOPP, 2017 Ten-Year SHOPP Plan

ID	County	Route	Postmile (approximate)	EA	Activity Category	Description	Source*
11	Marin	101	0.3/9.0	15161	Transportation Management Systems	In and near Sausalito, Corte Madera, and Larkspur, from north of Golden Gate Bridge to 0.3 mile north of Sir Francis Drake Boulevard. Install Ramp Metering (RM) and Traffic Operations System (TOS) elements.	2016 SHOPP, 2018 SHOPP, 2017 Ten-Year SHOPP Plan
12	Marin	101	0.9/1.1	n/a	Safety - Monitoring	Waldo Tunnels- Lighting Rehabilitation - Upgrade to LED 27-40L, 27-40R	2017 Ten-Year SHOPP Plan
13	Marin	101	4.7/5.6	4H980	Safety Improvements	Near Mill Valley, from Redwood Highway frontage Road to SR 131 (Tiburon Boulevard). Install concrete barrier.	2016 SHOPP
14	Marin	101	4.75/5.53	n/a	Safety - SI	Between NB US 101 and the Redwood Highway frontage road from PM 4.75 to PM 5.53 in Marin County	2017 Ten-Year SHOPP Plan
15	Marin	101	5.57/5.57	n/a	Mobility	MRN-101-PM 5.57 - Widen southbound on-ramp from eastbound E. Blithedale Avenue	2017 Ten-Year SHOPP Plan
16	Marin	101	6.0/6.9	1K630	Permanent Restoration	In and near Corte Madera, from 1.4 miles to 0.5 mile south of Tamalpais Drive. Reconstruct culvert riser and repair slope.	2016 SHOPP,2017 Ten-Year SHOPP Plan
17	Marin	101	7.37/18.88	4J860	Bridge	Tamalpais Dr. OC Priority 155 BR#27-0072 - Bridge rehabilitation, bridge rails, ADA upgrade, storm water mitigation, and roadside safety improvements	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
18	Marin	101	9.4-10.4	2K810	Roadside Safety Improvements/ Freeway Maintenance Access	In San Rafael, at I-580; and in Sonoma County in Santa Rosa from PM 19.7 to PM 20.7; in Solano County on SR 37 in Vallejo from PM R9.4 to PM R10.4 and on Route 80 in and near Vallejo and Fairfield from PM 6.5 to 17.5; also, in Napa County on SR 29 in and near the Cities of Napa and Yountville from PM 11.0 to 21.0. Upgrade fencing to reduce maintenance worker exposure	2018 SHOPP, 2017 Ten-Year SHOPP Plan
19	Marin	101	9.5/9.5	n/a	Major Damage	In Marin County, at Cal Park Hill, construct wire mesh drapery	2017 Ten-Year SHOPP Plan
20	Marin	101	10.1	2J480	Permanent Restoration	In San Rafael, at the US 101/I-580 Interchange. Repair sinking pavement and drainage systems.	2016 SHOPP
21	Marin	101	10.6/10.9	4G820	Bridge Major Rehabilitation	In San Rafael, from US 101 northbound off-ramp to 2nd Street at San Rafael Harbor Bridge No. 27-0033. Replace bridge.	2016 SHOPP

ID	County	Route	Postmile (approximate)	EA	Activity Category	Description	Source*
22	Marin	101	11.3	0K510	Bridge Preventative Maintenance	In San Rafael, at Irwin Creek Bridge No. 27 -0097. Rehabilitate corrugated metal arch culvert bridge and adjoining deteriorated culvert structures.	2018 SHOPP,2017 Ten-Year SHOPP Plan
23	Marin	101	13.7	0K800	Americans with Disabilities Act New Curb Ramps	In San Rafael, at Manuel T. Freitas Parkway. Upgrade curb ramps, sidewalk, and other facilities to make compliant with ADA standards	2018 SHOPP,2017 Ten-Year SHOPP Plan
24	Marin	101	15.4	4G871	Bridge Scour Mitigation	Near San Rafael on US 101 at Miller Creek Bridge No. 27-0004. Scour mitigation.	2016 SHOPP
25	Marin	101	17.5/17.5	n/a	Mobility	US 101 PM 17.5 City of Novato - new Weigh-in-Motion site	2017 Ten-Year SHOPP Plan
26	Marin	101	18/27.6	n/a	Pavement	Ignacio Blvd to Sonoma County Line	2017 Ten-Year SHOPP Plan
27	Marin	101	23.8/26.7	n/a	Drainage	Near Novato	2017 Ten-Year SHOPP Plan
28	Marin	101	25.6/25.8	n/a	Drainage	In Marin County, at San Antonio Road	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
29	Marin	101	n/a	n/a	Mobility	In Sausalito, Corte Madera, Larkspur, and Tiburon, on US 101 and SR 131 at various locations. Upgrade curb ramps, driveways and sidewalks.	2017 Ten-Year SHOPP Plan
30	Marin	131	0/4.4	n/a	Pavement	From Jct. US 101 to end of the SR 131	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
31	Marin	580	2.47/4.782	n/a	Pavement	Richmond-San Rafael Bridge to US 101	2017 Ten-Year SHOPP Plan
32	Sonoma	12	14.5/16.9	n/a	Safety - Collision Reduction	In Sonoma County, on SR 12 PM 14.5/16.9, & in Napa County on Route SR 128 PM 0.5/1.0, US 101 PM 18.5/19.6 & SR 121 PM 4.6/4.95 - Install high friction surface treatment	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
33	Sonoma	101	0.01/0.01	n/a	Bridge	San Antonio Creek Bridges 20-0019R & 20-0019L	2017 Ten-Year SHOPP Plan

ID	County	Route	Postmile (approximate)	EA	Activity Category	Description	Source*
34	Sonoma	101	0/56.2	n/a	Mobility	US 101 in Sonoma (0/56.2 PM). Install TOS/RM on US 101 between the Marin County Line and the Mendocino County Line, and Pavement Work on the Atherton/Hetherton/Alameda Del Prado/Rohnert Park-SW LOT/Smith Ranch/Lincoln Park-and-Ride Lots.	2017 Ten-Year SHOPP Plan
35	Sonoma	101	0.7/45.6	n/a	Drainage	In Sonoma County, from Skinner Road to Barilani Road, and at Duer Road.	2017 Ten-Year SHOPP Plan
36	Sonoma	101	1.2	4K360	Major Damage Restoration	Near Petaluma, at 0.3 mile south of Tunzi Road. Stabilize slope, place rock slope protection, and repair drainage system.	2016 SHOPP
37	Sonoma	101	4/4.01	n/a	Facilities	Paving for yard, canopy for fuel dispenser, upgrade facility for ADA compliance, paint facility, upgrade to LED and water conservation devices. / In Petaluma MS (5749)	2017-18,18-19 PID Work Plan 2017 Ten-Year SHOPP Plan
38	Sonoma	101	4.55/4.55	n/a	Mobility	In Sonoma County, on US 101, at PM 4.55 - Rebuild Kenilworth POC Bridge No. 20-0247 in Petaluma (ADA case #615399)	2017 Ten-Year SHOPP Plan
39	Sonoma	101	7.1/13.9	n/a	Pavement	0.2 mile north of Corona Road overcrossing to Rohnert Park Expressway	2017 Ten-Year SHOPP Plan
40	Sonoma	101	9.0	0J100	Permanent Restoration	Near Petaluma, north of Pepper Road. Repair slide.	2016 SHOPP
41	Sonoma	101	9.2/9.5	0J090	Major Damage	In Sonoma County, near Petaluma, at 0.4 mile to 0.7 mile north of Pepper Road, regrade slope and install dewatering drains	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
42	Sonoma	101	13.9/21.7	n/a	Pavement	Rohnert Park Expressway to Steele Lane	2017 Ten-Year SHOPP Plan
43	Sonoma	101	16.54/19	n/a	Bridge	Br. Rail Replacement: Todd Rd OC 20-0172, Hearn Ave OC 20-0176, Baker Ave OC 20-0173, Miller Rd OC 27-0082	2017 Ten-Year SHOPP Plan
44	Sonoma	101	19.5/19.89	n/a	Mobility	US 101 PM19.52/19.89 & SR 12 PM R15.6/16.0 - Widen westbound SR-12 to northbound US-101 connector to 2 lanes	2017 Ten-Year SHOPP Plan
45	Sonoma	101	19.52/19.89	n/a	Mobility	US 101 PM19.52/19.89 & SR 12 PM R15.6/16.0 - Widen westbound SR-12 to southbound US-101 connector to 2 lanes	2017 Ten-Year SHOPP Plan

ID	County	Route	Postmile (approximate)	EA	Activity Category	Description	Source*
46	Sonoma	101	19.52/19.89	n/a	Mobility	US 101 PM19.52/19.89 & SR 12 PM R15.6/16.0 - Widen eastbound SR-12 to southbound US-101 connector to 2 lanes	2017 Ten-Year SHOPP Plan
47	Sonoma	101	19.52/19.89	n/a	Mobility	US 101 PM19.52/19.89 & SR 12 PM R15.6/16.0 - Widen eastbound SR-12 to northbound US-101 connector to 2 lanes	2017 Ten-Year SHOPP Plan
48	Sonoma	101	20.6	n/a	Facilities	Santa Rosa Maintenance Station-Relocate New Facility (5732)	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
49	Sonoma	101	21.7/29.3	n/a	Pavement	Steele Lane undercrossing to Windsor undercrossing	2017 Ten-Year SHOPP Plan
50	Sonoma	101	22.4	1J020	Safety Improvements	In Sonoma County on SRs 12, 101, 116 and 121 at various locations; also, in Napa County on SR 128 near Calistoga from PM 0.5 to 1.0. Place high friction surface treatment.	2016 SHOPP
51	Sonoma	101	22.81/32.79	n/a	Bridge	Mendocino Ave over crossing 20-0179, Fulton Rd overcrossing 20-0200, Shiloh Rd over crossing 20-0202, Limerick Ln overcrossing 20-0066, bridge rail	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
52	Sonoma	101	24.86/25	n/a	Bridge	River Rd OC #20 0199 Br Health; rehabilitation and rails	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
53	Sonoma	101	29.3/R54.3	0J642	Roadway Rehabilitation (2R)	In and near Windsor, Healdsburg, and Cloverdale, from Old Redwood Highway to two miles south of Mendocino County line. Roadway rehabilitation.	2016 SHOPP
54	Sonoma	101	33.5	2J550	Permanent Restoration	In and near Healdsburg, at Old Redwood Highway/Grant Undercrossing Bridge No. 20-0067L/R. Upgrade drainage elements and restore erosion and settlement damage.	2016 SHOPP
55	Sonoma	101	33.5/R43.4	4G480	Safety Improvements	In and near Healdsburg, from Grant Undercrossing to US 101/128 Separation at various locations. Upgrade electroliers.	2016 SHOPP
56	Sonoma	101	37.1/37.2	4K450	Major Damage Restoration	In Healdsburg, at 0.9 mile north of Dry Creek Road. Remove slide debris and construct soldier pile tieback retaining wall.	2016 SHOPP
57	Sonoma	101	38.33/41.4	2K330	Major Damage	Repair and replace culverts at west if Lytton Spring Road and west of S. Geyserville Avenue	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan

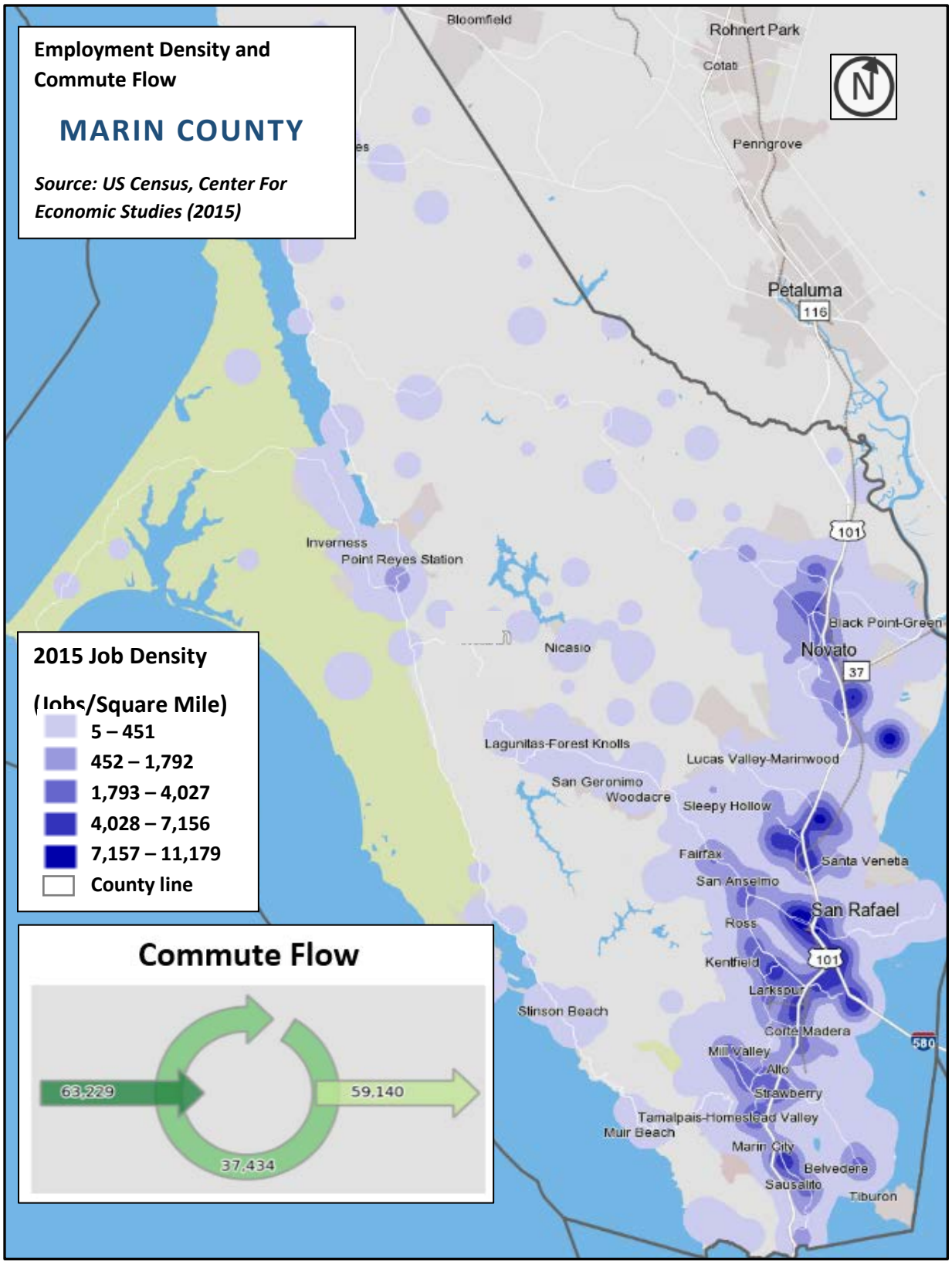
ID	County	Route	Postmile (approximate)	EA	Activity Category	Description	Source*
58	Sonoma	101	39.5/54.99	n/a	Safety - Collision Reduction	In Sonoma County, in various locations - install shoulder rumble strips	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
59	Sonoma	101	52.3/52.3	n/a	Major Damage	In Sonoma County, in Cloverdale, at King Ridge Heights Road, construct slope stressing	2017 Ten-Year SHOPP Plan
60	Sonoma	101	54.2/56.2	n/a	Pavement	US 101/SR 128 Separation to Mendocino County Line	2017 Ten-Year SHOPP Plan
61	Sonoma	101	55.5/55.5	2K350	Major Damage	Soldier pile wall at north of SR 128	2017-18,18-19 PID Work Plan, 2017 Ten-Year SHOPP Plan
62	Sonoma	var	var/var	3K350	Transportation Management Systems	In Sonoma, Marin, Napa, and Solano Counties, on State Routes 12, 29, 37, 80, 101, 580, 680, and 780 at various locations. Repair and replace existing Transportation Management System elements.	2016 SHOPP

