

Highway 101 Interchange

Tiburon Boulevard (Highway 131) and East Blithedale Avenue

SEPTEMBER 2017



BACKGROUND

The Tiburon Boulevard/East Blithedale Avenue interchange serves Mill Valley to the west of Highway 101 (via East Blithedale Avenue) and Strawberry, Tiburon and Belvedere to the east (along State Route 131, also known as Tiburon Boulevard).

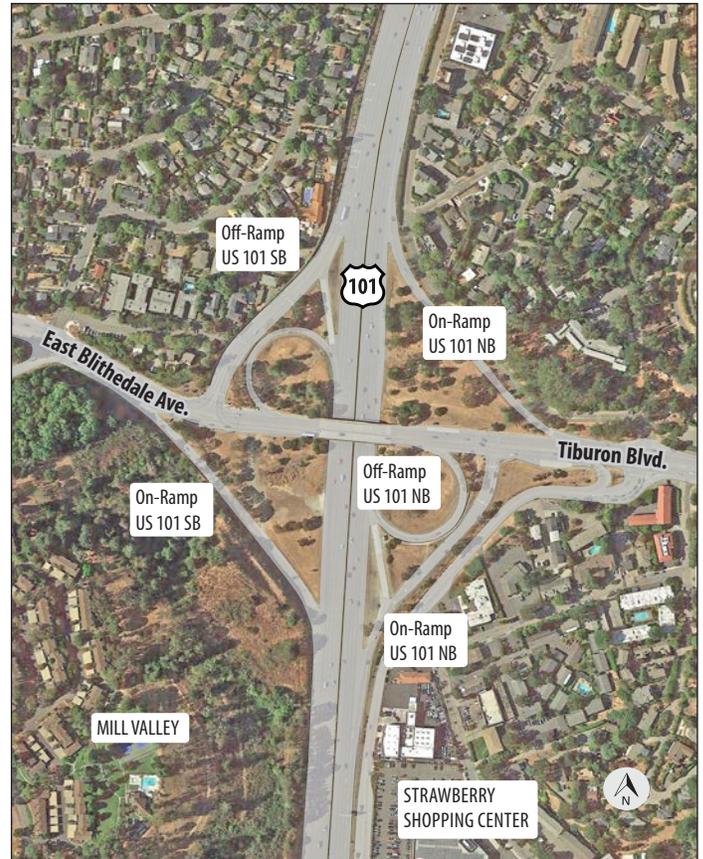
Initially an at-grade intersection in the 1930's, it was later built as a grade-separated interchange with four cloverleaf ramps and four diagonal ramps. Today it retains its 1950's design except for the removal of the loop off-ramps (for safety purposes) and the added lane on the southbound off-ramp.

East Blithedale Avenue and Tiburon Boulevard, both multilane arterial roadways, and Redwood Highway Frontage Road connect with the interchange.

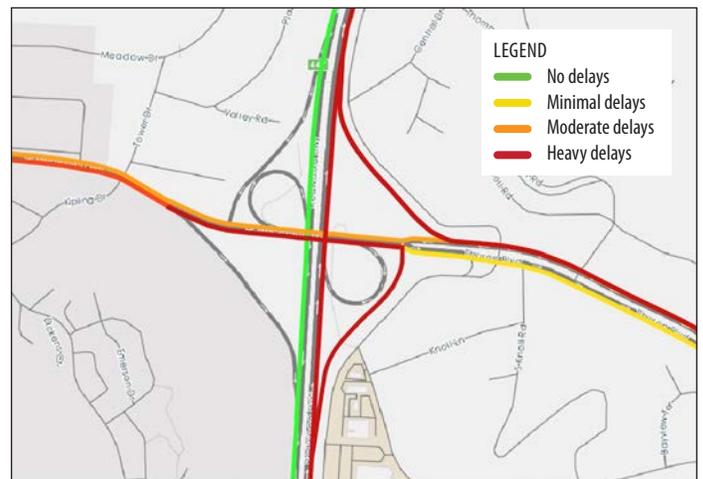
The interchange serves 10 bus stops, including highway level stops between off- and on-ramps. It has a narrow sidewalk along the north side of the overcrossing. No bicycle facilities exist.

