DATE: May 12, 2020

TO: Honorable Mayor and City Council

FROM: Dawn S. Cameron, Public Works Director
Michael A. Fuller, Assistant City Manager

VIA: Kimbra McCarthy, City Manager

TITLE: **North Bayshore Circulation and Feasibility Study**

STUDY SESSION MEMO

CITY OF MOUNTAIN VIEW

PURPOSE

The purpose of this Study Session memorandum is to update the City Council on preliminary results of the North Bayshore Circulation and Feasibility Study and to solicit Council direction on the alternative gateway infrastructure concepts and other key project issues.

BACKGROUND

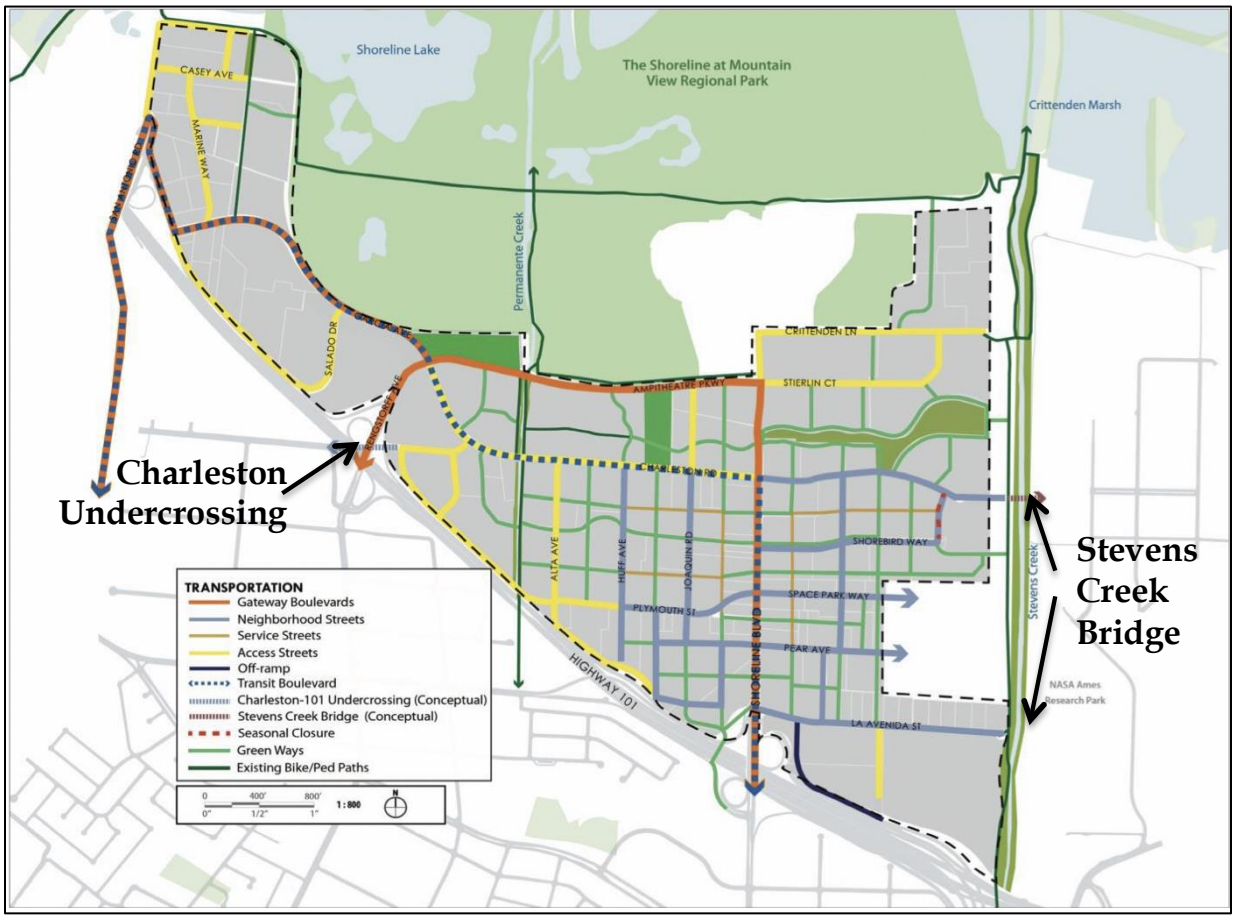
The North Bayshore Precise Plan (2014 and amended 2017) envisions commercial and residential growth in North Bayshore while minimizing additional vehicle capacity to the three gateway corridors. Instead, a number of multi-modal transportation improvements are being implemented, in conjunction with Transportation Demand Management (TDM) programs, to support a 45 percent mode share of drive-alone into and out of the area. A cap on the number of peak-hour vehicles has been established, and volumes are measured semiannually.

