Transportation Authority of Marin

HIGHWAY 101 INTERCHANGE & APPROACHING ROADWAY STUDY

Lucas Valley/Smith Ranch Road

EXISTING CONDITIONS, CONSTRAINTS, & OPPORTUNITIES REPORT

HNTB

Parisi
TRANSPORTATION CONSULTING

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INTRODUCTION

This report on the Lucas Valley Road/Smith Ranch Road Interchange forms one of a series of reports being prepared under the Transportation Authority of Marin's (TAM) Highway 101 Interchange and Approaching Roadway Study that examines the existing conditions, deficiencies, and constraints of 12 selected interchanges on Highway 101 in Marin County. The reports also identify opportunities for improvement under a program of near- and long-term projects that aim to improve operations and safety for all users.

The planning study is funded through Measure AA – the reauthorized ½-cent transportation sales tax that was approved by Marin voters in 2018. The overarching goal of the Transportation Sales Tax Renewal Expenditure Plan is to "reduce congestion and reduce greenhouse gas emissions, maintain and improve local transportation infrastructure, and provide high quality transportation options for people of all ages who live, work, and travel in Marin County."

Each interchange was evaluated to determine the existing conditions of the roadway, such as nonstandard features or outmoded design and flooding, traffic conditions, pedestrian/bicyclist circulation and intermodal connectivity, and environmental conditions, including vulnerability to sea level rise (SLR). The study looked at previous planning studies for these interchanges as well as any recent or proposed nearby development, including the new Sonoma–Marin Area Rail Transit (SMART) passenger rail line which aligns closely with Highway 101.

EXISTING CONDITIONS

There are a number of existing physical and operational deficiencies associated with the interchange, including short acceleration and merge lengths for the northbound (NB) and southbound (SB) on-ramps, short deceleration length for the SB off-ramp, non-Americans with Disabilities Act (ADA) compliant paths of travel for pedestrians, and an incomplete network for bicyclists.

Pavement conditions on Lucas Valley Road/Smith Ranch Road are rated to be very good/excellent.

In the five-year period from 2014-2018, the interchange reported a total of 38 collisions. A majority of the crashes occur on the SB loop off-ramp within the interchange. Of the 38 total reported collisions, 13, or 34%, resulted in minor injuries. Approximately 45% of collisions were the result of a driver hitting a fixed object. An additional 29% were rear-ends, with an additional 8% of collision types being broadsides.

Congestion patterns for the AM and PM peak periods are moderate. The Lucas Valley Road/Los Gamos Drive intersection AM level of service is F and is rated E in the PM peak periods. All other locations within the interchange for AM and PM level of service rate E or better.

Executive Summary

IMPROVEMENT CONCEPTS

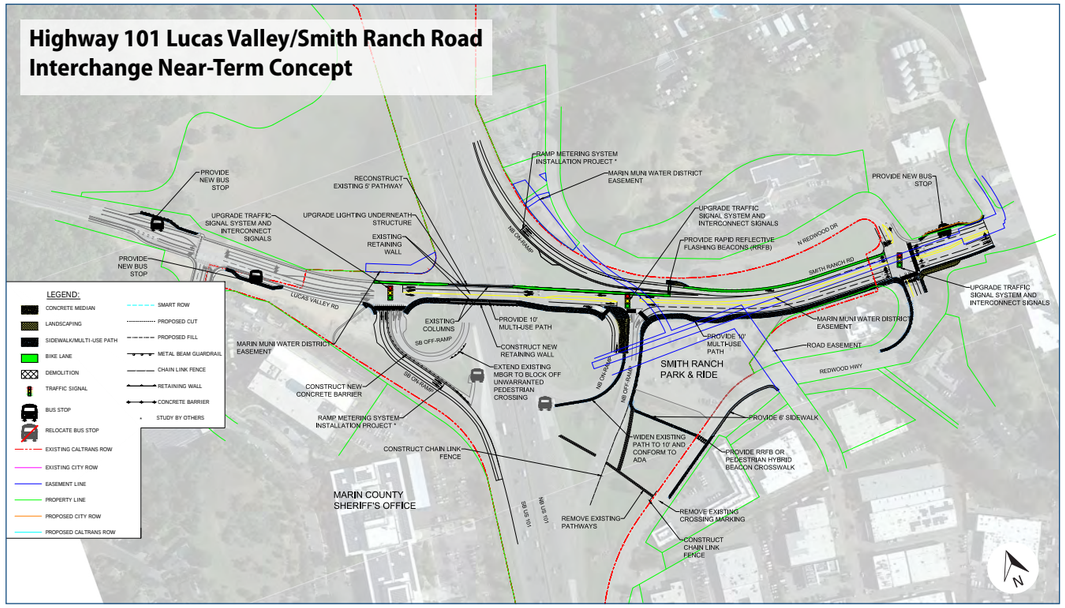
Proposed improvements seek to address deficiencies and to upgrade the conditions for vehicular traffic, transit users, pedestrians, and bicyclists. The improvements vary from readily implementable solutions, such as new crosswalks, curb ramp replacements, restriping, new bike facilities, upgrading sidewalk and existing transit stops, improved multimodal connectivity, and widened bridges. Many of the improvements recommended by this study will strengthen the interchange's relationship with the surrounding area and new developments, and they will improve the operation and safety of these interchanges for all users, allowing smoother travel to, from, and across Highway 101 and local roads.

Concepts are presented as near- and long-term improvements based on the ease of implementation.

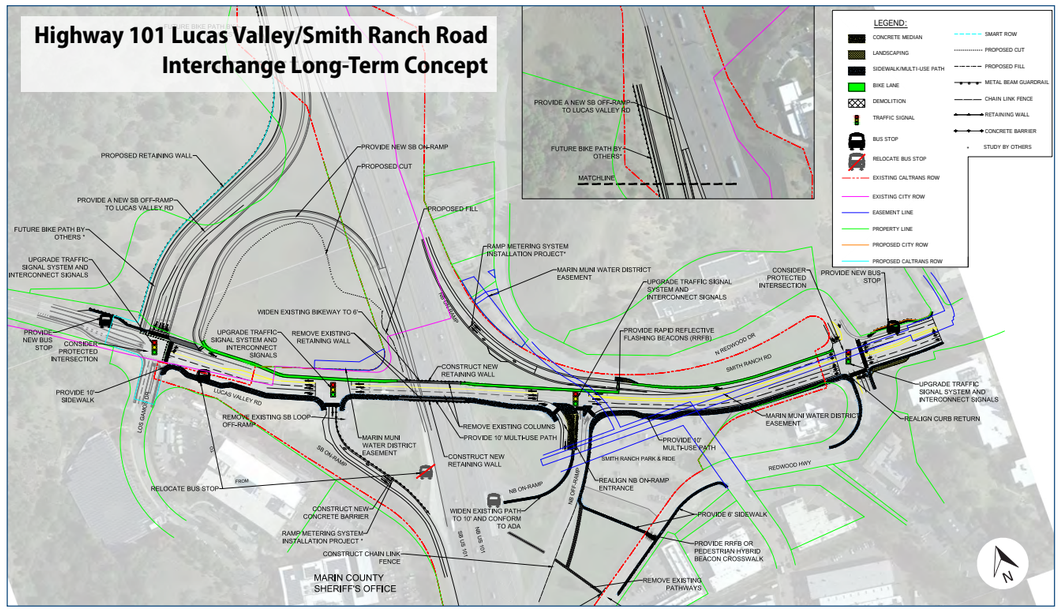
The near-term concept focuses on improving connectivity for all modes, reducing conflicts, improving traffic operations, and providing upgraded signalized intersections on Lucas Valley Road/Smith Ranch Road within the project study are. Restriping is proposed between the SB on-ramp to Redwood Highway along Lucas Valley Road. The lane configuration will generally remain the same with exceptions as noted. EB Lucas Valley Road will be restriped to provide for a Class II bike lane between Redwood Highway and the SB on-ramp. New transit stops are also proposed along Lucas Valley Road/Smith Ranch Road.

The long-term concept will carry forward some of the near-term proposals with the exceptions as noted below. A new SB off-ramp and SB loop on-ramp is proposed for the northwest quadrant of the interchange. The existing SB loop off-ramp is proposed to be removed. To enhance existing bicycle/pedestrian connectivity, a multi-use path is proposed between Los Gamos Drive to Redwood Highway along the southside of Lucas Valley Road.

The improvement concepts have been shared with the local jurisdictions and transit agency representatives, who have had an opportunity to review and comment on the concepts presented.



Refer to Attachment I for the exhibits associated with the near- and long-term concepts.



Executive Summary

IMPLEMENTATION

As part of this study, each of the 12 interchanges will undergo evaluation and prioritization with the goal of identifying the most appropriate projects to move forward into project development.

It is anticipated that the improvements proposed under both the near- and long-term concepts would follow the typical three-phase California Department of Transportation (Caltrans) project development process for approval of work within the state's right of way.

- Project Initiation Document (PID) (Project Study Report-Project Development Support)
- Project Approval/Environmental Document (PA&ED)
- Plans, Specifications, and Estimates (PS&E)

Elements of the project could be implemented in a phased manner by either TAM or the City of San Rafael to meet funding opportunities.

Additionally, elements of the project could be incorporated into projects sponsored by Caltrans, such as a long-range ramp-squaring project identified by the System Planning Group.

NEXT STEPS

1. TAM Board to select projects(s) to move forward into project development in consultation with agency stakeholders.
2. TAM and the local jurisdiction will coordinate with the Metropolitan Transportation Commission (MTC) to have the project included in the current Regional Transportation Plan (RTP).
3. TAM and the local jurisdiction will secure funding for the PID and enter into a cooperative agreement with Caltrans for project development.
4. TAM will work with the local jurisdiction and a Project Development Team to prepare the PID for Caltrans approval to proceed to the PA&ED Phase for a locally funded project. Alternatively, the local jurisdiction can identify elements that can be implemented via a Caltrans encroachment permit process or on the approaching roadway outside Caltrans right of way.
5. TAM and the local jurisdiction will seek funding for subsequent phases of the project. If there is insufficient funding available, it may be possible to phase the improvements.

Introduction

This report on the Lucas Valley Road/Smith Ranch Road Interchange forms one of a series of reports being prepared under TAM's Highway 101 Interchange and Approaching Roadway Study that examines the existing conditions, deficiencies, and constraints of 12 selected interchanges on Highway 101 in Marin County. The reports also identify opportunities for improvement under a program of near- and long-term projects that aim to improve operations and safety for all users.

The reports provide the basis for establishing performance measures against which improvement concepts can be evaluated and prioritized in a subsequent phase of the study.

The planning study is funded through Measure AA – the reauthorized ½-cent transportation sales tax that was approved by Marin voters in 2018. The overarching goal of the Transportation Sales Tax Renewal Expenditure Plan is to "reduce congestion and reduce greenhouse gas emissions, maintain and improve local transportation infrastructure, and provide high quality transportation options for people of all ages who live, work, and travel in Marin County." The Plan allocates 3% of the revenue for a 30-year program of improvements to interchanges and freeway access routes on Highway 101 to reduce congestion, improve local traffic flow, and address flooding impacts within the county. These funds will serve to leverage larger regional, state, and federal funds.

Throughout Marin County, Highway 101 serves as the primary north-south roadway and is a key link between communities. Accessing Highway 101 in Marin is a major source of congestion on local roads, which reduces the connectivity of communities across Marin. Interchanges vary in age and in needs for improvements. As communities around Marin have grown over the last 30-40 years, interchanges built in the 1950s and 1960s have not been altered to meet demands of vehicles, transit, bicyclists, and pedestrians. Many do not meet current design or operational standards.

In addition to the vehicular traffic these interchanges serve, many also provide bus stops for Marin Transit and Golden Gate Transit, which offer local and regional bus services but have poor connectivity with local land uses or for transfer between transit providers. Provisions for bike and pedestrian access are also typically poor, with missing, discontinuous, or generally unsafe paths of travel and a general lack of connectivity with the local pedestrian and bike networks.

The 12 interchanges identified for improvement within this study span the cities of Sausalito, Larkspur, San Rafael, and Novato; town of Corte Madera; and unincorporated areas of Marin County. The southernmost interchange is located just north of the Golden Gate Bridge at Alexander Avenue, and the northernmost interchange is located in Novato at Atherton Avenue.

Each interchange was evaluated to determine the existing conditions of the roadway, such as nonstandard features or outmoded design and flooding, traffic conditions, pedestrian/bicyclist circulation and intermodal connectivity, and environmental conditions, including vulnerability to SLR. The study looked at previous planning studies for these interchanges as well as any recent or proposed nearby development, including the new SMART passenger rail line which aligns closely with Highway 101.

This study addresses alleviating these nonstandard features and upgrading the conditions for vehicular traffic, transit users, pedestrians, and bicyclists. Proposed improvements vary from readily implementable solutions, such as new crosswalks, curb ramp replacements and restriping to new bike facilities, improved multimodal connectivity, and widened bridges. Many of the improvements recommended by this study will strengthen the interchange's relationship with the surrounding area and new developments, and they will improve the operation and safety of these interchanges for all users, allowing smoother travel to, from, and across Highway 101 and local roads.

Project Location and Background

The interchange at Lucas Valley Road/Smith Ranch Road is located at U.S. 101 postmile (PM) 14.71 in the City of San Rafael in Marin County accessing the McInnis Park Golf Center and the Lucas Valley neighborhoods. It is situated in an urban environment characterized by office parks located in the southeast quadrant and residential communities in the northeast corner and further to the west in Lucas Valley.

Lucas Valley Road is located on the west of U.S. 101 and connects to Smith Ranch Road on the east going under U.S. 101. The northbound diagonal off-ramp connects at a signalized intersection to Lucas Valley Road for motorists headed westbound. Motorists exiting the northbound diagonal off-ramp headed east have an uncontrolled right turn movement to merge with local traffic on Smith Ranch Road. A northbound loop on-ramp serves eastbound traffic from Lucas Valley Road connecting with U.S. 101. The southbound loop off-ramp connects to Lucas Valley Road at a signalized intersection, allowing travelers to head in either the east or west direction. The southbound diagonal on-ramp connects at the same intersection.

The bridge at this interchange, officially called the Lucas Valley Road Overcrossing (Bridge No. 27-0059) was constructed in 1952. The total roadway travel width passing under the bridge is minimal with two westbound travel lanes and one eastbound travel lane with no shoulders. The travel way on Lucas Valley Road at the overcrossing is also a Class III bike path. There is a paved path on either side of the roadway. The paved path on the south side provides sidewalk connectivity. The paved path on the north side provides bicyclists an alternative route to pass underneath U.S. 101 and connecting back onto the shoulders.

A continuous sidewalk is provided along eastbound Lucas Valley Road/ Smith Ranch Road passing underneath U.S. 101. There is no sidewalk in the eastbound direction between Redwood Highway and Las Gallinas Avenue.

Bus stops serving Golden Gate Transit and Marin Transit are located on short travel lanes in between the U.S. 101 on- and off-ramps. The bus lane in the southbound direction connects the southbound loop off-ramp and the southbound diagonal ramp allowing the bus to re-enter the freeway. Riders accessing the bus stops take a paved path located alongside the freeway ramps to access the bus stop. Alternatively, there is an unofficial path requiring riders to traverse across the northbound diagonal off-ramp to the bus stop. There is also an unpaved path ("goat trail") providing a more direct route from Lucas Valley Road/Smith Ranch Road to the bus stop requiring riders to traverse across the northbound loop on-ramp. Alternatively, there is an unofficial path ("goat trail") requiring riders to traverse across the off-ramp to access the bus stop. These unofficial paths provide unsafe routes for riders looking for a shorter path of travel to and from the bus stops located along the freeway.

The intersection of Lucas Valley Road and Los Gamos Drive was recently improved. Improvements included upgrades to curb ramps, high visible pedestrian crosswalk markings, restriping and restriped for a painted Class II bike lanes approaching the intersection.

View of informal pedestrian path serving northbound Highway 101 bus stop from Smith Ranch Road.

Project Location and Background

Previous Studies

The Caltrans *US 101 North Comprehensive Multimodal Corridor Plan* (2020) observed a bottleneck to the north of this interchange in the southbound AM peak. This sometimes overlaps with previous bottlenecks further north. There is a sporadic northbound PM peak to the north up to the Miller Creek Road off-ramp. The corridor plan proposed a range of project improvements for U.S. 101 corridor.

- A short-term project currently under development by Caltrans to install ramp metering for all remaining locations on Highway 101 in Marin County. This project has been environmentally cleared.
- A medium-term project listed in the RTP proposes to modernize the Lucas Valley Road / Smith Ranch Road interchange which includes reconfiguring ramps to eliminate high-speed entry and exit.

The San Rafael Bike and Pedestrian Master Plan (2018) recommends Class II buffered bicycle lanes to connect to the Lucas Valley Road bicycle lanes and McInnis County Park.

The Marin County Travel Safety Plan (2018) recommends a Highway Safety Improvements Program (HSIP) to install guardrails (where applicable), widen shoulders, and install dynamic/variable speed warning signs for downhill sections.

Potential solutions for the interchange were identified in TAM's Highway 101 Interchange Fact Sheet (2017), including:

- Replacing the highway overcrossing to enable widening Lucas Valley Road
- Replacing the existing nonstandard southbound loop off-ramp with a new off-ramp located in the interchange's NW quadrant
- Adding a southbound loop on-ramp in the NW quadrant
- Providing improvements along Lucas Valley Road through the Los Gamos Drive intersection, including potential traffic lane changes and signalization
- Providing bus stop improvements and bus stop access
- Enhancing pedestrian and bicycle facilities
- Installing on-ramp meters to improve overall operational efficiency of Highway 101
- Improving intersection signal coordination

Caltrans developed a PSR evaluating development of the northwest corner of this interchange with a southbound diagonal off-ramp, southbound loop-on ramp connecting to a new signalized intersection at Los Gamos Drive and Lucas Valley Road.

Future Development

There is a new development by Kaiser Permanente located in the southwest quadrant of the interchange at the corner of Lucas Valley Road and Los Gamos Drive.

Looking east at heavy left-turn traffic from Lucas Valley Road onto the Highway 101 southbound on-ramp.

Existing Conditions and Constraints

OVERVIEW

The following pages present an overview of the interchange study area's existing infrastructure, transportation, and environmental conditions and constraints. Data are from field observations as well as a number of national, state, and local sources, and they provide an important understanding of the interchange area.

Photo Exhibit

Photographs were taken during visits to the interchange area in early 2021. These capture existing conditions at various locations throughout the interchange area.

Infrastructure

A review of current infrastructure was undertaken to describe structures, utilities, drainage, right of way, and pavement conditions. Data considered for this section came from Caltrans, MarinMap, and MTC.

Nonstandard Design Features

Existing features within the interchange area were evaluated against the current Caltrans Highway Design Manual as well as local and ADA standards. Four types of nonstandard features were highlighted: nonstandard features on the highway, nonstandard features on the local roadway, ADA compliance, and nonstandard bike/pedestrian features.

Multimodal Infrastructure

Multimodal infrastructure was assessed through in-field reviews of facilities throughout the interchange area. The review noted the interchange configuration and the number of roadway lanes, and it included the location and condition of bike and pedestrian facilities, including sidewalks, Class I shared-use paths, Class II bike lanes, and any informal paths (e.g., dirt walking routes). The location of public transit stops and any connectivity gaps for people traveling to or from the stops were also noted for the purpose of the assessment.

Transit Routes

Marin Transit and Golden Gate Transit routes serving the interchange area as of early 2019 (pre-COVID) were identified. Distinction was made between local and freeway-only service routes. This section includes a brief discussion of transit stop amenities and accessibility issues.

Transit Ridership

Onboardings and alightings for each public transit stop within the interchange area were analyzed using Marin Transit (2017) and Golden Gate Transit (2020) ridership data provided by the respective transit agencies. For Golden Gate Transit routes, a growth factor was used to estimate pre-COVID ridership numbers based on the data provided. The resulting map shows onboardings, alightings, and total estimated daily passengers for each transit stop.

Weekday Peak Hour Traffic Volumes

Weekday AM and PM peak hour traffic volume turning movements are displayed for each intersection within the intersection area. These data are mostly from pre-COVID conditions (2017 to early 2019), but some counts were taken in Fall 2019 and adjusted to reflect a pre-COVID scenario.

Weekday AM & PM Peak Period Congestion

Year 2019 congestion data from INRIX was displayed for hourly periods during the AM and PM weekday peak periods. These data were assessed to determine which parts of the interchange area typically experience notably high or low vehicle congestion.

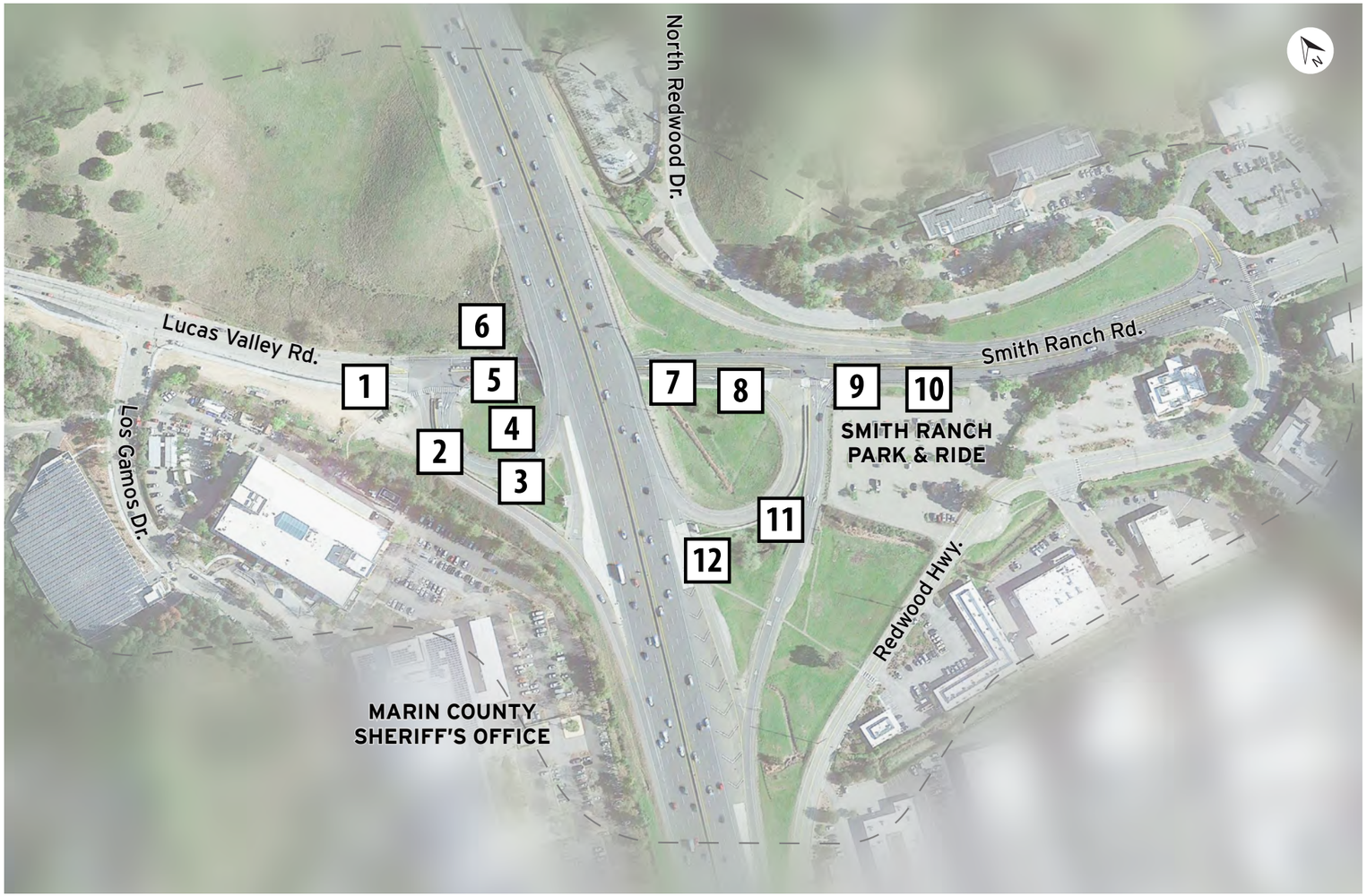
Crash Type & Severity

Five years of crash data (2014-2018) from SWITRS were analyzed within the project study area local roads and ramps. Particular note was taken of crashes involving pedestrians or bicyclists. The Crash Type exhibit notes the locations of crashes by type (i.e., head-on, sideswipe, etc.). The Crash Severity map displays the location of fatal crashes, crashes resulting in severe injury, and crashes resulting in minor injury. The exhibits include a brief discussion of primary collision factor trends.

Environmental Constraints

A desktop review considered environmental conditions and constraints within the interchange area. This review noted cultural resources, hazardous waste/materials, biological resources including water quality, susceptibility to SLR, and land use/growth. The data reviewed were from a number of sources, including the Golden Gate National Parks Conservancy, MarinMap, and GeoTracker. The environmental disciplines also reviewed the following databases: Northwest Information Center (NWIC) of the California Historical Resources Information System (CHRIS), National Wetlands Inventory (NWI), California Natural Diversity Database (CNDDB), and the San Francisco Bay Conservation and Development Commission (BCDC) mapping tool Adapting to Rising Tides (ART) Bay Shoreline Flood Explorer.

PHOTO EXHIBIT



Source: Parisi Transportation Consulting 2021

Looking west along sidewalk under Highway 101 overcrossing; photo taken during field review.

Pedestrian walkway serving northbound Highway 101 bus stop from Redwood Highway; photo taken during field review.

LEGEND

Study Boundary

\# Photo Number; see next two pages

PHOTO EXHIBIT

Looking west at new sidewalk along south side of Lucas Valley Road between the Highway 101 southbound on-ramp and Los Gamos Drive.

Broken divider separating the southbound off- and on-ramps with sidewalk serving the southbound Highway 101 bus stop.

Informal walking path between the southbound loop off-ramp and the southbound Highway 101 bus stop.

Walking path between Lucas Valley Road and the southbound Highway 101 bus stop; pedestrians using this route cross the southbound loop off-ramp.

View looking east under the Highway 101 overcrossing; three vehicular travel lanes without shoulders and a sidewalk on the south side.

Westbound bicyclists crossing under Highway 101 use a nonstandard separated bikeway with a ramp merging with Lucas Valley Road.

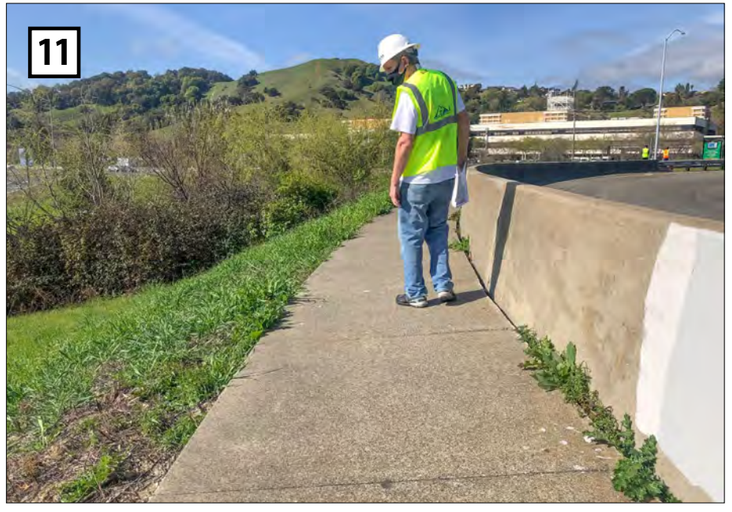
PHOTO EXHIBIT

View looking west under the Highway 101 overcrossing; three vehicular travel lanes without shoulders and a sidewalk on the south side.