TRAFFIC AND CONGESTION

Recent traffic counts show that each weekday about 80,000 vehicles traverse the interchange's approach roadways of East Blithedale Avenue, Tiburon Boulevard, and Redwood Highway Frontage Road. Traffic congestion occurs during morning, after-school, and late afternoon/early evening periods, with eastbound back-ups extending into Mill Valley, westbound



Traffic congestion approaching the 101 crossing.



Weekday PM peak period traffic congestion.

vehicle queuing to Strawberry, and northbound congestion on the frontage road's approach.

Northbound Highway 101 suffers from recurring congestion, further constraining throughput along the interchange's roadways.

Vehicle collisions, with some involving pedestrians or bicyclists, have occurred along the arterial roadways, and conflict potential is exacerbated during congested periods.

CHALLENGES / CONSTRAINTS

Weekday and weekend traffic congestion will persist due to recurring back-ups on northbound Highway 101 and because of limited throughput capacity available on East Blithedale Avenue and Tiburon Boulevard.

The interchange area is served with four separate signalized intersections within just one-third of a mile, including the signal at the multi-phased intersection with Redwood Highway Frontage Road.

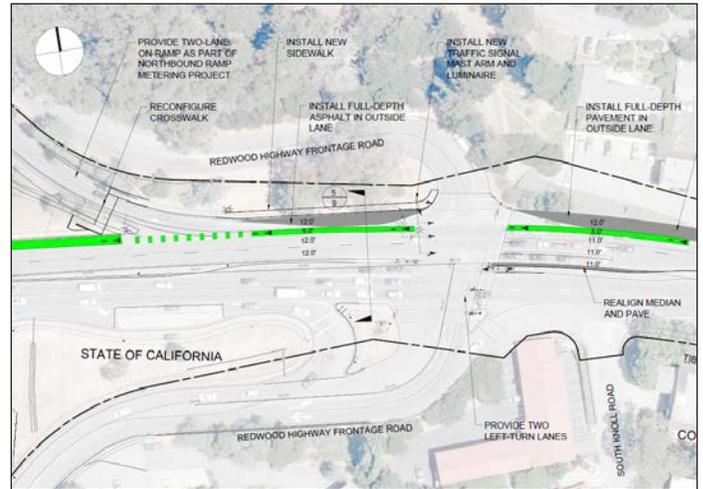
The overcrossing bridge accommodates four traffic lanes and a sidewalk in its 59-foot width, and lacks adequate shoulders or bicycle lanes.

Traffic demands are forecast to increase through the interchange area. Bus use, pedestrian activity, and bicycle ridership – on weekdays and weekends – is also expected to increase.

OPPORTUNITIES / SOLUTIONS

Potential solutions include:

- Increasing the capacity of the Tiburon Boulevard/ Redwood Highway Frontage Road intersection by providing a second northbound left-turn lane and an additional westbound through lane
- Adding an additional lane to the northbound diagonal on-ramp
- Providing more capacity to the northbound loop on-ramp
- Widening the Highway 101 overcrossing to accommodate a third eastbound traffic lane between Kipling Drive and South Knoll Road
- "Squaring up" on-ramp connections with the overcrossing to improve safety
- Relocating and/or improving the bus stops and bus access



Decreasing East Blithedale Ave./Tiburon Blvd. vehicle delays by providing improvements at key eastside congestion hot spot.