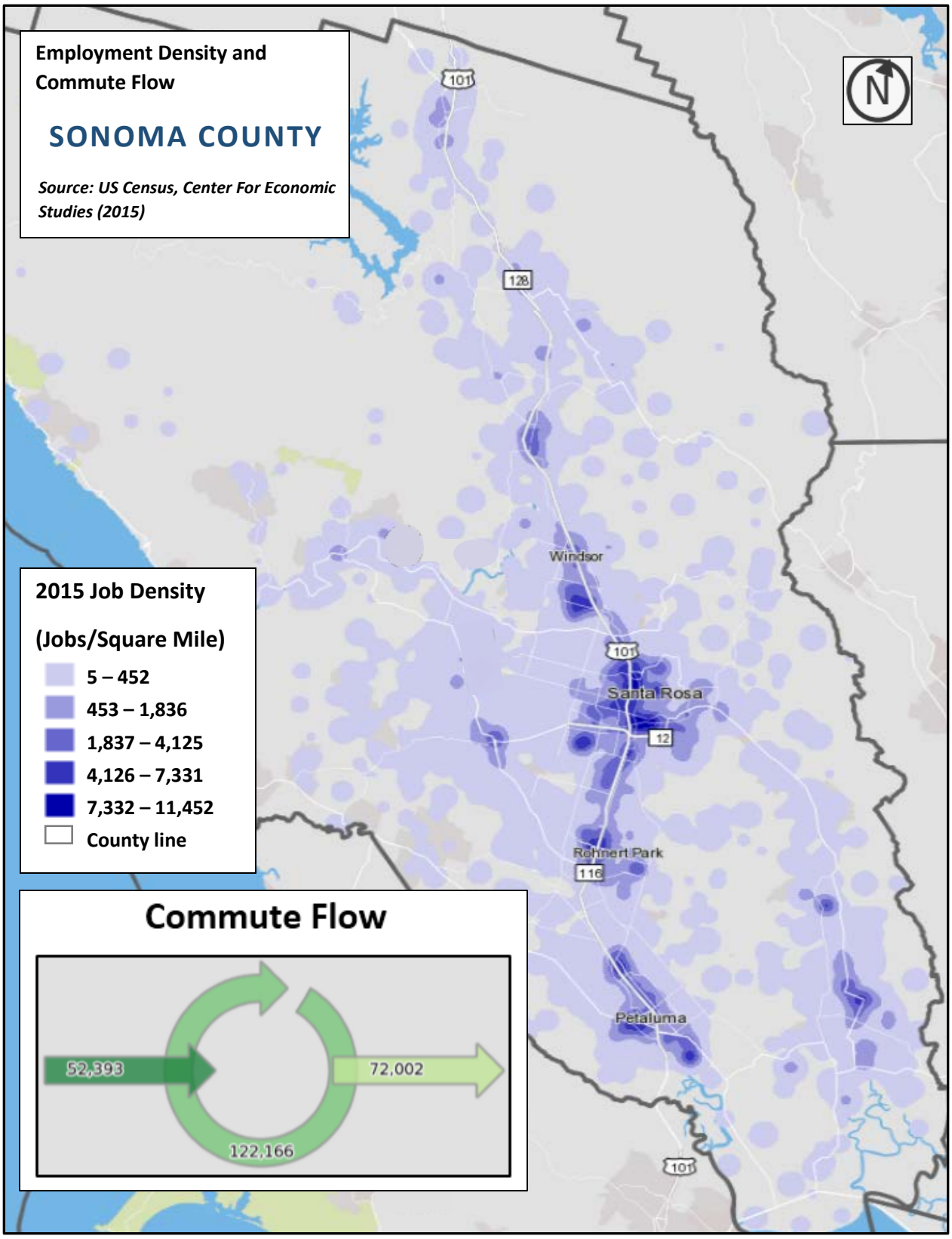
Notes:

- 2016 SHOPP: Project in the adopted 2016 SHOPP program and in pre-construction phases, including projects amended into the program from future cycles due to SB 1 funding augmentation (ID 12 and 66)
- Draft 2018 SHOPP: Draft project list for the 2018 SHOPP program to be adopted by the California Transportation Commission in 2018
- FY 17-18/18-19 PID Workload: Projects with PID to be developed during Fiscal Year (FY) 2017/2018 and 2018/2019
- 2017 Ten-Year SHOPP Plan: Projects in the 2017 Ten-Year SHOPP Plan.

APPENDICES

Appendix A: Employment Density Maps




Employment Density and Commute Flow
SONOMA COUNTY
Source: US Census, Center For Economic Studies (2015)
N
101
128
Windsor
101
Santa Rosa
12
Rohnert Park
116
Petaluma
101
2015 Job Density
(Jobs/Square Mile)
5 – 452
453 – 1,836
1,837 – 4,125
4,126 – 7,331
7,332 – 11,452
County line
Commute Flow
52,393
72,002
122,166

Appendix B: Sea Level Rise Vulnerability Studies

Caltrans Climate Change Vulnerability Assessment Report

Caltrans is developing a study of the potential effects of climate change on the State Highway System. Climate change and extreme weather events have received increasing attention worldwide as potentially one of the greatest challenges facing modern society. Many state agencies—such as the California Coastal Commission, the California Energy Commission (CEC), and the California Department of Water Resources (DWR)—have developed approaches for understanding and assessing the potential impacts of a changing climate on California's natural resources and built environment. State agencies have invested significant resources in defining the implications of climate change, and many of California's academic institutions are engaged in developing resources for decision-makers. Caltrans initiated the current study to better understand the vulnerability of California's State Highway System and other Caltrans assets to future changes in climate.

The study has three objectives:

- Understand the types of weather-related and longer-term climate change events that will likely occur with greater frequency and intensity in future years,
- Conduct a vulnerability assessment to determine those Caltrans assets vulnerable to various climate-influenced natural hazards, and
- Develop a method to prioritize candidate projects for actions that are responsive to climate change concerns, when financial resources become available.

Marin County Vulnerability Assessment

Marin County faces sensitivity to sea level rise due to the location of a number of transportation assets along Bay frontage. While Marin's shoreline already experiences regular erosion, flooding, and significant storm events, sea level rise will exacerbate these natural processes, leading to significant social, environmental, and economic impacts.

A Countywide Vulnerability Assessment was conducted in 2017 to identify the risks and exposure from sea level rise.[100] Key findings within the US 101 Corridor include:

- Southern Marin would likely suffer the worst flooding impacts, which could occur in the near-term.
- Compromised access to and from the Manzanita Interchange of US 101 and SR 1 could affect hundreds of thousands of residents, employees, and visitors.
- Reductions in useable space for living, tourism, transportation, and natural resources could impact approximately 12,750 properties, more than 12,000 buildings, and 100 miles in roads.
- Waves, wind, and temporary flooding during storms could account for $60 million to $6 billion (2016 dollars) in building damages.

[100] Marin County draft Bayside Vulnerability Assessment (2017): https://www.marincounty.org/main/baywave/vulnerability-assessment

- Areas that are not exposed to rising bay waters can still be vulnerable to sea level rise when the wastewater treatment plant, ports, and major roadways become compromised under flooding conditions.
- Marin is not self-contained, and could be impacted by other parts of the Bay Area affected by sea level rise. For example, the Port of Oakland receives imports and exports for the entire Bay Area.

Climate Ready Sonoma County: Climate Hazards and Vulnerabilities

Climate Ready Sonoma County (2014), prepared by North Bay Climate Adaptation Initiative (NBCAI) for the Sonoma County Regional Climate Protection Authority (RCPA), identifies climate change hazards and adaptation goals.[101]

- *More Frequent and Intense Droughts*: Whether the North Bay experiences more or less rainfall, the land will likely be drier overall because warmer temperatures increase evapotranspiration.
- *More Frequent and Intense Wildfires*: Fire risk is likely to rise due to increased dryness of vegetation, compounded by productivity of plants in the spring (which creates more fuel for dry season wildfires).
- *Increased Risk of Extreme Floods*: Climate scenarios project increased seasonal variability of precipitation, runoff, and stream flows for Sonoma County, along with increased likelihood of "extreme" precipitation and drought events.
- *More Frequent Coastal Flooding, Increased Erosion, and Saltwater Intrusion*: Sea levels are projected to rise between 16.5 and 65.8 inches by the end of this century. Rising sea levels, combined with increased storm surge, will lead to more frequent inundation of low lying areas, and flooding of homes, infrastructure, agricultural lands, and natural areas on the shores of San Pablo Bay in southern Sonoma County and Bodega Bay, on the ocean coast. The greatest impact is anticipated during winter storms.

Sonoma County Regional Action Plan: Climate Action 2020 and Beyond

Climate Action 2020 and Beyond (2016) builds on prior commitments to reduce greenhouse gas emissions through a community-wide climate action plan (CAP) for all communities in Sonoma County.[102] Expanding on *Climate Ready Sonoma County*, this assessment lays out the overall strategy for reducing GHG emissions in each sector, and contains the near-term action plans for each city and unincorporated area within Sonoma County. Furthermore, it highlights each community's vulnerability to the hazards of climate change and describes goals to improve resilience, including land use and transportation strategies. Transportation strategies include expansion of public transit, bicycle and pedestrian facilities, and renewable energy resources.

[101] https://rcpa.ca.gov/wp-content/uploads/2016/07/CA2020_Plan_7-7-16_web.pdf
[102] http://www.adaptationclearinghouse.org/resources/sonoma-county-california-climate-readiness-plan-climate-action-2020-and-beyond.html

Prior to completion of the Countywide Action Plan, the City of Santa Rosa adopted a municipal Climate Action Plan (2012).[103]

Adapting to Rising Tides

The Adapting to Rising Tides Program (ART Bay Area) is a partnership between the Metropolitan Transportation Commission (MTC), the Bay Conservation and Development Commission (BCDC), and the Bay Area Regional Collaborative (BARC), which is working with local, State, regional and federal agencies and organizations to gather, develop and analyze the data needed to understand the impacts of a changing climate on Bay Area communities, infrastructure, services, and natural resources. ART Bay Area was awarded a Caltrans Sustainable Transportation Planning Grant, along with Bay Area Toll Authority (BATA) matching funds, to develop a regional adaptation planning process aimed at increasing the resilience of the region's transportation and community assets. So far, the program has developed a set of intricate, locally relevant maps of the San Francisco Bay shoreline and anticipated flooding as sea levels rise. The maps are available to the public and designed to support consistent sea level rise assessment and adaptation in the region, with work expected to continue through the winter of 2019.[104]

[103] https://srcity.org/DocumentCenter/View/10762
[104] ART Bay Area: http://www.adaptingtorisingtides.org/project/art-bay-area/

Appendix C: Other Environmental Factors

Habitat Connectivity

In the face of human development and climate change, maintaining a network of connected wildlands is essential to supporting California's diverse species of plants and animals, whom rely on connected habitats to move through territories, find mates, hunt, forage and reproduce.

The California Department of Fish and Wildlife (CDFG) and Caltrans commissioned the California Essential Habitat Connectivity Project in 2010 to produce a statewide assessment of critical habitat areas.[105] The goal was to identify large remaining blocks of intact habitat or natural landscape and model linkages between them that need to be maintained, particularly as corridors for wildlife. The Project identifies large *Natural Landscape Blocks* and *Essential Connectivity Areas*—that connect the Landscape Blocks.[106] Natural Landscape Blocks identified along US 101 North corridor include: Indian Valley Open Space Preserve southern Novato and Olompali State Park in Northern Novato, Petaluma Valley area along the Sonoma-Marin Countyline, China Camp State Park and San Pedro Mountain in San Rafael, and in the Marin Headlands in southern Marin. No identified Essential Connectivity Areas cross the US 101 North Corridor.

To preserve and restore the State's threatened fish populations, California Senate Bill (SB) 857 requires Caltrans to assess potential barriers to anadromous fish prior to commencing any project using State or federal transportation funds. The bill requires projects to be constructed without presenting barriers to fish passage.[107] Although there are several river crossings along US 101 through Sonoma County and a few stream crossings across US 101 in Marin County, no priority fish passage barriers are currently identified for remediation.[108]

Environmental Justice

CalEnviroScreen is a mapping tool that helps identify communities suffering from cumulative impacts of multiple pollutants. Cumulative impacts scores are produced using information on environmental exposures from all sources of pollution in a geographic area, and take into account groups of people that are particularly sensitive to pollution's effects as well as socioeconomic factors. CalEnviroScreen produces cumulative impact scores for every census tract in the State so that scores in different communities can be compared. An area with a high score experiences a much higher pollution burden than areas with low scores.

---

[105] CA Fish and Wildlife, BIOS Mapping: https://map.dfg.ca.gov/bios/?bookmark=648 (Last Assessed 10/2016)
[106] Additional details, including essential habitat by species, can be found in the SC Wildland Report, Critical Linkages: The Bay Area and Beyond http://www.scwildlands.org/reports/CriticalLinkages_BayAreaAndBeyond.pdf
[107] Senate Bill No. 857, Fish Passages http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060SB857
[108] Caltrans, Coastal Anadromous Fish Passage Assessment and Remediation Progress Report (2016)

Marin and Sonoma Counties generally rank low on CalEnviroScreen, however higher cumulative impact scores are identified along the US 101 Corridor, with the highest percentile areas in Rohnert Park and Santa Rosa in Sonoma County (70 to 80 percent) and San Rafael in Marin County, west of US 101 near the I-580 junction (66 - 70 percent).[109]

Green House Gas Emission Measures

State Assembly Bill 32 (AB 32): *Global Warming Solutions Act* (2006) requires the State's greenhouse gas emissions to be reduced to 1990 levels by the Year 2020, and directs the California Air Resources Board (ARB) to be the lead agency to implement the law. The Climate Action Team, made up of relevant State agencies including Caltrans, is charged with helping direct State efforts on the reduction of GHG emissions and engaging State agencies. Caltrans strategy to reduce global warming has two elements: the first is to make transportation systems more efficient through operational improvements and the second is to integrate reduction measures into the planning, development, operations and maintenance of transportation elements.[110] In 2016, the Legislature passed SB 32, which codifies a 2030 GHG emissions reduction target of 40 percent below 1990 levels.

Senate Bill 375 (SB 375): *Adressing Greenhouse Gas Emissions from the Transportation Sector* (2008) provides a means for achieving AB 32 goals from cars and light trucks. The transportation sector contributes over 40 percent of the state's GHG emissions, with automobiles and light trucks contributing almost 30 percent. SB 375 requires the California Air Resources Board to develop a regional GHG emissions reductions targets for cars and lights trucks for each of the state's metropolitan planning organizations (MPOs). Through their planning processes, each of the MPOs is required to develop plans to meet their regional reduction target; which is either accomplished through a financially constrained *Sustainable Communities Strategy*, such as Plan Bay Area, or an unconstrained alternative planning strategy. SB 375 also provides streamlining of California Environmental Quality Act (CEQA) requirements for specific residential and mixed-use developments, such as those idenfied in *Priority Development Areas*.

Senate Bill 375 (SB 743): *California Environmental Quality Act Updates* (2013) requires the Office of Planning and Research (OPR) to update guidelines for analyzing transportation project impacts as they related to CEQA legislation. Vehicle Miles Travelled (VMT) now provides an alternative to Level of Service (LOS) for evaluating transportation impacts, particularly within areas served by transit. Alternative criteria must promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses.