The 2017 North Bayshore Precise Plan includes several priority transportation projects and strategies that would potentially augment the improvements embedded in the original 2014 North Bayshore Precise Plan. These projects include studies of potential gateway improvements (i.e., a new transit bridge over Stevens Creek and a Charleston Road connection under U.S. 101) as well as strategies to reduce single-occupant vehicle (SOV) trips (see Table 1 and Figure 1).

Table 1: North Bayshore Precise Plan Transportation Strategies

Implementation Action	Description
Stevens Creek Transit Bridge Feasibility Study	Prepare a Stevens Creek Transit Bridge Feasibility Study to assess the feasibility of a new transit bridge across Stevens Creek at Charleston Road.
Charleston Road Underpass Feasibility Study	Prepare a Charleston Road Underpass Feasibility Study to assess the feasibility of a new underpass below U.S. 101 that connects Charleston Road with Landings Drive.
Rengstorff Avenue Adaptive Signal Study	Prepare a Rengstorff Avenue Adaptive Signal Study.
Rengstorff Avenue Corridor Study	Prepare a Rengstorff Avenue Corridor Study that would extend beyond North Bayshore to determine how vehicles, bicycles, and pedestrians interact and if any specific improvements are recommended to improve overall multi-modal circulation.
Residential TDM Guidelines	Develop residential TDM guidelines that specify how residential TDM programs shall be prepared.
Decrease SOV Rate Feasibility Study	Prepare a study that analyzes the feasibility of decreasing the SOV rate below 45 percent for office uses in North Bayshore.
Future Transit Facility	Continue to monitor ongoing North Bayshore transportation studies, including any Santa Clara Valley Transportation Authority (VTA) studies. As these studies recommend preferred routes or technologies, identify necessary transit facility space and location needs based on direction from the City Council. Potential strategies include identifying transit facilities within existing right-of-way; requiring new development to dedicate right-of-way for new facilities; and adding land dedication for facilities or funding transit infrastructure as priority Bonus Floor Area Ratio (FAR) community benefits.

Figure 1: North Bayshore Precise Plan Transportation Plan



The North Bayshore Circulation and Feasibility Study (Circulation Study) is focusing on the feasibility of the Stevens Creek Bridge and Charleston Road undercrossing proposals, the Rengstorff Avenue corridor, and the overall gateway traffic impacts of various strategies to reduce SOV trips.

On December 11, 2018, Council approved a contract with TJKM Transportation Consultants to conduct the Circulation Study. Jim Lightbody, through a contract with James Lightbody Consulting, has provided project management services for this study.

The Council also requested that the Circulation Study explore an alternative Stevens Creek Bridge crossing in the vicinity of La Avenida. Since receiving this direction, Google has entered into discussions with City staff, the Santa Clara Valley Water District (Valley Water), and U.S. Army for Google to conduct environmental studies, design, and construct a public bicycle/pedestrian bridge just south of La Avenida that would connect bicyclists traveling from the Moffett Boulevard/R. T. Jones Road

intersection on the east side of Stevens Creek to the trail and La Avenida on the west side of the creek.

As part of the Circulation Study, the consultant team has, throughout 2019 and early 2020, completed several tasks in support of the development of a North Bayshore transportation strategy. These include:

- Developing and calibrating a multi-modal traffic simulation model (VISSIM model) based on the spring 2019 traffic counts;

- Using the model to test the impact of previously approved development projects together with planned transportation improvements, such as the 101/Shoreline Ramp Realignment and the Shoreline Transit Lane project;

- Using the model to evaluate the transportation impacts of the pending Landings development project and to test potential mitigations;

- Conducting a feasibility analysis of the potential gateway improvements, including the Charleston Road/U.S. 101 undercrossing and Stevens Creek Bridge alternatives at Charleston Road and La Avenida. This analysis addressed potential design concepts, benefits, cost, constructability, and other issues.