- Installing on-ramp meters to improve overall operational efficiency of Highway 101
- Improving intersection coordination
- Providing bikeways
- Improving sidewalks and filling in missing gaps

COSTS

Planning-level estimated capital (design, environmental clearance, and construction) and right-of-way costs range as follows:

- Capital: \$60,000,000 to \$120,000,000
- Right-of-way: \$1,000,000 to \$5,000,000

NEXT STEPS

Potential next steps include:

- Identify interchange area stakeholders
- Obtain funding to further evaluate challenges and identify short- and long-range interchange improvement options
- Prepare geometric layout, identify right-of-way needs, and conduct environmental studies
- Obtain funding for design and construction
- Construct improvements



Highway 101 Interchange

Paradise Drive and Tamalpais Drive

SEPTEMBER 2017



BACKGROUND

The Paradise Drive/Tamalpais Drive interchange, located in Corte Madera, was originally constructed in the 1950's with four cloverleaf ramps and four diagonal ramps. Due to safety reasons, the two loop off-ramps were removed in late 1970's. The overcrossing is only four lanes wide and provides limited motorist sight distance. There is a narrow sidewalk along one side of the overcrossing. The interchange serves four bus stops, including two stops at highway level.

The interchange connects the east and west sides of Corte Madera; major regional shopping malls are located on each side of Highway 101.

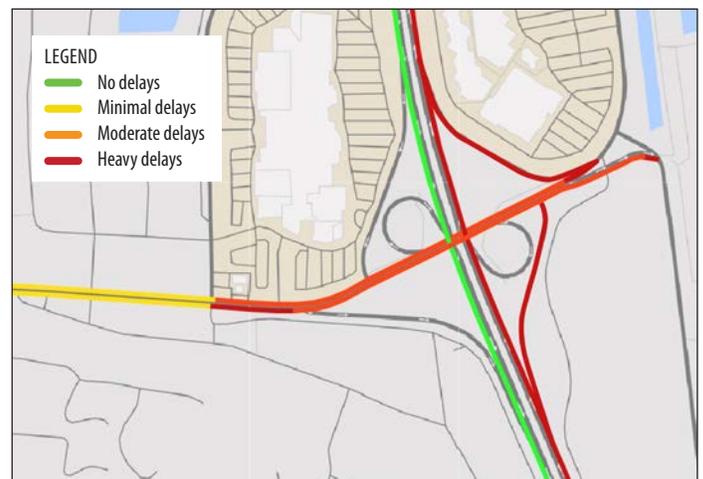
TRAFFIC AND CONGESTION

Eastbound and westbound traffic often experiences congestion along the Paradise Drive/Tamalpais Drive overcrossing, particularly during the weekday late afternoon/early evening peak period.

Northbound Highway 101 faces heavy congestion for a number of hours during the late afternoon and early evening. Traffic backs up along both of the interchange's northbound on-ramps, and extends along Paradise Drive and Tamalpais Drive.



Northbound Highway 101 traffic back-up.



Weekday PM peak traffic congestion.

A number of vehicle collisions have occurred along the overcrossing's approaches to the signalized ramp intersections due to back-ups and limited sight distance.

CHALLENGES / CONSTRAINTS

Late afternoon/early evening congestion will continue to occur due to northbound Highway 101 back-ups and the lack of an auxiliary traffic lane between the interchange's diagonal on-ramp and the off-ramp serving Sir Francis Drake Boulevard. The northbound off-ramp will continue to back-up.

The narrow four-lane width of the overcrossing will continue to constrain vehicle throughput, and the profile of the overcrossing will continue to limit motorist sight lines when approaching the ramp intersections.

The four-foot wide sidewalk on the south side is not comfortable for most pedestrians, and the lack of continuous bike lanes across the overcrossing contributes to conflicts.

OPPORTUNITIES / SOLUTIONS

Potential solutions include:

- Adding a northbound Highway 101 auxiliary lane to Sir Francis Drake Blvd.
- Widening the overcrossing to provide more traffic and/or turning lanes
- Reconstructing the overcrossing with a different profile to improve motorist sight lines
- Providing a wide sidewalk on both sides of the overcrossing, or a multiuse pathway along one side
- "Squaring up" on-ramp connections from the overcrossing to improve safety
- Widening the on-ramps to provide added traffic capacity
- Relocating and/or improving the bus stops and bus stop access
- Installing on-ramp meters to improve overall operational efficiency of Highway 101
- Improving intersection signal coordination



Reconstructing overcrossing and providing additional traffic lanes.