[109] Developed by the California Environmental Protection Agency (CalEPA) and the Office of Environmental Health Hazard Assessment (OEHHA), CalEnviroScreen 3.0 Map (10/2017): https://oehha.ca.gov/calenviroscreen/maps-data

[110] Caltrans, Climate Action Plan (2006): http://www.dot.ca.gov/hq/tpp/offices/ogm/key_reports_files/State_Wide_Strategy/Caltrans_Climate_Action_Program.pdf

In addition to State measures, local counties and cities have also undertaken actions to reduce Greenhouse Gas Emissions. For example, Sonoma County and the City of Santa Rosa both have climate action plans and have been active in this area for years.

Air Quality

California is divided geographically into air basins for the purpose of managing the air resources of the State on a regional basis; emissions are regulated and monitored by the Air Resources Board, as required by SB 375.[111] The San Francisco Bay Air Basin covers the State's second largest metropolitan region, with approximately twenty percent of Californians residing in the air basin.[112] The San Francisco Bay Air Basin includes the following counties: Alameda, Contra Costa, Marin, Napa, San Francisco, San Mateo, Santa Clara, the southern half of Sonoma County, and the southwestern portion of Solano County. Oversight of regional policies and regulations for the control of air pollution within the air basin are conducted by the Bay Area Quality Management District (BAAQMD). [113] The remaining portion of Sonoma County is located within the North Coast Basin, under the jurisdiction of the Northern Sonoma County Air Pollution Control District (NSCAPCD), which regulates the emissions of air pollution from stationary sources.

The Bay Area currently is in non-attainment status for ozone (O_3) and particulate matter emissions (PM_{10} and $PM_{2.5}$), but is in attainment for Carbon Monoxide (CO) emissions, which has declined over the last few decades due to stringent control measures from motor vehicles. In the Bay Area, Ozone and Particulate Matter (PM) emissions are primarily attributed to exhaust from combustion engines, such as cars, trucks, and other mobile sources.[114] Table below shows the pollution summary for the Bay Area Air Basin's North Counties.[115]

North Counties Pollution Summary (2016)

MONITORING STATIONS	OZONE						CARBON MONOXIDE			NITROGEN DIOXIDE				SULFUR DIOXIDE				PM_{10}				$PM_{2.5}$				
	Max 1-Hr	Cal 1-Hr Days	Max 8-Hr	Nat 8-Hr Days	Cal 8-Hr Days	3-Yr Avg	Max 1-Hr	Max 8-Hr	Nat/Cal Days	Max 1-Hr	Ann Avg	Nat 1-Hr Days	Cal 1-Hr Days	Max 1-Hr	Max 24-Hr	Nat 1-Hr Days	Cal 24-Hr Days	Ann Avg	Max 24-Hr	Nat 24-Hr Days	Cal 24-Hr Days	Max 24-Hr	Nat 24-Hr Days	3-yr Avg	Ann Avg	3-yr Avg
North Counties	(ppb)		(ppb)				(ppm)			(ppb)				(ppb)				($\mu g/m^3$)				($\mu g/m^3$)			($\mu g/m^3$)	
Napa	80	0	67	0	0	62	2.2	1.5	0	39	7	0	0	-	-	-	-	16.6	33	0	0	24.3	0	25	8.5	10.4
San Rafael	88	0	67	0	0	61	1.4	1.0	0	46	9	0	0	-	-	-	-	13.8	27	0	0	15.6	0	22	6.4	8.6
Sebastopol	73	0	64	0	0	52	1.6	1.0	0	32	4	0	0	-	-	-	-	-	-	-	-	18.7	0	18	4.6	6.4
Vallejo	97	1	72	1	1	63	2.1	1.8	0	43	7	0	0	10.1	1.9	0	0	-	-	-	-	23.0	0	25	7.4	9.0

[111] California Air Resources Board (ARB), Summary Data by County (2012): https://www.arb.ca.gov/app/emsinv/2017/emseic1_query.php?F_DIV=4&F_YR=2012&F_SEASON=A&SP=SIP105ADJ&F_AREA=AB&F_AB=SF&F_DD=Y

[112] Caltrans US 101 North Corridor System Management Plan (2010)

[113] Bay Area Air Quality Management District (BAAQMD), Air Quality Standards and Attainment Status (2017): http://www.baaqmd.gov/research-and-data/air-quality-standards-and-attainment-status

[114] While ozone is a gas created by reactive organic compounds, particulate matter consists of solid particles suspended in the air and is usually measured in two size ranges, referring to the size of particles.

[115] Bay Area Air Basin, North Counties Pollution Summary (2016): http://www.baaqmd.gov/~/media/files/communications-and-outreach/annual-bay-area-air-quality-summaries/pollsum2016-pdf.pdf?la=en

Appendix D: TOS Elements

Guidelines for Positioning TOS Elements

Caltrans District 4 has established the following informal guidelines for positioning TOS elements along a freeway corridor.

• TMSs could be spaced approximately between 0.33 and 0.50 miles apart. Several traffic monitoring stations within the corridor are Wireless Microwave Vehicle Detection Stations (WMVDSs), which include two battery-powered sensors embedded in each lane. These sensors communicate wirelessly to a pole-mounted roadside node. WMVDS are subject to replacement by inductance loop installations, when new ramp meters are installed. Metering traditionally works with inductance loops. Standalone WMVDS locations may also be replaced to address battery replacement issues.

• CCTV cameras may be spaced at one-mile intervals. Cameras are considered at interchanges and between interchanges.

• CMSs should be considered at decision points upstream of freeway-to-freeway interchanges. They may also be considered for installations along long stretches of highway. VMSs, which are smaller changeable message signs, are present on US 101 in Marin County for messaging related to Muir Woods.

• HARs could be spaced at intervals that will provide full coverage of the highway. Depending on the terrain, HAR transmitters are typically located between five and ten miles apart. EMS units should be deployed at locations within the HAR transmitter's operating range.

• Caltrans District 4 Fiber Communications Master Plan includes future installation of fiber optic communications for TOS elements on US 101 in Marin and Sonoma Counties.

TOS Inventory

Table 1: Closed Circuit Television Cameras (CCTV)

County	Post Mile	Fwy Dir	Description
Mrn	0.10	N	Dana Bowers Safety Roadside Rest Area (SRRA) (Golden Gate Bridge North Vista Point)
Mrn	0.25	S	Sausalito Lateral (Alexander Ave) On-ramp
Mrn	0.52	N	Just South of Waldo Tunnel (Berry Baker Tunnel)
Mrn	1.52	N	Spencer Ave. Off-ramp
Mrn	3.41	N	Waldo Undercrossing (UC), On-ramp
Mrn	4.28	S	Sign mounted - Off-ramp Stevens
Mrn	8.29	S	Just North of Greenbrae Pedestrian Overcrossing (OC) South of Sir Francis Drake Blvd.
Mrn	9.50	N	North of Sir Francis Drake Blvd
Mrn	10.01	N	Route 580 Connector to Northbound (NB) 101
Mrn	10.84	S	2nd St./Hetherton Ave. Diag. On-ramp to Southbound (SB) 101
Mrn	11.40	N	North of Mission Ave Interchange (IC) (Coleman School Ped OC)

Table 1: Closed Circuit Television Cameras (CCTV)

County	Post Mile	Fwy Dir	Description
Mrn	12.47	S	Just North of Lincoln Avenue
Mrn	18.00	N	Just South of Ignacio Blvd
Mrn	19.05	N	Rte 37/101 IC
Mrn	20.18	S	Just South of Roland Blvd OC
Mrn	21.11	N	Just North of Delong Ave - Diagonal On-ramp to NB
Mrn	22.00	S	Just South of Atherton Ave. - Diagonal On-ramp to SB
Mrn	25.56	S	In Construction
Mrn	26.85	N	In Construction
Mrn	27.50	N	In Construction
Son	2.5	N	Kastania Rd
Son	3.16	S	before Kastania Rd Off-ramp
Son	3.82	S	Rte 116 to 101 Off-ramp
Son	7.68	N	Petaluma Blvd
Son	8.24	N	North of Petaluma Blvd
Son	8.9	S	Pepper Rd
Son	9.86	S	Cattle Pass UC
Son	11	N	North of Railroad Ave
Son	11.43	S	South of Sierra Ave
Son	12	S	Sierra Ave
Son	12.7	S	Junction Rte 116
Son	13.32	N	North of junction Rte 116
Son	13.9	S	Rohnert Park EXP
Son	15	S	Wilfred Ave
Son	15.5	S	Before Wilfred Ave
Son	16.54	S	Todd Rd
Son	19	S	Baker Ave
Son	19.8	S	Junction 12
Son	20.7	S	College Ave
Son	21.72	S	Cleveland Ave
Son	22.25	S	Mendocino Ave
Son	22.52	N	Bicentennial Way
Son	23.97	S	South of River Rd
Son	24.95	S	River Rd
Son	25.95	S	Fulton Rd
Son	26.33	S	Airport Blvd
Son	26.8	S	South of Shiloh Rd
Son	27.64	N	Shiloh Rd

Table 1: Closed Circuit Television Cameras (CCTV)

County	Post Mile	Fwy Dir	Description
Son	28.36	S	South of Windsor River Road

Table 2: Highway Advisory Radio (HAR)

County	Post Mile	Fwy Dir	Description
Mrn	9.49	N	North of Sir Francis Drake Blvd.
Son	2.95	S	Kastania Rd Off-ramp
Son	8.98	S	Pepper Rd
Son	14.92	S	Wilfred Ave
Son	19.8	S	Junction 12
Son	25.95	S	Fulton Rd

Table 3: Changeable Message Signs (CMS)

County	Post Mile	Fwy Dir	Description
Mrn	3.03	S	North of Rodeo Ave. Off-ramp. Needs Power Connection
Mrn	7.80	N	North of Paradise Drive/Mt. Tamalpais Drive
Mrn	12.47	S	Just North of Lincoln Avenue
Mrn	16.86	N	North of Nave Dr. On-ramp to Northbound (NB) 101
Mrn	20.70	S	South of Franklin Undercrossing (UC)
Mrn	26.86	N	In Construction
Son	2.53	N	Kastania Rd
Son	11.01	N	North of Railroad Ave
Son	21.72	S	South of Steel Lane
Son	28.34	S	South of Windsor River Rd
Son	28.38	N	North of Shiloh Rd
Son	50.5	N	South of Cloverdale Blvd

Table 4: Variable Message Signs (VMS)

County	Post Mile	Fwy Dir	Description
Mrn	0.86	N	Just South of Waldo Tunnel (Golden Gate National Recreation Area [GGNRA]: Muir Woods)
Mrn	3.50	N	Bridgeway On-ramp to Northbound (NB) (GGNRA: Muir Woods)
Mrn	5.61	S	Tiburon Blvd (Rte 131) On-ramp to Southbound (SB) (GGNRA: Muir Woods)
Son	2.6	S	Kastania Rd
Son	3.791	N	Rte 116 On-ramp

Table 5: Extinguishable Message Signs (EMS) for Highway Advisory Radio

County	Post Mile	Fwy Dir	Description
Mrn	4.03	N	Shoreline Hwy. Off-ramp
Mrn	5.52	S	Just North of Tiburon Blvd. (Route 131; Blithedale) Off-ramp
Mrn	7.70	S	North of Madera Blvd.
Mrn	10.03	N	Sign mounted - North of Francisco
Mrn	13.14	N	South of Freitas Pkwy Interchange (IC)
Mrn	16.02	S	North of Miller Creek Road IC
Mrn	19.50	N	North of So. Novato Blvd./Rte 37
Mrn	22.27	N	North of Atherton Ave.
Son	8.98	N	Pepper Rd
Son	8.98	S	Pepper Rd
Son	11.23	S	South of Sierra Ave
Son	11.7	N	South of Sierra Ave
Son	14.83	N	South of Wilfred Ave
Son	14.92	S	Wilfred Ave
Son	20.86	S	South of Bicentential Way
Son	23.6	N	North of Hopper Ave
Son	25.58	S	South of Fulton Rd
Son	26.79	N	South of Shiloh Rd
Son	28.35	S	South of Windsor River Rd

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Mrn	0.05	N	S	Bowers Vista Point (Magnetometer)
Mrn	0.25	N	S	Wireless Magnetometer Vehicle Detection Station (WMVDS)

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Mrn	0.80	N	S	WMVDS
Mrn	1.26	N	S	WMVDS
Mrn	2.10	N	S	WMVDS
Mrn	2.39	N		WMVDS
Mrn	2.60		S	WMVDS
Mrn	2.90	N	S	WMVDS
Mrn	3.50	N	S	WMVDS
Mrn	4.00	N	S	WMVDS
Mrn	4.58		S	WMVDS
Mrn	4.75	N		WMVDS
Mrn	5.20	N	S	WMVDS
Mrn	5.70	N	S	WMVDS
Mrn	6.10	N	S	WMVDS
Mrn	6.50	N	S	WMVDS
Mrn	7.00	N	S	WMVDS
Mrn	7.35	N		WMVDS
Mrn	7.50		S	WMVDS
Mrn	8.00	N	S	WMVDS
Mrn	8.40	N		WMVDS
Mrn	8.52		S	Sir Francis Drake Blvd
Mrn	8.70		S	WMVDS
Mrn	8.85	N	S	Sir Francis Drake Blvd
Mrn	9.05	N	S	WMVDS
Mrn	9.94	N	S	Westbound 580/Bellam Blvd
Mrn	10.04	N	S	North of Francisco Interchange (IC) (Hoag Ave)
Mrn	10.52	N	S	South of 2nd St IC (Rice Dr)
Mrn	11.21	N	S	Mission Ave (Irwin)
Mrn	11.41	N	S	North of Mission Ave IC (Coleman School Pedestrian Overcrossing [OC])
Mrn	11.85	N	S	South of Lincoln IC
Mrn	12.11		S	Lincoln
Mrn	12.26	N		Lincoln
Mrn	12.44	N	S	North of Lincoln IC
Mrn	13.20	N	S	WMVDS
Mrn	13.70	N	S	WMVDS
Mrn	14.20	N	S	WMVDS
Mrn	14.70	N	S	WMVDS
Mrn	14.90	N	S	WMVDS

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Mrn	15.40	N	S	WMVDS
Mrn	15.80	N	S	WMVDS
Mrn	15.85	N	S	Miller Creek Rd
Mrn	16.15	N	S	2600' North of Miller Creek Rd
Mrn	16.30	N	S	2000' South of Pacheco Creek OC
Mrn	16.77	N	S	North of Pacheco Creek OC
Mrn	17.04	N	S	2000' North of Pacheco Creek OC
Mrn	17.33	N	S	South of Los Robles Rd
Mrn	17.79	N	S	North of Posada Del Sol
Mrn	17.96	N	S	Just South of Ignacio Blvd
Mrn	18.24	N	S	
Mrn	18.62	N	S	Ramp Meter on Novato Blvd/Rte 37 Connector to SB 101
Mrn	18.76	N	S	South of Rte 37 IC
Mrn	19.23	N	S	Rte 37/Novato Blvd Connector to Northbound (NB) 101 Ramp Meter just North of Rte 37 (Abandoned)
Mrn	19.59	N	S	
Mrn	20.05	N	S	Roland Blvd. On-ramp to Southbound (SB) 101 Ramp Meter
Mrn	20.34	N	S	Roland Blvd. On-ramp to NB 101 Ramp Meter
Mrn	20.80		S	WMVDS
Mrn	R20.9	N		WMVDS
Mrn	21.06	N	S	DeLong Ave. On-ramp to SB 101 Ramp Meter
Mrn	21.23	N	S	DeLong Ave. On-ramp to NB 101 Ramp Meter
Mrn	21.3		S	WMVDS
Mrn	21.70		S	WMVDS
Mrn	21.80	N		WMVDS
Mrn	21.91	N	S	Atherton Ave. On-ramp to SB 101 Ramp Meter
Mrn	22.10	N	S	Atherton Ave. On-ramp to NB 101 Ramp Meter
Mrn	22.12	N	S	WMVDS
Mrn	22.60	N	S	WMVDS
Mrn	23.00	N	S	WMVDS
Mrn	24.00	N	S	WMVDS
Mrn	24.50	N	S	WMVDS
Mrn	25.54		S	New Redwood Landfill on-ramp to SB 101 Ramp Meter
Mrn	25.66	N		New Redwood Landfill on-ramp to NB 101 Ramp Meter
Mrn	25.90	N	S	WMVDS
Mrn	26.94	N	S	In Construction - Will replace WMVDS with Loops
Mrn	27.50	N	S	In Construction