Eastbound bicyclists using the sidewalk about to cross the loop on-ramp to northbound Highway 101.

New ADA upgrades were recently provided at many of the pedestrian crossings, including at the northbound off-ramp terminal intersection.

Asphalt walkway along the south side of Smith Ranch Road between Highway 101's northbound off-ramp and Redwood Highway.



Sidewalk serving the Highway 101 northbound bus stop; the sidewalk is peripheral to the northbound loop on-ramp and its cross-slope exceeds ADA standards.

Bus approaching the Highway 101 northbound bus stop.

INFRASTRUCTURE

Geometric Conditions and Nonstandard Features

Retaining wall along the sidewalk under the Highway 101 overcrossing; provision of a new wall to the south could enable a wider active transportation facility.

The existing geometric conditions and features were evaluated for the Lucas Valley Road/Smith Ranch Road interchange within the project study area. The project objective was to assess the existing condition for the ramps and the local roadways leading to and from the ramps within the project study area. The Highway 101 mainline was not evaluated as part of this study. The existing conditions were evaluated against the current Caltrans Highway Design Manual, Marin County, ADA criteria, Marin Transit standards, and Novato Design and Construction Standards.

In addition to the noted nonstandard design features, the lighting at the Lucas Valley overcrossing provides inadequate lighting for users.

On the north side of the Lucas Valley overcrossing a pathway is provided for westbound bicyclists. This pathway is approximately 5 feet in width. This pathway provides a nonstandard bicycle ramp to merge bicyclists back onto the westbound shoulder. An existing drainage inlet also is located within the bicycle ramp.

There are also existing bus stops within the interchange that require transit riders to cross at the ramps to access it. The NB bus stop is accessible by two routes. One of the two routes require transit riders to cross the NB diagonal off-ramp at an unmarked crossing to access it. This crossing occurs after the vehicles have exited the freeway and are decelerating speed as they approach the Lucas Valley/Smith Ranch Road intersection. There is a designated pathway provided to access the SB bus stop from Lucas Valley Road. However, it was observed in the field that transit riders often cut across the SB loop on-ramp utilizing a well-used unpaved path to connect to the SB bus stop for quicker access.

As part of the recent improvements at the intersection of Lucas Valley Road and Los Gamos Drive, a high visible crosswalk with was constructed on the west side connecting in the north and south direction. An ADA ramp with signal was provided on the north side of the pedestrian crossing. There currently does not exist a sidewalk on the north side of Lucas Valley Road.

Refer to the Nonstandard Design Features exhibit and the Deficiency Matrix (Attachment J) for additional details on less than standard roadway features identified at this interchange.

Structures Conditions

The Lucas Valley Road overcrossing, Caltrans Bridge No. 27-0059, was constructed in 1952. The structure type is a reinforced concrete slab and bents are supported on spread footings. The bridge has a sufficiency rating of 78.5. The Lucas Valley Road overcrossing has a vertical clearance of 15.42, meeting current standards over local roadways per Caltrans Highway Design Manual.

A bridge requiring replacement is not judge solely on the age of the bridge and it's sufficiency rating. There are other factors to consider such as the bridge's ability to meet standards with further improvement such as bridge widening or the benefit to cost of repairing the bridge versus a full bridge replacement. Consideration for bridge replacement will need to be reviewed on a bridge-by bridge basis.

Refer to the Nonstandard Design Features exhibit for the detail location where these less than standard structural features exist.

Identified Maintenance Needs

The project completed a review of the current Caltrans Bridge Inspection Report and recommends the following work:

- Seismic retrofit of existing columns with steel casing will likely be needed if this bridge is modified

Pavement Condition Index

The Lucas Valley Road/Smith Ranch Road interchange pavement condition were collected via the MTC Vital Signs website for street pavement condition. MTC provides a pavement condition index (PCI) for local streets within the Bay Area, dated 2018.

The existing pavement conditions were given a PCI range as categorized:

- Failed/Poor (0-49)
- At Risk (50-59)
- Fair/Good (60-79)
- Very Good/Excellent (80-100)

For locations where information was not provided, a visual check was performed on Google Earth and validated in the field. This was also completed to corroborate data against more current conditions. The PCIs for the interchange study area are rated as follows:

- Lucas Valley Road/Smith Ranch Road – Very good/excellent (80-100) [1]

Lucas Valley was repaved in Fall of 2020 between the southbound ramps on Lucas Valley Road to intersection of Smith Ranch Road/Redwood Highway.

Pavement conditions rated fair/good and above do not require improvements at this time. Pavement condition rated "at risk" can be considered for rehabilitation under future improvement projects to return existing roadways to good condition. Existing pavement conditions rated "failed/poor" can be considered for reconstruction under future improvement projects to restore structural integrity to the roadway.

[1] MTC Vital Signs, "Street Pavement Conditions", 9 Nov 2020: https://www.vitalsigns.mtc.ca.gov/street-pavement-condition

Utilities

The project team researched existing utilities and identified all known utilities within the project study area. Utility data was gathered from local utility owners, Caltrans, and MarinMap.

The project team collected data on major utilities that are defined by Caltrans as high priority. These major utilities included electric or gas transmission lines, sanitary sewer lines larger than 24 inches in diameter, and water lines greater than 12 inches in diameter.

Refer to the Project Base Map (Attachment A) for the Existing Utility Mapping (location and type).

Drainage

The existing drainage conditions were assessed for Lucas Valley Road/Smith Ranch Road interchange. Watersheds are located within the city boundaries of San Rafael. On-site drainage areas consist of highway, interchange ramps, surface streets, commercial areas with parking lots, unpaved roadside areas, and landscaped areas. Topographic relief throughout the project varies, with fill slopes ranging from 10:1 to 2:1 in steepness, pervious areas with slopes of approximately 2-20%, and undeveloped slopes as steep as approximately 30% to the northwest of the project. Runoff occurring on U.S. 101 is collected in a system of inlets and culverts and conveyed to local drainage where it is conveyed east to Gallinas creek.

The study area falls within Federal Emergency Management Agency (FEMA) designated Flood Zones AE, X (shaded), and X (unshaded) (see **Attachment L**). FEMA defines Zone AE as "the base floodplain where base flood elevations are provided" (FEMA, n.d.). Within the Study area, Zone AE denotes a 1% annual chance flood hazard and a base flood elevation of 10 feet (NAVD 88). FEMA defines shaded Zone X as "area of moderate flood hazard, usually the area between the limits of the 100-year and 500-year floods." Unshaded Zone X is defined as "areas of minimal flood hazard, usually depicted on Flood Insurance Rate Maps as above the 500-year flood level" (FEMA, n.d.).

Design of new drainage located within Caltrans' right of way should adhere to the Caltrans Highway Design Manual published in 2020 and the standard drawings of the Caltrans Standard Plans published in 2018. Design of new drainage within local right of way should comply with standard drawings published in Marin County Uniform Construction Standards published 2018.

All proposed stormwater treatment facilities within Caltrans' right of way will adhere to the Caltrans National Pollutant Discharge Elimination System (NPDES) permit. Treatment facilities outside Caltrans' right of way will adhere to the Marin County Phase 1 Municipal Separate Storm Sewer System (MS4) permit for Marin County.

Refer to the Project Base Map (Attachment A) and FEMA Flood Map (Attachment L) for the existing drainage mapping.

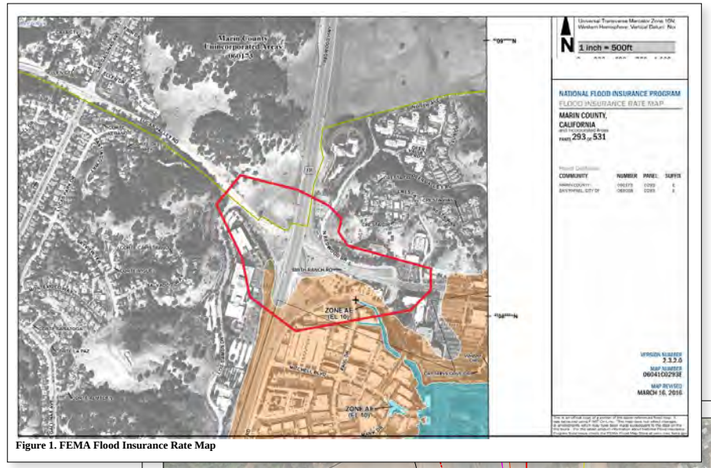
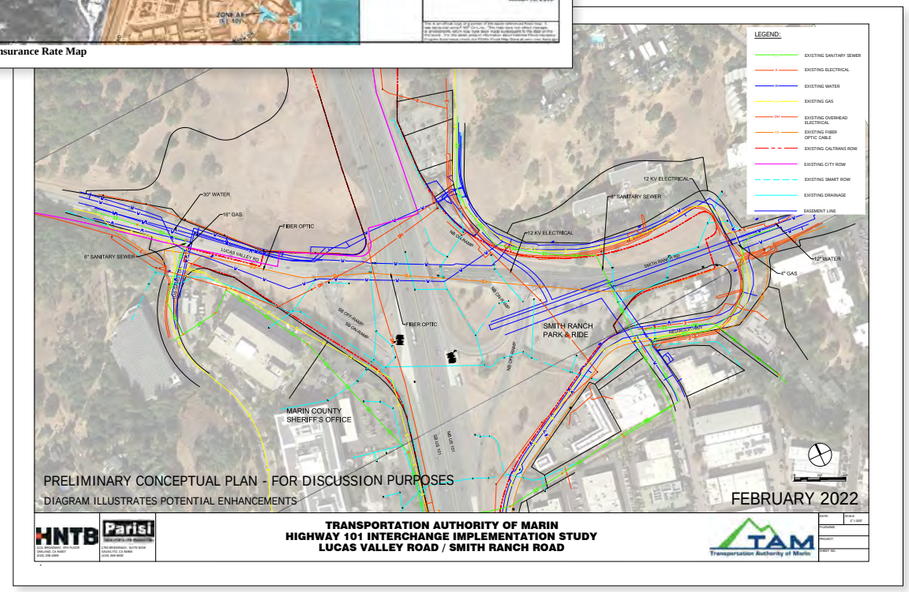


Figure 1. FEMA Flood Insurance Rate Map

Right of way

The Lucas Valley Road/Smith Ranch Road Interchange is located within Caltrans right of way. Caltrans right of way on the east ends just before the Smith Ranch Road/Redwood Highway intersection. Caltrans right of way on the west extends approximately 200 feet beyond the southbound ramp intersection on Lucas Valley Road.

Refer to the Project Base Map (Attachment A) for the existing right of way mapping.



NONSTANDARD DESIGN FEATURES

Source: HNTB 2022

- The northbound off-ramp and southbound on- and off-ramps have less than standard shoulder widths.
- The southbound loop on-ramp has less than standard lane width that does not meet truck lane width requirements.
- The southbound loop off-ramp has less than standard deceleration length for vehicles to exit Highway 101.
- The southbound diagonal on-ramp has less than standard merge and acceleration length for vehicles to enter Highway 101.
- The northbound loop and diagonal on-ramp have less than standard distance between successive on-ramps providing less than standard merge length for vehicles to enter Highway 101.
- The northbound diagonal on-ramps have less than standard merge length for vehicles to enter Highway 101.
- The Lucas Valley overpass currently has less than standard horizontal clearance between the local travel way and the bridge structure.
- The Lucas Valley overpass has less than standard safety-shape concrete barriers for the local travel way.
- The existing local travel lane widths on Lucas Valley Road are less than standard.

Refer to the Deficiency Matrix (Attachment J) for more information.

LEGEND

Study Boundary

Nonstandard Features on Highway

Nonstandard Features on Local Roadway

MULTIMODAL INFRASTRUCTURE

Source: Parisi Transportation Consulting 2021

LEGEND

- Study Boundary
- Traffic Signal
- Golden Gate Transit Bus Stop
- Marin Transit Bus Stop
- Class II Bike Lane
- Sidewalk
- Sidewalk Under Freeway
- Unpaved Path

- This interchange provides vehicle and bicycle access to Lucas Valley Road and Smith Ranch Road, providing limited east-west connectivity to north San Rafael and west Marin County.
- The interchange is a Partial Cloverhead Type A, with two loop on-ramps and three diagonal ramps.
- The interchange was constructed in 1952, with widening of Lucas Valley Road in 1969 and Highway 101 in 1987.
- In general, Lucas Valley Road carries one lane of traffic in each direction, widening to two lanes of traffic in each direction east of the interchange along Smith Ranch Road. The roadway does include shoulders, though they are minimal in width in the undercrossing.
- The northbound and southbound off-ramps are signalized at their intersections with Lucas Valley Road as is the eastbound on-ramp to southbound Highway 101, while the two northbound on-ramps are uncontrolled for vehicles.
- Pedestrian facilities in the interchange study area are incomplete. Sidewalks are generally present along the south side of Lucas Valley Road, though pedestrians are required to cross on- and off-ramps on both sides of the undercrossing. A sidewalk on the north side of the undercrossing is only available immediately in the Highway 101 undercrossing without connections to pedestrian facilities on either side of the interchange. There are no other pedestrian facilities on the north side of Lucas Valley Road or Smith Ranch Road until east of North Redwood Highway. Pedestrian access to the Highway 101 bus pads requires walking along a narrow dirt path from Lucas Valley Road and crossing on- and off-ramps without the benefit of crosswalks.
- There are no bicycle facilities in the interchange study area, with the exception of Class II bicycle lanes that have been striped west of Los Gamos Drive. Lucas Valley Road west of the Highway 101 interchange attracts many recreational cyclists, though connectivity to the remainder of the San Rafael bicycle network is limited. The 2018 update to the city's Bicycle and Pedestrian Master Plan identified areas of concern for bicyclists throughout the adjacent Terra Linda neighborhood.
- There is a total of three bus stops throughout the interchange study area, including two stops located on the Highway 101 bus pads and one on North Redwood Highway.

TRANSIT ROUTES

Source: Marin Transit 2020 & Golden Gate Transit 2020

- The interchange study area is served by seven separate Golden Gate Transit and Marin Transit bus routes. Five routes run along Highway 101 with stops at the bus pads, one provides local bus service, and one provides both local and freeway service.
- While the Highway 101 stops are considered to have high ridership, the adjacent Smith Ranch Park-and-Ride is not heavily used, indicating that bus passengers may have destinations in the adjacent Marin Commons office complex.

LEGEND

Study Boundary
Golden Gate Transit Bus Stop
Marin Transit Bus Stop
Golden Gate Transit Route
Marin Transit Route
Golden Gate Transit Route (101 Only)
Marin Transit Route (101 Only)

TRANSIT RIDERSHIP

Source: Marin Transit 2020 & Golden Gate Transit 2020

- There are a total of three bus stops throughout the interchange study area, including the two stops located on the Highway 101 bus pads and one on North Redwood Highway, providing service to the Marin County Health and Human Services Department. There is no bus service along Redwood Highway.
- The study area's bus stops provide service for approximately 375 passengers per day. Collectively, the two Highway 101 bus pad stops attract about 320 daily passengers, while the North Redwood Highway bus stop sees about 55 passengers on and off-board per day.
- Both Highway 101 bus pad stops are accessed via narrow paved pathways adjacent to the northbound and southbound ramps. The southbound bus pad is also accessible via a dirt path from Lucas Valley Road that requires passengers to cross an on- or off-ramp to access the stop, and the northbound bus pad is accessible via a pathway from Redwood Highway. Access along Lucas Valley Road to the paths also requires crossings of on- and off-ramps, both signalized and uncontrolled, to reach destinations such as Marin Commons or the Park-and-Ride parking lot. The dirt paths are not ADA accessible.

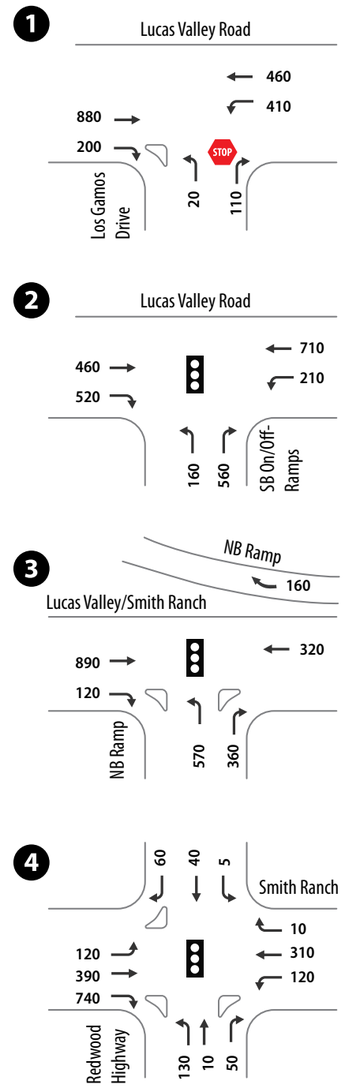
LEGEND

Study Boundary
Traffic Signal
Golden Gate Transit Bus Stop
Marin Transit Bus Stop
Class II Bike Lane
Sidewalk
Onboardings
Offboardings

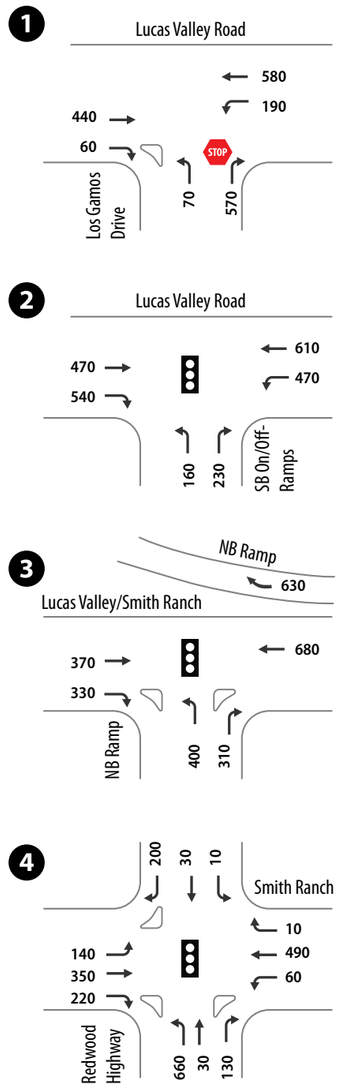
WEEKDAY PEAK HOUR TRAFFIC VOLUMES

Source: Parisi Transportation Consulting 2021

AM Peak Hour



PM Peak Hour



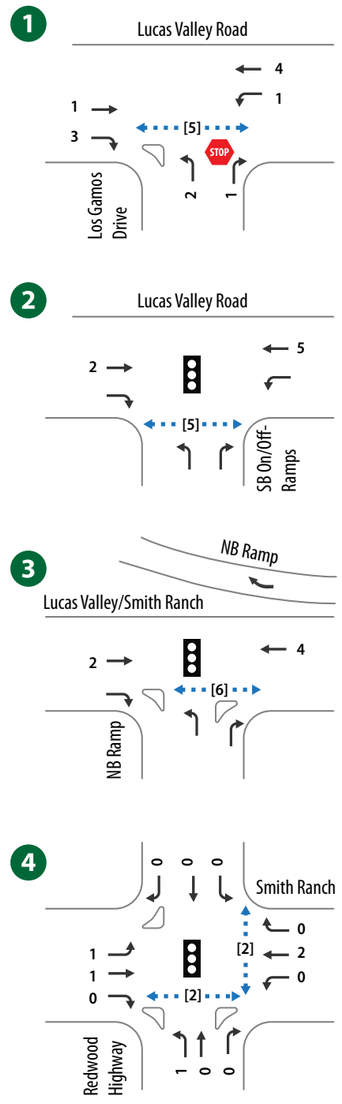
LEGEND

Study Boundary

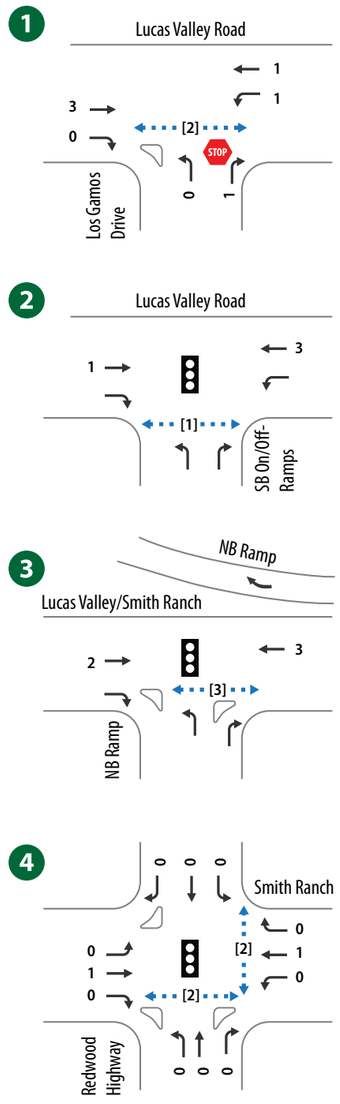
WEEKDAY PEAK HOUR PEDESTRIAN & BICYCLE TRAFFIC VOLUMES

Source: Parisi Transportation Consulting 2021

AM Peak Hour



PM Peak Hour

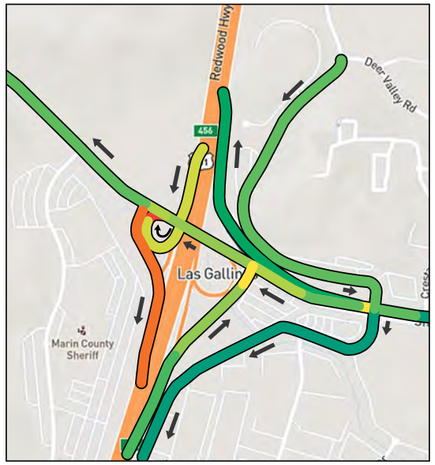


LEGEND

Study Boundary [xx] - Pedestrian xx - Bike

WEEKDAY AM PEAK PERIOD CONGESTION

7–8 AM - Westbound & Southbound



8–9 AM - Westbound & Southbound

7–8 AM - Eastbound & Northbound

8–9 AM - Eastbound & Northbound

Source: INRIX 2019

LEGEND

Study Boundary Most congested Least congested

- More than 22,000 vehicles per day travel along Lucas Valley Road at the Highway 101 interchange.
- In the morning peak period traffic congestion is moderate, with the most pronounced congestion on the southbound ramp to Highway 101. Some westbound traffic congestion occurs at the approach to the undercrossing.

Highway 101 Lucas Valley Road/Smith Ranch Road Interchange – AM Level of Service (LOS) Summary

No.	Intersection	LOS	Delay (s)
1	Lucas Valley Road/Los Gamos Drive	F	>150
2	Lucas Valley Road/Hwy. 101 Southbound Ramps	B	20
3	Smith Ranch Road/Hwy. 101 Southbound Ramps	D	42.6
4	Lucas Valley Road/N. Redwood Drive	B	12.6

WEEKDAY PM PEAK PERIOD CONGESTION

4–5 PM - Westbound & Southbound

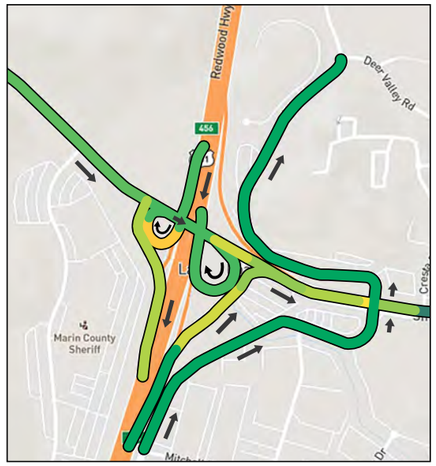
5–6 PM - Westbound & Southbound

6–7 PM - Westbound & Southbound

4–5 PM - Eastbound & Northbound

5–6 PM - Eastbound & Northbound

6–7 PM - Eastbound & Northbound



Source: INRIX 2019

LEGEND

Study Boundary Most congested Least congested

- In the afternoon peak period traffic congestion is moderate, with some congestion on the southbound Highway 101 on-ramp as well as some localized congestion in the westbound direction at the undercrossing.
- The locations where congestion tends to occur generally correlates to the collision locations. The highest levels of congestion are generally located on the southbound Highway 101 on-ramp where the biggest cluster of collisions is located, with hit objects, rear ends, and other collisions most prevalent. Additionally, the Smith Ranch Road intersection with the northbound off-ramp is typically congested where the collision exhibits show clusters of sideswipes, rear ends, and other collisions.

Highway 101 Lucas Valley Road/Smith Ranch Road Interchange – PM LOS Summary

No.	Intersection	LOS	Delay (s)
1	Lucas Valley Road/Los Gamos Drive	E	38.2
2	Lucas Valley Road/Hwy. 101 Southbound Ramps	E	56.4
3	Smith Ranch Road/Hwy. 101 Southbound Ramps	B	15.7
4	Lucas Valley Road/N. Redwood Drive	C	30.3

CRASH TYPE

Source: SWITRS 2014-2018

- In the five-year period from 2014 - 2018 the interchange study area experienced a total of 38 reported collisions.
- Of the 38 total reported collisions, 13, or 34% resulted in injury. All of the collisions resulting in injuries were considered to be minor.
- Approximately 45% of collisions were the result of a driver hitting a fixed object. An additional 29% were rear-ends, with an additional 8% of collision types being broadsides.
- Almost half of all collisions were the result of unsafe speeds. An additional 24% of collisions were the result of improper turning and violation of auto right of way.
- One of the collisions involved a pedestrian, and one involved a bicyclist. Both of the collisions involving pedestrians and bicyclists resulted in minor injuries.
- Collisions were primarily located at the southbound Highway 101 ramps from Lucas Valley Road, with a cluster at the signalized intersection between Lucas Valley Road and the northbound Highway 101 off-ramp. Several collisions were also reported at the Smith Ranch Road intersection with Redwood Highway.

LEGEND

Study Boundary

TYPE OF CRASH

- Head-On
- Rear End
- Hit Object
- Side Swipe
- Broadside
- Other

PEDESTRIAN & BICYCLE INVOLVEMENT

- Involving Bicycle
- Involving Pedestrian

CRASH SEVERITY

Source: SWITRS 2014-2018

- Of the 38 total reported collisions, 13, or 34%, resulted in injury. All of these injuries were considered to be minor.
- One collision involved a pedestrian and one involved a bicyclist. Each of these collisions resulted in minor injury.
- The locations of the collisions resulting in injury were distributed throughout the interchange study area, with clusters mirroring the general collision trend - at the southbound ramps and the Lucas Valley Road intersection with the northbound off-ramp. The pedestrian collision was located near the Smith Ranch Road and Cresta Drive intersection, and the bicycle collision at the Smith Ranch Road intersection with Redwood Highway.
- Of all 13 collisions resulting in injury, 46% were due to unsafe speeds, with another 30% due to improper turning and violation of the auto right of way.
- The pedestrian collision at Smith Ranch Road at Cresta Road took place with the pedestrian in the intersection, indicating a violation of the pedestrian right of way. The bicyclist collision just west of the Smith Ranch Road intersection with Redwood Highway was the result of a violation of the auto right of way.