COSTS

Planning-level estimated capital (design, environmental clearance, and construction) and right-of-way costs range as follows:

- Capital: \$60,000,000 to \$90,000,000
- Right-of-way: \$1,000,000 to \$5,000,000

NEXT STEPS

Potential next steps include:

- Identify interchange area stakeholders
- Obtain funding to further evaluate challenges and identify short- and long-range interchange improvement options
- Prepare geometric layout, identify right-of-way needs, and conduct environmental studies
- Obtain funding for construction
- Construct improvements



Highway 101 Interchange

Central San Rafael: Ramps to and from 2nd Street

SEPTEMBER 2017



BACKGROUND

The Central San Rafael interchange was constructed in the 1950's. The southern ramps and the local streets that intersect them experience recurring traffic congestion throughout the day.

The two-lane on-ramp to southbound Highway 101 is served by 2nd Street and Hetherton Street. Its two lanes quickly merge to one lane before joining southbound Highway 101 as an auxiliary lane that extends to the off-ramp to eastbound I-580.

The two-lane off-ramp from northbound Highway 101 is served by auxiliary lanes along northbound Highway 101. It widens out to four lanes at the signalized 2nd Street and Irwin Street intersection.

The San Rafael Transit Center, serving about 750 buses a day and the SMART train, is located just north of 2nd Street along Hetherton Street.

There are no sidewalks along the south side of 2nd Street or on the east side of Hetherton Street. Barriers discourage pedestrians from crossing some of the legs at both the 2nd Street/Hetherton Street and 2nd Street/Irwin Street intersections. No bike lanes exist.



Southbound traffic backs up on Hetherton Street.



Weekday PM peak period traffic congestion.

TRAFFIC AND CONGESTION

The southbound on-ramp serves heavy traffic volumes from both southbound Hetherton Street and eastbound 2nd Street; both roadways have two lanes “feeding” the on-ramp. During peak periods traffic backs up along both roadways due to congestion along the southbound on-ramp, as well as the limited capacity of the 2nd/Hetherton signalized intersection. The back-ups often extend several blocks from the intersection, causing congestion along other Central San Rafael roadways.

Traffic using the northbound off-ramp often waits through multiple signal cycles at the 2nd Street/Irwin Street intersection, resulting in long delays and back-ups along the off-ramp. Irwin Street north of 2nd Street experiences recurring congestion due to its heavy traffic demands, and high volumes on the intersecting cross-streets.

CHALLENGES / CONSTRAINTS

Traffic back-ups will continue to occur due to recurring congestion on southbound Highway 101 and the heavy traffic demands in Central San Rafael, particularly along Hetherton, Irwin, 2nd, 3rd, 4th and 5th Streets.

Potential enhancements could be limited due to right-of-way limitations, as well as planned multimodal improvements at the San Rafael Transit Center and with the SMART extension to Larkspur. Potential environmental issues could occur due to the nearby canal and other constraints.

Right-of-way, environmental, and heavy traffic volume considerations could also limit potential pedestrian and bicycle improvements within the ramp intersection area.

OPPORTUNITIES / SOLUTIONS

Potential solutions include:

- Extending the southbound on-ramp’s double entry lanes farther to the south
- Adding a high-occupancy vehicle bypass lane along the on-ramp
- Increasing the turning radius from eastbound 2nd Street onto the on-ramp
- “Separating” the dual right-turning lanes from 2nd Street from the straight-through lanes before the on-ramp
- Obtaining right-of-way to increase the capacity of the 2nd Street/Irwin Street intersection, e.g., providing dual right-turning lanes



Extending the length of dual on-ramp lanes to Highway 101.