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Son	0.610	N	S	WMVDS
Son	0.870	N		
Son	1.020	N	S	WMVDS
Son	1.510	S		
Son	2.010	N	S	WMVDS
Son	2.310	N	S	WMVDS
Son	2.620	N		
Son	2.810	N	S	WMVDS
Son	3.470	N		
Son	3.500	S		
Son	3.810	N	S	WMVDS
Son	3.810	S		Lakeview Rd
Son	3.820	N		Rte 116 / Lakeville Hwy
Son	4.220	N	S	
Son	4.700	N	S	E Washington St
Son	4.730	N	S	WMVDS
Son	4.730	S		WMVDS
Son	4.950	N	S	E Washington St
Son	5.580	N	S	WMVDS
Son	5.990	N	S	WMVDS
Son	6.180	N		
Son	6.190	S		
Son	6.500	N	S	WMVDS
Son	7.020	N	S	WMVDS
Son	7.320	N	S	South of Old Redwood Hwy
Son	7.560	S		Petaluma Blvd
Son	7.600	N		WMVDS
Son	7.620	N		Petaluma Blvd
Son	7.680	S		WMVDS
Son	7.710	S		Petaluma Blvd
Son	7.730	N		Petaluma Blvd
Son	8.000	N	S	WMVDS
Son	8.150	N	S	Denman Rd
Son	8.280	S		
Son	8.530	N	S	WMVDS
Son	8.920	N	S	South of Pepper Rd
Son	8.970	N	S	WMVDS
Son	9.320	N		
Son	9.500	N	S	WMVDS
Son	9.990	N	S	WMVDS

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Son	10.530	N	S	South of Railroad Ave
Son	10.550	N	S	WMVDS
Son	11.110	N	S	WMVDS
Son	11.330	N		
Son	11.370	S		
Son	11.500	N	S	WMVDS
Son	11.640	N	S	North of W Sierra Ave
Son	11.900	S		W Sierra Ave
Son	11.930	N	S	WMVDS
Son	11.970	N		W Sierra Ave
Son	12.230	N	S	North of W Sierra Ave
Son	12.340	N	S	WMVDS
Son	12.380	N		
Son	12.550	N	S	Gravenstein Hwy
Son	12.800	N	S	WMVDS
Son	12.820	N	S	Gravenstein Hwy
Son	13.350	N	S	South of Rohnert Park Expwy
Son	13.450	N	S	WMVDS
Son	13.770	N	S	Rohnert Park Expwy
Son	13.830	N	S	Rohnert Park Expwy
Son	13.900	S		Rohnert Park Expwy
Son	14.000	N		Rohnert Park Expwy
Son	14.500	N	S	WMVDS
Son	14.980	N		Wilfred Ave
Son	14.990	S		Wilfred Ave
Son	15.260	S		Laguna De Santa Rosa
Son	16.000	N	S	WMVDS
Son	16.510	N	S	Todd Rd
Son	17.000	N	S	WMVDS
Son	17.450	N	S	WMVDS
Son	18.430	N	S	Hearn Ave
Son	18.900	S		Baker Ave
Son	18.950	N		Baker Ave
Son	19.330	N		
Son	19.490	N		WMVDS
Son	19.620	S		SB 12
Son	19.660	N		
Son	19.700	S		Westbound 12

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Son	19.710	N		Eastbound 12
Son	19.890	N		
Son	20.070	N	S	3rd St
Son	20.340	N	S	opposite 6th St
Son	20.420	S		
Son	20.430	N		
Son	20.730	N	S	SB College Ave
Son	20.850	N	S	NB College Ave
Son	21.230	N	S	NB College Ave
Son	21.280	N		
Son	21.720	N	S	Steele Lane
Son	21.770	S		
Son	21.840	N		Steele Lane
Son	22.150	N		
Son	22.430	N	S	Bicentennial Way
Son	22.440	N		WMVDS
Son	22.900	S		Mendocino Dr
Son	22.920	N	S	WMVDS
Son	22.980	N		Mendocino Dr
Son	23.110	N		
Son	23.280	N	S	Hopper Ave
Son	23.990	N	S	WMVDS
Son	24.110	S		
Son	24.290	N		
Son	24.500	S		WMVDS
Son	24.750	N		River Rd
Son	24.750	N		WMVDS
Son	24.820	S		River Rd
Son	24.940	N		Mark West Spring Rd
Son	24.960	S		WMVDS
Son	24.990	S		Mark West Spring Rd
Son	25.260	N		WMVDS
Son	25.500	N	S	WMVDS
Son	25.600	S		
Son	25.850	N		WMVDS
Son	25.860	N		
Son	25.940	S		WMVDS
Son	26.270	S		WMVDS
Son	26.310	S		Airport Blvd
Son	26.320	N		WMVDS

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Son	26.370	S		
Son	26.430	N		Airport Blvd
Son	26.450	S		Airport Blvd
Son	26.580	N		
Son	26.940	N	S	WMVDS
Son	27.530	N		Shiloh Rd
Son	27.590	S		Shiloh Rd
Son	27.660	N		Shiloh Rd
Son	27.700	S		Shiloh Rd
Son	27.700	S		WMVDS
Son	28.040	N		WMVDS
Son	28.280	N	S	WMVDS
Son	28.480	N		WMVDS
Son	29.000	N		WMVDS
Son	29.230	N	S	Old Redwood Hwy
Son	29.500	N		WMVDS
Son	30.030	N	S	WMVDS
Son	30.590	N	S	WMVDS
Son	30.990	N		WMVDS
Son	31.080	S		Arata Ln
Son	31.150	N	S	WMVDS
Son	31.950	N	S	WMVDS
Son	32.500	N	S	WMVDS
Son	33.030	N	S	WMVDS
Son	33.610	N		WMVDS
Son	33.900	N	S	WMVDS
Son	34.400	N	S	WMVDS
Son	34.960	N	S	WMVDS
Son	35.930	N	S	WMVDS
Son	36.350	N	S	WMVDS
Son	37.030	N	S	WMVDS
Son	37.800	N	S	WMVDS
Son	38.470	N	S	WMVDS
Son	39.000	N	S	WMVDS
Son	39.480	N	S	WMVDS
Son	39.900	S		WMVDS
Son	40.300	N	S	WMVDS
Son	41.000	N	S	WMVDS

Table 6: Traffic Monitoring Systems (TMS)

County	Post Mile	Fwy Dir		Description
Son	41.560	N	S	WMVDS
Son	42.000	S		WMVDS
Son	42.500	S		WMVDS
Son	42.560	N		WMVDS
Son	42.900	N		WMVDS
Son	43.160	S		WMVDS
Son	43.470	N	S	WMVDS
Son	44.000	N	S	WMVDS
Son	44.500	N	S	WMVDS
Son	45.020	N	S	WMVDS
Son	45.450	N	S	WMVDS
Son	45.890	N	S	WMVDS
Son	47.090	N	S	WMVDS
Son	47.570	N	S	WMVDS
Son	48.200	N	S	WMVDS
Son	48.600	N	S	WMVDS
Son	49.050	N	S	WMVDS
Son	49.500	N	S	WMVDS
Son	51.000	N	S	WMVDS
Son	51.630	N	S	WMVDS
Son	52.100	S		WMVDS
Son	52.180	N		WMVDS
Son	52.500	N	S	WMVDS
Son	53.000	N	S	WMVDS
Son	53.472	N	S	N Redwood Hwy
Son	54.400	N	S	WMVDS
Son	55.000	N	S	WMVDS
Son	55.580	N	S	WMVDS
Son	56.000	N	S	WMVDS

Table 7: Ramp Meters

County	Post Mile	Fwy Dir	Location	Ramp Type	# of Lanes	HOVL	Comment	Status (1)
Mrn	0.06	NB	Vista Point	S	1		Planned	
Mrn	0.31	NB	Alexander Ave / Bunker Rd	S	1		Planned	
Mrn	1.83	NB	Monte Mar Dr / Spencer Ave	S	1		Planned	
Mrn	2.4	NB	Rodeo Ave	S	1		Planned	
Mrn	3.57	NB	N Bridge Blvd/Bridgeway / Gate 6 Rd / Donahue (Marin City)	S	1		Planned	

Table 7: Ramp Meters

County	Post Mile	Fwy Dir	Location	Ramp Type	# of Lanes	HOVL	Comment	Status (1)
Mrn	4.02	NB	Southbound (SB) Rte 1 (Shoreline Hwy / Almonte Blvd)	H	1		Planned	
Mrn	4.75	NB	Redwood Hwy Frontage Rd / De Silva Dr	H	1		Planned	
Mrn	5.66	NB	Eastbound (EB) E Blithedale Ave / Tiburon Blvd	L	1		Planned	
Mrn	5.83	NB	Westbound (WB) Rte 131 (Tiburon Blvd / E Blithedale Ave)	S	1		Planned	
Mrn	7.33	NB	EB Tamalpais Dr	L	1		Planned	
Mrn	7.51	NB	WB Tamalpais Dr / Redwood Hwy / San Clemente Dr	S	1		Planned	
Mrn	8.1	NB	Industrial Way / Redwood Hwy / Wornum Dr	S	1		Planned	
Mrn	8.85	NB	Sir Francis Drake Blvd	S	3	NM	Non Op	.
Mrn	10	NB	WB Rte 580 / Bellam Blvd / Francisco Blvd	D	2		Non Op	.
Mrn	11.2	NB	Mission Ave	S	2		Non Op	.
Mrn	12.27	NB	Villa Ave / Lincoln Ave / Lillian Ln	H	1		Non Op	.
Mrn	12.85	NB	N San Pedro Rd	S	1		Planned	
Mrn	13.63	NB	EB Manuel T Freitas Pkw / Civic Center Dr	H	1		Planned	
Mrn	13.76	NB	Redwood Frontage Rd / Civic Center Dr	S	1		Planned	
Mrn	14.66	NB	EB Lucas Valley Rd	L	1		Planned	
Mrn	14.79	NB	WB Smith Ranch Rd / Lucas Valley Rd	S	1		Planned	
Mrn	15.75	NB	St Vincent Dr / Miller Creek Rd	S	1		Planned	
Mrn	16.79	NB	Nave Dr / Bolling Dr	H	1		Planned	
Mrn	18.05	NB	Nave Dr / Ignacio Blvd / Roblar Dr	H	1		Part Const	
Mrn	18.18	NB	Bel Marin Keys Blvd / Ignacio Blvd / Nave Dr	S	2		Part Const	
Mrn	19.17	NB	WB Rte 37	C	1		Non Op	.
Mrn	19.17	NB	EB Novato Blvd	S	1		Non Op	.
Mrn	R20.4	NB	Rowland Blvd	S	2		Non Op	.
Mrn	R21.23	NB	De Long Ave / Davidson St	S	1		Non Op	.
Mrn	R22.11	NB	Atherton Ave	S	2		Non Op	.
Mrn	25.66	NB	San Antonio Rd / Redwood Sanitary Landfill Rd	S	1		Non Op	.
Mrn	0.17	SB	Alexander Ave / Conzelman Rd / Sausalito Lateral	S	1		Planned	

Table 7: Ramp Meters

County	Post Mile	Fwy Dir	Location	Ramp Type	# of Lanes	HOVL	Comment	Status (1)
Mrn	1.71	SB	Spencer / Monte Mar Dr	H	1		Planned	
Mrn	2.49	SB	Rodeo Ave	H	1		Planned	
Mrn	3.42	SB	Donahue St / N Bridge Blvd (Marin City)	L	1		Planned	
Mrn	3.99	SB	Rte 1 (Shoreline Hwy / Almonte Blvd)	S	1		Planned	
Mrn	4.75	SB	Redwood Hwy Frontage Rd / Hamilton Dr	H	1		Planned	
Mrn	5.56	SB	EB East Blithedale Ave / Tiburon Blvd	S	1		Planned	
Mrn	5.73	SB	WB Rte 131 (Tiburon Blvd) / E Blithedale Ave	L	1		Planned	
Mrn	6.54	SB	Meadow Valley Rd / Casa Buena Dr	S	1		Planned	
Mrn	7.24	SB	EB Tamalpais Dr	S	1		Planned	
Mrn	7.4	SB	WB Tamalpais Dr	L	1		Planned	
Mrn	7.64	SB	Madera Blvd	S	1		Planned	
Mrn	8.17	SB	Fifer Ave	S	1		Planned	
Mrn	8.46	SB	Sir Francis Drake Blvd	D	2		Part Const	
Mrn	9.83	SB	W Francisco Blvd / Jacoby St / Andersen Dr	S	1		Part Const	
Mrn	10.76	SB	2nd St	S	2		Part Const	
Mrn	12.1	SB	Lincoln Ave / Prospect Dr	H	1		Non Op	.
Mrn	12.77	SB	Merrydale Rd / N San Pedro Rd	H	1		Planned	
Mrn	13.67	SB	WB Manuel T Freitas Pkwy	L	1		Planned	
Mrn	13.67	SB	EB Manuel T Freitas Pkwy / Del Presidio Blvd	S	1		Planned	
Mrn	14.62	SB	Lucas Valley Rd	S	1		Planned	
Mrn	15.43	SB	Miller Creek Rd	S	1		Planned	
Mrn	16.66	SB	Alameda del Prado / Nave Dr	S	1		Planned	
Mrn	17.89	SB	Ignacio Blvd / Enfrente Rd	S	1		Planned	
Mrn	18.66	SB	WB Rte 37 / EB Novato Blvd	C	2		Non Op	.
Mrn	19.97	SB	Rowland Blvd	S	3	NM	Non Op	.
Mrn	R21.03	SB	De Long Ave	S	2		Non Op	.
Mrn	R21.85	SB	Atherton Ave	S	2		Non Op	.
Mrn	25.48	SB	San Antonio Rd / Redwood Sanitary Landfill Rd	L	1		Non Op	.
Son	0.19	NB	San Antonio Rd	S	1		Non Op	.
Son	2.7	NB	Kastania Rd / S Petaluma Blvd	S	2		Non Op	.
Son	3.84	NB	Rte 116 / Lakeville Hwy	S	1		Non Op	
Son	4.7	NB	WB E Washington St	L	1		Non Op	.
Son	4.89	NB	EB E Washington St	S	2		Non Op	.