- Conducting stakeholder meetings, particularly in regard to the Stevens Creek Bridge alternatives, with Valley Water, Pacific Gas & Electric Company (PG&E), NASA/Ames, and Google.

Staff acknowledges that the impact of the recent COVID-19 pandemic on current transportation patterns could result in modifications to existing transportation analysis and models. The long-term transportation impacts of COVID-19 are unknown at this time and will need to be assessed over the next several months to determine if further changes to the strategy are necessary.

DISCUSSION

This Study Session memorandum addresses two components of the Circulation Study: (1) preliminary results from the traffic simulation model; and (2) results of the feasibility analysis for the Stevens Creek Bridge and Charleston Undercrossing alternatives.

Preliminary Traffic Modeling Results

The Circulation Study is evaluating the transportation implications of full development of the 2017 North Bayshore Precise Plan (an additional 2.1 million square feet of office, including the Landings project and up to 9,850 residential units) and developing potential strategies for accommodating future needs, utilizing the VISSIM model to analyze the performance of vehicles and other travel modes. Several different scenarios have been modeled and each is described briefly below.

Existing Conditions

The modeling effort uses the traffic conditions reflected in the spring 2019 Gateway Monitoring Report. It is important to note that the 2019 conditions do not include traffic that will be generated from several office development projects under construction but not yet occupied. Of particular note is the Microsoft campus, which is largely vacant now but will open with a total of approximately 644,000 square feet of office space in early 2021. Other observations relative to existing conditions include:

- Base traffic volumes (even without Microsoft trips) have increased slightly since 2017;

- SOV mode-share has averaged about 55 percent over the past five years and does not indicate progress towards the 45 percent target; and

- The peak period has shifted later (now 8:00 a.m. to 11:00 a.m.) and a significant number of trips occur outside of the three-hour peak period.

More recent early February 2020 counts have been received and show a continuation of the above trends with SOV rates around 55 percent and total vehicle traffic higher than 2019. Both the Shoreline Boulevard and Rengstorff Avenue gateways are approaching capacity.

Baseline Scenario

A Baseline Scenario was developed that includes development projects that are approved but not yet occupied (Charleston East, Microsoft, Sobrato, and others) and transportation improvements that are in design but not yet complete (U.S. 101/Shoreline Boulevard ramp realignment, Plymouth Street/Space Park Way realignment, and extension of Inigo Way to Space Park Way).

Trip allocations were based on the approved traffic reports for each development, which reflect a 45 percent SOV rate for each project. To reflect progress toward the 45 percent SOV target, existing traffic volumes were reduced based on an assumed 50 percent SOV rate (about a 10 percent reduction).

The Baseline Scenario model run shows that both the Shoreline Boulevard and Rengstorff Avenue gateways will operate at, or close to, capacity. The VISSIM analysis also shows that operational constraints (e.g., merging conflicts and backups from turn lanes) restrict the ability of the roadways to fully reach available capacity, resulting in traffic backing up on these corridors, causing longer travel times and lower average speeds.

Google's Landings Project

Landings is a significant project that was included in the modeling effort so that staff and Council can evaluate the project's effect on the Shoreline Boulevard and Rengstorff Avenue gateways. The Landings analysis includes trips associated with the new office space as well as the shift of Charleston East traffic from the temporary parking at the Shoreline Amphitheatre (anticipated through 2025) to the proposed garage on Huff Avenue.