LEGEND

Study Boundary

TYPE OF CRASH

Minor Injury

PEDESTRIAN & BICYCLE INVOLVEMENT

Involving Bicycle

Involving Pedestrian

ENVIRONMENTAL CONSTRAINTS

Cultural Resources

Soil types within the interchange and its surroundings are highly sensitive for buried cultural resources, which is supported by a documented resource within a quarter-mile radius of the study area. Ground disturbing activities could adversely impact previously documented and/or undiscovered prehistoric and historic period archaeological resources.

Although there are no documented built environment resources within the study area, changes to visual elements within the interchange could affect undocumented built resources.

Technical studies will be required to comply with the California Environmental Quality Act (CEQA) and the National Environmental Policy Act (NEPA). Native American consultation is also recommended early in project planning to gather further information on the nature and location of tribal cultural resources.

Hazardous Waste / Materials

Despite the presence of one historic release, there is a low risk for encountering hazardous waste. However, aerially deposited lead originating from past vehicle emissions could be a source of contamination within the interchange. Proper disposal of any contaminated soil could add to the overall project cost and potentially delay construction.

An Initial Site Assessment is recommended to further evaluate potential sources of hazardous contamination.

Biological Resources / Water Quality

Habitat for special-status plant and animal species has been documented within and near the interchange. Field surveys would be needed to confirm the presence of any special-status species. If present, agency coordination would be required to identify any impacts and permitting may be required.

Streams and their associated riparian habitat are present within (and near) the interchange. A field survey will be needed to confirm the extent of Waters of the US and Waters of the State. Impacts to any surface waters or wetlands would require permitting and potentially mitigation.

The interchange is not susceptible to sea level rise inundation before 2050 (1 in 200 high emissions scenario equating to two feet of SLR).

Sea Level Rise Susceptibility

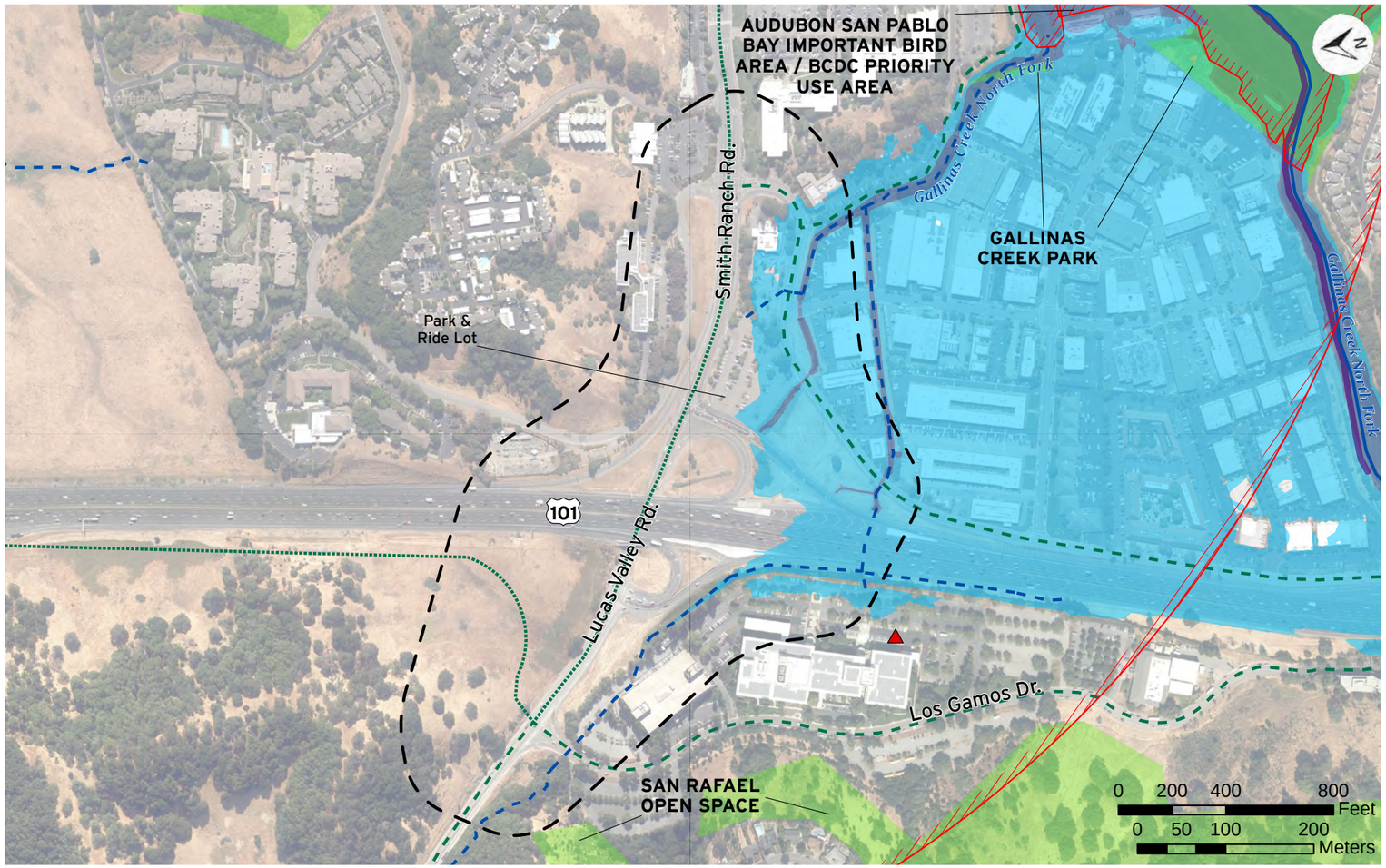
Interchange ramps are susceptible to sea level rise inundation during 100-year storm events by 2030 (1 in 200 high emissions scenario equating to a 0.5 foot rise in sea level). Additional portions of the interchange would be susceptible during 100-year events by 2050 (1 in 200 high emissions scenario equating to 2 feet of SLR). SLR abatement measures would need to be evaluated for incorporation into any proposed interchange project.

Land Use/Growth

Caltrans operates a park-and-ride lot in the southwest quadrant of the interchange. Closure of this facility would require public outreach and an analysis of potential community impacts.

Based on review of applicable city general plans, there is a low likelihood that interchange improvements would induce growth.

ENVIRONMENTAL CONSTRAINTS



- The interchange and its surroundings are highly sensitive for buried cultural resources.
- There is low risk of encountering hazardous waste contamination.
- Special-listed plant and animal species could occur within the interchange and its immediate surroundings.
- The interchange would be susceptible to sea level rise by 2030.
- Streams are mapped within and/or near the interchange.

Sources: Golden Gate National Parks Conservancy, MarinMap, CNDDB, ART, NRHP, NHD, GeoTracker, DTSC.

LEGEND

- Study Boundary
- Trail
- Park
- Hazardous Waste
- Proposed Bike Facility
- Existing Bike Facility
- Built Historical Resources
- Census Tract
- Environmentally Sensitive Area
- Fish Barrier
- Special-Status Plant
- Special-Status Animal
- Perennial Stream
- Intermittent Stream/Culvert
- Critical Habitat
- 36" Sea Level Rise (2052 H++)
- 108" Sea Level Rise (2092 H++)

STAKEHOLDER AGENCY AND PUBLIC OUTREACH

Stakeholder Outreach

At the onset of the project, TAM contacted representatives from the Public Works and Planning departments of the jurisdictions along the project corridor; Marin Transit; Golden Gate Bridge, Highway, and Transportation District; and Caltrans to advise them of the project and solicit a point of contact from each agency. Follow-up meetings were scheduled to seek input on issues of concern, to inform the team of planned projects within the vicinity, and to obtain project information relevant to the study. Jurisdictional stakeholders were also apprised of the evaluation process to select a 12th interchange for study and to gain their concurrence.

TAM Executive Committee and Board Briefings

Briefings were also made to the TAM Administration, Projects & Planning Executive Committee, and the TAM Board for selection of the 12th interchange and to establish the project goals and objectives for evaluation purposes.

Online Survey

An online survey was conducted between March 17 and April 16, 2021, to solicit input from Marin County residents and travelers on the project study interchange locations.

The survey was launched to support the development and refinement of the program's goals and objectives and to gather thoughts and priorities on transportation modes and deficiencies related to interchange improvements and access.

The online survey was distributed widely throughout Marin County through the following mechanisms:

- TAM social media feeds via Facebook and Twitter
- TAM project website
- TAM Traveler Newsletter
- TAM electronic mailer/e-blast
- Partner Agencies and Jurisdictions electronic mailer/e-blast – Organizations/Jurisdictions included in the distribution of the survey included California Walk & Bicycle Technical Advisory Committee, (Caltrans), Marin Transit, Golden Gate Transit, SMART Transit, and cities and towns in Marin County
- Community Groups electronic mailer/e-blast – Organizations included in the distribution of the survey were Marin Bicycle Coalition, San Rafael Canal Alliance, and others
- Paid Facebook advertisement targeting Spanish-speaking audiences
- TAM press release

A total of 2,758 participants were engaged with the survey, which was conducted in Spanish and English.

The online survey asked a series of questions, mostly in multiple choice format, with the last question allowing participants to provide additional input. These questions were:

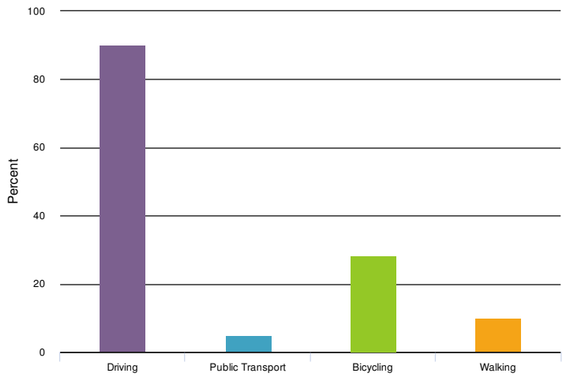
1. How do you normally travel through this interchange? Select up to 2.
   a. Driving
   b. Public Transport
   c. Bicycling
   d. Walking
2. What are the main purposes you use this interchange for? Select up to 2.
   a. Commuting to/from work
   b. School
   c. Shopping
   d. Recreation
   e. Other (please specify)
3. Please rank the following priorities (listed below) for this interchange based on their importance to you. (Priorities were ranked not important, lower importance, no opinion, somewhat important, most important.)
   a. Reduce traffic congestion
   b. Make it easier to drive to and ride from this interchange
   c. Improve the quality and access to bus stops near this interchange
   d. Increase park and ride capacity
   e. Make it safer to walk around this interchange
   f. Make it safer to bike around this interchange
   g. Improve lighting and security
   h. Improve environmental sustainability (e.g., protection from flooding and sea level rise)
4. Is there anything else you'd like to let us know about traveling on or around this interchange?

Refer to the Online Survey Comments (Attachment K) for a summary of the comments received for the Lucas Valley Road/Smith Ranch Road Interchange.

	Not Important	Lower Importance	No Opinion	Somewhat Important	Most Important
Reduce traffic congestion	11.1%	19.8%	11.1%	35.8%	22.2%
Make it easier to drive to and from this interchange	6.2%	13.6%	18.5%	25.9%	35.8%
Improve the quality and access to bus stops near this interchange	11.1%	11.1%	27.2%	34.6%	16.0%
Increase Park and Ride capacity	16.0%	19.8%	34.6%	25.9%	3.7%
Make it safer to walk around this interchange	7.4%	6.21%	24.7%	27.2%	34.6%
Make it safer to bike around this interchange	8.6%	7.4%	19.8%	25.9%	38.3%
Improve lighting and security	7.4%	7.4%	30.9%	28.4%	25.9%
Improve environmental sustainability and resiliency (e.g., protection from flooding and sea level rise)	10.0%	8.8%	26.3%	26.3%	28.8%

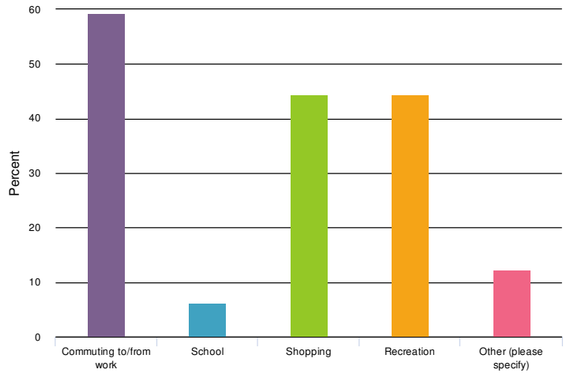
LUCAS VALLEY ROAD/SMITH RANCH ROAD

How do you normally travel through this interchange? Select up to two



Value	Percent
Driving	90.1%
Public Transport	4.9%
Bicycling	28.4%
Walking	9.9%

What are the main purposes you use this interchange for? Select up to two



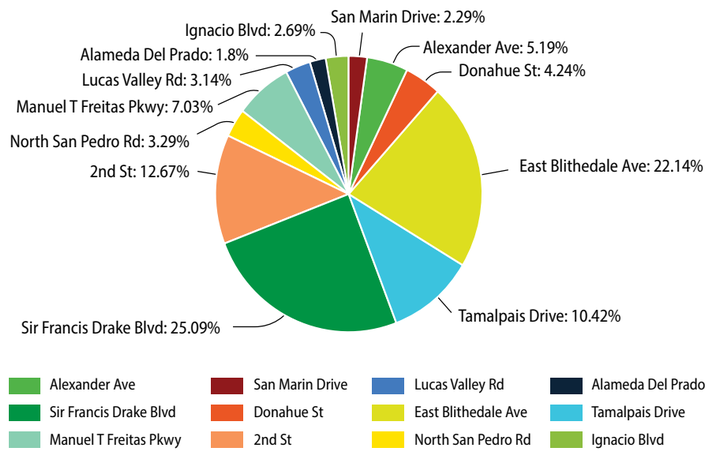
Value	Percent
Commuting to/from work	59.3%
School	6.2%
Shopping	44.4%
Recreation	44.4%
Other (please specify)	12.3%

A total of 48 participants provided additional input for the Lucas Valley Road/Smith Ranch Road interchange. Responses from those survey are summarized below:

- Traffic operations (i.e., improve signage, ramp entrance/ exit safety, merging safety, and traffic signal operations)
- Improve pedestrian and bike connectivity
- Provide a safe pedestrian and bike facility
- Improve pedestrian lighting
- Improve park and ride proximity
- Improve access to bus stops
- Address flooding
- Southbound on-ramp merge

Corridor Summary

The chart below describes the breakdown by interchange for the 2,758 surveyed. The interchange receiving the most input was Sir Francis Drake Blvd with 25.09%, followed by East Blithedale Ave with 22.14%. The third and fourth ranked interchanges in terms of input received were Second Street with 12.67% and Tamalpais Drive with 10.42%. The remaining interchanges received less than 10% of the total input received.



meta-chart.com

Opportunities and Concept Development

PRELIMINARY INTERCHANGE AREA CONCEPTS

This section describes the improvement opportunities identified for the Lucas Valley Road/Smith Ranch Road Interchange to address operational deficiencies and safety for all users of the interchange and approaching roadways. These improvements will alleviate existing nonstandard conditions by upgrading existing facilities for vehicular traffic, transit users, pedestrians, and bicyclists.

Concepts aim to address safety for all modes and will provide the following upgrades within the project study area:

- Curb ramps upgraded to meet current ADA requirements.
- Existing traffic signals upgraded and interconnected, where beneficial.
- High visibility crosswalks installed at pedestrian crossings.
- Class II and IV bike lanes painted green.
- Existing sidewalks widened to a 6-foot-wide minimum.
- Minimum 11-foot-wide travel lanes provided.

These features may not necessarily be identified on the concept plans, but they have been accounted for in the project's conceptual cost. The concepts developed take into consideration the deficiencies noted in the preceding sections, data collected from field observations, and an understanding of the interchange from discussions with the local jurisdictions and transit agency representatives.

In addition, the concepts take into consideration planned developments and project improvements in the vicinity of the interchange and projected traffic conditions to the year 2040.

For this interchange, the study has assessed the following projects that have been studied or are currently under consideration:

- Caltrans' PSR (EA 04-218-28140K) dated May 2003
- Caltrans' Ramp Metering System project that proposes to install ramp metering at all remaining locations on Highway 101 in Marin County.
- San Rafael Bicycle Pedestrian Master Plan 2018 Update

Concepts have been developed as near- and long-term concepts, which are based primarily on ease of implementation using the following guidelines:

- Near-term projects generally include improvements that may not necessarily be complicated in design, are lower cost, and require a less rigorous project approval process. For example, these improvements can be squaring off curb returns or lane reassignment within the current right of way to provide for a Class II bike lane and sidewalk widening.
- Long-term projects generally include improvements that are more complicated in design, entail significant capital investment, have right of way requirements, and require a more involved project development and approval process. For example, long-term improvements could be a proposal for a bridge widening/replacement or modification to freeway entry and exit points that will require Caltrans and Federal Highway Administration (FHWA) review and approval.

Note that the near-term design features are generally included in the long-term project, allowing for phased implementation to meet funding availability.

The improvement concepts have been shared with the local jurisdictions and transit agency representatives, who have had an opportunity to review and comment on the concepts presented.

Each concept has been assessed for utility impacts, right of way requirements, and potential for environmental impacts. Conceptual cost estimates have been prepared for the near- and long-term concepts.

Examples of Potential Near-Term and Long-Term Improvements

Near-Term	Long-Term
Lane reconfiguration and reassignments	Separated bike/pedestrian paths
Resolve discontinuities in bike lanes	Separate bike/pedestrian overcrossings
Resolve paths of travel and ADA	Structure widening
Signalization and crossing protections	Roundabouts
Tighten curb returns/shorten sidewalks	New interchange configuration
Ramp metering	Significant right of way acquisitions
Access to transit and interconnectivity	Significant environmental impacts

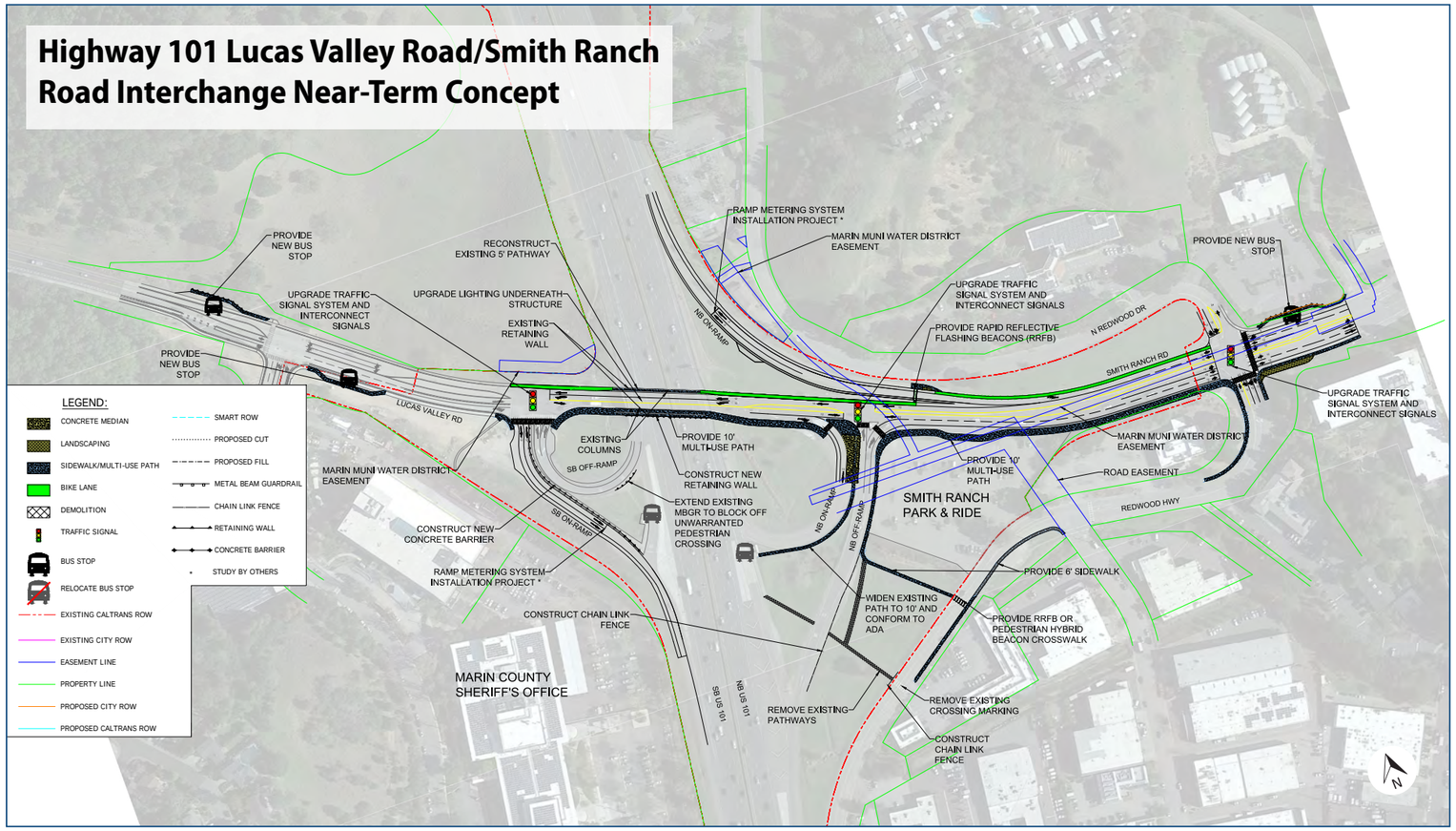
Near-Term Concept

The near-term improvements for Lucas Valley are largely focus on improving connectivity for all modes at the local street level. Restriping is proposed between the SB on-ramp to Redwood Highway along Lucas Valley Road. The lane configuration will generally remain the same with exceptions as noted. EB Lucas Valley Road will be restriped to provide for a class II bike lane between Redwood Highway and the SB on-ramp. The entrance to the NB loop on-ramp from Lucas Valley to U.S. 101 is reconfigured to tighten the curb radius and provide for a right-turn pocket to enter the ramp.

The sidewalk on the south side of Lucas Valley between the SB on-ramp and Redwood Highway will also be improved to a multi-use path. The Lucas Valley underpass will be widened to the south with installation of a new retaining wall to provide additional width to accommodate the multi-use path. The underpass will also be modified to improve lighting for all modes.

The existing bus stops will remain in place with additional bus stops to be added. Access to the bus stops will be provided with facilities that meet current ADA standards. The pathway leading to the bus stop near the NB on-ramp will be widened to 6 feet and reconstructed to meet ADA standards both longitudinally and horizontally. The existing pathway connected from Redwood Highway leading to the bus stop near the NB on-ramp will be removed by this project and fences will be installed to prohibit transit riders to traverse across the NB off-ramp to access it. The near term concept will also propose three new bus stops with pull outs along Lucas Valley Road. Bus stops are proposed in the EB and WB direction near the Los Gamos Drive intersection on Lucas Valley Road. A third bus stop is proposed in the WB direction near the Redwood Drive on Lucas Valley Road.

An alternative route is provided for pedestrians trying to access the shopping area in the southeast quadrant of the interchange. A new sidewalk is provided along the NB off-ramp and cross the green field to connect to Redwood Highway. Pedestrians utilizing this crossing will be provided with a pedestrian hybrid beacon and a new sidewalk on the south side of Redwood Highway. This sidewalk will close the gap that currently exist between Paul Drive and the strip mall on Redwood Highway.



Refer to Attachment I for the exhibit associated with the near-term concept.

Long-Term Concept

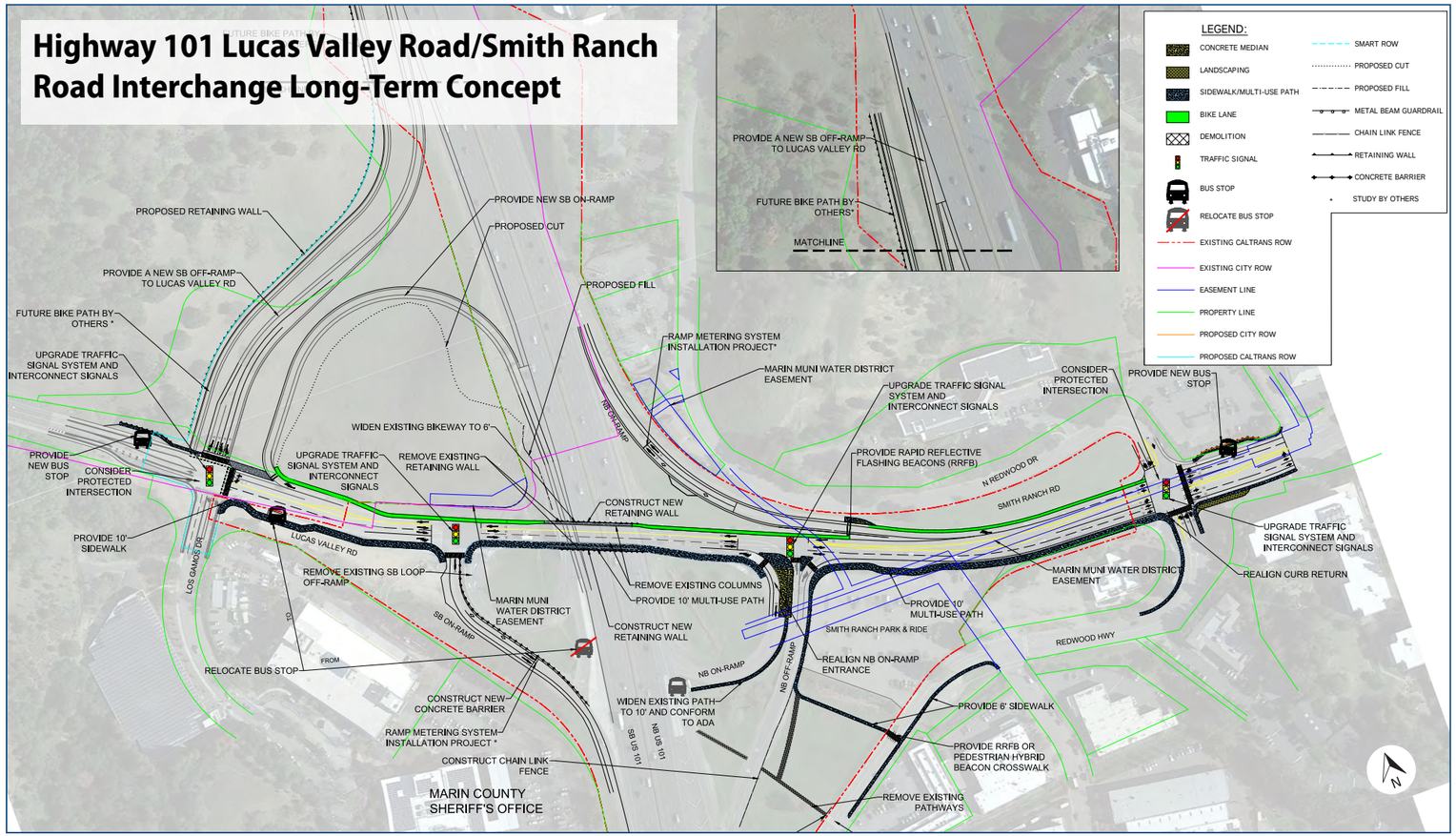
The long term concept will carry forward some of the near-term proposals with the exceptions as noted below.