Table 7: Ramp Meters

County	Post Mile	Fwy Dir	Location	Ramp Type	# of Lanes	HOVL	Comment	Status (1)
Son	7.63	NB	Northbound (NB) N Old Redwood Hwy / N Petaluma Blvd	L	1		Non Op	.
Son	7.71	NB	SB N Old Redwood Hwy	S	1		Non Op	.
Son	12.87	NB	Rte 116 / Gravenstein Hwy / Old Redwood Hwy / Commerce Blvd	S	3	M	Operational	.
Son	13.83	NB	EB Rohnert Park Expy	L	2	M	Operational	.
Son	14.23	NB	WB Rohnert Park Expy	S	3	M	Operational	.
Son	14.86	NB	Commerce Blvd / Golf Course Dr / Roberts Lake Rd	S	2		Operational	.
Son	16.62	NB	Todd Rd / Santa Rose Ave	S	2		Operational	.
Son	18.5	NB	Yolanda Ave / Santa Rosa Ave / Hearn Ave	S	2	M	Operational	.
Son	18.98	NB	Santa Rosa Ave / Colgan Ave / Baker Ave	S	1		Operational	.
Son	19.75	NB	EB Rte 12	C	1		Operational	.
Son	19.76	NB	WB Rte 12	C	1		Operational	.
Son	20.42	NB	6th St / Morgan St	S	1		Operational	.
Son	20.9	NB	College Ave	S	2		Operational	.
Son	21.93	NB	Steele Lane / Guerneville Rd	S	3	M	Operational	.
Son	22.96	NB	Mendocino Ave / Fountaingrove Pkwy / Old Redwood Hwy	H	2	M	Operational	.
Son	24.77	NB	EB River Rd / Mark West Springs Rd	L	1		Operational	.
Son	24.9	NB	WB River Rd / Mark West Springs Rd	S	1		Operational	.
Son	26.39	NB	Airport Blvd	S	3	M	Operational	.
Son	27.54	NB	EB Shiloh Rd	L	1		Operational	.
Son	27.65	NB	WB Shiloh Rd	S	1		Operational	.
Son	29.56	NB	Old Redwood Hwy / Windsor River Rd	S	1		Non Op	.
Son	33.67	NB	Old Redwood Hwy / Grant Ave / Healdsburg Ave	S	1		Planned	
Son	35.05	NB	Westside Rd / Mill St	S	1		Planned	
Son	36.48	NB	Dry Creek Rd	S	1		Planned	
Son	R38.71	NB	Lytton Springs Rd	S	1		Planned	
Son	R40.25	NB	Independence Undps / Souverain Rd / Geyserville Ave	S	1		Planned	
Son	R41.65	NB	Geyserville Ave / Banli Ln	S	1		Planned	
Son	R43.57	NB	Canyon Rd / Geyserville Ave (Rte 128)	S	1		Planned	
Son	R48.06	NB	Asti Store Rd / Simmons Rd	S	1		Planned	

Table 7: Ramp Meters

County	Post Mile	Fwy Dir	Location	Ramp Type	# of Lanes	HOVL	Comment	Status (1)
Son	R49.22	NB	Theresa Dr / Asti Rd	S	1		Planned	
Son	R50.64	NB	Santana Dr / Asti Rd / S Redwood Hwy	S	1		Planned	
Son	R51.82	NB	Citrus Fair Dr / Asti Rd	S	1		Planned	
Son	R53.76	NB	N Redwood Hwy (Rte 128)	S	1		Planned	
Son	0.18	SB	San Antonio Rd	S	1		Non Op	.
Son	2.63	SB	Kastania Rd / S Petaluma Blvd	S	2		Non Op	.
Son	3.8	SB	Rte 116 / Lakeville St / Caulfield Ln	H	1		Planned	
Son	4.71	SB	E Washington St	S	2		Non Op	.
Son	7.58	SB	NB N Petaluma Blvd / N Old Redwood Hwy	H	1		Non Op	.
Son	7.67	SB	SB N Old Redwood Hwy / N Petaluma Blvd	L	1		Non Op	.
Son	8.87	SB	Pepper Rd	S	1		Operational	.
Son	11.86	SB	W Sierra Ave / W School St	S	2	M	Operational	.
Son	12.61	SB	Rte 116 / Gravenstein Hwy	S	2	M	Operational	.
Son	13.71	SB	EB Rohnert Park Expy	S	2	M	Operational	.
Son	13.89	SB	WB Rohnert Park Expy	L	2	M	Operational	.
Son	14.85	SB	Golf Course Dr / Redwood Dr / Wilfred Ave	D	3	M	Operational	.
Son	16.56	SB	Todd Rd / S Moorland Ave	S	1		Operational	.
Son	18.38	SB	Corby Ave / Hearn Ave	S	2		Operational	.
Son	18.82	SB	Baker Ave / Corby Ave / Santa Rosa Ave	S	2		Operational	.
Son	19.59	SB	EB Rte 12	C	2		Operational	.
Son	19.59	SB	WB Rte 12	C	2		Operational	.
Son	19.79	SB	3rd St / Davis St	S	1	M	Operational	.
Son	20.63	SB	College Ave	S	2		Operational	.
Son	21.56	SB	Guerneville Rd / Steele Lane	S	2		Operational	.
Son	22.4	SB	Bicentennial Way / Cleveland Ave	S	3	M	Operational	.
Son	22.9	SB	Mendocino OC / Cleveland Ave / Industrial Dr	H	1		Operational	.
Son	23.13	SB	Cleveland Ave / Hopper Ave	L	2	M	Operational	.
Son	24.82	SB	EB River Rd / Mark West Springs Rd	S	2	M	Operational	.
Son	24.97	SB	WB River Rd / Mark West Springs Rd	L	2	M	Operational	.
Son	26.24	SB	EB Airport Blvd	S	3	M	Operational	.
Son	26.41	SB	WB Airport Blvd	L	2	M	Operational	.
Son	27.58	SB	EB Shiloh Rd	S	2	M	Operational	.
Son	27.69	SB	WB Shiloh Rd	L	1		Operational	.

Table 7: Ramp Meters

County	Post Mile	Fwy Dir	Location	Ramp Type	# of Lanes	HOVL	Comment	Status (1)
Son	29.2	SB	Old Redwood Hwy / Windsor River Rd	S	2	M	Operational	.
Son	31.09	SB	Arata Lane / Old Redwood Hwy	S	1		Operational	.
Son	33.3	SB	Old Redwood Hwy / Limerick Ln	S	1		Planned	
Son	34.37	SB	Healdsburg Ave / Exchange Ave	H	1		Planned	
Son	36.13	SB	Dry Creek Rd	S	1		Planned	
Son	R38.43	SB	Lytton Springs Rd	S	1		Planned	
Son	R39.91	SB	Independence Undps / Souverain Rd / Via Archimedes	S	1		Planned	
Son	R41.24	SB	Geyserville Ave / Geiserville Rd	S	1		Planned	
Son	R43.08	SB	Canyon Rd (Rte 128) / Chianti Rd	S	1		Planned	
Son	R47.66	SB	Simmons Rd / Asti Store Rd	S	1		Planned	
Son	R48.92	SB	Theresa Dr / Dutcher Creek Rd	S	1		Planned	
Son	R50.23	SB	Santana Dr / S Redwood Hwy / S Cloverdale Blvd	S	1		Planned	
Son	R51.46	SB	Citrus Fair Dr / N Cloverdale Blvd	S	1		Planned	
Son	R53.32	SB	N Redwood Hwy (Rte 128)	H	1		Planned	

Note:

(1) Status: A black dot "." identifies "existing" ramp metering locations. This include locations where there are operational ramp meters or locations where ramp metering hardware is fully installed and accepted by the Division of Traffic Operations, but it is currently not activated (Non Operational). Ramp meters which are in construction are identified as "planned" ramp metering locations.

(2) Ramp Type:

L = Loop

H = Hook

C = Freeway-to-freeway Connector

S = Slip or diagonal

D = Collector/Distributor

(3) HOVPL

M = metered HOVPL

NM = non-metered HOVPL

Blank space = No HOVPL lane

(4) Comments:

Operational = Ramp meter is currently actively metering

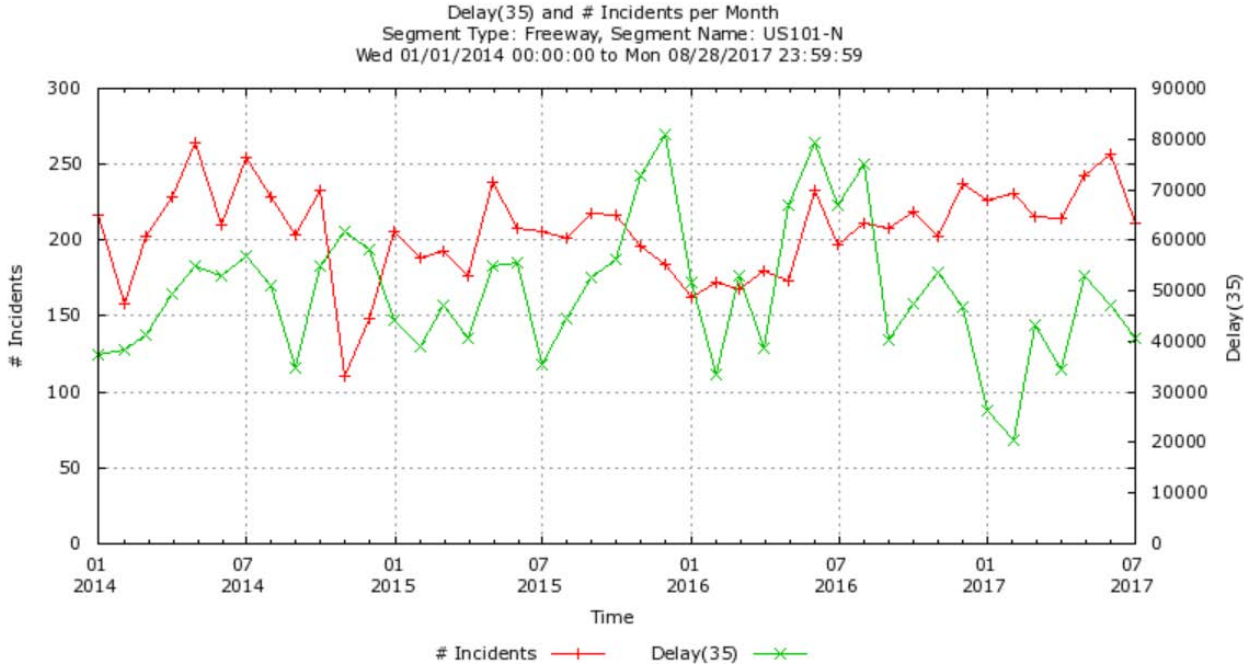
Non Operational (Non Op) = Ramp metering hardware is fully installed and accepted by the Division of Traffic Operations, but it is currently not activated.

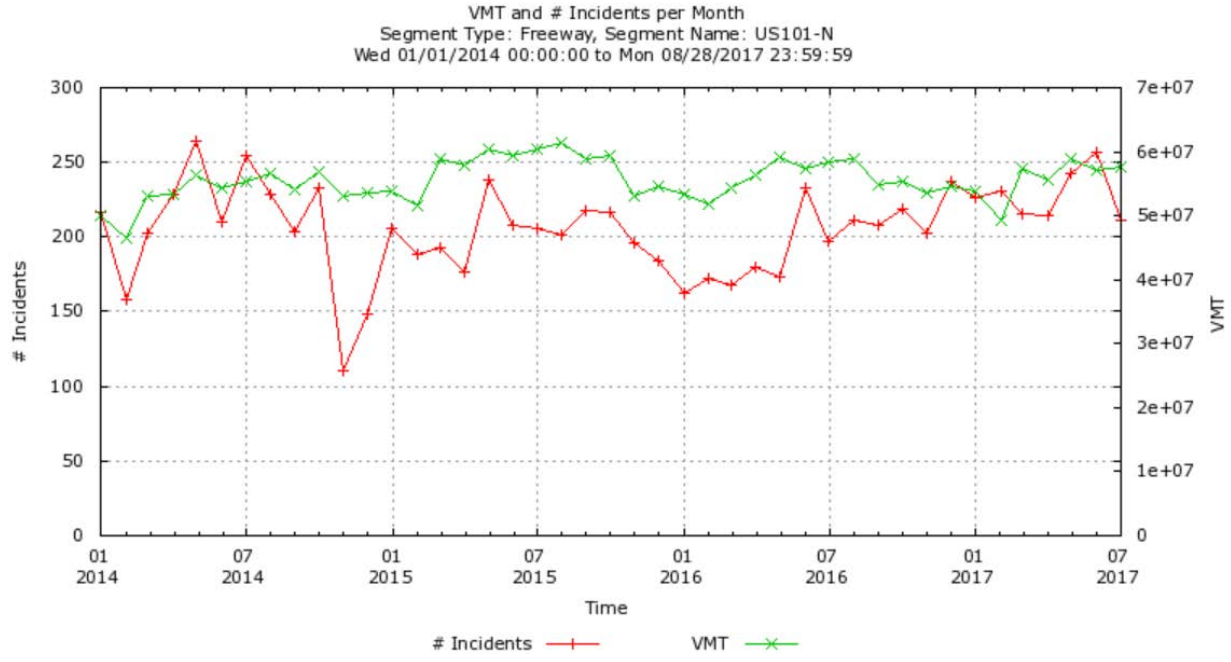
Partially Constructed (Part Const) = Ramp meter in construction, or just the underground equipment constructed, with no poles/signs/heads in place.

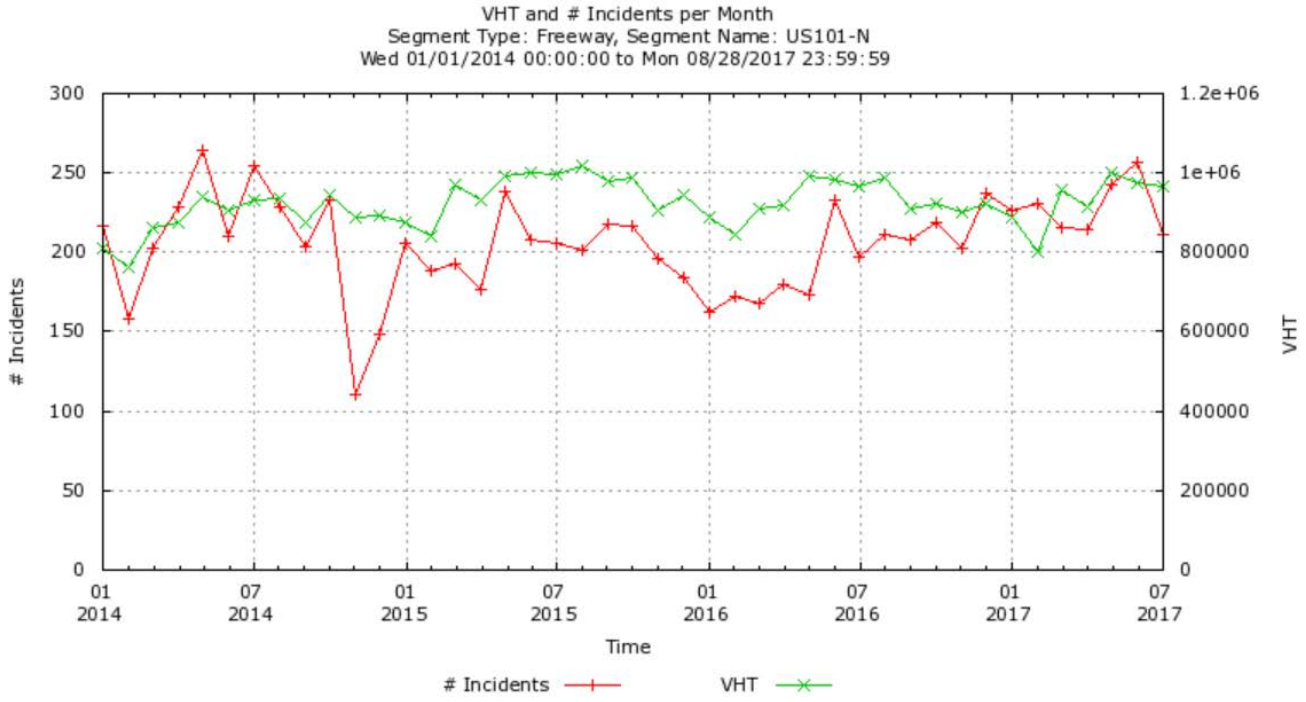
Planned = Meter non-existent; only planned/proposed