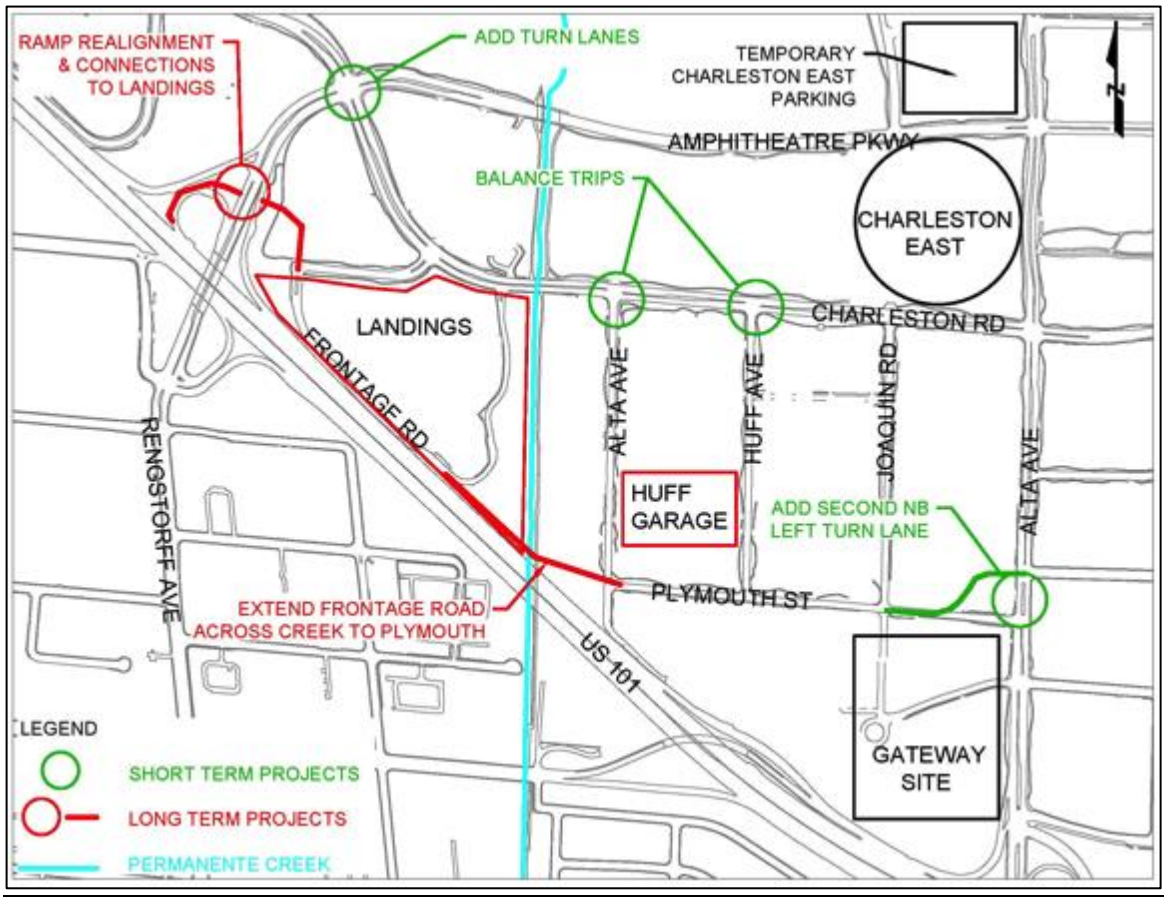
Preliminary results for Landings indicate that, in the absence of new transportation improvements, traffic on both Shoreline Boulevard and Rengstorff Avenue will likely exceed the gateway capacities.

Several transportation improvements are being evaluated in conjunction with the Landings analysis (see Table 2 and Figure 2).

Table 2
Transportation Improvements for Landings Analysis

Description	Notes
Additional left-turn lane on Shoreline Boulevard at the new Plymouth Street/Space Park Way intersection	With the shift of Charleston East parking from the Amphitheatre parking lot to the proposed Huff Avenue garage, additional vehicles will turn left at this intersection. An additional turn lane is needed to keep queueing vehicles from backing up onto Shoreline Boulevard.
Turn lane improvements at the Charleston Road/Rengstorff Avenue/Garcia Avenue/ Amphitheatre Parkway (CRAG) Intersection	The volume of several turning movements exceed the capacity of the existing intersection. Additional and modified turn lanes will improve the efficiency through this intersection.
U.S. 101/Rengstorff Avenue Ramp Realignment and Frontage Road	This project is described in more detail below.

Figure 2: Potential North Bayshore Improvements



The Shoreline Boulevard left-turn lanes and the CRAG intersection improvements can be completed within the time frame of Google's schedule for the Landings project. The off-ramp realignment, discussed further below, will take longer due to required approvals from Caltrans as well as funding constraints. The results of the Landings analyses will be discussed further with Council during discussion of the entitlements for the project scheduled for June 2020.