The intersection at Los Gamos Drive and Lucas Valley Road will be reconfigure with the addition of a new SB on- and off-ramp. A new diagonal SB off-ramp is introduce carrying drivers to Lucas Valley Road to a signalize intersection. Drivers utilizing the SB off-ramp have two right-turn, a thru lane and right-turn only lane to allow drivers to travel east, west or south. Drivers coming from westbound Lucas Valley have the option to merge right to enter the new SB loop on-ramp to access SB U.S. 101. The existing SB loop-off-ramp located in the southwest quadrant of the interchange will be removed. The reconfiguration of the interchange with the addition of the new SB ramps are similar to the concept presented in the Caltrans' PSR (EA 04-218-28140K) dated May 2003.

The multi-use path on the south side of Lucas Valley Road is extended from the Los Gamos Drive to Redwood Highway.

The class II bike lane on the north side of Lucas Valley Road will extend from Redwood Highway to the new SB loop on-ramp and conform to a multi-use path at the Los Gamos Drive intersection. Bicyclists have the option to cross over on a green painted bike crossing either to the south or west. In the west, bicyclists will conform to the existing shoulder and continue to head west on Lucas Valley Road. In the south, bicyclists have the option to utilize the multi-use path proposed on the south side of Lucas Valley Road.

Transit improvements are similar between the near-term and long-term concepts.



Refer to Attachment I for the exhibit associated with the long-term concept.

Utility Requirements

Attachment C provides the utility conflict matrix summarizing the impacts for the near- and long-term concepts. A recommended disposition is provided for each utility for this phase of work. It is recommended that these utilities be further evaluated in subsequent design phases as the design is further refined.

A summary of the major utilities identified and affected by the concepts are noted below.

Utility impacts common to the near- and long-term concepts are:

- Along Lucas Valley Road between Los Gamos Drive and Redwood Highway, a water, communication and electric line is impacted and are identified to be protected in place.
- Along Lucas Valley Road near the U.S. 101 SB off-ramp, a water line will be impacted and is identified to be protected in place.
- Along Lucas Valley Road near the Redwood Highway/ N Redwood Drive intersection, there are a water and communication lines identified to be protected in place.

Right of Way Requirements

The project collected GIS right of way information from MarinMap, Caltrans and right of way record maps, and the assessor's map to assess the right of way requirements for the alternatives developed. The findings are summarized in Attachment D listing the right of way requirements for the near- and long-term concepts. The right of way requirements will be further refined in subsequent design phases.

For the near-term improvement, a sliver of right of way take is required near the Lucas Valley Road and Redwood Highway/N Redwood Drive intersection to accommodate the proposed bus stop improvements.

For the long-term improvements, right of way take is required for the northwest quadrant of the Lucas Valley Road interchange to accommodate the new SB on- and off-ramps. In addition, the sliver right of way take identified for the near-term will also be required for the long-term improvements.

Environmental Considerations

Benefit to Environmental Justice Communities:

Based on Census data, no Environmental Justice communities are located within the project area.

Ability to Gain Project Approvals

Soil types within the project area are highly sensitive for buried cultural resources. Near-term improvements have a low risk of impacting buried cultural resources. Long-term improvements include a new southbound on/ off ramps and retaining walls northwest of the interchange. Excavation there could impact previously unrecorded buried cultural resources. If resources are encountered, regulatory approvals may be required.

Habitat for special-status plant and animal species has been documented within the project area. Near-term improvements have a low risk of impacting biological resources. However, the long-term improvements include a new ramp in the vegetated tract northwest of the interchange that could provide habitat for these species. Agency coordination would be required to identify any impacts, which may require permitting and/or mitigation.

Cost Estimate

The project cost for the near- and long-term improvements are summarized below, inclusive of right of way and support costs:

		Escalated Total Project Cost
1	Lucas Valley Road / Smith Ranch Road near-term	$16,800,000
2	Lucas Valley Road / Smith Ranch Road long-term	$76,900,000

The escalated project cost assumes the project for near- and long-term improvements will start construction in five years with the estimated start to be April 2026 at an annual escalation rate of 3.5%. The project cost is conceptual and will be further refined in subsequent phases.

Refer to Attachment B for backup support for the conceptual cost.

Funding

The Highway 101 Interchange and Approaching Roadway Study is funded through Measure AA – the reauthorized ½-cent transportation sales tax that was approved by Marin voters in 2018. The funding will be used to leverage regional, state, and federal funds for a program of improvements that will be determined through the TAM Board in coordination with Caltrans and the local jurisdictional stakeholders.

Regional and state transportation funding opportunities increased with passage of the Bay Area's Regional Measure 3 in June 2018 and California's Senate Bill 1 (SB1) in 2017. Federal funding is anticipated to play a larger role with recent passage of the Infrastructure Investment and Jobs Act (IIJA) in 2021. In addition, the Highway 101 interchange improvement projects are anticipated to be competitive to a number of grant programs that promote regional and state goals for sustainability and equity, access and mobility, congestion management, clean air, and climate action, such as the Active Transportation Program (ATP), the Transportation Fund for Clean Air (TFCA), and the Climate Action Plan for Transportation Infrastructure (CAPTI).

PROJECT IMPLEMENTATION

As part of this study, each of the 12 interchanges will undergo evaluation and prioritization with the goal of identifying the most appropriate projects to move forward into project development.

It is anticipated that the improvements proposed under both the near- and long-term concepts would follow the typical three-phase Caltrans project development process for approval of work within the state's right of way.

- PID (Project Study Report-Project Development Support)
- PA&ED
- PS&E

Project Initiation

The first step in the process is for funding to be obtained for preparation of the PID for the selected project(s). This would likely be sponsored by TAM under Measure AA – the reauthorized ½-cent transportation sales tax that was approved by Marin voters in 2018 – or with assistance from other local and regional funding sources.

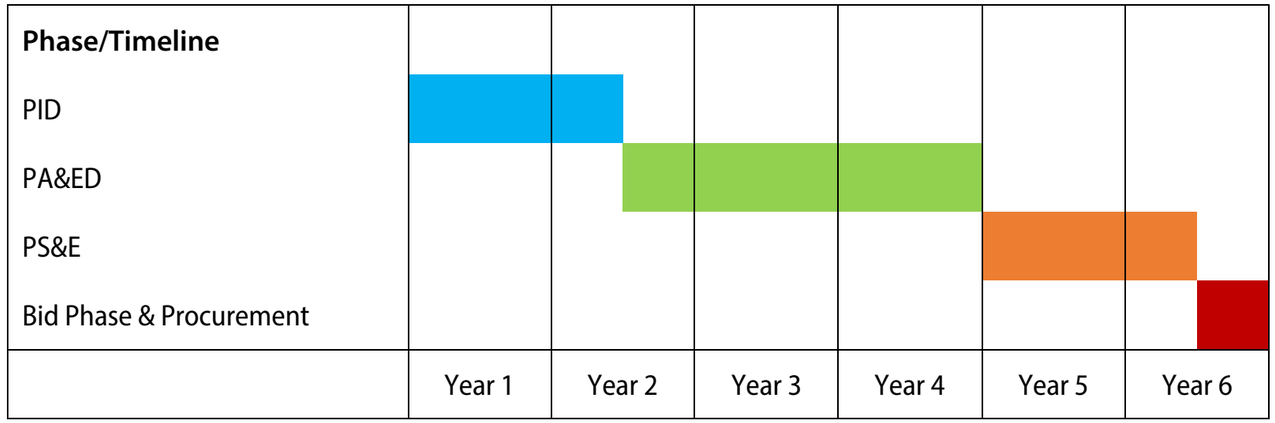
The document would refine and scope the project, or project alternatives, and define the level of effort needed for the environmental phase, including the level of environmental document anticipated and what supporting technical studies would be required. Coordination is required with MTC to ensure the project is entered into the current RTP (Plan Bay Area 2050) and with Caltrans to ensure they have appropriate resources scheduled to support the project.

Phased Implementation

Elements of the project could be implemented in a phased manner by either TAM or the City of San Rafael to meet funding opportunities. For example, improvements outside of Caltrans' right of way could be implemented without entailing the Caltrans project development process, or smaller scale improvements could progress through the Caltrans encroachment permit process once environmental clearance was obtained. Additionally, elements of the project could be incorporated into projects sponsored by Caltrans, such as the long-range ramp-squaring project identified by the System Planning Group.

Timeline

The following chart provides a representative timeline for project development.



Next Steps

1. TAM Board to select a projects(s) to move forward into project development in consultation with agency stakeholders.
2. TAM and the local jurisdiction will coordinate with MTC to have the project included in the current Regional Transportation Plan (RTP).
3. TAM and the local jurisdiction will secure funding for the PID and will enter into a cooperative agreement with Caltrans for project development.
4. TAM will work with the local jurisdiction and a Project Development Team to prepare the PID for Caltrans approval to proceed to the PA&ED Phase for a locally funded project. Alternatively, TAM can work with the local jurisdiction and a Project Development Team to identify design features that can be implemented through the Caltrans encroachment permit process or on the approaching roadways outside of Caltrans' right of way.
5. TAM and the local jurisdiction will seek funding for subsequent phases of the project. If there is insufficient funding available, it may be possible to phase the improvements.

LUCAS VALLEY ROAD/SMITH RANCH ROAD

ATTACHMENTS

A. Project Base Map

B. Cost Estimates (Near-Term and Long-Term)

C. Utility Impact Matrix

D. Right of Way Requirement Matrix

E. Existing and 2040 Traffic Volumes

F. Collision Data

G. Transit Ridership Data

H. Synchro Output

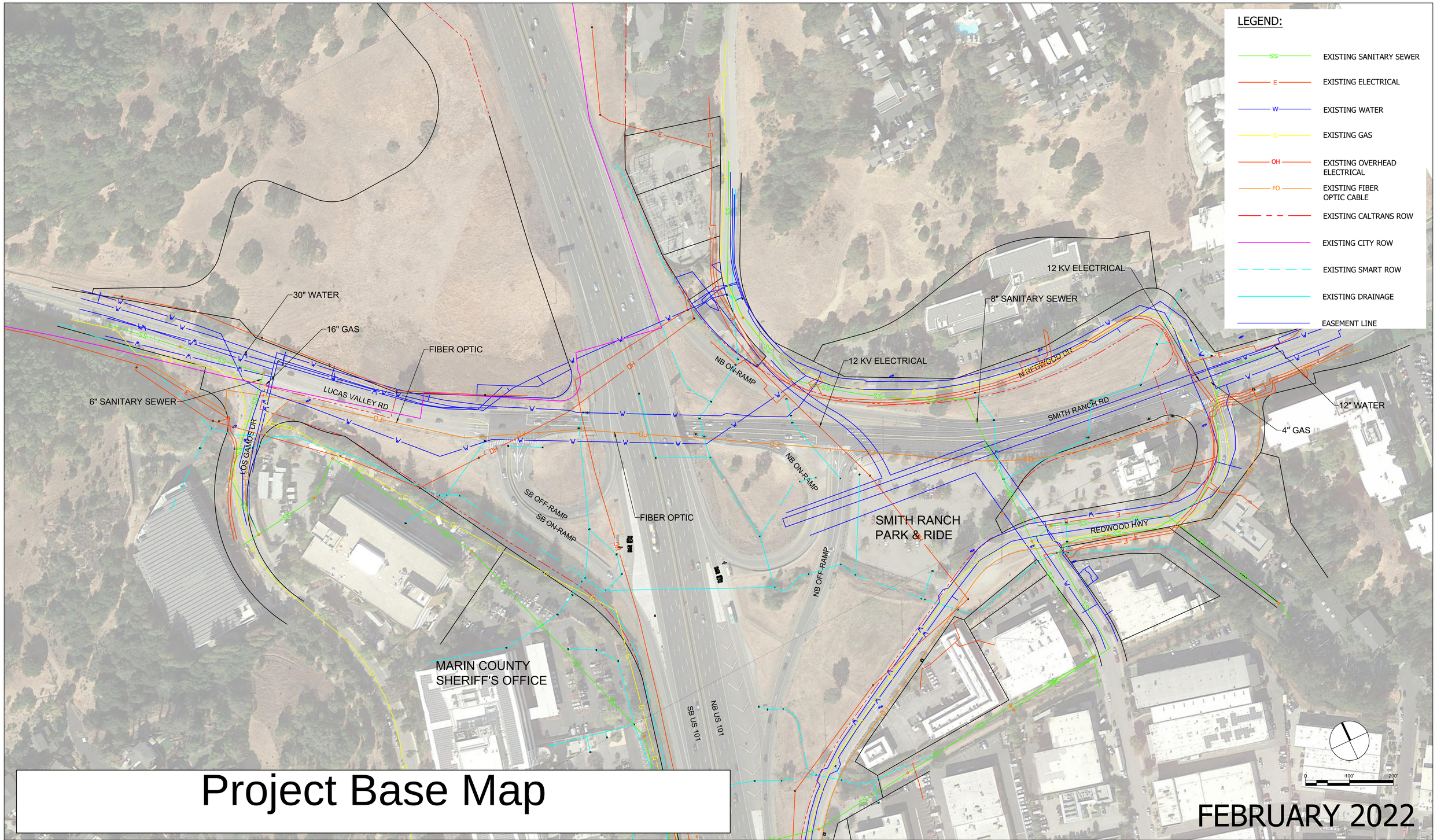
I. Preliminary Conceptual Plans

J. Deficiency Matrix

K. Online Survey Comments

L. Existing FEMA Map

A. Project Base Map



Project Base Map

FEBRUARY 2022

HNTB
1111 BROADWAY, 9TH FLOOR
OAKLAND, CA 94607
(510) 208-4599

Parisi TRANSPORTATION CONSULTING
1750 BRIDGEWAY, SUITE B208
SAUSILITO, CA 94965
(415) 649-6000

TRANSPORTATION AUTHORITY OF MARIN
HIGHWAY 101 INTERCHANGE IMPLEMENTATION STUDY
LUCAS VALLEY ROAD / SMITH RANCH ROAD

TAM Transportation Authority of Marin

DATE:	SCALE: 1"=100'
FILENAME:	
PROJECT:	
SHEET NO.	

B. Cost Estimates (Near-Term and Long-Term)

Project Owner:	Transportation Authority of Marin
Project Description:	Hwy 101 Interchange and Approach Roadway Improvement Program
Location:	Lucas Valley Road / Smith Ranch Road - Near Term Improvements
Type of Estimate:	Conceptual Level Cost Estimate
Prepared by:	HNTB

SUMMARY OF PROJECT OUTLAY COSTS

		Current Year Cost	Escalated Cost
I	ROADWAY	$ 9,259,729	$ 10,810,104
II	STRUCTURES	$ -	$ -
III	RIGHT OF WAY	$ 583,989	$ 681,767
	TOTAL CAPITAL OUTLAY COST	**$ 9,843,718**	**$ 11,491,871**
IV	PRELIMINARY ENGINEERING/ENVIRONMENTAL	$ 740,778	$ 793,540
V	DESIGN ENGINEERING	$ 925,973	$ 958,382
VI	DESIGN SERVICES DURING CONSTRUCTION	$ 277,792	$ 277,792
VII	CONSTRUCTION MANAGEMENT	$ 1,388,959	$ 1,487,888
	TOTAL SUPPORT COST	**$ 3,333,502**	**$ 3,517,602**
	DIRECT PROJECT COST	**$ 13,177,221**	**$ 15,009,473**
VIII	AGENCY MANAGEMENT	$ 1,388,959	$ 1,828,994
	TOTAL PROJECT COST	**$ 14,566,180**	**$ 16,838,467**

Project Cost Estimate

Project Owner: Transporation Authority of Marin
Project Description: Hwy 101 Interchange and Approach Roadway Improvement Program
Location: Lucas Valley Road / Smith Ranch Road - Near Term Improvements

Item code	Description	Unit	Quantity	Unit Price ($)	Cost	
I. Roadway						
01 Earthwork						
1.1	Clearing & Grubbing	LS	1	10,000.00	$ 10,000	
1.2	Roadway Excavation	CY	0	65.00	$ -	
				Subtotal for Item 01 Earthwork	**$ 10,000**	
02 Pavement Structural Section						
2.1	Remove Curb and Gutter	LF	3,000	25.00	$ 75,000	
2.2	Remove Concrete Sidewalk	SF	22,100	5.00	$ 110,500	
2.3	Remove Asphalt Concrete Pavement	SF	2,300	5.00	$ 11,500	
2.4	Remove Concrete Island	SF	7,300	10.00	$ 73,000	
2.5	Remove Concrete Slope Paving	SF	0	50.00	$ -	
2.6	Pavement Section	SF	3,600	11.00	$ 39,600	
2.7	Microsurfacing	SF	160,000	1.00	$ 160,000	
2.8	Curb and Gutter	LF	2,100	65.00	$ 136,500	
2.9	Sidewalk / Multi-Use Path	SF	40,000	5.00	$ 200,000	
2.10	Concrete Island/Median	SF	2,400	25.00	$ 60,000	
				Subtotal for Item 02 Pavement Structural Section	**$ 866,100**	
03 Drainage						
3.1	Drainage (assume % of Roadway Cost Items 1 through 2)		1%		$ 8,761.00	
				Subtotal of Item 03 Drainage	**$ 8,761**	
04 Specialty Items						
4.1	Metal Beam Guard Railing	LF	70	65.00	$ 4,550	
4.2	ADA Curb Ramps	EA	14	4,700.00	$ 65,800	
4.3	Concrete Barrier	LF	410	300.00	$ 123,000	
4.4	Retaining Wall (Caltrans Type 1) (H=4'-10')	SQFT	1,500	160.00	$ 240,000	
4.5	Retaining Wall (Caltrans Type 1) (H=10'-20')	SQFT	2,100	190.00	$ 399,000	
4.6	Remove Metal Beam Guard Railing	LF	0	20.00	$ -	
4.7	Remove Concrete Barrier	LF	0	50.00	$ -	
				Subtotal for Items 04 Specialty Items	**$ 832,350**	
05 Environmental						
5.1	Landscape and Irrigation	SF	2,200	35.00	$ 77,000	
5.2	Environmental Mitigation (assume % of Total Cost of Items 1 through 5.1)		30%		$ 538,263	
				Subtotal for Item 05 Environmental	**$ 615,263**	
06 Traffic						
06a Traffic Items						
6a.1	Traffic Signal Upgrade	EA	3	350,000.00	$ 1,050,000	
6a.2	Pedestrian Hybrid Beacon (PHB)	EA	1	175,000.00	$ 175,000	
6a.3	Rapid Reflective Flashing Beacons (one pair)	EA	1	25,000.00	$ 25,000	
6a.4	Traffic Signal Priority	EA	0	150,000.00	$ -	
6a.5	Traffic Operations Systems (Ramp Metering)	EA	0	350,000.00	$ -	
6a.6	Traffic Signal (New)	EA	0	500,000.00	$ -	
6a.7	Protected Intersection	EA	2	1,000,000.00	$ 2,000,000	
				Subtotal for Item 06a Traffic Items	**$ 3,250,000**	
					Subtotal Sections 1 through 6a	**$ 5,582,474**
06b Additional Traffic Items						
6b.1	High Visibility Crosswalk (cost by width of roadway)	LF	600	36.00	$ 21,600	
6b.2	Highway Signage Structure	EA	0	1,000,000.00	$ -	
6b.3	Signing and Striping	LS	1	120,000.00	$ 120,000	
6b.4	Remove Signing and Striping		1%		$ 55,825	
6b.5	Roadway Lighting		1%		$ 55,825	
6b.6	Stage Construction and Traffic Handling	LS	1	100,000.00	$ 100,000	
				Subtotal for Item 06b Traffic Items	**$ 353,249**	
					Subtotal Sections 1 through 6	**$ 5,935,724**
07 Minor Items						
7.1	American with Disabilities Act Items		1%		$ 59,357.24	
7.2	Bike Path Items		1%		$ 59,357	
7.3	Other Minor Items		8%		$ 474,858	
				Subtotal of Item 07 Minor Items	**$ 593,572**	
08 Roadway Mobilization						
8.1	Roadway Mobilization		10%		$ 593,572	
				Subtotal for Item 08 Roadway Mobilization	**$ 593,572**	
09 Roadway Contingency						
9.1	Roadway Contingency (assume % of total cost of Section Items 01-08)		30%		$ 2,136,861	
				Subtotal for Item 09 Roadway Contingency	**$ 2,136,861**	
					Subtotal for Items 1-9 (Roadway)	**$ 9,259,729**

Project Cost Estimate

Project Owner: Transporation Authority of Marin
Project Description: Hwy 101 Interchange and Approach Roadway Improvement Program
Location: Lucas Valley Road / Smith Ranch Road - Near Term Improvements

Item code	Description	Unit	Quantity	Unit Price ($)	Cost	
II. Structures						
10 Structures						
10.1	Bridge Demolition	SF	0	60.00	$ -	
10.2	New Bridge Structure	SF	0	500.00	$ -	
10.3	Bridge Widening	SF	0	600.00	$ -	
10.4	Pedstrian Overcrossing (including ramp)	SF	0	550.00	$ -	
10.5	Pedestrian Undercrossing (including ramp)	SF	0	600.00	$ -	
10.6	Tunnel	SF	0	1,200.00	$ -	
10.7	Structure modification	SF	0	700.00	$ -	
				Subtotal for Item 10 Structures	**$ -**	
10.9	Structure Contingency		30%		$ -	
					Subtotal for Structures	**$ -**
	TOTAL CONSTRUCTION COST (TCC) - SUM OF ITEMS 1-10 (ROADWAY AND STRUCTURES)					**$ 9,259,729**
III. Right of Way						
III.1	Right of Way Acquisition	SF	1,125	65.00	$ 73,125	
III.2	TCE	SF	18,900	15.00	$ 283,500	
III.3	Utility Relocation (assume % of total cost of Section 01-10)		1%		$ 92,597	
				Subtotal for Item 11 Right of Way	**$ 449,222**	
III.4	Right of Way Contingency		30%		$ 134,766.69	
					Subtotal for Right of Way	**$ 583,989**

Engineering and Management Costs						
			TCC	**Duration (Year)**	**Unescalatd Risk Loaded**	**Escalated (per year of TCC)**
						(escalation rate = 3.5%)
IV	**Preliminary Engineering/Environmental**	8%	***$ 9,259,729***	*2*	$ 740,778.33	$ 793,540.26
V	**Design Engineering**	10%	***$ 9,259,729***	*1*	$ 925,972.91	$ 958,381.96
VI	**Design Services During Construction**	3%	***$ 9,259,729***	*2*	$ 277,791.87	$ 277,791.87
VII	**Construction Management**	15%	***$ 9,259,729***	*2*	$ 1,388,959.37	$ 1,487,888.00
VIII	**Agency Management**	15%	***$ 9,259,729***	*8*	$ 1,388,959.37	$ 1,828,994.25

Escalation					
		Value			
	Date of Estimate (Month/Year)	11/4/2021			
	Anticipated Project Inititation Document Start (1-year duration)	April 2022			
	Anticipated year to begin construction (Month Year)	April 2026			
	Estimated construction duration (in years)	2			
	Years of Escalation (to start of construction)	4.5			
	Annual Escalation Rate, percentage	3.5%			
	Total Escalation	117%			
				Current Year Cost	**Escalated**
			Escalated Roadway Cost	**$ 9,259,729**	**$ 10,810,104**
			Escalated Structure Cost	**$ -**	**$ -**
			Escalated Right of Way Cost	**$ 583,989**	**$ 681,767**

Project Cost Estimate

Project Owner: Transportation Authority of Marin
Project Description: Hwy 101 Interchange and Approach Roadway Improvement Program
Location: Lucas Valley Road / Smith Ranch Road - Long Term Improvements
Type of Estimate: Conceptual Level Cost Estimate
Prepared by: HNTB

SUMMARY OF PROJECT OUTLAY COSTS

		Current Year Cost	Escalated Cost
I	ROADWAY	$ 41,438,101	$ 48,376,163
II	STRUCTURES	$ -	$ -
III	RIGHT OF WAY	$ 3,974,595	$ 4,640,070
	TOTAL CAPITAL OUTLAY COST	**$ 45,412,696**	**$ 53,016,232**
IV	PRELIMINARY ENGINEERING/ENVIRONMENTAL	$ 3,315,048	$ 3,551,162
V	DESIGN ENGINEERING	$ 4,143,810	$ 4,288,843
VI	DESIGN SERVICES DURING CONSTRUCTION	$ 1,243,143	$ 1,243,143
VII	CONSTRUCTION MANAGEMENT	$ 6,215,715	$ 6,658,429
	TOTAL SUPPORT COST	**$ 14,917,716**	**$ 15,741,578**
	DIRECT PROJECT COST	**$ 60,330,412**	**$ 68,757,811**
VIII	AGENCY MANAGEMENT	$ 6,215,715	$ 8,184,910
	TOTAL PROJECT COST	**$ 66,546,128**	**$ 76,942,720**

Project Cost Estimate

Project Owner: Transporation Authority of Marin
Project Description: Hwy 101 Interchange and Approach Roadway Improvement Program
Location: Lucas Valley Road / Smith Ranch Road - Long Term Improvements

Item code	Description	Unit	Quantity	Unit Price ($)	Cost	
I. Roadway						
01 Earthwork						
1.1	Clearing & Grubbing	LS	1	50,000.00	$ 50,000	
1.2	Roadway Excavation	CY	150,000	65.00	$ 9,750,000	
				Subtotal for Item 01 Earthwork	**$ 9,800,000**	
02 Pavement Structural Section						
2.1	Remove Curb and Gutter	LF	3,300	25.00	$ 82,500	
2.2	Remove Concrete Sidewalk	SF	25,000	5.00	$ 125,000	
2.3	Remove Asphalt Concrete Pavement	SF	14,300	5.00	$ 71,500	
2.4	Remove Concrete Island	SF	7,700	10.00	$ 77,000	
2.5	Remove Concrete Slope Paving	SF	0	50.00	$ -	
2.6	Pavement Section	SF	78,000	11.00	$ 858,000	
2.7	Microsurfacing	SF	200,000	1.00	$ 200,000	
2.8	Curb and Gutter	LF	4,000	65.00	$ 260,000	
2.9	Sidewalk / Multi-Use Path	SF	49,000	5.00	$ 245,000	
2.10	Concrete Island/Median	SF	2,700	25.00	$ 67,500	
				Subtotal for Item 02 Pavement Structural Section	**$ 1,986,500**	
03 Drainage						
3.1	Drainage (assume % of Roadway Cost Items 1 through 2)		1%		$ 117,865.00	
				Subtotal of Item 03 Drainage	**$ 117,865**	
04 Specialty Items						
4.1	Metal Beam Guard Railing	LF	400	65.00	$ 26,000	
4.2	ADA Curb Ramps	EA	20	4,700.00	$ 94,000	
4.3	Concrete Barrier	LF	500	300.00	$ 150,000	
4.4	Retaining Wall (Caltrans Type 1) (H=4'-10')	SQFT	1,500	160.00	$ 240,000	
4.5	Retaining Wall (Caltrans Type 1) (H=10'-20')	SQFT	21,000	190.00	$ 3,990,000	
4.6	Remove Metal Beam Guard Railing	LF	0	20.00	$ -	
4.7	Remove Concrete Barrier	LF	500	50.00	$ 25,000	
				Subtotal for Items 04 Specialty Items	**$ 4,525,000**	
05 Environmental						
5.1	Landscape and Irrigation	SF	1,500	35.00	$ 52,500	
5.2	Environmental Mitigation (assume % of Total Cost of Items 1 through 5.1)		20%		$ 3,296,373	
				Subtotal for Item 05 Environmental	**$ 3,348,873**	
06 Traffic						
06a Traffic Items						
6a.1	Traffic Signal Upgrade	EA	4	350,000.00	$ 1,400,000	
6a.2	Pedestrian Hybrid Beacon (PHB)	EA	1	175,000.00	$ 175,000	
6a.3	Rapid Reflective Flashing Beacons (one pair)	EA	1	25,000.00	$ 25,000	
6a.4	Traffic Signal Priority	EA	1	150,000.00	$ 150,000	
6a.5	Traffic Operations Systems (Ramp Metering)	EA	0	350,000.00	$ -	
6a.6	Traffic Signal (New)	EA	0	500,000.00	$ -	
				Subtotal for Item 06a Traffic Items	**$ 1,750,000**	
					Subtotal Sections 1 through 6a	**$ 21,528,238**
06b Additional Traffic Items						
6b.1	High Visibility Crosswalk (cost by width of roadway)	LF	800	36.00	$ 28,800	
6b.2	Highway Signage Structure	EA	2	1,000,000.00	$ 2,000,000	
6b.3	Signing and Striping	LS	1	200,000.00	$ 200,000	
6b.4	Remove Signing and Striping		1%		$ 215,282	
6b.5	Roadway Lighting		2%		$ 430,565	
6b.6	Stage Construction and Traffic Handling	LS	1	160,000.00	$ 160,000	
6b.7	Protected Intersection	EA	2	1,000,000.00	$ 2,000,000	
				Subtotal for Item 06b Traffic Items	**$ 5,034,647**	
					Subtotal Sections 1 through 6	**$ 26,562,885**
07 Minor Items						
7.1	American with Disabilities Act Items		1%		$ 265,628.85	
7.2	Bike Path Items		1%		$ 265,629	
7.3	Other Minor Items		8%		$ 2,125,031	
				Subtotal of Item 07 Minor Items	**$ 2,656,289**	
08 Roadway Mobilization						
8.1	Roadway Mobilization		10%		$ 2,656,289	
				Subtotal for Item 08 Roadway Mobilization	**$ 2,656,289**	
09 Roadway Contingency						
9.1	Roadway Contingency (assume % of total cost of Section Items 01-08)		30%		$ 9,562,639	
				Subtotal for Item 09 Roadway Contingency	**$ 9,562,639**	
					Subtotal for Items 1-9 (Roadway)	**$ 41,438,101**