Appendix E: Correlation between Incidents and Vehicle Hours of Delay (VHD), Vehicle Miles Traveled (MMT), and Vehicle Hours Traveled (VHT)

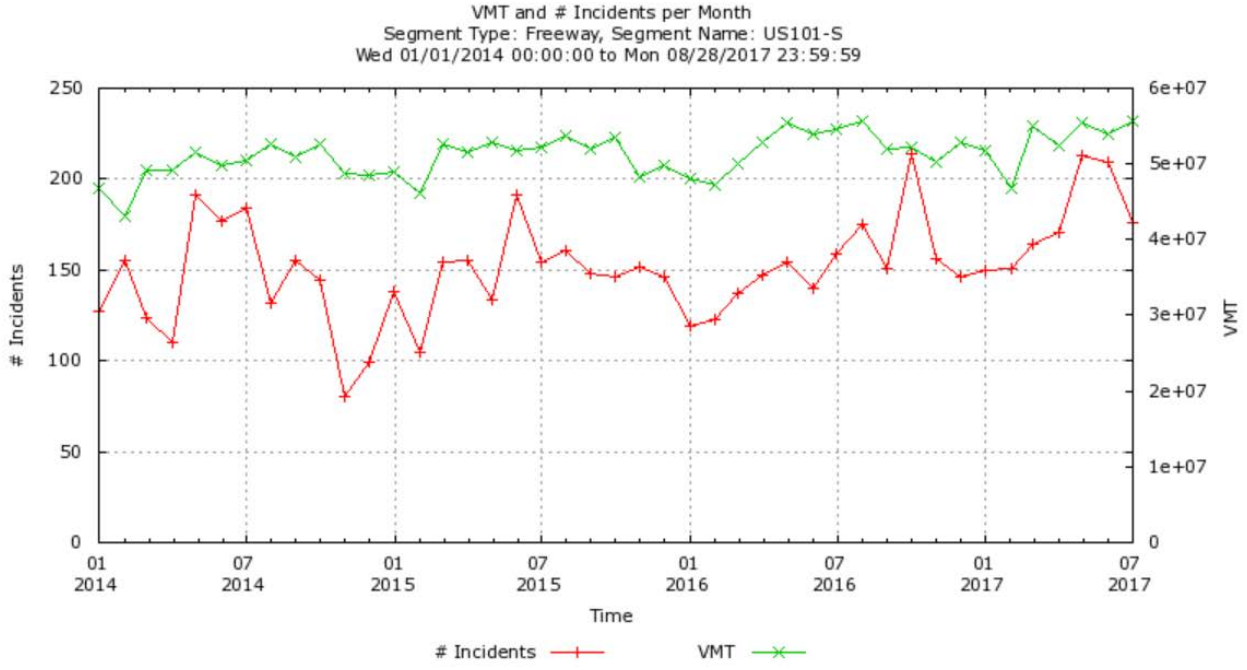
Northbound US 101 Postmile MRN L0.3 to Postmile MRN 26.3

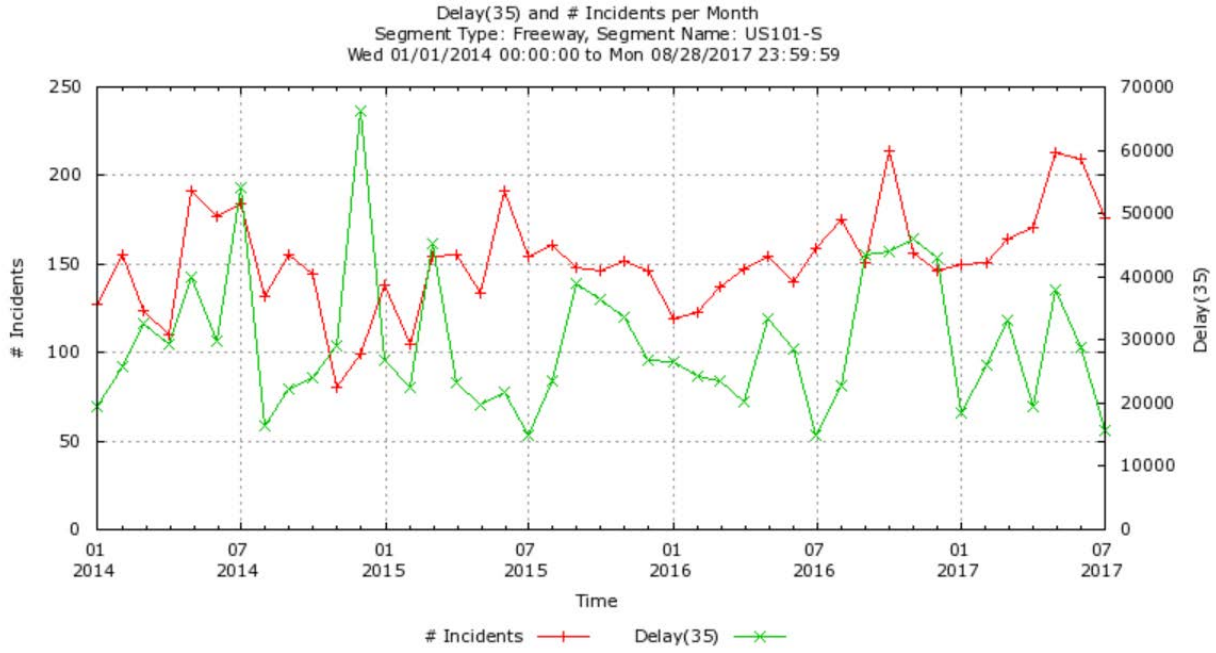


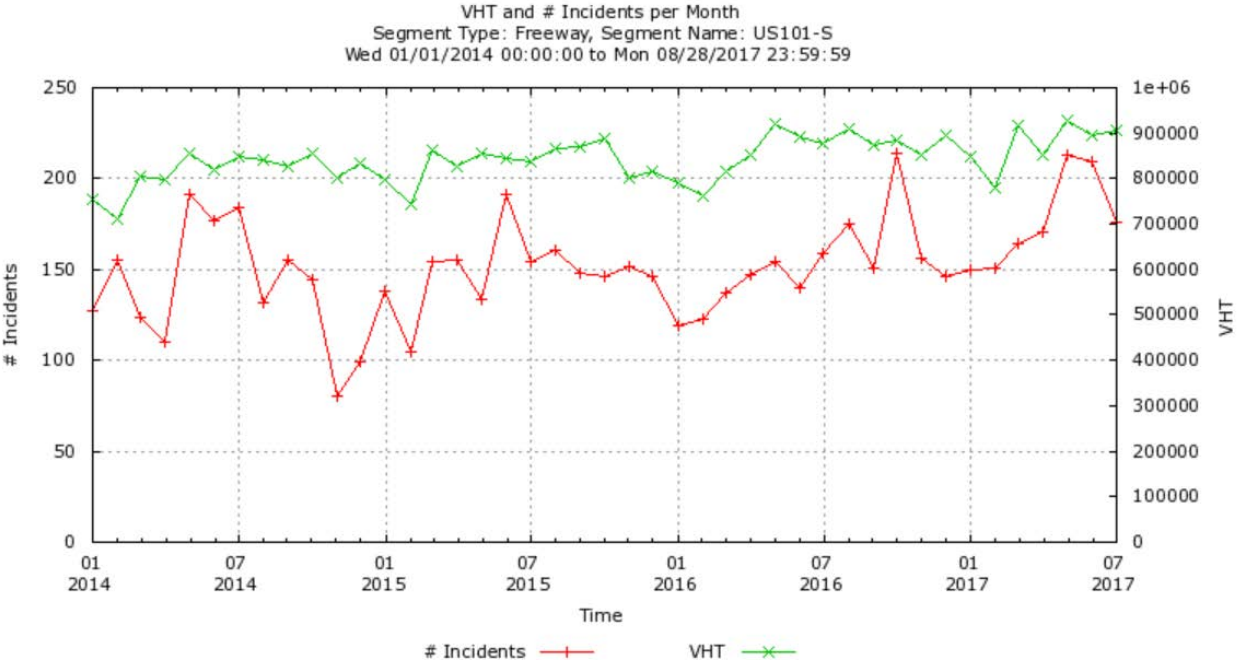




Southbound US 101 Postmile MRN L0.3 to Postmile MRN 26.3

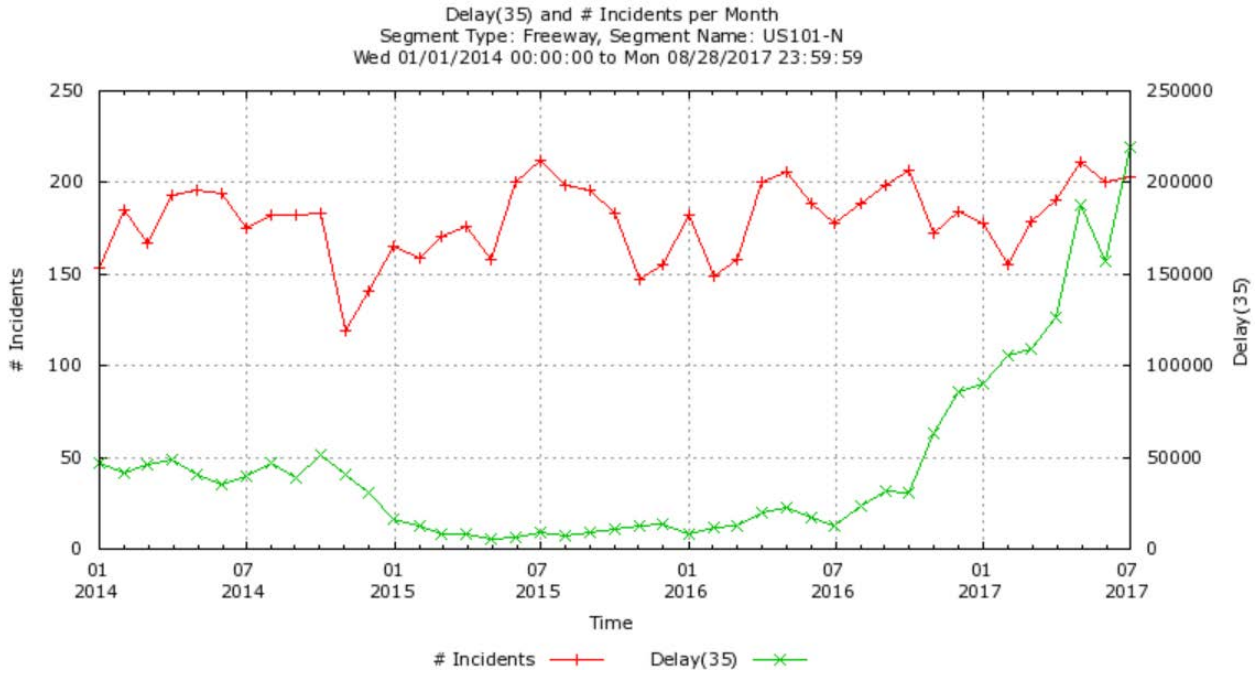


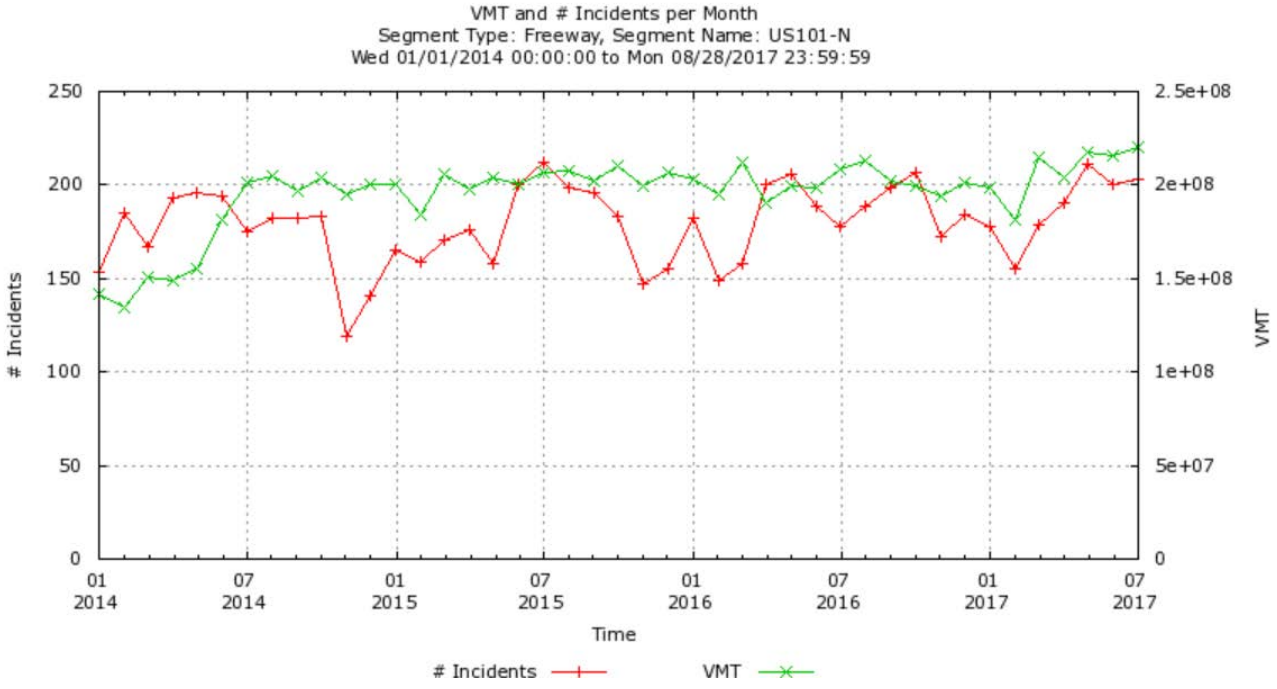

Delay(35) and # Incidents per Month
Segment Type: Freeway, Segment Name: US101-S
Wed 01/01/2014 00:00:00 to Mon 08/28/2017 23:59:59
# Incidents
Delay(35)
Time
01 2014
07 2014
01 2015
07 2015
01 2016
07 2016
01 2017
07 2017
# Incidents
Delay(35)