- Installing on-ramp meters to improve overall operational efficiency of Highway 101
- Improving intersection signal coordination
- Integrating an east-west bikeway corridor under Highway 101 between 3rd and 5th Streets
- Providing new or improved walkways, were feasible

COSTS

Planning-level estimated capital (design, environmental clearance, and construction) and right-of-way costs range as follows:

- Capital: \$55,000,000 to \$80,000,000
- Right-of-way: \$10,000,000 to \$25,000,000

NEXT STEPS

Potential next steps include:

- Identify interchange area stakeholders
- Obtain funding to further evaluate challenges and identify short- and long-range on-ramp and intersection area improvement options
- Prepare geometric layout, identify right-of-way needs, and conduct environmental studies
- Obtain funding for design and construction
- Construct improvements



Highway 101 Interchange

North San Pedro Road



SEPTEMBER 2017

BACKGROUND

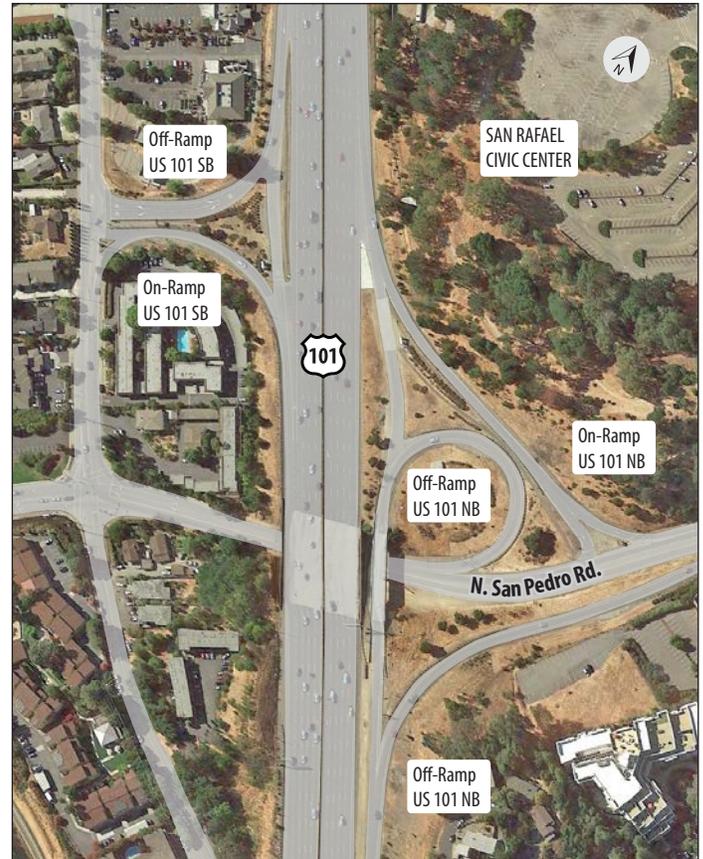
The North San Pedro Road interchange, located in San Rafael, was originally constructed in the 1950's. Its two northbound off-ramps and single on-ramp intersect directly with North San Pedro Road. Its southbound off-ramp and on-ramp are "hook" ramps that connect with Merrydale Road about 500 feet north of North San Pedro Road, creating high turning traffic volumes at the signalized North San Pedro Road/Merrydale Road intersection.

The interchange serves five bus stops, including stops at highway level. There are minimal sidewalk and bikeway facilities along North San Pedro Road within the interchange area.