Project Cost Estimate

Project Owner: Transporation Authority of Marin
Project Description: Hwy 101 Interchange and Approach Roadway Improvement Program
Location: Lucas Valley Road / Smith Ranch Road - Long Term Improvements

Item code	Description	Unit	Quantity	Unit Price ($)	Cost	
II. Structures						
10 Structures						
10.1	Bridge Demolition	SF	0	60.00	$ -	
10.2	New Bridge Structure	SF	0	500.00	$ -	
10.3	Bridge Widening	SF	0	600.00	$ -	
10.4	Pedstrian Overcrossing (including ramp)	SF	0	550.00	$ -	
10.5	Pedestrian Undercrossing (including ramp)	SF	0	600.00	$ -	
10.6	Tunnel	SF	0	1,200.00	$ -	
10.7	Structure modification	SF	0	700.00	$ -	
			Subtotal for Item 10 Structures		**$ -**	
10.8	Structure Contingency		30%		$ -	
					Subtotal for Structures	**$ -**
	TOTAL CONSTRUCTION COST (TCC) - SUM OF ITEMS 1-10 (ROADWAY AND STRUCTURES)					**$ 41,438,101**
III. Right of Way						
III.1	Right of Way Acquisition	SF	37,200	65.00	$ 2,418,000	
III.2	TCE	SF	15,000	15.00	$ 225,000	
III.3	Utility Relocation (assume % of total cost of Section 01-10)		1%		$ 414,381	
			Subtotal for Item 11 Right of Way		**$ 3,057,381**	
III.4	Right of Way Contingency		30%		$ 917,214.30	
					Subtotal for Right of Way	**$ 3,974,595**

Engineering and Management Costs						
			TCC	**Duration (Year)**	**Unescalatd Risk Loaded**	**Escalated (per year of TCC)**
						(escalation rate = 3.5%)
IV	**Preliminary Engineering/Environmental**	8%	***$ 41,438,101***	*2*	$ 3,315,048.07	$ 3,551,162.36
V	**Design Engineering**	10%	***$ 41,438,101***	*1*	$ 4,143,810.08	$ 4,288,843.43
VI	**Design Services During Construction**	3%	***$ 41,438,101***	*2*	$ 1,243,143.02	$ 1,243,143.02
VII	**Construction Management**	15%	***$ 41,438,101***	*2*	$ 6,215,715.12	$ 6,658,429.43
VIII	**Agency Management**	15%	***$ 41,438,101***	*8*	$ 6,215,715.12	$ 8,184,909.84

Escalation					
		Value			
	Date of Estimate (Month/Year)	11/4/2021			
	Anticipated Project Initiation Document Start (1-year duration)	April 2022			
	Anticipated year to begin construction (Month Year)	April 2026			
	Estimated construction duration (in years)	2			
	Years of Escalation (to start of construction)	4.5			
	Annual Escalation Rate, percentage	3.5%			
	Total Escalation	117%			
				Current Year Cost	**Escalated**
			Escalated Roadway Cost	**$ 41,438,101**	**$ 48,376,163**
			Escalated Structure Cost	**$ -**	**$ -**
			Escalated Right of Way Cost	**$ 3,974,595**	**$ 4,640,070**

C. Utility Impact Matrix

Utility Conflict Matrix

Project Owner: Transportation Authority of Marin
Project No. : P20062
Project Description: Utility Conflict Assessment
Highway or Route: US 101- Marin County

Utility Conflict Matrix Developed/Revised By: WRECO
Date: 10/27/2021
Reviewed By:
Date:

Note: refer to subsheet for utility conflict cost analysis.

Utility Owner and/or Contact Name	Conflict ID	Location	Utility Type	Size and/or Material	Utility Conflict Description	Recommended Disposition
MMWD	73	Lucas Valley Rd LT & NT (5973670.67, 2201112.95) 282 LF	Water	N/A	Sidewalk/ concrete work along Lucas Valley Rd by Los Gamos Dr and NB ramp	Confirm depth. Protect in place
MMWD	75	Lucas Valley Rd LT & NT (5974217.88, 2200720.83) 744 LF	Water	N/A	Sidewalk/ concrete work Lucas Valley Rd from SB ramp and NB ramp	Confirm depth. Protect in place
PG&E	77	Lucas Valley Rd LT & NT (5975601.73, 2200109.29) 288 LF	Electric	12kV	Sidewalk/ concrete work on Lucas Valley Rd by Redwood Hwy	Confirm depth. Protect in place
SONIC TELECOM	78	Lucas Valley Rd LT & NT (5974726.06, 2200004.23) 885 LF	Communications	N/A	Sidewalk/ concrete work on Redwood Hwy	Confirm depth. Protect in place
MMWD	79	Lucas Valley Rd LT & NT (5975408.76, 2200011.38) 450 LF	Water	N/A	Sidewalk/ concrete work on Redwood Hwy	Confirm depth. Protect in place
MMWD	80	Lucas Valley Rd LT & NT (5975487.09, 2200096.48) 96 LF	Water	N/A	Sidewalk/ concrete work on Redwood Hwy	Confirm depth. Protect in place
MMWD	145	Lucas Valley Rd NT (5973538.87, 2201400.61) 157 LF	Water	N/A	sidewalk improvement/ concrete work along Lucas Valley Rd by Los Gamos Dr	Confirm depth. Protect in place
SONIC TELECOM	146	Lucas Valley Rd NT (5973704.84, 2201095.18) 192 LF	Communications	N/A	sidewalk improvement/ concrete work along Lucas Valley Rd by Los Gamos Dr	Confirm depth. Protect in place
SONIC TELECOM	147	Lucas Valley Rd NT (5974741.74, 2200398.79) 2075 LF	Communications	N/A	sidewalk improvement/ concrete work along Lucas Valley Rd from SB on-ramp to Redwood Hwy	Confirm depth. Protect in place
PG&E	148	Lucas Valley Rd NT (5975607.46, 2200180.93) 255 LF	Electric	12kV	Sidewalk/ concrete work on Lucas Valley Rd by Redwood Hwy	Confirm depth. Protect in place

Key:
[List of acronyms used in the utility conflict matrix]

Utility Conflict Matrix

Project Owner: Transportation Authority of Marin
Project No. : P20062
Project Description: Utility Conflict Assessment
Highway or Route: US 101- Marin County

Utility Conflict Matrix Developed/Revised By: WRECO
Date: 10/27/2021
Reviewed By:
Date:

Note: refer to subsheet for utility conflict cost analysis.

Utility Owner and/or Contact Name	Conflict ID	Location	Utility Type	Size and/or Material	Utility Conflict Description	Recommended Disposition
MMWD	71	Lucas Valley Rd LT (5974062.83, 2200898.06) 1183 LF	Water	8"-12"	On-ramp and off-ramp addition along Lucas Valley Rd by Los Gamos Dr	Confirm depth. Protect in place
MMWD	72	Lucas Valley Rd LT (5973700.03, 2201204.35) 143 LF	Water	6"	On-ramp and off-ramp addition along Lucas Valley Rd by Los Gamos Dr	Confirm depth. Protect in place
MMWD	73	Lucas Valley Rd LT & NT (5973670.67, 2201112.95) 282 LF	Water	N/A	Sidewalk/ concrete work along Lucas Valley Rd by Los Gamos Dr and NB ramp	Confirm depth. Protect in place
SONIC TELECOM	74	Lucas Valley Rd LT (5974581.05, 2200507.40) 2587 LF	Communications	N/A	Sidewalk/ concrete work on Lucas Valley Rd from Los Gamos Dr to Redwood Hwy	Confirm depth. Protect in place
MMWD	75	Lucas Valley Rd LT & NT (5974217.88, 2200720.83) 744 LF	Water	N/A	Sidewalk/ concrete work Lucas Valley Rd from SB ramp and NB ramp	Confirm depth. Protect in place
PG&E	76	Lucas Valley Rd LT (5975574.07, 2200085.47) 522 LF	Electric	12kV	Sidewalk/ concrete work on Lucas Valley Rd by Redwood Hwy	Confirm depth. Protect in place
PG&E	77	Lucas Valley Rd LT & NT (5975601.73, 2200109.29) 288 LF	Electric	12kV	Sidewalk/ concrete work on Lucas Valley Rd by Redwood Hwy	Confirm depth. Protect in place
SONIC TELECOM	78	Lucas Valley Rd LT & NT (5974726.06, 2200004.23) 885 LF	Communications	N/A	Sidewalk/ concrete work on Redwood Hwy	Confirm depth. Protect in place
MMWD	79	Lucas Valley Rd LT & NT (5975408.76, 2200011.38) 450 LF	Water	N/A	Sidewalk/ concrete work on Redwood Hwy	Confirm depth. Protect in place
MMWD	80	Lucas Valley Rd LT & NT (5975487.09, 2200096.48) 96 LF	Water	N/A	Sidewalk/ concrete work on Redwood Hwy	Confirm depth. Protect in place

Key:
[List of acronyms used in the utility conflict matrix]

D. Right of Way Requirement Matrix

Right of Way Requirement Matrix

Project Owner: Transportation Authority of Marin
Project No. : P20062
Project Description: Right of Way Requirement Investigation
Highway or Route: US 101 - Marin County

ROW Requirement Matrix Developed/Revised By: WRECO
Date: 12/6/2021
Reviewed By:
Date:

Note: Refer to attachment for ROW requirement mapping

APN	Address	Location	Owner	Property Type	Partial ROW Acquisition (SF)	Full ROW Acquisition	TCE (SF)
155-251-19	99 Smith Ranch Road, San Rafeal, CA	9- Lucas Valley Road- NT	N/A	Commercial	1125		

Key:
[List of acronyms used in the utility conflict matrix]

Right of Way Requirement Matrix

Project Owner: Transportation Authority of Marin
Project No. : P20062
Project Description: Right of Way Requirement Investigation
Highway or Route: US 101 - Marin County

ROW Requirement Matrix Developed/Revised By: WRECO
Date: 12/6/2021
Reviewed By:
Date:

Note: Refer to attachment for ROW requirement mapping

APN	Address	Location	Owner	Property Type	Partial ROW Acquisition (SF)	Full ROW Acquisition	TCE (SF)
155-251-19	99 Smith Ranch Road, San Rafeal, CA	9- Lucas Valley Road- LT	N/A	Commercial	1125		
164-270-04	N/A	9- Lucas Valley Road- LT	County of Marin	Unincorporated - Residential	237999		
164-270-06	N/A	9- Lucas Valley Road- LT	Marinwood Community Services District	Unincorporated - Residential	36035		

Key:
[List of acronyms used in the utility conflict matrix]

E. Existing and 2040 Traffic Volumes

Highway 101 - Lucas Valley Interchange - Traffic Volumes Summary

9. Hwy 101 Lucas Valley Interchange - AM Traffic Volumes Summary - Existing

No.	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Lucas Valley Rd./Los Gamos Dr.	20	-	110	-	-	-	-	880	200	410	460	-
2	Lucas Valley Rd./Hwy. 101 Southbound Ramps	160	560	-	-	-	-	-	460	520	210	710	-
3	Smith Ranch Rd./Hwy. 101 Northbound Ramps	570	-	360	-	-	-	-	890	120	-	320	-
4	Smith Ranch Rd./N. Redwood Dr./Redwood Hwy.	130	10	50	5	40	60	130	390	740	120	310	10

9. Hwy 101 Lucas Valley Interchange - PM Traffic Volumes Summary - Existing

No.	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Lucas Valley Rd./Los Gamos Dr.	70	-	570	-	-	-	-	440	60	580	190	-
2	Lucas Valley Rd./Hwy. 101 Southbound Ramps	160	230	-	-	-	-	-	470	540	610	470	-
3	Smith Ranch Rd./Hwy. 101 Northbound Ramps	400	-	310	-	-	-	-	370	330	-	680	-
4	Smith Ranch Rd./N. Redwood Dr./Redwood Hwy.	660	30	130	10	30	200	140	350	220	60	490	10

9. Hwy 101 Lucas Valley Interchange - AM Traffic Volumes Summary - 2040

No.	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Lucas Valley Rd./Los Gamos Dr.	21	-	116	-	-	-	-	924	210	431	483	-
2	Lucas Valley Rd./Hwy. 101 Southbound Ramps	168	588	-	-	-	-	-	483	546	221	746	-
3	Smith Ranch Rd./Hwy. 101 Northbound Ramps	599	-	378	-	-	-	-	935	126	-	336	-
4	Smith Ranch Rd./N. Redwood Dr./Redwood Hwy.	137	11	53	5	42	63	137	410	777	126	326	11

9. Hwy 101 Lucas Valley Interchange - PM Traffic Volumes Summary - 2040

No.	Intersection	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
1	Lucas Valley Rd./Los Gamos Dr.	77	-	627	-	-	-	-	484	66	638	209	-
2	Lucas Valley Rd./Hwy. 101 Southbound Ramps	176	253	-	-	-	-	-	517	594	671	517	-
3	Smith Ranch Rd./Hwy. 101 Northbound Ramps	440	-	341	-	-	-	-	407	363	-	748	-
4	Smith Ranch Rd./N. Redwood Dr./Redwood Hwy.	726	33	143	11	33	220	154	385	242	66	539	11

F. Collision Data

SWITRS Collision Raw Data Export Layout

ITEM NAME	DESCRIPTION	POSSIBLE VALUES
CASE_ID	The unique identifier of the collision report (barcode beginning 2002; 19 digit code prior to 2002)	
ACCIDENT_YEAR	The year when the collision occurred	
COLLISION_DATE	The date when the collision occurred (YYYYMMDD)	
COLLISION_TIME	The time when the collision occurred (24 hour time)	
PRIMARY_RD		
SECONDARY_RD		
DISTANCE		Distance converted to feet
DIRECTION		N - North E - East S - South W - West Blank - Not Stated, In Intersection
INTERSECTION		Y - Intersection N - Not Intersection Blank - Not Stated
COLLISION_SEVERITY	The injury level severity of the collision (highest level of injury in collision)	1 - Fatal 2 - Injury (Severe) 3 - Injury (Other Visible) 4 - Injury (Complaint of Pain) 0 - PDO
NUMBER_KILLED	Counts victims in the collision with collision severity of 1	0 to N for each collision
NUMBER_INJURED	Counts victims in the collision with collision severity of 2, 3, or 4	0 to N for each collision

SWITRS Collision Raw Data Export Layout

ITEM NAME	DESCRIPTION	POSSIBLE VALUES
PCF_VIOL_CATEGORY		01 - Driving or Bicycling Under the Influence 02 - Impeding Traffic 03 - Unsafe Speed 04 - Following Too Closely 05 - Wrong Side of Road 06 - Improper Passing 07 - Unsafe Lane Change 08 - Improper Turning 09 - Automobile Right of Way 10 - Pedestrian Right of Way 11 - Pedestrian Violation 12 - Traffic Signals and Signs 13 - Hazardous Parking 14 - Lights 15 - Brakes 16 - Other Equipment 17 - Other Hazardous Violation 18 - Other Than Driver (or Pedestrian 19 - 20 - 21 - Unsafe Starting or Backing 22 - Other Improper Driving 23 - Pedestrian or "Other" Under the Influence of Alcohol or Drug 24 - Fell Asleep 00 - Unknown Blank - Not Stated

SWITRS Collision Raw Data Export Layout

ITEM NAME	DESCRIPTION	POSSIBLE VALUES
TYPE_OF_COLLISION		A - Head-On B - Sideswipe C - Rear End D - Broadside E - Hit Object F - Overturned G - Vehicle/Pedestrian H - Other Blank - Not Stated
MVIW		A - Non-Collision B - Pedestrian C - Other Motor Vehicle D - Motor Vehicle on Other Roadway E - Parked Motor Vehicle F - Train G - Bicycle H - Animal I - Fixed Object J - Other Object Blank - Not Stated
PED_ACTION		A - No Pedestrian Involved B - Crossing in Crosswalk at Intersection C - Crossing in Crosswalk Not at Intersection D - Crossing Not in Crosswalk E - In Road, Including Shoulder F - Not in Road G - Approaching/Leaving School Bus Blank - Not Stated
PEDESTRIAN_ACCIDENT	Indicates whether the collision involved a pedestrian	Y or blank

SWITRS Collision Raw Data Export Layout

ITEM NAME	DESCRIPTION	POSSIBLE VALUES
BICYCLE_ACCIDENT	Indicates whether the collision involved a bicycle	Y or blank
COUNT_PED_KILLED	Counts the victims in the collision with Party Type 2 and Collision Severity 1	0 to N for each collision
COUNT_PED_INJURED	Counts the victims in the collision with Party Type 2 and Collision Severity 2. 3. or 4	0 to N for each collision
COUNT_BICYCLIST_KILLED	Counts the victims in the collision with Party Type 4 and Collision Severity 1	0 to N for each collision
COUNT_BICYCLIST_INJURED	Counts the victims in the collision with Party Type 4 and Collision Severity 2. 3. or 4	0 to N for each collision
LATITUDE		
LONGITUDE		

SWITRS Collision Raw Data Export

CASE_ID	ACCIDENT_ YEAR	COLLISION_ DATE	COLLISION_ TIME	PRIMARY_RD	SECONDARY_RD	DISTANCE
6708571	2014	20141111	1758	CRESTA DR	SMITH RANCH RD	0
6618887	2014	20140907	1115	LUCAS VALLEY RD	RT 101	60
6663520	2014	20141025	730	RT 101	LUCAS VALLEY RD	200
6458278	2014	20140501	405	RT 101	LUCAS VALLEY RD	300
6635979	2014	20140919	941	REDWOOD HWY	SMITH RANCH RD	0
6788321	2014	20141225	1815	RT 101	LUCAS VALLEY RD	257
6565364	2014	20140720	1015	US 101	LUCAS VALLEY RD	116
6888411	2015	20150410	1210	RT 101	LUCAS VALLEY RD	116
90042031	2015	20151030	2100	US-101 N/B	LUCAS VALLEY ROAD	1500
6801485	2015	20150129	645	RT 101	LUCAS VALLEY RD	135
6861466	2015	20150309	1220	SMITH RANCH RD	RT 101	295
6841515	2015	20150303	1909	SMITH RANCH RD	REDWOOD HWY	0
90327773	2016	20161102	950	LOS GAMOS DR.	LUCAS VALLEY RD.	0
90291059	2016	20161006	849	US 101 SB	LUCAS VALLEY RD U/C	350
90261396	2016	20160829	1410	US-101 N/B TO SMITH RANCH RD.	SMITH RANCH RD.	10
8151339	2016	20160927	1503	SMITH RANCH RD	DEER VALLEY RD	0
90206443	2016	20160616	1615	US-101 S/B TO LUCAS VALLEY RD.	LUCAS VALLEY RD	195
90298398	2016	20161014	1315	US101 S/B	LUCAS VALLEY RD.	10
90256389	2016	20160818	1419	US 101N N/B	LUCAS VALLEY RD OFF-RAMP	100
90298389	2016	20161014	710	US101 SB	LUCAS VALLEY UNDERCROSSING	30
90445178	2017	20170413	1755	LUCAS VALLEY ROAD	US-101 SOUTHBOUND OFF RAMP	50
8471176	2017	20170927	1440	SMITH RANCH RD	OLD REDWOOD HWY	0
90474677	2017	20170608	640	US-101 S/B	LUCAS VALLEY ROAD	190
90554458	2017	20170917	910	US-101 S/B TO LUCAS VALLEY ROAD	LUCAS VALLEY RD U/C	200
90477970	2017	20170607	1330	US-101 SB	LUCAS VALLEY RD	186
90399720	2017	20170216	1529	US-101 S/B FROM LUCAS VLY RD	LUCAS VALLEY RD	31
8415793	2017	20171226	1726	LUCAS VALLEY RD	RT 101	0
90554364	2017	20170915	1120	US-101 N/B TO SMITH RANCH ROAD	SMITH RANCH ROAD	3
8454757	2017	20170922	1956	REDWOOD HWY	SMITH RANCH RD	28
90657695	2018	20180124	2330	US-101 S/B FROM LUCAS VALLEY RD.	LUCAS VALLEY RD	245
8773160	2018	20181223	2229	SMITH RANCH RD	CRESTA DR	147

CASE_ID	DIRECTION	INTERSECTION	COLLISION_ SEVERITY	NUMBER_ KILLED	NUMBER_ INJURED	PCF_VIOL_ CATEGORY	TYPE_OF_ COLLISION	MVIW	PED_ACTION	PEDESTRIAN _ACCIDENT
6708571		Y	4	0	1	10	G	B	B	Y
6618887	E	N	0	0	0	-	C	C	A	
6663520	S	N	0	0	0	3	E	I	A	
6458278	N	N	0	0	0	18	E	H	A	
6635979		Y	0	0	0	18	E	I	A	
6788321	S	N	3	0	1	1	E	I	A	
6565364	S	N	3	0	1	8	E	I	A	
6888411	S	N	0	0	0	8	E	I	A	
90042031	N	N	0	0	0	18	H	H	A	
6801485	S	N	4	0	1	3	C	C	A	
6861466	E	N	4	0	2	3	C	C	A	
6841515		Y	4	0	1	12	D	C	A	
90327773		Y	0	0	0	3	C	C	A	
90291059	N	N	0	0	0	3	C	C	A	
90261396	S	N	0	0	0	21	C	C	A	
8151339		Y	0	0	0	9	D	C	A	
90206443	N	N	0	0	0	3	E	I	A	
90298398	N	N	0	0	0	3	E	I	A	
90256389	N	N	0	0	0	7	E	I	A	
90298389	N	N	4	0	1	3	C	C	A	
90445178	E	N	0	0	0	3	C	C	A	
8471176		Y	0	0	0	9	D	C	A	
90474677	S	N	0	0	0	3	E	I	A	
90554458	S	N	0	0	0	3	E	I	A	
90477970	S	N	0	0	0	8	E	I	A	
90399720	S	N	4	0	1	9	B	C	A	
8415793		Y	4	0	2	3	C	C	A	
90554364	S	N	4	0	1	3	C	C	A	
8454757	S	N	3	0	1	9	H	G	A	
90657695	S	N	0	0	0	3	A	I	A	
8773160	E	N	0	0	0	1	B	E	A	

CASE_ID	BICYCLE_ ACCIDENT	COUNT_PED_ KILLED	COUNT_PED_ INJURED	COUNT_BICYCLIST_ KILLED	COUNT_BICYCLIST_ INJURED	LATITUDE	LONGITUDE
6708571		0	1	0	0	38.01986	-122.53412
6618887		0	0	0	0	38.02166	-122.53978
6663520		0	0	0	0	38.02129	-122.54033
6458278		0	0	0	0	38.02168	-122.53926
6635979		0	0	0	0	38.02012	-122.53517
6788321		0	0	0	0	38.02068	-122.54012
6565364		0	0	0	0	38.02108	-122.53956
6888411		0	0	0	0	38.02129	-122.5402
90042031		0	0	0	0	38.0206	-122.53784
6801485		0	0	0	0	38.02081	-122.53951
6861466		0	0	0	0	38.02062	-122.53785
6841515		0	0	0	0	38.01957	-122.53459
90327773		0	0	0	0	38.02249	-122.54163
90291059		0	0	0	0	38.02245	-122.53908
90261396		0	0	0	0	38.02047	-122.53776
8151339		0	0	0	0	38.01964	-122.53401
90206443		0	0	0	0	38.02096	-122.53994
90298398		0	0	0	0	38.02208	-122.53926
90256389		0	0	0	0	38.01986	-122.53675
90298389		0	0	0	0	38.02208	-122.53926
90445178		0	0	0	0	38.02152	-122.53974
8471176		0	0	0	0	38.01978	-122.53508
90474677		0	0	0	0	38.02096	-122.54026
90554458		0	0	0	0	38.02091	-122.53988
90477970		0	0	0	0	38.0209	-122.53988
90399720		0	0	0	0	38.0215	-122.54029
8415793		0	0	0	0	38.02153	-122.54023
90554364		0	0	0	0	38.02046	-122.53775
8454757	Y	0	0	0	1	38.01978	-122.53508
90657695		0	0	0	0	38.02095	-122.54027
8773160		0	0	0	0	38.01964	-122.53401

SWITRS Collision Raw Data Export

CASE_ID	ACCIDENT_ YEAR	COLLISION_ DATE	COLLISION_ TIME	PRIMARY_RD	SECONDARY_RD	DISTANCE
8713448	2018	20181017	1039	PAUL DR	REDWOOD HWY	18
90709635	2018	20180406	1240	US-101 S/B FROM LUCAS VALLEY ROAD	LUCAS VALLEY RD	100
90636712	2018	20180105	1115	US-101 S/B FROM LUCAS VALLEY RD.	LUCAS VALLEY ROAD	190
90642237	2018	20180115	1930	US-101 SOUTHBOUND TO LUCAS VALLEY ROAD	LUCAS VALLEY RD	200
90868554	2018	20181121	1600	US-101 S/B ON FROM LUCAS VALLEY ROAD	LUCAS VALLEY ROAD	205
90872127	2018	20181123	1740	US-101 S/B FROM LUCAS VALLEY ROAD	LUCAS VALLEY ROAD	211
90713545	2018	20180423	2140	US-101 SOUTHBOUND	LUCAS VALLEY RD	500