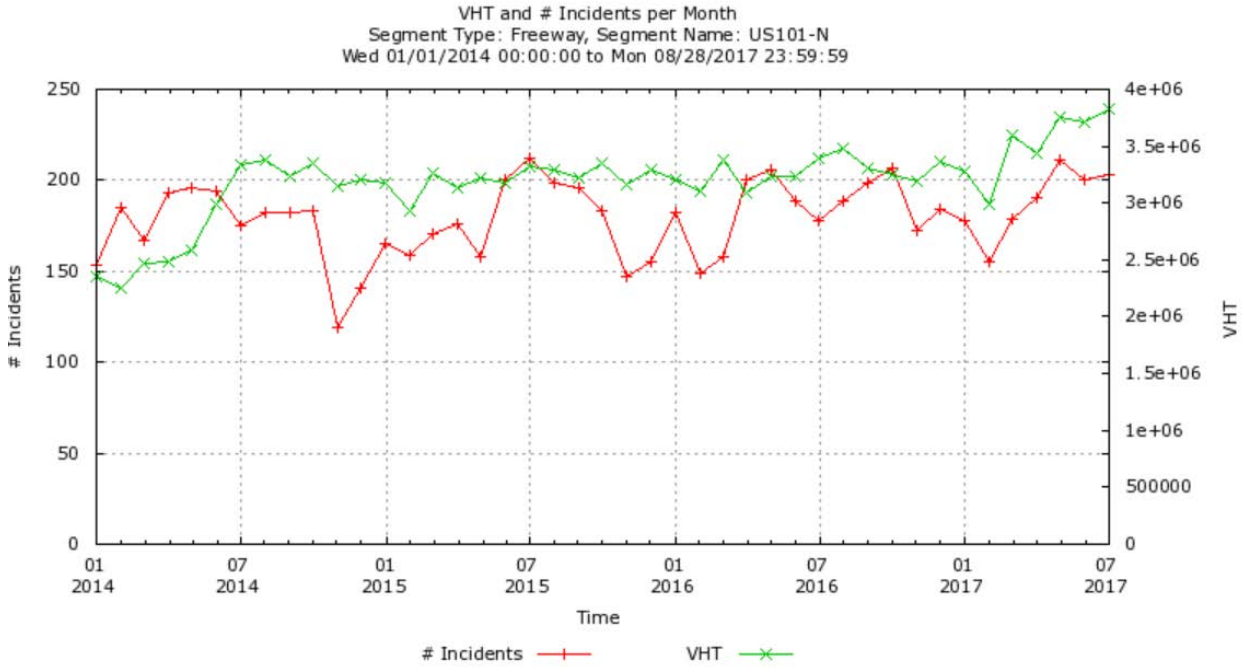

VHT and # Incidents per Month
Segment Type: Freeway, Segment Name: US101-S
Wed 01/01/2014 00:00:00 to Mon 08/28/2017 23:59:59
Incidents
VHT
Time
01 2014
07 2014
01 2015
07 2015
01 2016
07 2016
01 2017
07 2017
Incidents
VHT

US 101 in Sonoma County

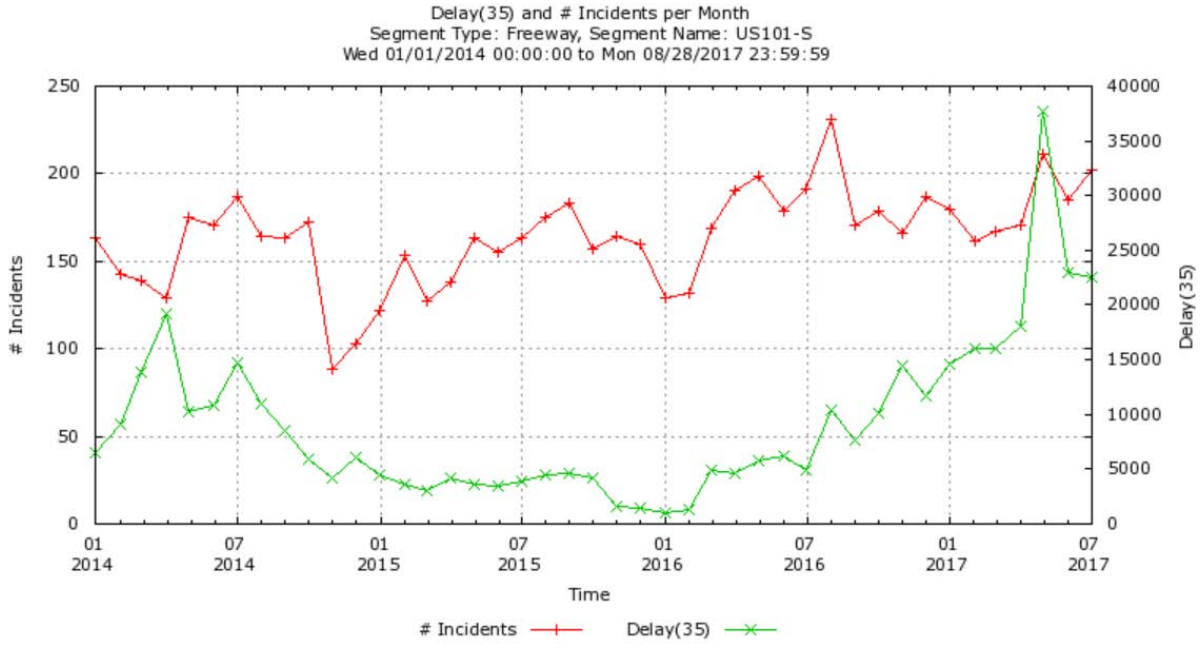
Northbound US 101 Postmile MRN 27.3 to Postmile SON R 55.8

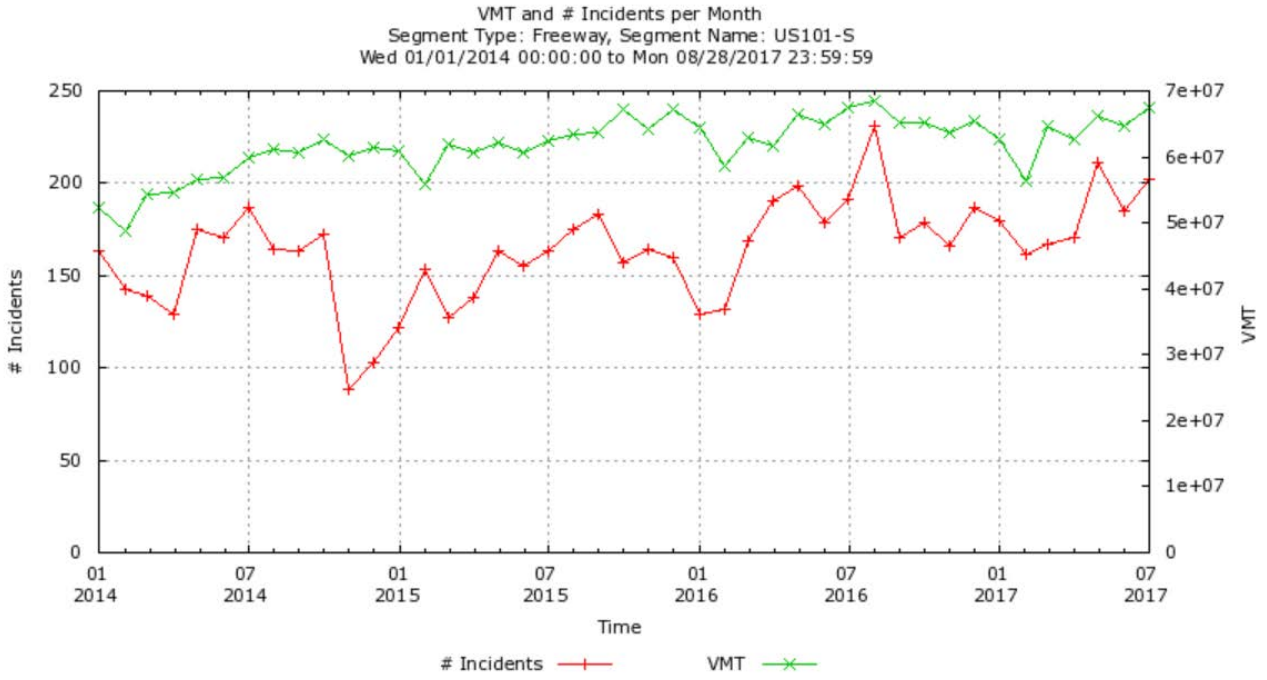


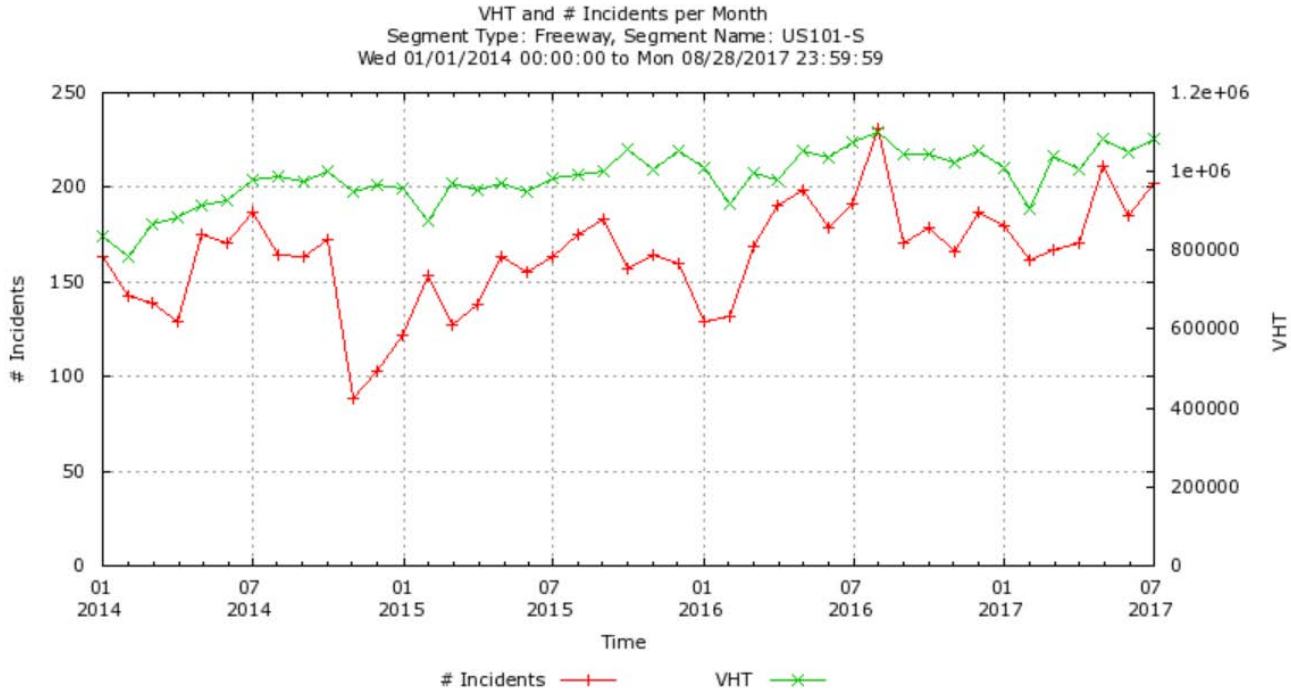




Southbound US 101 Postmile MRN 27.3 to Postmile SON R 55.8




VMT and # Incidents per Month
Segment Type: Freeway, Segment Name: US101-S
Wed 01/01/2014 00:00:00 to Mon 08/28/2017 23:59:59
Incidents
VMT
Time
Incidents
VMT
0
50
100
150
200
250
0
1e+07
2e+07
3e+07
4e+07
5e+07
6e+07
7e+07
01 2014
07 2014
01 2015
07 2015
01 2016
07 2016
01 2017
07 2017


VHT and # Incidents per Month
Segment Type: Freeway, Segment Name: US101-S
Wed 01/01/2014 00:00:00 to Mon 08/28/2017 23:59:59
Incidents
VHT
Time
Incidents
VHT
0
50
100
150
200
250
0
200000
400000
600000
800000
1e+06
1.2e+06
01 2014
07 2014
01 2015
07 2015
01 2016
07 2016
01 2017
07 2017

Appendix F: Results from MTC Travel Demand Model

Table 1: Baseline 2015 Performance of Marin-Sonoma 101 by Segment[116]

Segment		AM Peak Period			PM Peak Period		
		NB	SB	Total	NB	SB	Total
1	Sum of CTIM	15.4	17.0	32.4	17.1	14.7	31.8
	Sum of DELAY	10.0	969.7	979.7	683.4	55.0	738.4
	Sum of VMT	120970.2	249791.4	370761.5	255379.6	133274.2	388653.8
	Sum of VHT	1903.8	4870.8	6774.6	4674.0	2137.7	6811.7
2	Sum of CTIM	17.9	23.7	41.7	21.2	18.0	39.2
	Sum of DELAY	16.2	2536.4	2552.6	1339.9	45.5	1385.5
	Sum of VMT	115745.8	252322.6	368068.5	242129.2	128883.1	371012.2
	Sum of VHT	1825.0	6470.6	8295.7	5115.0	2060.4	7175.4
3	Sum of CTIM	12.9	14.8	27.6	15.3	9.3	24.6
	Sum of DELAY	1.0	1540.5	1541.5	596.7	1.7	598.4
	Sum of VMT	50578.2	135795.0	186373.3	123700.5	53829.1	177529.5
	Sum of VHT	779.1	3629.7	4408.8	2499.8	829.8	3329.6
4	Sum of CTIM	8.0	12.6	20.7	10.7	8.2	18.9
	Sum of DELAY	3.1	1181.8	1184.9	629.0	5.1	634.1
	Sum of VMT	50239.2	125778.9	176018.2	114301.1	54896.9	169198.0
	Sum of VHT	803.0	3173.9	3976.8	2437.2	879.9	3317.1
5	Sum of CTIM	40.5	45.1	85.6	44.2	42.9	87.1
	Sum of DELAY	180.9	935.2	1116.1	1094.1	396.4	1490.5
	Sum of VMT	207390.1	287859.7	495249.9	291866.1	242160.9	534027.0
	Sum of VHT	3429.8	5423.1	8852.9	5650.7	4185.2	9835.9
6	Sum of CTIM	24.9	25.1	50.0	24.9	25.1	50.1
	Sum of DELAY	0.4	0.8	1.2	1.2	0.8	2.0
	Sum of VMT	75129.1	97843.4	172972.4	102053.3	89098.2	191151.5
	Sum of VHT	1156.2	1506.1	2662.3	1571.3	1371.6	2942.8
Total	Total Sum of CTIM	119.7	138.3	258.0	133.3	118.2	251.5
	Total Sum of DELAY	211.7	7164.3	7376.0	4344.3	504.6	4848.9
	Total Sum of VMT	620052.7	1149391.1	1769443.7	1129429.7	702142.3	1831572.0
	Total Sum of VHT	9897.0	25074.1	34971.1	21947.9	11464.6	33412.5

Note: All measures are for average weekday peak periods, AM or PM.
CTIM = congested travel time, minutes VOL= vehicle volume
DELAY = difference between the congested travel time and the free flow travel time, vehicle hours
VMT = vehicle mile traveled, vehicle-miles VHT = vehicle hours traveled, vehicle-hours

[116] Summarized based on MTC Travel Model One 2017

Table 2: Forecasted 2040 Performance of Marin-Sonoma 101 by Segment [117]

Segment		AM Peak Period			PM Peak Period		
		NB	SB	Total	NB	SB	Total
1	Sum of CTIM	15.4	17.1	32.5	18.0	14.7	32.8
	Sum of DELAY	11.1	1,064.6	1,075.7	1,205.7	74.8	1,280.5
	Sum of VMT	130,648.9	265,655.8	396,304.8	291,085.2	147,632.6	438,717.9
	Sum of VHT	2,055.4	5,213.4	7,268.8	5,754.4	2,382.2	8,136.6
2	Sum of CTIM	18.0	24.4	42.4	21.7	18.1	39.8
	Sum of DELAY	27.0	3,028.2	3,055.2	1,652.1	89.1	1,741.2
	Sum of VMT	131,482.0	272,631.2	404,113.1	261,072.1	149,355.4	410,427.5
	Sum of VHT	2,081.2	7,279.7	9,361.0	5,723.4	2,424.0	8,147.4
3	Sum of CTIM	15.1	21.2	36.3	18.1	15.1	33.2
	Sum of DELAY	1.5	1,852.7	1,854.2	804.5	2.9	807.4
	Sum of VMT	56,916.5	155,602.0	212,518.5	139,007.0	61,703.5	200,710.5
	Sum of VHT	877.1	4,246.6	5,123.7	2,943.0	952.2	3,895.2
4	Sum of CTIM	15.8	21.6	37.4	19.2	16.1	35.3
	Sum of DELAY	3.0	1,582.5	1,585.5	876.6	6.6	883.2
	Sum of VMT	54,526.6	148,445.7	202,972.3	133,736.4	61,652.2	195,388.6
	Sum of VHT	869.2	3,930.6	4,799.8	2,991.0	987.5	3,978.4
5	Sum of CTIM	41.0	47.5	88.6	46.5	43.5	90.1
	Sum of DELAY	279.0	1,713.9	1,992.9	1,766.4	603.5	2,369.9
	Sum of VMT	226,696.9	325,518.9	552,215.9	328,010.2	269,110.6	597,120.7
	Sum of VHT	3,830.4	6,788.0	10,618.4	6,886.6	4,812.4	11,699.0
6	Sum of CTIM	24.9	25.2	50.1	24.9	25.2	50.1
	Sum of DELAY	0.7	1.9	2.6	3.1	1.9	5.1
	Sum of VMTPM	83,689.8	117,571.8	201,261.6	122,274.4	102,863.5	225,138.0
	Sum of VHTPM	1,288.2	1,810.7	3,098.9	1,884.3	1,584.4	3,468.7
Total	Total Sum of CTIM	130.3	157.1	287.4	148.5	132.7	281.2
	Total Sum of DELAY	322.3	9,243.9	9,566.2	6,308.5	778.9	7,087.4
	Total Sum of VMT	683,960.7	1,285,425.4	1,969,386.1	1,275,185.4	792,317.9	2,067,503.2
	Total Sum of VHT	11,001.5	29,269.1	40,270.6	26,182.7	13,142.6	39,325.3