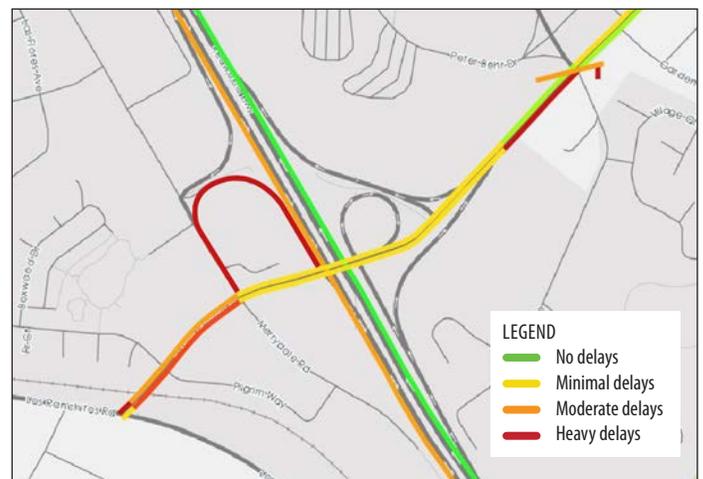
The intersection provides access to the Marin County Civic Center located to the east of Highway 101.

TRAFFIC AND CONGESTION

Several ramps experience recurring traffic congestion due to high vehicular demands and their original unique geometry. For example, the ramps from and to southbound Highway 101 are short and have tight curves, resulting in back-ups both along southbound Highway 101 and on Merrydale Road. The on-ramp joins Highway 101 on an uphill grade, resulting in vehicle speed differentials at the merge point.



Traffic on northbound Highway 101.



Weekday AM peak period congestion.

A substantial amount of traffic exiting the northbound off-ramp is destined for the Civic Center, requiring motorists to cross a traffic lane in a short distance, contributing to congestion along North San Pedro Road.

In addition, the North San Pedro Road/Merrydale Road intersection often experiences congestion.

CHALLENGES / CONSTRAINTS

Traffic congestion will continue to occur due to the heavy traffic demands and outdated ramp and roadway geometry.

Potential traffic relief enhancements could be limited due to the existing narrow North San Pedro Road undercrossing of Highway 101, the elevation grade changes throughout the interchange area, and the limited Caltrans' right-of-way, particularly between Highway 101 and Merrydale Road.

These constraints could also limit the potential to provide improved transit, pedestrian, and bicycle related improvements.

OPPORTUNITIES / SOLUTIONS

Potential solutions include:

- Adding a traffic lane to North San Pedro Road, including under Highway 101
- Increasing the capacity of the southbound off-ramp at Merrydale Road, e.g., signaling the intersection and/or adding a second left-turn lane
- Providing multimodal enhancements at the North San Pedro Road/Merrydale Road intersection
- Reconfiguring the northbound off-ramp and its connection with eastbound North San Pedro Road to improve access to the Civic Center
- Providing an accessible path of travel along North San Pedro Road
- Installing on-ramp meters to improve overall operational efficiency of Highway 101
- Improving intersection signal coordination



Increasing the capacity of off-ramp terminal with local roadway.

COSTS

Planning-level estimated capital (design, environmental clearance, and construction) and right-of-way costs range as follows:

- Capital: \$20,000,000 to \$30,000,000
- Right-of-way: \$1,000,000 to \$7,000,000

NEXT STEPS

Potential next steps include:

- Identify interchange area stakeholders
- Obtain funding to further evaluate challenges and identify short- and long-range interchange improvement options
- Prepare geometric layout, identify right-of-way needs, and conduct environmental studies
- Obtain funding for construction
- Construct improvements



Highway 101 Interchange

Manuel T. Freitas Parkway



SEPTEMBER 2017

BACKGROUND

The Manuel T. Freitas Parkway interchange, located in San Rafael, was originally constructed in 1950's. The interchange's ramps provide access to the multilane arterial parkway to the west of Highway 101, and to Redwood Highway/Civic Center Drive on the east. It consists of loop on-ramps and diagonal off-ramps.

The interchange's overcrossing has four traffic lanes and a narrow sidewalk on the north side. There are no bicycle facilities on the overcrossing of Highway 101. It serves three bus stops, including two stops at highway level between the off- and on-ramps.