CASE_ID	DIRECTION	INTERSECTION	COLLISION_ SEVERITY	NUMBER_ KILLED	NUMBER_ INJURED	PCF_VIOL_ CATEGORY	TYPE_OF_ COLLISION	MVIW	PED_ACTION	PEDESTRIAN _ACCIDENT
8713448	S	N	0	0	0	21	C	E	A	
90709635	S	N	0	0	0	3	E	I	A	
90636712	S	N	0	0	0	3	E	I	A	
90642237	S	N	0	0	0	3	E	I	A	
90868554	S	N	0	0	0	8	F	A	A	
90872127	S	N	4	0	1	3	E	I	A	
90713545	S	N	4	0	1	8	E	I	A	

CASE_ID	BICYCLE_ ACCIDENT	COUNT_PED_ KILLED	COUNT_PED_ INJURED	COUNT_BICYCLIST_ KILLED	COUNT_BICYCLIST_ INJURED	LATITUDE	LONGITUDE
8713448		0	0	0	0	38.01895	-122.53632
90709635		0	0	0	0	38.02127	-122.54033
90636712		0	0	0	0	38.02096	-122.54026
90642237		0	0	0	0	38.02095	-122.53998
90868554		0	0	0	0	38.02096	-122.54026
90872127		0	0	0	0	38.02101	-122.54031
90713545		0	0	0	0	38.01993	-122.53989

G. Transit Ridership Data

Highway 101 Lucas Valley Rd Interchange - Transit Ridership

	Marin Transit Routes			Golden Gate Transit Routes			Total	
Stop ID	Route Numbers	Board	Exit	Route Numbers	Board*	Exit*	Board	Exit
40606	35, 49	42	43	54, 58, 70, 35, 54C	50	14	92	57
40607	35, 49	26	52	54, 58, 70, 35, 54C	18	72	44	124
41326	245	32	26				32	26

Data Sources: Marin Transit 2017, Golden Gate Transit 2020

*2020 Golden Gate Transit data were multiplied by a factor of 1.04 per transit agency recommendation to adjust for pandemic ridership

H. Synchro Output

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	877	200	405	457	17	112
Future Volume (Veh/h)	877	200	405	457	17	112
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	974	222	450	508	19	124
Pedestrians					11	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						7
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				554		
pX, platoon unblocked					0.88	
vC, conflicting volume			1207		2393	985
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1207		2511	985
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			21		0	58
cM capacity (veh/h)			570		6	297

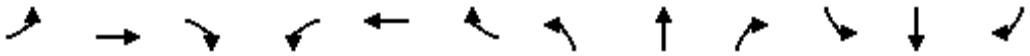
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	974	222	450	508	143
Volume Left	0	0	450	0	19
Volume Right	0	222	0	0	124
cSH	1700	1700	570	1700	41
Volume to Capacity	0.57	0.13	0.79	0.30	3.50
Queue Length 95th (ft)	0	0	188	0	Err
Control Delay (s)	0.0	0.0	30.9	0.0	Err
Lane LOS			D		F
Approach Delay (s)	0.0		14.5		Err
Approach LOS					F

Intersection Summary			
Average Delay	628.6		
Intersection Capacity Utilization	93.8%	ICU Level of Service	F
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	455	524	205	707	163	564
Future Volume (vph)	455	524	205	707	163	564
Ideal Flow (vphpl)	1800	1600	1800	1800	1700	1700
Lane Width	11	13	11	15	15	13
Total Lost time (s)	2.0	5.0	3.0	2.0	5.0	5.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1706	1358	1621	1941	1742	1464
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1706	1358	1621	1941	1742	1464
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	506	582	228	786	181	627
RTOR Reduction (vph)	0	91	0	0	0	96
Lane Group Flow (vph)	506	491	228	786	181	531
Confl. Bikes (#/hr)		7				
Turn Type	NA	pm+ov	Prot	NA	Prot	pt+ov
Protected Phases	2	3	1	6	3	3 1
Permitted Phases		2				
Actuated Green, G (s)	37.0	63.3	18.3	60.0	26.3	49.3
Effective Green, g (s)	40.1	62.7	20.0	63.1	26.0	49.0
Actuated g/C Ratio	0.42	0.65	0.21	0.66	0.27	0.51
Clearance Time (s)	5.1	4.7	4.7	5.1	4.7	
Vehicle Extension (s)	5.0	5.0	3.5	3.0	5.0	
Lane Grp Cap (vph)	711	956	337	1274	471	746
v/s Ratio Prot	c0.30	0.14	0.14	0.40	0.10	c0.36
v/s Ratio Perm		0.22				
v/c Ratio	0.71	0.51	0.68	0.62	0.38	0.71
Uniform Delay, d1	23.2	8.7	35.1	9.5	28.5	18.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.0	0.9	5.5	2.2	1.1	4.0
Delay (s)	29.2	9.7	40.6	11.8	29.6	22.1
Level of Service	C	A	D	B	C	C
Approach Delay (s)	18.7			18.2	23.8	
Approach LOS	B			B	C	

Intersection Summary			
HCM 2000 Control Delay	20.0	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	96.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	71.8%	ICU Level of Service	C
Analysis Period (min)	15		

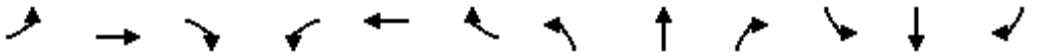
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	892	124	0	320	156	573	0	362	0	0	0
Future Volume (vph)	0	892	124	0	320	156	573	0	362	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	12	14	16	12	13	13	14	12	16	12	12	12
Total Lost time (s)		3.0	3.0		3.0	3.0	5.0		5.0			
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00		1.00			
Frpb, ped/bikes		1.00	0.97		1.00	1.00	1.00		1.00			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		1882	1650		1824	1550	1788		1700			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		1882	1650		1824	1550	1788		1700			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	991	138	0	356	173	637	0	402	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	78	0	0	0
Lane Group Flow (vph)	0	991	138	0	356	173	637	0	324	0	0	0
Confl. Peds. (#/hr)			19						19			
Turn Type		NA	Free		NA	Free	Prot		Prot			
Protected Phases		6			2		4		4			
Permitted Phases			Free			Free	4		4			
Actuated Green, G (s)		55.9	96.0		55.9	96.0	30.3		30.3			
Effective Green, g (s)		58.0	96.0		58.0	96.0	30.0		30.0			
Actuated g/C Ratio		0.60	1.00		0.60	1.00	0.31		0.31			
Clearance Time (s)		5.1			5.1		4.7		4.7			
Vehicle Extension (s)		5.0			4.0		3.0		3.0			
Lane Grp Cap (vph)		1137	1650		1102	1550	558		531			
v/s Ratio Prot		c0.53			0.20		c0.36		0.19			
v/s Ratio Perm			0.08			0.11						
v/c Ratio		0.87	0.08		0.32	0.11	1.14		0.61			
Uniform Delay, d1		15.9	0.0		9.3	0.0	33.0		28.0			
Progression Factor		1.00	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		9.3	0.1		0.8	0.1	83.5		2.0			
Delay (s)		25.1	0.1		10.1	0.1	116.5		30.0			
Level of Service		C	A		B	A	F		C			
Approach Delay (s)		22.1			6.9			83.1			0.0	
Approach LOS		C			A			F			A	

Intersection Summary			
HCM 2000 Control Delay	42.6	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.96		
Actuated Cycle Length (s)	96.0	Sum of lost time (s)	8.0
Intersection Capacity Utilization	89.7%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	116	386	741	122	309	11	127	9	50	4	35	55
Future Volume (vph)	116	386	741	122	309	11	127	9	50	4	35	55
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1600	1600	1600	1600	1600	1600
Lane Width	12	13	12	13	13	12	12	12	13	12	13	15
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.98		1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		1.00	1.00
Satd. Flow (prot)	1676	3465	1451	1732	3444		1416	1431	1344		1613	1393
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		1.00	1.00
Satd. Flow (perm)	1676	3465	1451	1732	3444		1416	1431	1344		1613	1393
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	129	429	823	136	343	12	141	10	56	4	39	61
RTOR Reduction (vph)	0	0	0	0	2	0	0	0	45	0	0	54
Lane Group Flow (vph)	129	429	823	136	353	0	94	57	11	0	43	7
Confl. Peds. (#/hr)			17						16			14
Confl. Bikes (#/hr)			11			4			1			
Turn Type	Prot	NA	Free	Prot	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			Free						8		7	7
Actuated Green, G (s)	8.6	22.9	63.3	7.2	21.5		11.4	11.4	11.4		5.8	5.8
Effective Green, g (s)	9.6	23.9	63.3	8.2	22.5		12.4	12.4	12.4		6.8	6.8
Actuated g/C Ratio	0.15	0.38	1.00	0.13	0.36		0.20	0.20	0.20		0.11	0.11
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	254	1308	1451	224	1224		277	280	263		173	149
v/s Ratio Prot	0.08	0.12		0.08	0.10		0.07	0.04			0.03	
v/s Ratio Perm			c0.57						0.01			0.00
v/c Ratio	0.51	0.33	0.57	0.61	0.29		0.34	0.20	0.04		0.25	0.04
Uniform Delay, d1	24.7	14.0	0.0	26.0	14.7		21.9	21.3	20.6		25.9	25.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	1.6	0.1	1.6	4.6	0.1		0.7	0.4	0.1		0.8	0.1
Delay (s)	26.3	14.1	1.6	30.6	14.8		22.7	21.7	20.7		26.7	25.5
Level of Service	C	B	A	C	B		C	C	C		C	C
Approach Delay (s)		7.8			19.2			21.9			26.0	
Approach LOS		A			B			C			C	

Intersection Summary			
HCM 2000 Control Delay	12.6	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	63.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	48.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	437	58	194	576	69	568
Future Volume (Veh/h)	437	58	194	576	69	568
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	486	64	216	640	77	631
Pedestrians					11	
Lane Width (ft)					16.0	
Walking Speed (ft/s)					3.5	
Percent Blockage					1	
Right turn flare (veh)						7
Median type	None			None		
Median storage veh)						
Upstream signal (ft)				554		
pX, platoon unblocked					0.83	
vC, conflicting volume			561		1569	497
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			561		1584	497
tC, single (s)			4.1		6.4	6.2
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			78		0	0
cM capacity (veh/h)			996		76	565

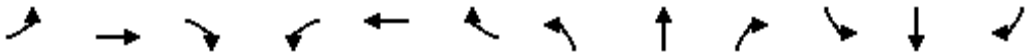
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1
Volume Total	486	64	216	640	708
Volume Left	0	0	216	0	77
Volume Right	0	64	0	0	631
cSH	1700	1700	996	1700	634
Volume to Capacity	0.29	0.04	0.22	0.38	1.12
Queue Length 95th (ft)	0	0	21	0	539
Control Delay (s)	0.0	0.0	9.6	0.0	111.0
Lane LOS			A		F
Approach Delay (s)	0.0		2.4		111.0
Approach LOS					F

Intersection Summary			
Average Delay	38.2		
Intersection Capacity Utilization	74.9%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	468	537	470	609	161	233
Future Volume (vph)	468	537	470	609	161	233
Ideal Flow (vphpl)	1800	1600	1800	1800	1700	1700
Lane Width	11	13	11	15	15	13
Total Lost time (s)	3.1	5.7	3.7	3.1	5.7	5.7
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frpb, ped/bikes	1.00	0.99	1.00	1.00	1.00	1.00
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00	1.00
Frt	1.00	0.85	1.00	1.00	1.00	0.85
Flt Protected	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (prot)	1706	1359	1621	1941	1742	1464
Flt Permitted	1.00	1.00	0.95	1.00	0.95	1.00
Satd. Flow (perm)	1706	1359	1621	1941	1742	1464
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	520	597	522	677	179	259
RTOR Reduction (vph)	0	23	0	0	0	73
Lane Group Flow (vph)	520	574	522	677	179	186
Confl. Bikes (#/hr)		7				
Turn Type	NA	pm+ov	Prot	NA	Prot	pt+ov
Protected Phases	2	3	1	6	3	3 1
Permitted Phases		2				
Actuated Green, G (s)	35.5	63.3	23.3	63.5	27.8	55.8
Effective Green, g (s)	37.5	61.3	24.3	65.5	26.8	54.8
Actuated g/C Ratio	0.37	0.61	0.24	0.65	0.27	0.54
Clearance Time (s)	5.1	4.7	4.7	5.1	4.7	
Vehicle Extension (s)	5.0	5.0	3.5	3.0	5.0	
Lane Grp Cap (vph)	632	900	389	1257	461	793
v/s Ratio Prot	c0.30	c0.17	c0.32	0.35	0.10	0.13
v/s Ratio Perm		0.25				
v/c Ratio	0.82	0.64	1.34	0.54	0.39	0.23
Uniform Delay, d1	28.8	12.8	38.4	9.6	30.4	12.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	11.6	2.1	170.3	1.7	1.1	0.3
Delay (s)	40.3	14.8	208.7	11.3	31.6	12.5
Level of Service	D	B	F	B	C	B
Approach Delay (s)	26.7			97.2	20.3	
Approach LOS	C			F	C	

Intersection Summary			
HCM 2000 Control Delay	56.4	HCM 2000 Level of Service	E
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	101.1	Sum of lost time (s)	14.5
Intersection Capacity Utilization	75.1%	ICU Level of Service	D
Analysis Period (min)	15		

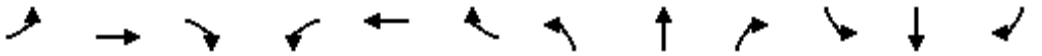
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	372	329	0	684	633	395	0	314	0	0	0
Future Volume (vph)	0	372	329	0	684	633	395	0	314	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	12	14	16	12	13	13	14	12	16	12	12	12
Total Lost time (s)		4.1	3.0		4.1	3.0	5.7		5.7			
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00		1.00			
Frpb, ped/bikes		1.00	0.97		1.00	1.00	1.00		1.00			
Flpb, ped/bikes		1.00	1.00		1.00	1.00	1.00		1.00			
Frt		1.00	0.85		1.00	0.85	1.00		0.85			
Flt Protected		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (prot)		1882	1650		1824	1550	1788		1700			
Flt Permitted		1.00	1.00		1.00	1.00	0.95		1.00			
Satd. Flow (perm)		1882	1650		1824	1550	1788		1700			
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	0	413	366	0	760	703	439	0	349	0	0	0
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	249	0	0	0
Lane Group Flow (vph)	0	413	366	0	760	703	439	0	100	0	0	0
Confl. Peds. (#/hr)			19						19			
Turn Type		NA	Free		NA	Free	Prot		Prot			
Protected Phases		6			2		4		4			
Permitted Phases			Free			Free	4		4			
Actuated Green, G (s)		61.2	101.0		61.2	101.0	30.0		30.0			
Effective Green, g (s)		62.2	101.0		62.2	101.0	29.0		29.0			
Actuated g/C Ratio		0.62	1.00		0.62	1.00	0.29		0.29			
Clearance Time (s)		5.1			5.1		4.7		4.7			
Vehicle Extension (s)		5.0			4.0		3.0		3.0			
Lane Grp Cap (vph)		1159	1650		1123	1550	513		488			
v/s Ratio Prot		0.22			c0.42		c0.25		0.06			
v/s Ratio Perm			0.22			0.45						
v/c Ratio		0.36	0.22		0.68	0.45	0.86		0.21			
Uniform Delay, d1		9.5	0.0		12.8	0.0	34.0		27.3			
Progression Factor		1.00	1.00		1.00	1.00	1.00		1.00			
Incremental Delay, d2		0.9	0.3		3.3	1.0	13.2		0.2			
Delay (s)		10.4	0.3		16.1	1.0	47.2		27.5			
Level of Service		B	A		B	A	D		C			
Approach Delay (s)		5.7			8.8			38.5			0.0	
Approach LOS		A			A			D			A	

Intersection Summary			
HCM 2000 Control Delay	15.7	HCM 2000 Level of Service	B
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	101.0	Sum of lost time (s)	9.8
Intersection Capacity Utilization	67.8%	ICU Level of Service	C
Analysis Period (min)	15		

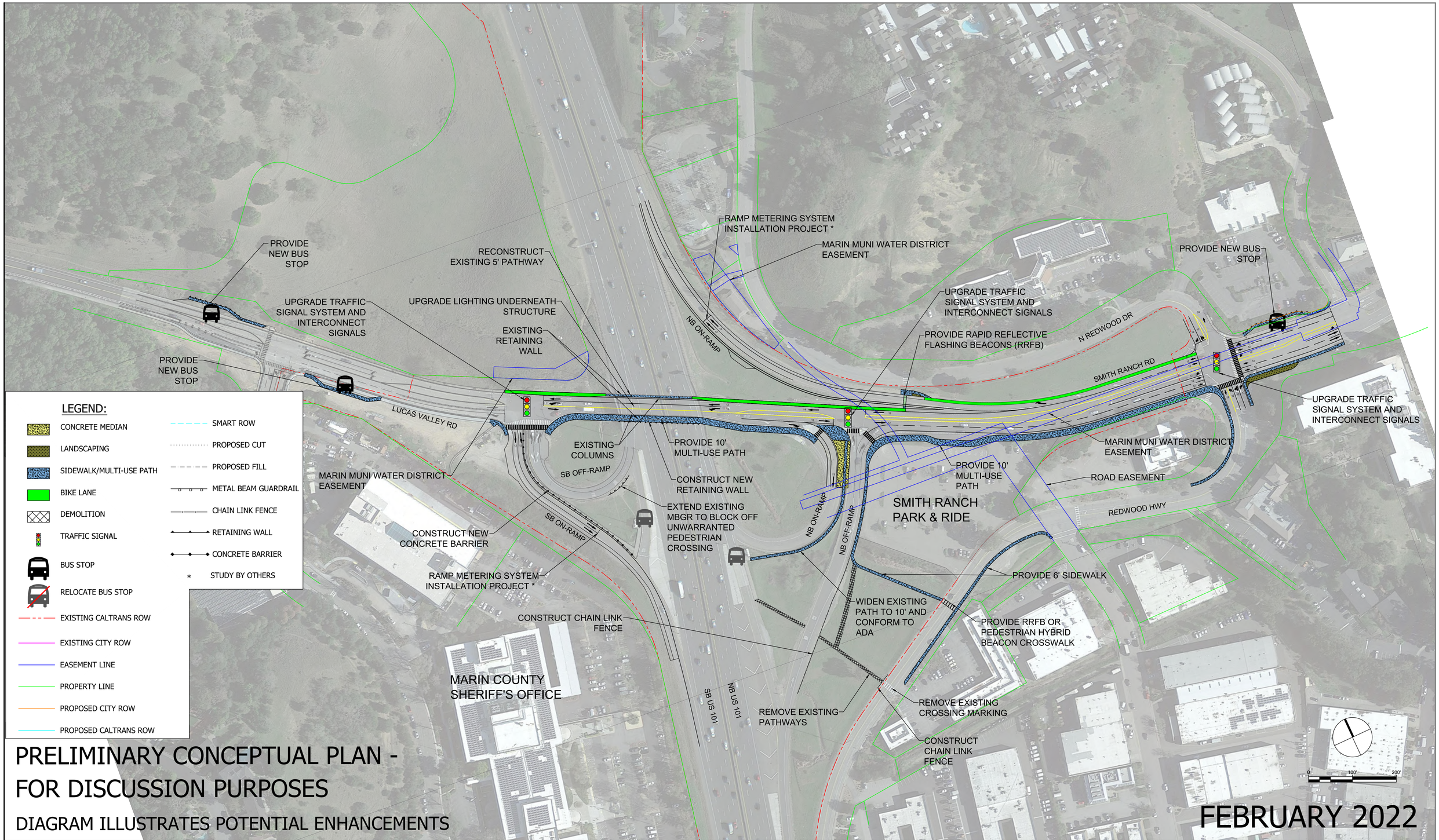
c Critical Lane Group



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	350	215	59	486	13	659	32	128	13	28	197
Future Volume (vph)	135	350	215	59	486	13	659	32	128	13	28	197
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1600	1600	1600	1600	1600	1600
Lane Width	12	13	12	13	13	12	12	12	13	12	13	15
Total Lost time (s)	3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Util. Factor	1.00	0.95	1.00	1.00	0.95		0.95	0.95	1.00		1.00	1.00
Frpb, ped/bikes	1.00	1.00	0.97	1.00	1.00		1.00	1.00	0.97		1.00	0.95
Flpb, ped/bikes	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Frt	1.00	1.00	0.85	1.00	1.00		1.00	1.00	0.85		1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	1.00
Satd. Flow (prot)	1676	3465	1451	1732	3449		1416	1428	1338		1596	1387
Flt Permitted	0.95	1.00	1.00	0.95	1.00		0.95	0.96	1.00		0.98	1.00
Satd. Flow (perm)	1676	3465	1451	1732	3449		1416	1428	1338		1596	1387
Peak-hour factor, PHF	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Adj. Flow (vph)	150	389	239	66	540	14	732	36	142	14	31	219
RTOR Reduction (vph)	0	0	0	0	2	0	0	0	87	0	0	198
Lane Group Flow (vph)	150	389	239	66	552	0	490	278	55	0	45	21
Confl. Peds. (#/hr)			17						16			14
Confl. Bikes (#/hr)			11			4			1			
Turn Type	Prot	NA	Free	Prot	NA		Split	NA	Perm	Split	NA	Perm
Protected Phases	5	2		1	6		8	8		7	7	
Permitted Phases			Free						8		7	7
Actuated Green, G (s)	13.3	25.6	89.8	6.9	19.2		33.5	33.5	33.5		7.8	7.8
Effective Green, g (s)	14.3	26.6	89.8	7.9	20.2		34.5	34.5	34.5		8.8	8.8
Actuated g/C Ratio	0.16	0.30	1.00	0.09	0.22		0.38	0.38	0.38		0.10	0.10
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0	4.0		4.0	4.0
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0	3.0		3.0	3.0
Lane Grp Cap (vph)	266	1026	1451	152	775		544	548	514		156	135
v/s Ratio Prot	c0.09	0.11		0.04	c0.16		c0.35	0.19			c0.03	
v/s Ratio Perm			0.16						0.04			0.02
v/c Ratio	0.56	0.38	0.16	0.43	0.71		0.90	0.51	0.11		0.29	0.16
Uniform Delay, d1	34.9	25.1	0.0	38.8	32.1		26.0	21.1	17.8		37.6	37.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00	1.00		1.00	1.00
Incremental Delay, d2	2.7	0.2	0.2	2.0	3.1		18.0	0.7	0.1		1.0	0.6
Delay (s)	37.6	25.3	0.2	40.8	35.2		44.0	21.9	17.8		38.6	37.7
Level of Service	D	C	A	D	D		D	C	B		D	D
Approach Delay (s)		20.0			35.8			33.2			37.8	
Approach LOS		B			D			C			D	

Intersection Summary			
HCM 2000 Control Delay	30.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	89.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	63.2%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			

I. Preliminary Conceptual Plans



LEGEND:

- CONCRETE MEDIAN
- LANDSCAPING
- SIDEWALK/MULTI-USE PATH
- BIKE LANE
- DEMOLITION
- TRAFFIC SIGNAL
- BUS STOP
- RELOCATE BUS STOP
- EXISTING CALTRANS ROW
- EXISTING CITY ROW
- EASEMENT LINE
- PROPERTY LINE
- PROPOSED CITY ROW
- PROPOSED CALTRANS ROW
- SMART ROW
- PROPOSED CUT
- PROPOSED FILL
- METAL BEAM GUARDRAIL
- CHAIN LINK FENCE
- RETAINING WALL
- CONCRETE BARRIER
- * STUDY BY OTHERS

PRELIMINARY CONCEPTUAL PLAN - FOR DISCUSSION PURPOSES

DIAGRAM ILLUSTRATES POTENTIAL ENHANCEMENTS

FEBRUARY 2022

HNTB
1111 BROADWAY, 9TH FLOOR
OAKLAND, CA 94607
(510) 208-4599

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1750 BRIDGEWAY, SUITE B208
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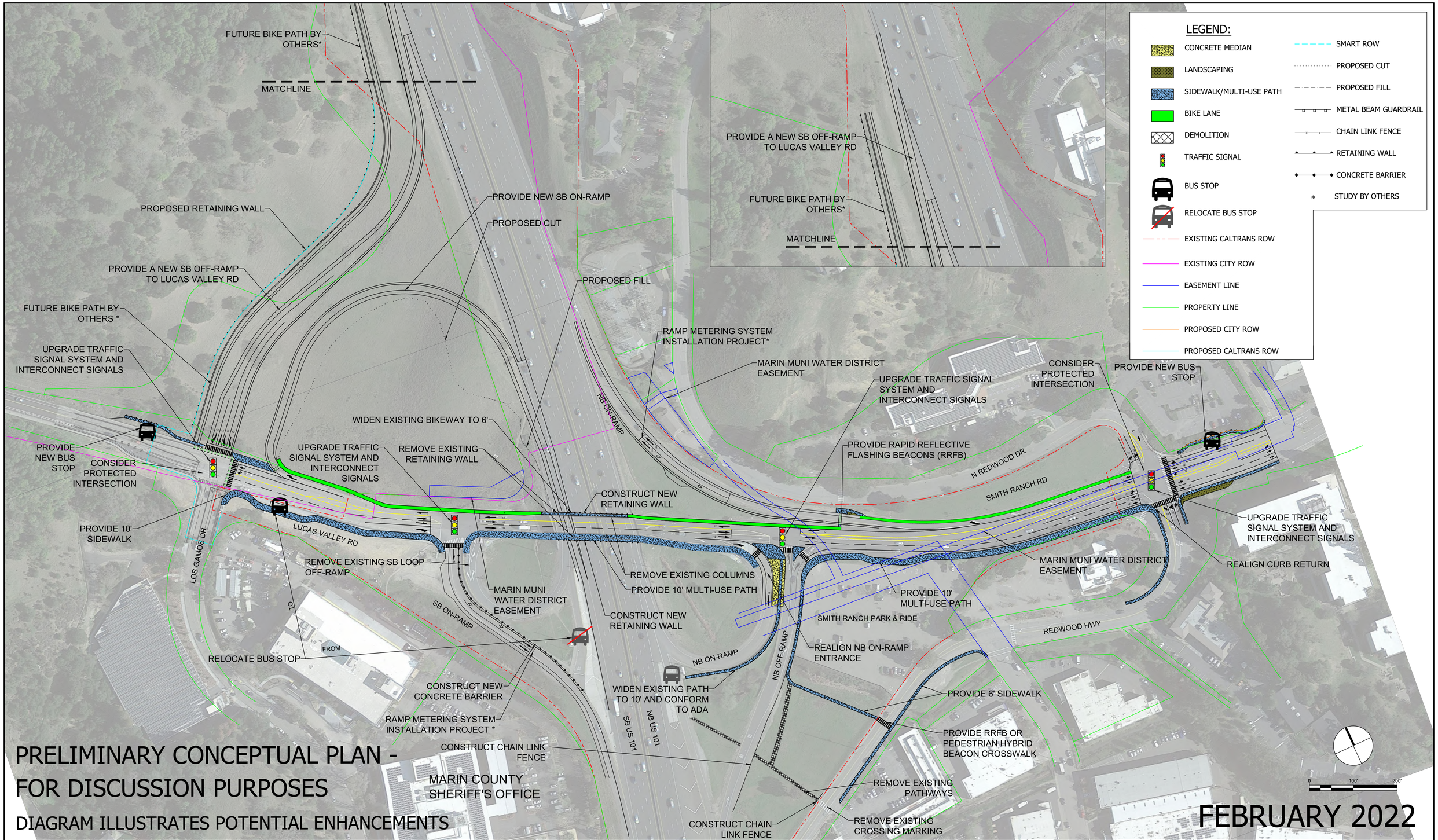
HIGHWAY 101 INTERCHANGE AND APPROACH ROADWAY IMPROVEMENT PROGRAM
LUCAS VALLEY ROAD / SMITH RANCH ROAD
NEAR-TERM IMPROVEMENTS

Transportation Authority of Marin

DATE:	SCALE: 1"=100'
FILENAME:	
PROJECT:	
SHEET NO.	