Gateway Project Feasibility Analysis

The project team evaluated the potential gateway improvements in terms of basic feasibility, benefits of added capacity and mode shift, cost and constructability, and other significant issues. The gateway project alternatives include:

1. Stevens Creek Bridge—This improvement is envisioned as a transit, pedestrian, and bicycle facility that would connect North Bayshore and NASA/Ames. The bridge would add a new connection to the Stevens Creek Trail and would also

provide a connection to North Bayshore for cyclists using the Moffett Boulevard corridor and the planned Manila Drive path. It could also facilitate a future transit connection to the NASA/Bayshore light rail station. Three design alternatives were explored at each of two locations:

- An extension of Charleston Road connecting to a location just south of the Google Bayview campus, near R. T. Jones Road on the NASA/Ames campus.

- A connection in the vicinity of La Avenida that would pass through property owned by the United States Army on the NASA/Ames side.

2. Charleston Undercrossing—This improvement would potentially add a new gateway by constructing a new roadway under U.S. 101 connecting to Charleston Road on the west and Landings Drive on the east. The roadway would have sidewalks and bike lanes. The facility could be operated as regular lanes, reversible lanes, high-occupancy vehicle lanes or transit-only lanes. The purpose would be to add gateway capacity and promote mode shift.

   Since this potential improvement is likely to be costly and challenging to construct, the study also explored other improvements on Rengstorff Avenue that could improve capacity and traffic operations.

Evaluation of Stevens Creek Bridge Alternatives

The Stevens Creek Bridge alternatives include three options for each location (Charleston Road and La Avenida) and three basic configurations for each:

1. Separate transit vehicle and pedestrian/bicycle bridges at different elevations. The pedestrian/bicycle bridge would provide a direct connection to the Stevens Creek Trail.

2. A high-level combined transit and pedestrian/bicycle bridge that fully spans the creek. The bridge would not directly connect to the Stevens Creek Trail.

3. A lower-level integrated transit and pedestrian/bicycle bridge that includes piers within the creek channel. The Stevens Creek Trail would intersect with the bridge via an at-grade crossing.

These alternatives are illustrated in Figures 3 and 4 and Attachments 1 and 2. Definitions, characteristics, cost, benefits, and issues for each alternative are

summarized in Tables 3 and 4. Following are key considerations that distinguish the alternatives:

- The Charleston Bridge alternatives provide a more direct connection to the Charleston Transit Corridor, the primary east-west transit connection through North Bayshore envisioned in the North Bayshore Precise Plan. The Charleston Transit Corridor also includes cycle tracks and is envisioned as an active transportation corridor.

- The Charleston alternatives provide a new connection to the Stevens Creek Trail, while a connection already exists at La Avenida.

- The La Avenida location better serves the Microsoft campus.

- The La Avenida location crosses the U.S. Army's Orion Park property, which introduces access challenges.

- The Charleston location needs to cross an easement controlled by PG&E.

- Alternative 1 for each location requires two separate bridges but separates pedestrians and bikes from transit traffic. Google is pursuing a pedestrian/bicycle bridge near La Avenida that may eliminate need for the second bridge at that location.

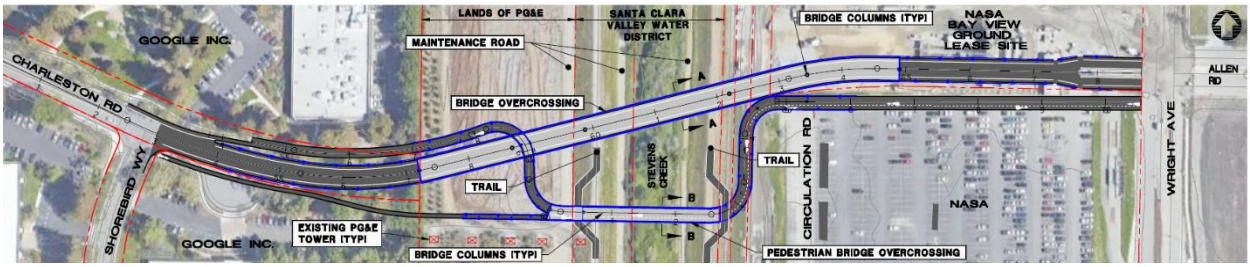
- Alternative 2 for each location requires a higher, clear-span bridge and are the most costly alternatives but have the least impact on the creek channel. A tied arch or suspension design would be needed. The connection to the Stevens Creek Trail would be indirect for pedestrians and cyclists.

- Alternative 3 for each location directly integrates with the Stevens Creek Trail, allowing a lower bridge profile. Trail users will cross the new bridge at grade, potentially requiring signals or signage that could delay transit operations.