The interchange provides access to northern San Rafael (Terra Linda) to the west, including a regional shopping center, and commercial and civic uses to the east, including the Marin County Civic Center.

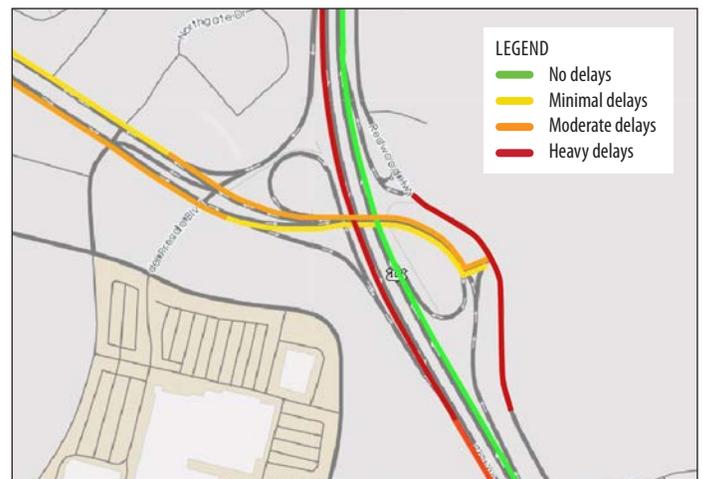
TRAFFIC AND CONGESTION

During peak traffic periods, traffic often backs up along the southbound on-ramp, impacting traffic operations along eastbound Manuel T. Freitas Parkway, including through the Del Presidio Boulevard and Northgate Drive intersections.

Multiple roadway and ramp approaches intersect on the east side of the interchange, with many uncontrolled traffic



Northbound Highway 101 traffic.



Weekday PM peak period congestion.

movements at the northbound ramps, on the parkway, and along Redwood Highway/Civic Center Drive. Motorists traversing the complex often appear confused.

Traffic levels through the interchange area are expected to increase in the future as land use changes occur.

CHALLENGES / CONSTRAINTS

Traffic congestion will continue to occur due to the increasing traffic demands, closely spaced major intersections to the west of Highway 101, and the multi-leg intersection with Redwood Highway to the east.

Potential multimodal enhancements could be limited due to existing land uses and intersection locations to the west, and topography and the proximity of Redwood Highway/Civic Center Drive to the east.

The unique configuration of the interchange and the available public right-of-way could also affect options for improvement. Retaining or modifying the interconnected Merrydale Road overcrossing could be a challenge.

These constraints could also limit the potential to provide improved transit, pedestrian, and bicycle related improvements.

OPPORTUNITIES / SOLUTIONS

Potential solutions include:

- Reconfiguring portions of the interchange
- Modifying the Manuel T. Freitas Parkway/northbound on-ramp/Redwood Highway/Civic Center Drive intersection
- “Re-purposing” the Merrydale Road overcrossing, e.g., modifying it to serve eastbound traffic and be better integrated into the interchange
- Modifying the southbound on-ramp to improve weaving length to Del Presidio Boulevard
- Installing on-ramp meters to improve overall operational efficiency of Highway 101
- Improving intersection signal coordination



Widening bridge (e.g., Merrydale Road) to relieve congestion at adjacent interchange.

COSTS

Planning-level estimated capital (design, environmental clearance, and construction) and right-of-way costs range as follows:

- Capital: \$50,000,000 to \$70,000,000
- Right-of-way: \$1,000,000 to \$7,000,000

NEXT STEPS

Potential next steps include:

- Identify interchange area stakeholders
- Obtain funding to further evaluate challenges and identify short- and long-range interchange improvement options
- Prepare geometric layout, identify right-of-way needs, and conduct environmental studies
- Obtain funding for construction
- Construct improvements



Highway 101 Interchange

Lucas Valley Road and Smith Ranch Road

SEPTEMBER 2017



BACKGROUND

The Lucas Valley Road/Smith Ranch Road interchange, located in San Rafael, was constructed in 1950's. It has five ramps, including two northbound on-ramps (a loop ramp from eastbound Lucas Valley Road and a diagonal ramp from Smith Ranch Road). The southbound off-ramp is a tight and circular ramp that terminates at a traffic signal with Lucas Valley Road.