PRELIMINARY CONCEPTUAL PLAN - FOR DISCUSSION PURPOSES

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HIGHWAY 101 INTERCHANGE AND APPROACH ROADWAY IMPROVEMENT PROGRAM
LUCAS VALLEY ROAD / SMITH RANCH ROAD
LONG-TERM IMPROVEMENTS

TAM Transportation Authority of Marin

DATE:	SCALE: 1"=100'
FILENAME:	
PROJECT:	
SHEET NO.	

J. Deficiency Matrix

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Caltrans HDM)

Note: Existing conditions evaluated against Caltrans HDM(July 2020).

No.	HDM Section	HDM Boldface/Underline Criteria	Standard Applied	Lucas Valley Road / Smith Ranch Rd
1	101.1(2)(c)(2) Local Streets or Roads	**Where the local facility connects to a freeway or expressway (such as ramp terminal intersections), the design speed of the local facility shall be a minimum of 35 miles per hour.** However, the design speed should be 45 miles per hour when feasible.	45 mph standard / 35 mph minimum	•Speed Limit:45mph.
2	Sidewalk	The minimum width of a sidewalk should be 8 feet between a curb and a building when in urban and rural main street place types. For all other locations the minimum width of sidewalk should be 6 feet when contiguous to a curb or 5 feet when separated by a planting strip.	8 feet for urban/rural main street to face of building 6 feet contiguous sidewalk 5 feet with separated planting	•7' sidewalk only on south side of undercrossing
3	201.6 Stopping Sight Distance on Horizontal Curve	Figure 201.6		•Doesn't appear to have issues to be concern with
4	206.3 Pavement Reductions	Through Lane Drops. When a lane is to be dropped, it should be done by tapering over a distance equal to WV, where W=Width of lane to be dropped and V=Design Speed.		•See 504.3(5)
5	208.4 Bridge Sidewalks	**The minimum width of a bridge sidewalk shall be 6 feet.**	6 feet	•N/A
6	208.6 Bicycle and Pedestrian Overcrossing and Undercrossings	The minimum width of walkway for pedestrian overcrossing should be 8 feet. The minimum vertical clearance of the pedestrian undercrossing should be 10 feet.	8 feet	•N/A
7	208.6 Bicycle and Pedestrian Overcrossing and Undercrossing	Class I bikeways are designed for the exclusive use of bicyclists and pedestrians; equestrian access is prohibited.		•Noted - N/A
8	208.10(2) Bridge Barriers and Railings Policies	To reduce the risk of objects being dropped or thrown upon vehicles, protective screening in the form of fence-type railings should be installed along new overcrossing structure sidewalks in urban areas (Sec 92.6 California Streets and Highway Code).		•N/A
9	208.10(2) Bridge Barriers and Railings Policies	**Any use of railings and barriers with sidewalks on structures with posted speeds greater than 45 miles per hour shall have a barrier separation between the roadway and the sidewalk.**		•Speed Limit:45mph. Yes, barriers and fencing installed between roadway and sidewalk. •Roadway appears elevated from roadway more than 6".
10	208.10(6) Bicycle Railing	As a general policy, bicycle railings should be installed at the following locations: (a) On a Class I bikeway, except that a lower rail may be used if a curbed sidewalk, not signed for bicycle use, separates the bikeway from the rail or a shoulder at least 8 feet wide exists on the other side of the rail. (b) On the outside of a Class II or III bikeway, unless a curbed sidewalk, not signed for bicycle use, separates the bikeways from the rail.		•N/A

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Caltrans HDM)

Note: Existing conditions evaluated against Caltrans HDM(July 2020).

No.	HDM Section	HDM Boldface/Underline Criteria	Standard Applied	Lucas Valley Road / Smith Ranch Rd
11	208.10(7) Bridge Approach Railings	**Approach railings shall be installed at the ends of bridge railings exposed to approach traffic.**		▪Has end protection for bridge columns
12	301.1 Width	**Table 302.1**	Single-lane ramps shoulder width: 4' LT, 8' RT Multilane ramps shoulder width: 4' LT, 8' RT	▪NB single lane on-ramp: 3.1'(LT),7.5(RT)- Left shoulder does not meet standards. ▪NB single lane on-ramp(Loop): Decreasing left shoulder width(eventually less than 4'). Right shoulder meets standard ~8'. ▪SB single lane on-ramp:2.1'(LT).8.0(RT) ▪NB single lane off-ramp: 1.5(LT),7.9(RT) ▪SB single lane off-ramp: 1.5(LT),8.1(RT)
13	301.1 Lane Width (travel lane width on overpass/underpass)	**The minimum lane width on two-lane and multilane highways, ramps, collector-distributor roads, and other appurtenant roadways shall be 12 feet, except as follows:** **▪ For conventional State highways and posted speeds less than or equal to 40 miles per hour and AADTT (truck volume) less than 250 per lane that are in urban, city or town centers (rural main streets), the minimum lane width shall be 11 feet.** **▪Where a 2-lane conventional State highway connects to a freeway within an interchange, the lane width shall be 12 feet.** **▪Where a multilane State highway connects to a freeway within an interchange, the outer most lane of the highway in each direction of travel shall be 12 feet.**	12 feet	Underpass lane widths: ▪WB Left lane:10' ▪WB left:10' ▪WB left:11'
14	301.1 Lane Width	**The minimum lane width on two-lane and multilane highways, ramps, collector-distributor roads, and other appurtenant roadways shall be 12 feet, except as follows:** **▪For conventional State highways and posted speeds less than or equal to 40 miles per hour and AADTT (truck volume) less than 250 per lane that are in urban, city or town centers (rural main streets), the minimum lane width shall be 11 feet.** **▪Where a 2-lane conventional State highway connects to a freeway within an interchange, the lane width shall be 12 feet.** **▪Where a multilane State highway connects to a freeway within an interchange, the outer most lane of the highway in each direction of travel shall be 12 feet.**	12 feet *(unless otherwise noted for truck lane width)*	▪NB diagonal off-ramp: single lane transitions to two lanes 14'(LT) 11'(RT) ▪NB diagonal on-ramp (r=145'): single 12' lane ▪NB loop on-ramp: single lane 22' in the middle, lane is widened. ▪SB diagonal on-ramp: single 12' lane ▪SB loop off-ramp (r=121') single lane 17' (20' standard for truck lane width)
15	301.2(1) Class II Bikeway (Bike Lane) Lane Width	**Class II bikeways (bike lanes), for the preferential use of bicycles, may be established within the roadbed and shall be located immediately adjacent to a traffic lane as allowed in this manual.**		▪Class I at underpass and connects to Class II on WB Lucas Valley west of 101. ▪Appears that bikers used shoulder on east side of 101 in WB direction to connect to bike path. (not clearly define between Las Gamos and Redwood).

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Caltrans HDM)

Note: Existing conditions evaluated against Caltrans HDM(July 2020).

No.	HDM Section	HDM Boldface/Underline Criteria	Standard Applied	Lucas Valley Road / Smith Ranch Rd
16	308.1 City Streets and County Roads	**Where local facility, not on the NHS, within the State right of way crosses over or under a freeway or expressway but has no connection to the State facility, the minium design standards for the cross section of the local facility within the State's right of way shall be the local agency adopted standards.**		•Noted
17	308.1 City Streets and County Roads	**Where a local facility crosses over or under a freeway or expressway and connects to the State facility (such as ramp terminal intersections), the minimum design standards for the cross section of the local facility shall be at least equal to those for a conventional highway with the exception that the outside shoulder width shall match the approach roadway, but not less than 4 feet, and as shown below.**		•Noted
18	308.1 City Streets and County Roads	**Where a 2-lane facility connects to a freeway within an interchange, the lane width of the local facility shall be 12 feet.**	12 feet	•Noted - N/A (within Caltrans ROW)
19	308.1 City Streets and County Roads	**Where a multilane local facility connects to a freeway within an interchange, the outer most lane in each direction of the local facility shall be 12 feet.**	Outer lane width = 12'	•Noted - N/A (within Caltrans ROW)
20	308.1 City Streets and County Roads	**Shoulder width shall not be less than 5 feet when railings or other lateral obstructions are adjacent to the right edge of shoulder.**	5' shoulder from lateral obstruction	•Noted - N/A (within Caltrans ROW)
21	308.1 City Streets and County Roads	**If gutter pans are used, then the minimum shoulder width shall be 3 feet wider than the width of the gutter pan being used.**	3' wide shoulder plus gutter pan width	•Noted - N/A (within Caltrans ROW)
22	308.1 City Streets and County Roads	**The minimum width for two-lane overcrossing structures at interchanges shall be 40 feet curb-to-curb.**	40 feet curb to curb	•N/A
23	301.2(1) Class II Bikeway (Bike Lane) Lane Width	**The minimum Class II bike lane width shall be 4 feet, except where:** -Adjacent to on-street parking, the minimum bike lane should be 5 feet -Posted speeds are greater than 40 miles per hour, the minimum bike lane should be 6 feet	Min Class II bike lane width = 4' Class II adjacent to street parking = 5' >40 mph, Class II bike lane width = 6'	•West Direction: Class I bike path at undercrossing?- No marked bike lane. •Unmarked/Discontinued bike lanes on both directions.

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Caltrans HDM)

Note: Existing conditions evaluated against Caltrans HDM(July 2020).

No.	HDM Section	HDM Boldface/Underline Criteria	Standard Applied	Lucas Valley Road / Smith Ranch Rd
24	309.1 (3) Horizontal Clearances for Highways - Minimum Clearances	**The following minimum horizontal clearances shall apply to all objects that are closer to the edge of traveled way than the clear recovery zone distances listed below: (a) The minimum horizontal clearance to all objects, such as bridge rails and safety-shaped concrete barriers, as well as sand-filled barrels, guardrail, etc., on all freeway and expressway facilities, including auxiliary lanes, ramps and collector-distributor roads, shall be equal to the standard shoulder width of the highway facility as stated in Table 302.1. A minimum clearance of 4 feet shall be provided where the standard shoulder width is less than 4 feet. Approach rail connections to bridge rail may require special treatment to maintain the standard shoulder width.**	Standard shoulder width from Table 302.1. 4' minimum for shoulder width < 4'.	•Less than 4' shoulder to columns at overpass
25	309.1 (3) Horizontal Clearances for Highways - Minimum Clearances	**The following minimum horizontal clearances shall apply to all objects that are closer to the edge of traveled way than the clear recovery zone distances listed below: (b) The minimum horizontal clearance to walls, such as abutment walls, retaining walls in cut locations, and noise barriers on all facilities, including auxiliary lanes, ramps and collector-distributor roads, shall not be less than 10 feet per Table 302.1.**	10 feet to abutment walls, retaining wall in cut locations, and noise barriers	•N/A
26	309.1 (3) Horizontal Clearances for Highways - Minimum Clearances	**The following minimum horizontal clearances shall apply to all objects that are closer to the edge of traveled way than the clear recovery zone distances listed below: (c) On conventional highways, frontage roads, city streets and county roads within the State right of way (all without curbs), the minimum horizontal clearance shall be the standard shoulder width as listed in Table 302.1 and 307.2, except that a minimum clearance of 4 feet shall be provided where the standard shoulder width is less than 4 feet.**	Conventional highway, frontage roads, city streets within State ROW, minimum horizontal clearance is standard shoulder width and/or 4 feet	•(City Street) Less than 4' shoulder to columns at overpass
27	309.1 (3) Horizontal Clearances for Highways - Minimum Clearances	In areas without curbs, the face of Type 60 concrete barrier should be constructed integrally at the base of any retaining, pier, or abutment wall which faces traffic and is 15 feet or less from the edge of traveled way (right or left of traffic and measures from the face of wall).		•Substandard - no safety shape present, vertical facing
28	309.2(1)(a) Vertical Clearances - Major Structures - Freeways and Expressways	**16 feet 6 inches shall be the minimum vertical clearance over the roadbed of the State facility (e.g. main lanes, shoulders, ramps, collector-distributor roads, speed change lanes, etc.)**	16.5'	•N/A
29	309.2(1)(c) Vertical Clearances - Major Structures - Conventional Highways, Parkways, and Local Facilities, All Projects	**15 feet shall be the minimum vertical clearance over the traveled way and 14 feet 6 inches shall be the minimum vertical clearance over the shoulders of all portions of the roadbed.**	15' traveled way 14' 6" shoulders	•15.42'
30	309.2(2)Vertical Clearances - Minor Structures	**Pedestrian over-crossings shall have a minimum vertical clearance 2 feet greater than the standard for major structures for the State facility in question. Sign structures shall have a vertical clearance of 18 feet over roadbed of the State facility.**	18.5' over freeways	•N/A

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Caltrans HDM)

Note: Existing conditions evaluated against Caltrans HDM(July 2020).

No.	HDM Section	HDM Boldface/Underline Criteria	Standard Applied	Lucas Valley Road / Smith Ranch Rd
31	403.6(1) Turning Traffic: Treatment of Intersections with Right-Turn Only Lanes	Optional right-turn lanes should not be used in combination with right-turn-only lanes on roads where bicycle travel is permitted.		•N/A
32	403.6(1) Turning Traffic: Treatment of Intersections with Right-Turn Only Lanes	Locations of right-turn-only lanes should provide a minimum of 4-foot width for bicycle use between the right-turn and through lane when bikes are permitted, except where posted speed is greater than 40 miles per hour, the minimum width should be 6 feet.		• Class III bike lane on Lucas Valley
33	405.1(2)(b) Public Road Intersection	The minimum value for corner sight distance at signalized intersections should be equal to the stopping sight distance as given in Table 201.1 measured as previously described.		•No Obstructions
34	405.1(3) Decision Sight Distance	At intersections where the State route turns or crosses another State route, the decision sight distance values given in Table 201.7 should be used.		•N/A
35	405.2(2)(a) Left-turn Channelization: Lane Widths	**The lane width for both single and double left-turn lanes on State highways shall be 12 feet.**	12 feet	•N/A
36	405.2(4) Two-way Left-turn Lane (TWLTL)	**The minimum width for a TWLTL (Two-way Left-turn Lane) shall be 12 feet (see Index 301.1)**	12 feet	•N/A
37	405.3(2)(a) Right-Turn Channelization: Lane and Shoulder Width	**Index 301.1 shall be used for right-turn lane width requirements. Shoulder width shall be a minimum of 4 feet. Lane width is 12'.**	12 feet	•Right turn on SB 101 off-ramp to EB Lucas Valley (approx. 12' Lane width, >4' shoulder width)
38	405.3(2)(b) Right-Turn Channelization: Curve Radius	Where pedestrians are allowed to cross a free right-turning roadway, the curve radius should be such that the operating speed of vehicular traffic is no more than 20 miles per hour at the pedestrian crossing. See Index 504.3(3) for additional information.		•NB off-ramp to Smith Ranch Rd •NB loop on-ramp
39	501.3 Spacing	**The minimum interchange spacing shall be one mile in urban areas, two miles outside of urban areas, and two miles between freeway-to-freeway interchanges and other interchanges. The minimum interchange spacing on interchanges outside of urban areas shall be three miles.**	1 mile (urban)	Existing Condition - •Miller Creek Rd - 0.9 mile •Freitas Parkway - 1 mi

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Caltrans HDM)

Note: Existing conditions evaluated against Caltrans HDM(July 2020).

No.	HDM Section	HDM Boldface/Underline Criteria	Standard Applied	Lucas Valley Road / Smith Ranch Rd
40	504.2(2) Freeway Entrances and Exits	Design of freeway entrances and exits should conform to the standard designs illustrated in Figure 504.2A-B (single lane), and Figure 504.3K (two-lane entrances and exits) and/or Figure 504.4 (diverging brand connections), as appropriate. *Deceleration Length: See HDM 504.2B* *Acceleration Length: See HDM 504.2A*	Single lane on-ramp entrance Acceleration Length = 467.11' (measure from curve to gore point) Merge length = 600' (measure from gore point to 12' lane drop)	•NB loop on-ramp: Accel: Meets Standards(Aux lane provided) Merge: Meets Standards •NB diagonal on-ramp: Accel: 557'>467.1', Meets Standards Merge: 367'<600' •SB diagonal on-ramp: Accel: 404'<467.11' Merge: 477'<600'
41	504.2(2) Freeway Entrances and Exits	**The minimum deceleration length shown on Figure 504.2B shall be provided prior to the first curve beyond the exit nose to assure adequate distance for vehicles to decelerate before entering the curve.**	R<300', DL=570' R=300'-499', DL=470' R=500'-999', DL =420' R=1,000 or greater, DL=270'	•SB loop off-ramp (r=121') = 290'<570'
42	504.3(1)(a) Ramps: Design Speed	When ramps terminate at an intersection at which all traffic is expected to make a turning movement, the minimum design speed along the ramp should be 25 miles per hour. When a "through" movement is provided at the ramp terminus, the minimum ramp design speed should meet or exceed the design speed of the highway facility for which the through movement is provided.		•Noted
43	504.3(1)(b) Ramps: Lane Width (Trucks)	**Ramp Lanes shall be a minimum of 12 feet in width. Where ramps have curve radii of 350 feet or less, measured along the outside edge of traveled way for single lane ramps or along the outside lane line for multilane ramps, with a central angle greater than 60 degrees, the single ramp, or the lane furthest to the right if the ramp is multilane, shall be widened in accordance with Table 504.3 in order to accommodate large truck wheel paths.**	(Inside lane for multilane ramps) R<150', Lane width = 20' R=150-179', Lane width = 17' R=180-209', Lane width = 16' R=210-249', Lane width = 15' R=250-299', Lane width = 14' R=300-350', Lane width = 13' R>35', Lane width = 12'	•NB off-ramp: Single lane transitions to two lanes 14'(LT) 11(RT) •NB on-ramp (r=145'): single 12' lane •NB loop on-ramp: single lane 22' in the middle, lane is widened. •SB on-ramp: single 12' lane •SB loop off-ramp, (r=121') single lane 17' in the middle, lane is widened.
44	504.3(1)(c) shoulder width	**Shoulder widths for ramps shall be as indicated in Table 302.1**		•Shoulder widths indicated above in Section 301.1
45	504.3(3) Location and Design of Ramp Intersections on the Crossroads	**For left-turn maneuvers from an off-ramp at an unsignalized intersection, the length of crossroads open to view should be according to the corner sight distance criteria in Index 405.1**		•N/A - signalized
46	504.3(3) Location and Design of Ramp Intersections on the Crossroads	**The minimum distance (curb return to curb return) between ramp intersections and local road intersections shall be 400 feet.** The preferred minimum distance should be 500 feet.		•680' between ramp entrance/exit
47	504.3(5) Single-lane Ramps	When additional lanes are provided near an entrance ramp intersection, the lane drop should be accomplished over a distance equal to WV. The lane to be dropped should be on the right so the traffic merges left.	WV for ramp entering or exiting the freeway	•Noted - N/A

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Caltrans HDM)

Note: Existing conditions evaluated against Caltrans HDM(July 2020).

No.	HDM Section	HDM Boldface/Underline Criteria	Standard Applied	Lucas Valley Road / Smith Ranch Rd
48	504.3(5) Single-lane Ramps	If the length of the single lane ramp exceeds 1,000 feet, an additional lane should be provided on the ramp to permit passing maneuvers.	exit ramps with lengths greater than 1000' require additional lane	•NB diagonal off-ramp > 1000' •SB diagonal off-ramp > 1000'
49	504.3(9) Distance Between Successive On-ramps	This distance should be about 1,000 feet unless the upstream ramp adds an auxiliary lane in which case the downstream ramp should merge with the auxiliary lane in a standard 50:1 (longitudinal to lateral) convergence.	1000' feet	•NB on ramps: 988' < 1000'
50	504.3(10) Distance Between Successive Exits	The minimum distance between successive exit ramps for guide signs should be 1,000 feet on the freeway and 600 feet on collector-distributor roads.	1000' feet	•Meets standard
51	504.7 Weaving Sections	**Between interchanges, the minimum entrance ramp-to-exit ramp spacing, measured as shown on Figure 504.2A and 504.2B shall be 2,000 feet in urban areas, 5,000 feet outside urban areas, and 5,000 feet between freeway-to-freeway interchanges and other interchanges.**	2000 feet for urban (entrance ramp-to-exist ramp spacing)	•Meets standard
52	1003.1(1)(a) Class I Bikeways (Bike Paths): Traveled Way	**The minimum paved width of a traveled way for a two-way bike path shall be 8 feet, 10 feet preferred. The minimum paved width for a one-way bike path shall be 5 feet.**	Two-way Class I =8' (10' preferred) (5' minimum)	•5' (assumed one-way)
53	1003.1(1)(b) Class I Bikeways (Bike Paths): Shoulder	**A minimum 2-foot wide shoulder, composed of the same pavement materials as the bike path or all weather surface material that is free of vegetation, shall be provided adjacent to the traveled way of the bike path when not on a structure.**	2' clear	•Unclear
54	1003.1(3) Class I Bikeways (Bike Paths): Clearance to Obstructions	**A minimum 2-foot horizontal clearance from the paved edge of a bike path to obstruction shall be provided.**	2' clear to obstruction	•Unclear
55	1003.1(3) Class I Bikeways (Bike Paths): Clearance to Obstructions	**The clear width of a bicycle path on structures between railings shall be not less than 10 feet.**	10' clear from structures	•Does not appear to have 10' clear from structures
56	1003.1(3) Class I Bikeways (Bike Paths): Clearance to Obstructions	**The vertical clearance to obstruction across the width of a bike path shall be a minimum of 8 feet and 7 feet over shoulder.**	Class I vertical clearance = 8' over roadway and 7' over shoulder	•Appears to pass
57	1003.1(7) Class I Bikeways (Bike Paths): Clearance to Obstructions	**The minimum separation between the edge of traveled way of a one-way or two-way bicycle path and edge of traveled way of a parallel road or street shall be 5 feet plus the standard shoulder width. Bike paths within the clear recovery zone of freeways shall include a physical barrier separation.**	Class I - 5' clear + shoulder width to one-way or two-way bicycle path. Can be less with barrier.	•Barrier + fence present

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Local Standards)

Note: Existing conditions evaluated against the Marin County Uniform Construction Standards(July 2008), the City of Novato's Uniform Standards(May 2013), and Marin Transit(August 2013).

No.	Jurisdiction	Criteria	Standard	Lucas Valley Road / Smith Ranch Rd
1	Uniform Construction Standards for Marin County dated July 2018		•Arterial road means road specified in the countywide plan or the Marin county annual road list, and other major roads with an actual or projected ADT over two thousand •Industrial commercial road means providing access to, or through, an industrial or commercial zone or an area of high truck and/or other large vehicle traffic •Collector road means a road with an actual or projected ADT from one though to two thousand •Residential road means a road providing access to a generally residential area and which serves or may serve twenty or more dwelling units, and a maximum potential ADT of one thousand •Minor residential road means a road providing access to a generally residential area and which serve seven to nineteen dwelling units, and a maximum potential ADT of five hundred •Limited residential road means a road which serves two to six dwelling units, and a maximum potential ADT of one hundred fifty	•Arterial/Collector
2	Uniform Construction Standards for Marin County dated July 2019	Design Speed	All roads except residential roads will have a minimum design speed of 25 mph	•Speed Limit:45mph. Yes, Barriers and fencing installed between roadway and sidewalk. ▪ Roadway appears elevated from roadway more than 6".
3	Uniform Construction Standards for Marin County dated July 2020	Centerline Radii	Follow Caltrans Highway Design Manual	•Noted
4	Uniform Construction Standards for Marin County dated July 2021	Intersections	Roads shall intersect each other as near to a right angle as is practical. Where several streets converge at one point, special approach treatment shall be provided to optimize driver sight distance and pedestrian safety. Provisions may include, but are not limited to, setback lines, special rounding, slope grading and/or vegetation removal. Block corners shall be rounded at the property line by a radius of not less than twenty feet and curb or pavement returns shall have a minimum radius of twenty-five feet.	•Noted
5	Uniform Construction Standards for Marin County dated July 2022	Roadway Width - lane widths	The following table sets forth the minimum widths for the improved section measured from face of curb to face of curb. Where no curb or berm is proposed the paved width shall be one foot greater than that listed to allow for edge striping and pavement edge raveling. •limited residential road: 20' with shoulders and 24' with curbs •minor residential road: 28' •residential road: 36' •collector road: 40' •arterial and industrial/commercial: as required	Lucas Valley Dr and Los Gamos Dr (west of underpass): •Lucas Valley Dr:45' •Los Gamos Dr:55' Smith Ranch Rd and Redwood Hwy Intersection(east of underpass): •Smith Ranch Rd:87 •S. Redwood Hwy:49 •N. Redwood Hwy:34' (sub-standard)
6	Uniform Construction Standards for Marin County dated July 2023	Roadway With - shoulder width	Shoulders shall be provided on each side of all roads. Shoulders shall normally be four feet although wider shoulders may be required as deemed appropriate by the agency.	•5' shoulder west of overpass ,outside of Caltrans ROW
7	Uniform Construction Standards for Marin County dated July 2024	Curbs	Curbs and gutters or berms shall be required adjacent to all parking lanes and where physical separation, delineation, or stormwater control is necessary. PCC curbs and gutters shall normally be required in order to minimize long-term maintenance. AC berms may be allowed where appropriate at the discretion of the agency.	**West of Underpass** •Lucas Valley Rd- yes curb yes gutter for EB, No curb yes gutter for WB. No parking lanes •Los Gamos Dr: yes curb yes gutter. Parking lanes on both directions **East of Overpass** •Smith Ranch Rd - yes curb yes gutter for both directions. No parking lanes •N Redwood Dr: yes curb yes gutter for both directions. parking lane on the WB direction •Redwood Hwy- yes curb yes gutter for both directions, no parking lanes

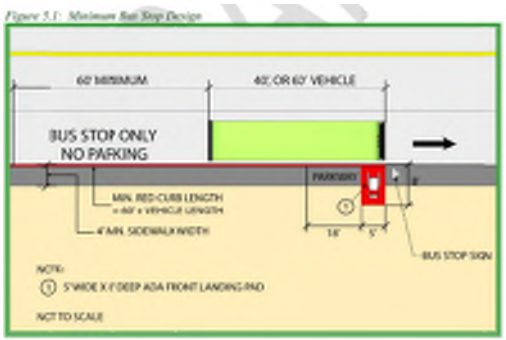
Hwy 101 Interchange Implementation Study - Deficiency Matrix (Local Standards)

Note: Existing conditions evaluated against the Marin County Uniform Construction Standards(July 2008), the City of Novato's Uniform Standards(May 2013), and Marin Transit(August 2013).