Note: All measures are for average weekday peak periods, AM or PM.
CTIM = congested travel time, minutes VOL= vehicle volume
DELAY = difference between the congested travel time and the free flow travel time, vehicle hours
VMT = vehicle mile traveled, vehicle-miles VHT = vehicle hours traveled, vehicle-hours

[117] Summarized based on MTC Travel Model One 2017

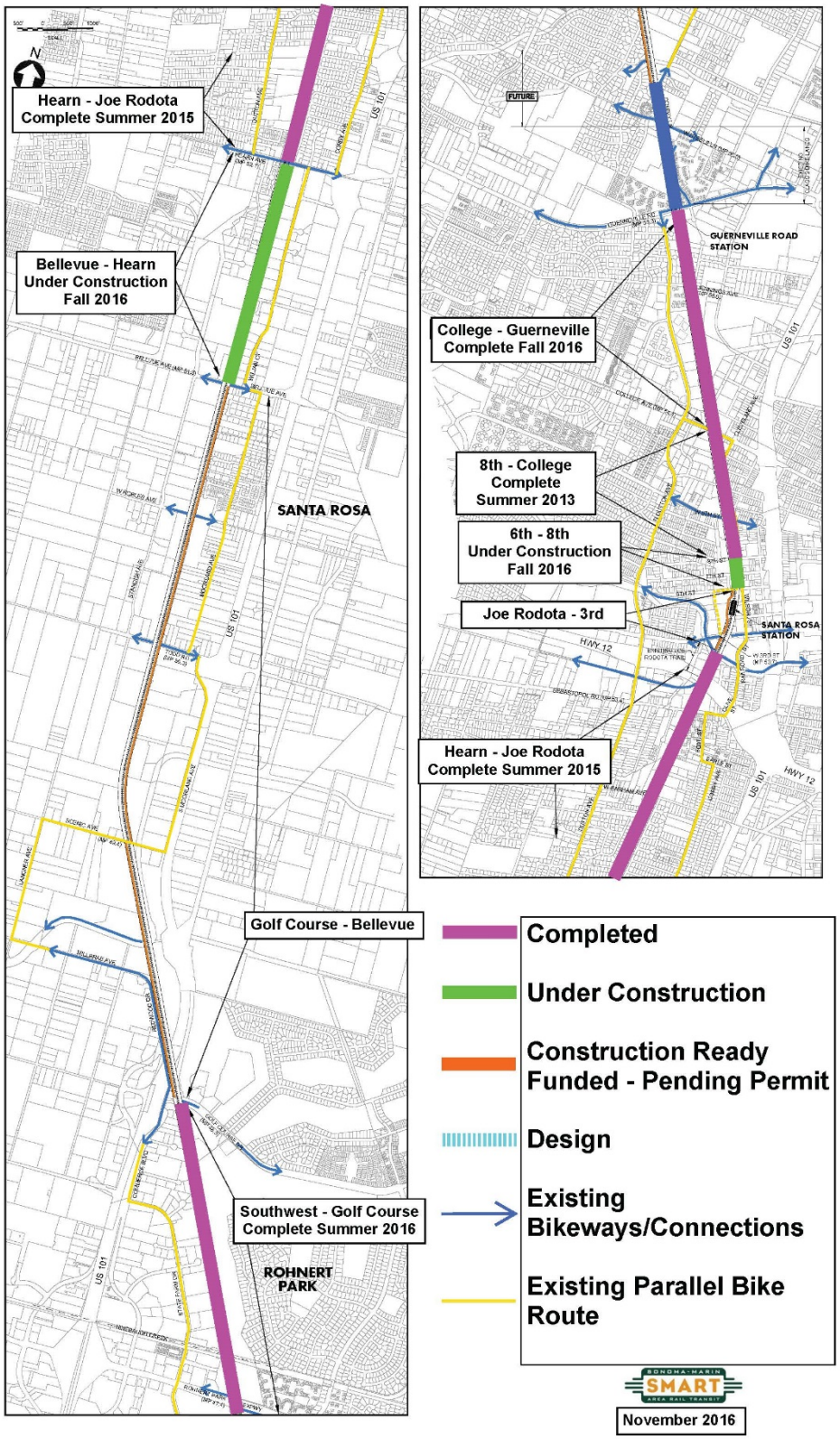
Table 3: Changes from 2015 to 2040

Segment		AM Peak Period			PM Peak Period		
		NB	SB	Total	NB	SB	Total
1	Sum of CTIM	0%	1%	0%	6%	0%	3%
	Sum of DELAY	11%	10%	10%	76%	36%	73%
	Sum of VMT	8%	6%	7%	14%	11%	13%
	Sum of VHT	8%	7%	7%	23%	11%	19%
2	Sum of CTIM	0%	3%	2%	2%	1%	2%
	Sum of DELAY	67%	19%	20%	23%	96%	26%
	Sum of VMT	14%	8%	10%	8%	16%	11%
	Sum of VHT	14%	13%	13%	12%	18%	14%
3	Sum of CTIM	17%	44%	31%	18%	62%	35%
	Sum of DELAY	56%	20%	20%	35%	71%	35%
	Sum of VMT	13%	15%	14%	12%	15%	13%
	Sum of VHT	13%	17%	16%	18%	15%	17%
4	Sum of CTIM	97%	71%	81%	80%	97%	87%
	Sum of DELAY	-4%	34%	34%	39%	30%	39%
	Sum of VMT	9%	18%	15%	17%	12%	15%
	Sum of VHT	8%	24%	21%	23%	12%	20%
5	Sum of CTIM	1%	5%	3%	5%	2%	3%
	Sum of DELAY	54%	83%	79%	61%	52%	59%
	Sum of VMT	9%	13%	12%	12%	11%	12%
	Sum of VHT	12%	25%	20%	22%	15%	19%
6	Sum of CTIM	n/a	n/a	n/a	n/a	n/a	n/a
	Sum of DELAY	67%	147%	120%	159%	136%	150%
	Sum of VMTPM	11%	20%	16%	20%	15%	18%
	Sum of VHTPM	11%	20%	16%	20%	16%	18%
Total	Total Sum of CTIM	11%	17%	14%	14%	16%	15%
	Total Sum of DELAY	52%	29%	30%	45%	54%	46%
	Total Sum of VMT	10%	12%	11%	13%	13%	13%
	Total Sum of VHT	11%	17%	15%	19%	15%	18%

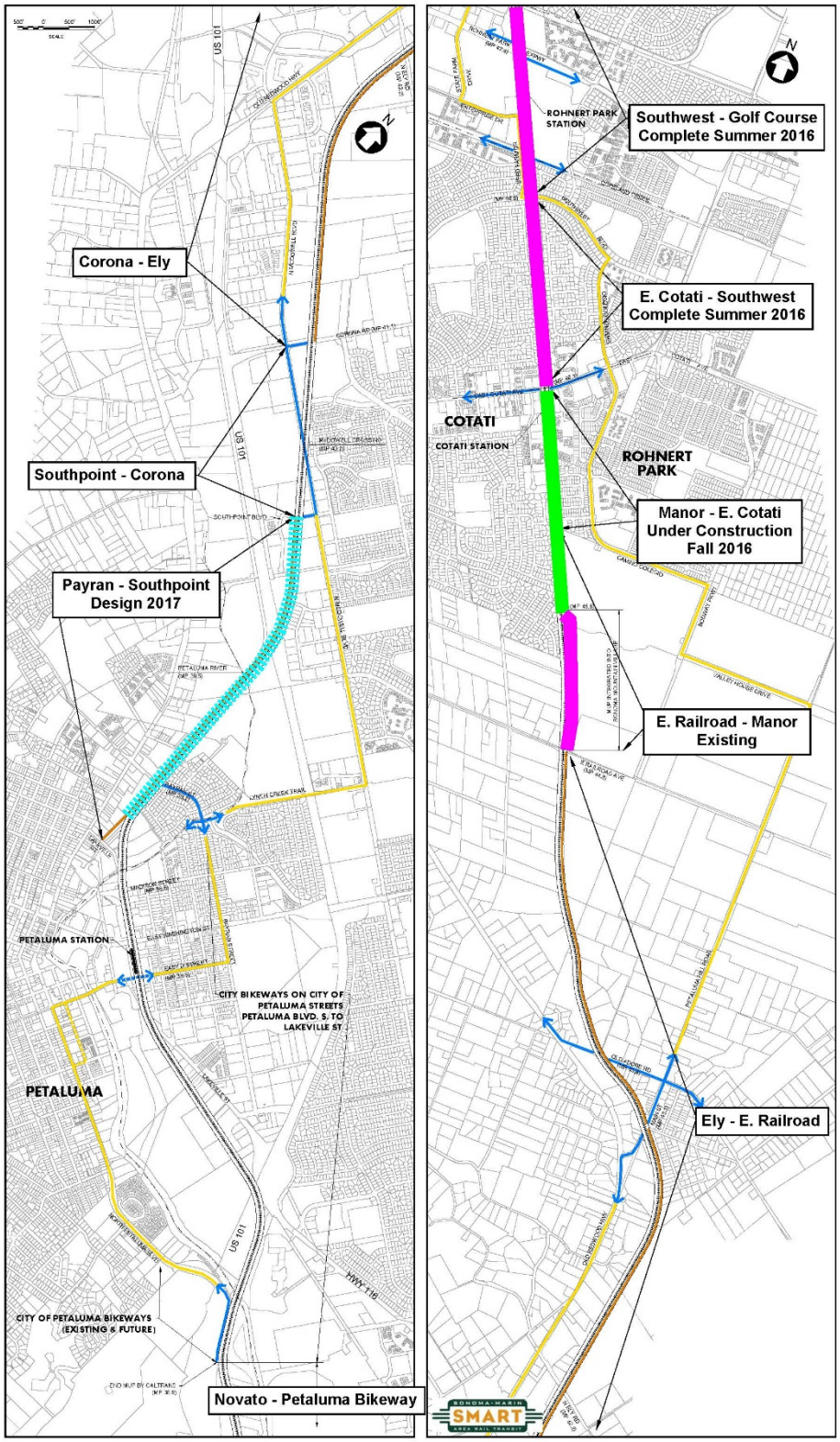
Note: All measures are for average weekday peak periods, AM or PM.
CTIM = congested travel time, minutes VOL= vehicle volume
DELAY = difference between the congested travel time and the free flow travel time, vehicle hours
VMT = vehicle mile traveled, vehicle-miles VHT = vehicle hours traveled, vehicle-hours

Appendix G: SMART Trail Maps

Sheet 1 of 3



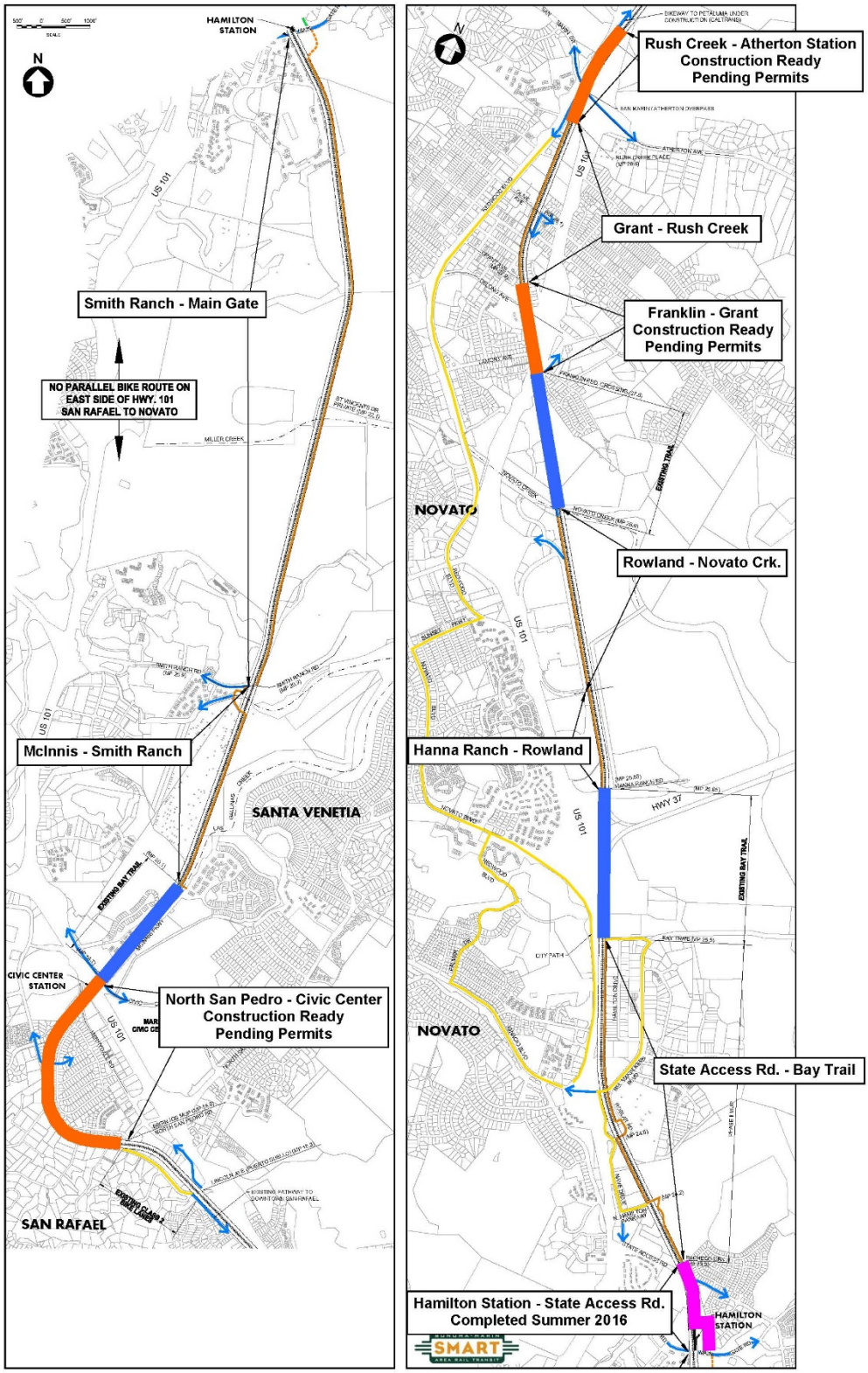
November 2016



End Novato to Petaluma Bikeway Built by Caltrans

Sheet 3 of 3

Begin Novato to Petaluma
Bikeway Built by Caltrans



Source: http://sonomamarintrain.org