West of Highway 101, Lucas Valley Road is a two-lane arterial roadway that extends 10 miles to Nicasio. To the east, five-lane Smith Ranch Road extends to McInnis Park.

The interchange serves two highway level stops between its off- and on-ramps. A park-and-ride lot is located on the east side of the interchange, and has 200 parking spaces.

Lucas Valley Road has three lanes under Highway 101 and a narrow sidewalk along the north side. There are no bicycle facilities.

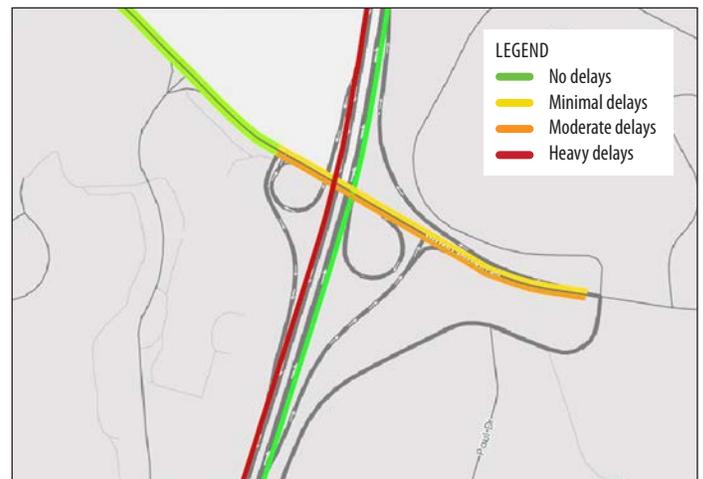
TRAFFIC AND CONGESTION

The limited capacity along Lucas Valley Road west of Smith Ranch Road, including under Highway 101 and west past Los Gamos Drive, contributes to traffic congestion during peak commute periods.

The interchange's short and tightly curved southbound off-ramp routinely experiences back-ups toward the highway's mainline, and provides limited driver sight distance.



Northbound Highway 101 traffic.



Weekday AM peak hour congestion.

During peak periods the southbound on-ramp serves heavy traffic volumes.

Traffic levels through the interchange area are expected to increase in the future as land use changes occur.

CHALLENGES / CONSTRAINTS

Traffic congestion and back-ups will continue to occur due to the increasing traffic demands, limited capacity of Lucas Valley Road, and the interchange's outdated ramp geometry.

Potential traffic relief enhancements could be limited due to the lack of available right-of-way in the interchange's southwest quadrant, and the presence of a hill in its northwest quadrant (which is located in the County of Marin right-of-way).

These constraints could also limit the potential to provide improved transit, pedestrian, and bicycle related improvements.

OPPORTUNITIES / SOLUTIONS

Potential solutions include:

- Replacing the highway overcrossing to enable widening Lucas Valley Road
- Replacing the existing non-standard southbound loop off-ramp with a new off-ramp located in the interchange's northwest quadrant
- Adding a southbound loop on-ramp in the northwest 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



Widening undercrossing of Highway 101 to provide additional traffic lanes.

COSTS

Planning-level estimated capital (design, environmental clearance, and construction) and right-of-way costs range as follows:

- Capital: \$40,000,000 to \$60,000,000
- Right-of-way: \$1,000,000 to \$5,000,000

NEXT STEPS

Potential next steps include:

- Identify interchange area stakeholders
- Obtain funding to further evaluate challenges and identify short- and long-range interchange improvement options
- Prepare geometric layout, identify right-of-way needs, and conduct environmental studies
- Obtain funding for design and construction
- Construct improvements