No.	Jurisdiction	Criteria	Standard	Lucas Valley Road / Smith Ranch Rd
8	Uniform Construction Standards for Marin County dated July 2025	Sidewalks required	Sidewalks shall be provided in conformance with any applicable general, specific, or community plan which has been adopted by the county. In addition, the following general standards shall apply: (a) Sidewalks shall be required on both side of all roads within residential areas where densities will be equal to or ultimately exceed four units per acre (b) Sidewalks shall be required on only one side of each road within a residential area where densities will be less than four units per acre (c) Pedestrian paths of an acceptable width may also be required through the center of long blocks; to provide access to schools, parks, playgrounds, open space, and other public areas; to river, lake, bay and ocean frontage; to connect cul -de-sac streets and where otherwise necessary as determined by the agency and/or the community development agency. If location outside of the right of way of a county maintained road, provisions must be made for their maintenance. (d) Sidewalks may be eliminated on one or both sides of streets where it is found that topography, density or other circumstances make them impractical as determined by the agency (e) Sidewalks shall be required on both sides of all roads in industrial, commercial and business districts (f) Safe and reasonable direct pedestrian access shall be provided between residential subdivisions and transit stops where feasible	
9	Uniform Construction Standards for Marin County dated July 2026	Sidewalks within city-centered corridor	4' in width adjacent to a curb or 4.5' when separated by a curb. Additional width may be required for potential high pedestrian volumes such as near schools, places of public assembly, commercial areas and in vicinity of senior citizen housing or convalescent hospital.	▪Sidewalk east of underpass: 5' ▪Sidewalk west of underpass: 5'
10	Uniform Construction Standards for Marin County dated July 2027	Sidewalk obstructions	(a) No poles, grates, covers, fire hydrants or other obstructions are allowed within a sidewalk. Utility boxes and other flush facility may be allowed within a sidewalk if their location and nature are deemed safe by the agency. (b) If the postal service requires that mailboxes be located adjacent to the curb then the sidewalk shall be either separated from the curb or wide enough to provide a four-foot obstructed width	Pole within a sidewalk: ▪East side of underpass- ▪West side of the underpass
11	Uniform Construction Standards for Marin County dated July 2028	Transit facilities - passenger shelters	Bus passenger shelters shall be designed to shelter at least eight persons, shall not obstruct a sidewalk and shall be subject to approval of the Marin County Transit District and the agency.	▪Bus Shelter outside of sidewalk
12	Uniform Standards (City of Novato) dated May 2013	Bus Turnout	Refer to drawing no. 195N	▪Missing Bus shelter ▪Missing biker rack ▪Missing Newspaper rack
13	Marin Transit (Golden Gate Transit) dated August 2013		The bus stop has ADA landing pads, 4 - feet accessible sidewalk, a clear wheelchair's space inside the shelter, and barrier and obstacle-free zone.	▪Yes
14	Marin Transit (Golden Gate Transit) dated August 2014		No parking in front of bus stop	▪Yes
15	Marin Transit (Golden Gate Transit) dated August 2015		60' clear from parking to bus stop (near side stops)	▪N/A
16	Marin Transit (Golden Gate Transit) dated August 2016		50' clear from parking to bus stop (far side stops)	▪N/A
17	Marin Transit (Golden Gate Transit) dated August 2017		60' clear from back and 60' clear from front of bus (mid block stops)	▪Yes

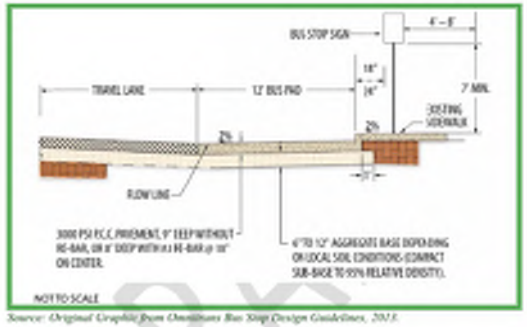
Hwy 101 Interchange Implementation Study - Deficiency Matrix (Local Standards)

Note: Existing conditions evaluated against the Marin County Uniform Construction Standards(July 2008), the City of Novato's Uniform Standards(May 2013), and Marin Transit(August 2013).

No.	Jurisdiction	Criteria	Standard	Lucas Valley Road / Smith Ranch Rd
18	Marin Transit (Golden Gate Transit) dated August 2018		Bus turn-out should be consider: •Traffic in the curb lane exceeds 250 vehicles during the peak hour •Traffic speed is greater than 40 mph •Bus volumes are 10 or more per peak hour on the roadway •Passenger volumes exceed 20 boardings per hour •Average peak-period dwell time exceed 30 second per bus •History of repeated traffic and/or pedestrian accidents at stop location •A right turn lane is used by buses as a queue jumper lane, •Improvements, such as widening, are planned for major roadway. This provides the opportunity to include the bus bay as part of the reconstruction, resulting in better-designed and less-costly bus turnout.	
19	Marin Transit (Golden Gate Transit) dated August 2019		When traffic volumes exceed 1000 veh/hr per lane, placement of a bus turnout on a high-volume road is guided by the following: •Far side intersection placement is desirable. Bus bays should be placed at signal-controlled intersection so that the signal can create gaps in traffic. •Near side bays should be avoided because of conflicts with right-turning vehicles, delays to transit service as buses attempt to re-enter the travel lane, and obstruction of traffic control devices and pedestrian activity unless associated with key sites or key pedestrian access to major transit-oriented activities centers. •Midblock bus bays locations are not desirable unless associated with key pedestrian access to major transit-oriented activities centers.	
20	Marin Transit (Golden Gate Transit) dated August 2020		Bus pad : 8" thick reinforced concrete pad with #3 rebar at 18" OC. Width of pad =11' and varies in length (40'-60') (depends on bus length)+3' buffer at beg/end	•Adjacent to SB 101 (Stop ID 40606): No Bus Pad, cracks on pavement visible. •Adjacent to NB 101 (Stop ID 40607): Standard Bus Pad
21	Marin Transit (Golden Gate Transit) dated August 2021		ADA Landing Pad : front landing pad are 5 feet parallel to street and 8 feet deep and rear landing pad are 5 feet parallel to street and 8 feet deep (ADAAG 10.2.1)	•Yes
22	Marin Transit (Golden Gate Transit) dated August 2022		Minimum Bus Stop Design 	•Noted

Hwy 101 Interchange Implementation Study - Deficiency Matrix (Local Standards)

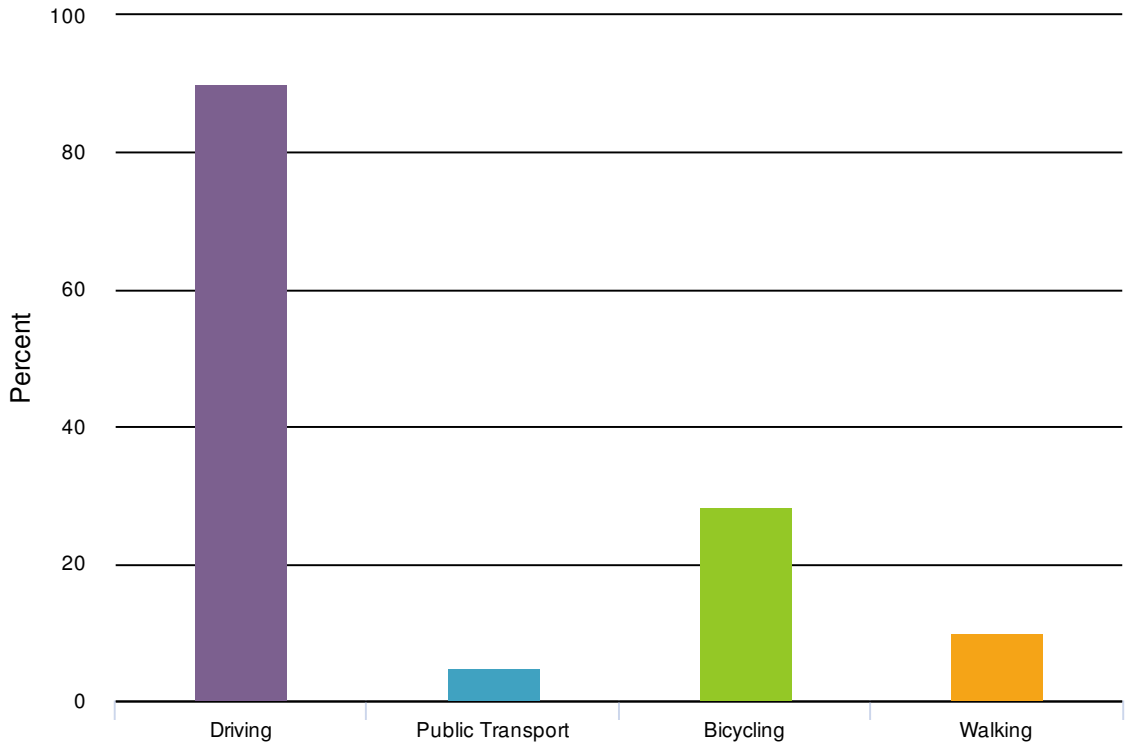
Note: Existing conditions evaluated against the Marin County Uniform Construction Standards(July 2008), the City of Novato's Uniform Standards(May 2013), and Marin Transit(August 2013).

No.	Jurisdiction	Criteria	Standard	Lucas Valley Road / Smith Ranch Rd
23	Marin Transit (Golden Gate Transit) dated August 2023		Bus Pad Design - Cross Section  Source: Original Graphic from Omnitrans Bus Stop Design Guidelines, 2015.	•Noted

K. Online Survey Comments

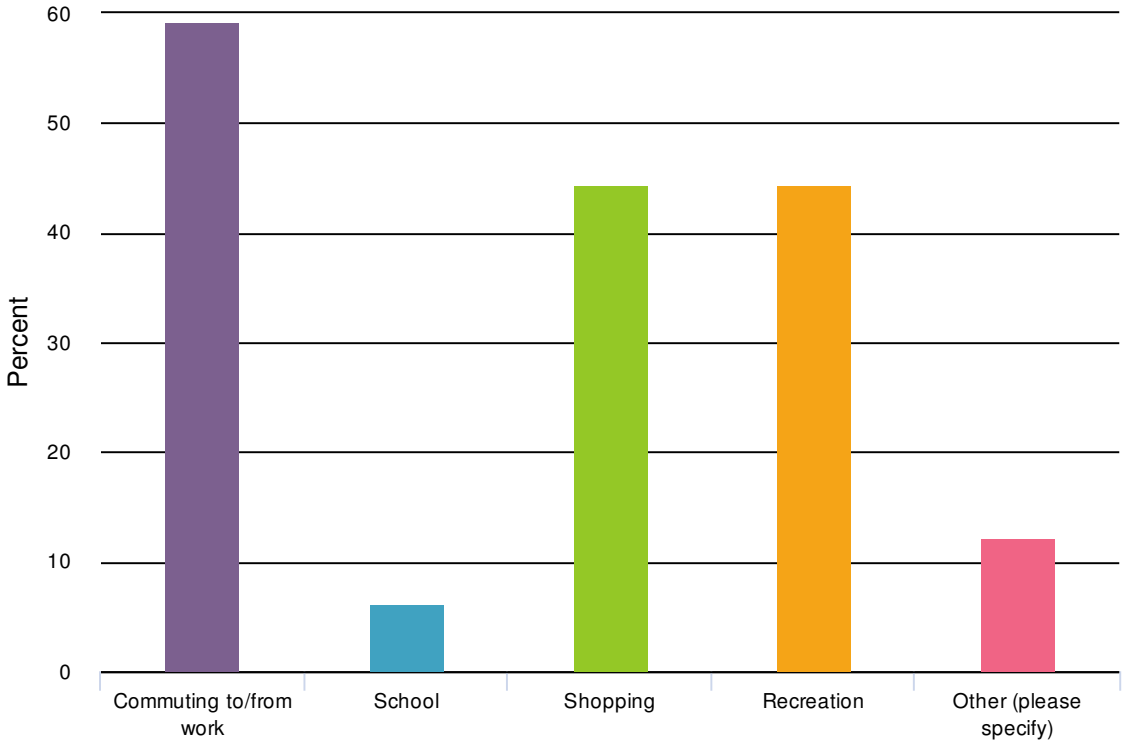
Lucas Valley Road / Smith Ranch Road

33. How do you normally travel through this interchange? Select up to 2



Value	Percent
Driving	90.1%
Public Transport	4.9%
Bicycling	28.4%
Walking	9.9%

34. What are the main purposes you use this interchange for? Select up to 2



Value	Percent
Commuting to/from work	59.3%
School	6.2%
Shopping	44.4%
Recreation	44.4%
Other (please specify)	12.3%

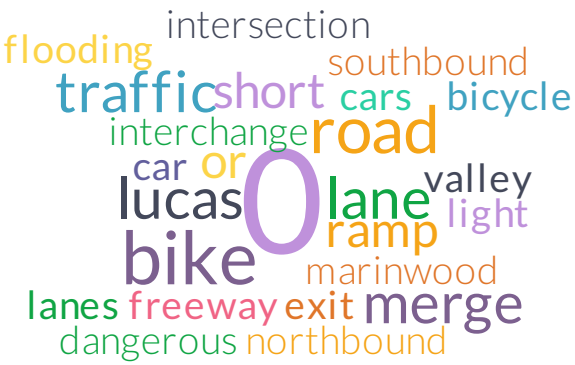
Other (please specify)
All of the above
Daily neighborhood access for everything
Driving while working
Go to Marin Conservation League office
Kaiser Hospital
Visit relative
Visiting family members
en route to appointments
everything else

35. Please rank the following priorities for this interchange based on their importance to you:

	Not Important	Lower Importance	No Opinion	Somewhat Important	Most Important	Responses
Reduce traffic congestion Row %	11.1%	19.8%	11.1%	35.8%	22.2%	81
Make it easier to drive to and from this interchange Row %	6.2%	13.6%	18.5%	25.9%	35.8%	81
Improve the quality and access to bus stops near this interchange Row %	11.1%	11.1%	27.2%	34.6%	16.0%	81
Increase Park and Ride capacity Row %	16.0%	19.8%	34.6%	25.9%	3.7%	81
Make it safer to walk around this interchange Row %	7.4%	6.2%	24.7%	27.2%	34.6%	81
Make it safer to bike around this interchange Row %	8.6%	7.4%	19.8%	25.9%	38.3%	81
Improve lighting and security Row %	7.4%	7.4%	30.9%	28.4%	25.9%	81

	Not Important	Lower Importance	No Opinion	Somewhat Important	Most Important	Responses
Improve environmental sustainability and resiliency (e.g. protection from flooding and sea level rise) Row %	10.0%	8.8%	26.3%	26.3%	28.8%	80
Totals Total Responses						81

36. Is there anything else you'd like to let us know about traveling on or around this interchange? Please be as specific as possible.



ResponseID	Response
327	SB Exit - that curve is Dangerous! On rainy days cars always take it too fast. take part of the hillside away to the north and have cars exit gradually instead of making that hairpin turn. Repurpuse that turn into a carpool/metering light configuration to enter the freeway.
357	Some of the roadway is in significant disrepair and needs to be repaved, especially the on-ramp to N- 101. I think making this interchange safer for pedestrians and bike riders who are getting to the bus pad on 101 is also important.
367	The overpass is very difficult to ride under when bicycling. It is too narrow, dark, and flooding creates even greater difficulty. Please consider the use of rotaries; I have traveled to The Netherlands and really love their approach to bike paths having priority in any community.
370	--Add green lanes for cyclists. Make sure to have the green lanes continue in the line of bike travel when crossing merge lanes. Encouraging cyclists to deviate right, then left confuses drivers. --Opposite Los Gamos Drive at Lucas Valley Road add bike/ped path that curls up through 101 gap near inspection station and then to Marinwood Avenue. This aligns well with North-South Greenway over Pacheco Hill.
384	I have had issue when exiting from 101 northbound to turn left onto LVR the curb seems too far out in the intersection at the light and it's easy to clip the edge of it. It has been improved which will help, but it seems to stick out into the intersection too far from the limit line.

ResponseID	Response
387	repave under the freeway. Difficult to navigate the intersection on bike, or as a ped.
390	--Add bicycle green lanes to the overpass. Be sure these lanes cross motor vehicle 101 ramp lanes in a straight alignment in the direction of intended travel. A zig-zag route confuses motorists. --Opposite Los Gamos Drive at Lucas Valley Road add bike/ped path that gently curls up to 101 gap (just south of inspection station) to Marinwood Avenue.
417	There is a slight diversion for those on bicyclists under the overpass. It is hardly identifiable as one cycles past and ends up in a darken (shadowed) lane with motor vehicles. It is clearly a poorly designed afterthought. People on bicycles and on foot deserve the same safety considerations as those in motor vehicles!
455	Flooding is problem at this intersection. The intersection disregards pedestrian and bicycle safety which discourages access from the west side residential areas to the east side recreation areas other than by car.
541	this area is going to become very bad very fast due to kaiser moving in. sherriffs office has increased traffic and flow already need to get a head of this interchange before it is too late
618	Actually commenting on the St Vincent's/Marinwood interchange, as many Marinwood residents avoid using Marinwood's unsafe onramp to 101S—instead using surface streets to get to the Lucas Valley onramp. Proposed fix for Marinwood onramp to 101S: Run onramp out to meet the bus lane sooner—giving drivers on 101S and the onramp more time to see each other and match their speed. The current Marinwood onramp to 101S is extremely dangerous, requiring drivers heading through a bumpy curve very little time to see and match speeds with freeway traffic—right before the concrete abutment just before the CHP truck scales.
653	You should consider fixing the 101S on-ramp coming from marinwood instead. The merge is very short and happens very quickly. I have nearly been run off the road (toward the metal/concrete guard rail on the far right edge of 101) because cars were coming up the far right lane and did not slow down/speed up to make space for me to merge in. There is nowhere to go but to crash into the guard rail or stop your car in the middle of the on-ramp.
657	Marinwood 101 Southbound pne exit north is very hazardous. On multiple occasions I have narrowly escaped a bad accident or being pushed off the road by oncoming traffic - even when there are work crews on the side of the road!

ResponseID	Response
668	This intersection works well. Don't screw it up. But this one is probably "easier" to work on, so you'll waste time and money playing here instead of doing real work like fixing 580/101 connections or finishing the widening of 101 to Petaluma.
748	The northbound interchange is in horrible shape and has been for many years. Resurfacing it to bring it up to standard will help all users.
911	Only ever used this on weekends, which means minimal congestion. I've always found this interchange to be easy to navigate, easy entrance/exit.
920	My comments are less about traffic flow and more directed toward surface conditions of the ramp, particularly the east bound Smith Ranch/Lucas Valley Road to Northbound 101. As a motorcyclist, the longitudinal grooves that have developed in the surface in the last ten or so years are a safety hazard to motorcyclists. "Edge trap hazards" as these kind of pavement faults are referred to, can catch a motorcycle wheel and not allow it to escape, potentially causing a crash for the rider. In high traffic areas like this ramp, that may lead to following cars running the rider over.
1056	This is a dangerous interchange. Cars are going fast. Children ride their bikes through here to get to McGuinness Park (Skateboard/scooter park, golf, fishing etc.). It would be nice to have guard rails, lighting and clearly marked signage.
1163	On-ramp at Marinwood miller creek going south bound is too short
1183	The Marinwood on-ramp to southbound 101 is a death trap and trucks exiting the CHP truck stop is even scarier! There is a very short distance for the on-ramp and a metal guardrail preventing crashing into the creek.
1237	This interchange isn't bad, except for the excessively long walk from the Park & Ride. But why isn't the Marinwood interchange on your list? The entrance to southbound 101 is short and very hazardous, with a guardrail on the right that forces a quick merge into traffic. That's the interchange that needs attention.
1257	I am answering the questions in response to an entry way to 101 S out of Marinwood. I am surprised that this merge onto highway 101 south is not on the list. This is a very dangerous and short merge that is close to the truck inspection station to the right of 101 south. Numerous times I have had to pull over where there is no shoulder to wait for cars to pass, then speed up to get onto the freeway. If there is a car in front of you driving too slow, it creates more of hazard.
1276	There needs to be better signage for cyclists and drivers so they'll both be aware of where to merge. This should happen at all the intersections where the routes are popular for cyclists. This is the route to China Camp, which is a popular road cycling loop and a destination for mt. bikers.

ResponseID	Response
1670	Improve timing of the light...too long wait for left turn!
1702	The underpass is poorly lit and subject to flooding. Also the new interchange at Los Gamos Drive introduces another traffic light to the area and that will no doubt increase backups.
1704	Another nearby interchange - Miller Creek/Marinwood. I lived in Marinwood, commuted to SF for years. the southbound on ramp is way too short. Numerous times lots of heavy brake/avoidance action. It doesn't help that 1. weigh station entrance is right there - and 2. bridge over the creek is really close.
1745	Public transport can be very difficult here with the amount of traffic
1750	The pooling of water under 101 in the winter is fairly substantial. Adding lighting and/or mitigating the standing water would be a great safety improvement.
1759	IMprovements were made to this intersection recently and love the improvements. I'm a little disappointed that a bike lane doesn't continue through the underpass but that seems like a much bigger job.
1775	This app medrosas is scary on a bike. Thank you for the opportunity to comment.
1801	IT IS LONG OVERDUE TO FIX THAT UNDERPASS SO IT DOES NOT FLOOD PLUS IT NEEDS MORE LANES AND A BIKE LANE
1825	The truck scales on southbound 101 are in a dangerous location. Trucks frequently merge unsafely and push other cars out of their lane. I've seen cars forced off the road. Please move it to a safer location
1841	Better signage and/or signal crossings to protect pedestrians are needed. But huge improvements are already being made here!
1843	The additional traffic signals adjacent to this interchange will require complex coordination of signal lights to avoid backups.
1916	There is no 'save' way to cross the highway by bike. The situation is confusing for cars and bikes. The underpass is too narrow. The traffic light at both sides should be timed in the mean time to have a stoped car cycle so bikes can safely pass under the highway

ResponseID	Response
1956	Flooding makes underpass impassible.
2019	Southbound Highway entrance is too short.
2061	Lucas Valley Rd between Las Gallinas and the freeway is vastly improved now with completed sidewalk and striping. Looking forward to the new signal at Los Gamos which will make it easier and safer to turn left there, esp on a bike. It's too narrow in the underpass, and the section of Smith Ranch Road between the freeway and the old Fair Isaac building are harrowing on a bicycle. It would be great if the underpass could be widened to include bike lane all the way east to McGinnis.
2294	There are bike lanes on Lucas Valley Road. I would not encourage anyone who is not an experience bike rider to merge into the travel lanes to cross under the freeway. Sometimes the interchange is closed to flooding. Frequency data should be collected. A better mitigation plan should be in place with advanced signage for detours. Northbound travelers should exit at Freitas to access the area. The area is ugly. Old abandoned ramps exist on the east side. Remove the AC and revegetate. Unfriendly place to walk. The west side has a large staging area that should be revegetated.
2380	The timing for the traffic signals at the northbound exit are timed poorly, causing exiting traffic to back up onto 101.
2441	The truck weigh station prior to southerly exit makes it difficult for trucks to merge back into 101 quickly from the exit only lane. Scary at times
2444	No comment to make. New traffic light may impact Lucas valley at 101 but need to see if any change after it is operational
2445	Comment on worst on-ramp in Marin. 101 southbound from Marinwood/Miller Creek Road. Merge lane is short, merging traffic enter from strong angle. I drive 101 S each day to leave at Lucas Valley Rd. I never stay in the right-hand lane when on 101S as too many times have traffic trying to merge with little concept of how to merge. Northbound offramp to Miller Creek is fantastic, southbound sucks. Second worst onramp: Rowland to southbound 101. 3 lanes, poor merge signs/markings into 1 lane, and no road signs/marking to remind they are merging to active highway w/o right of way
2476	Surface of roadway on NB 101 onramp from Lucas Valley Rd/Smith Ranch Road eastbound needs to be resurfaced.
2529	Very confusing as you leave the interchange or try to get on it again
2653	Undercossing is narrow and the pedestrian pathway is inadquate. Undepass is sometimes closed for flooding. Proposed southbound exit from 101 should be constructed.

ResponseID	Response
2722	Improve pedestrian, especially bicycle, access throughout the exchange with safer pathways and better lighting under the tunnel.
2847	Under the freeway floods during heavy rainfall.

L. Existing FEMA Map

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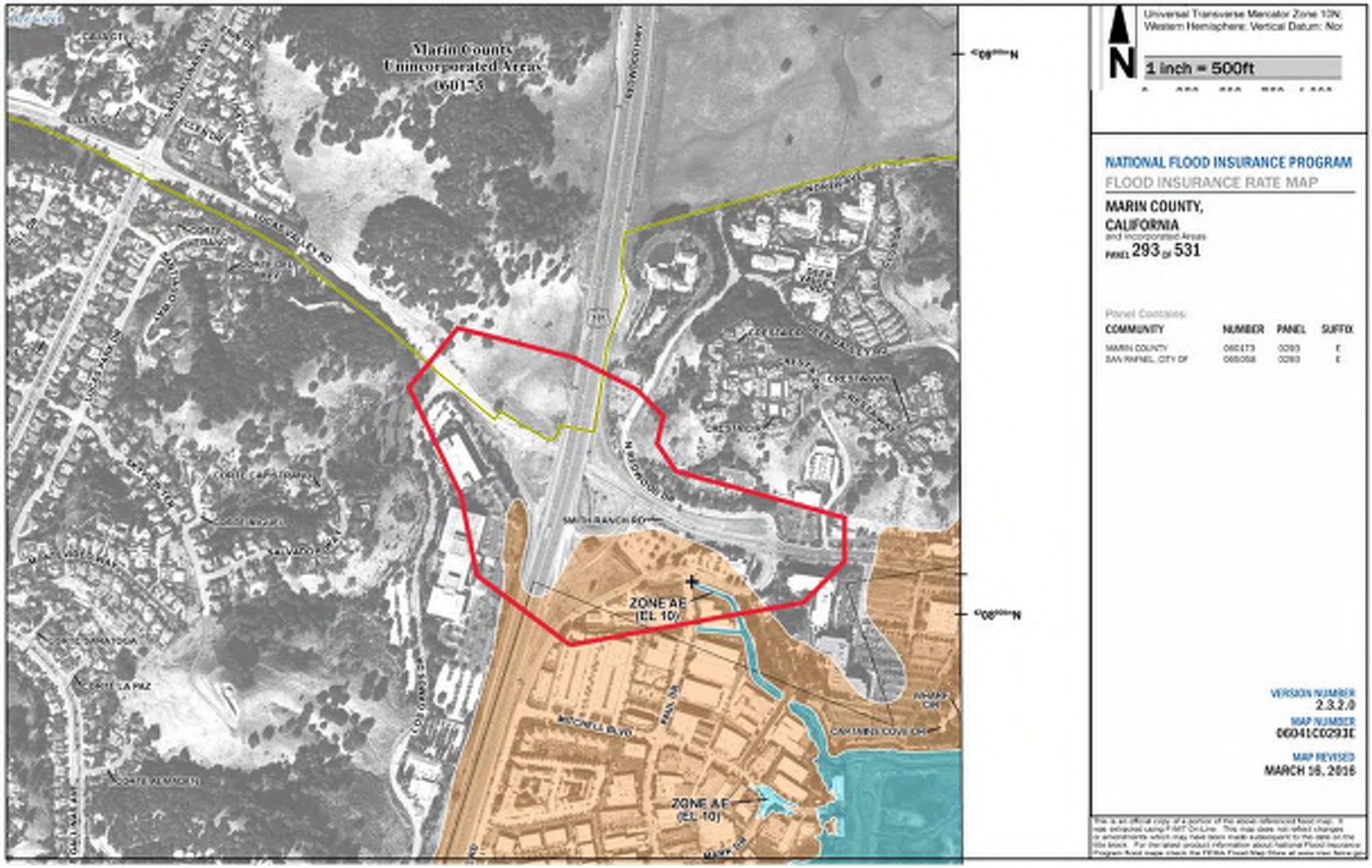

Figure 1. FEMA Flood Insurance Rate Map