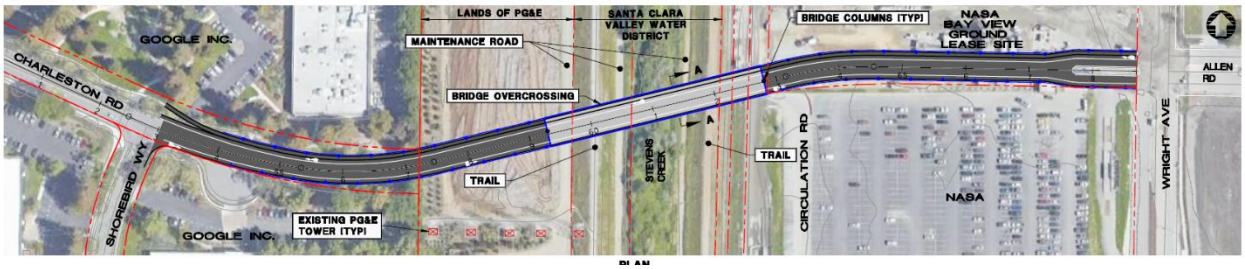
The stakeholder discussions did not identify any major flaws with the alternatives but did identify several design issues which needed further investigation, including: (1) hydraulic and flow studies to better determine creek impacts and pier locations; (2) wind tunnel evaluations for NASA; (3) analysis of structural clearances to access roads for NASA, Google, PG&E, and Valley Water; and (4) impacts to overhead PG&E transmission lines.

Figure 3: Charleston Bridge Alternatives

Alternative 1: Separate Transit and Bike/Pedestrian Bridges
(Pedestrian/Bicycle Bridge Direct Connection to Trail)



Alternative 2: High-Level, Clear-Span Combined Bridge
(Indirect Connection to Trail)



Alternative 3: Lower-Level Combined Bridge
(At-Grade Crossing of Trail)

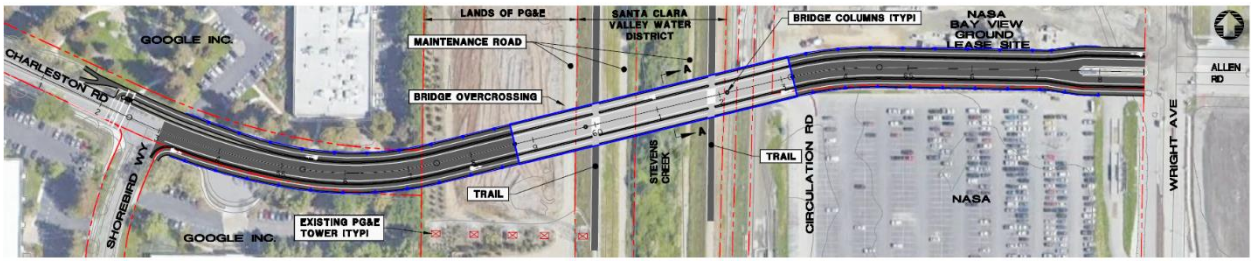


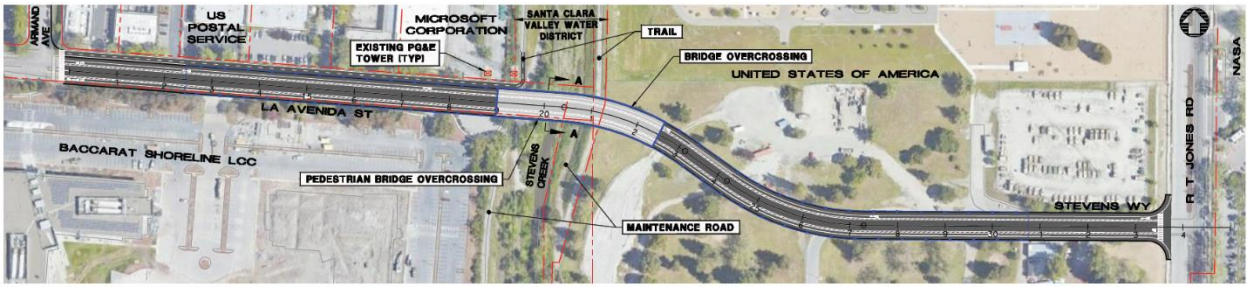
Table 3: Charleston Bridge Alternatives

Alternative	**1**	**2**	**3**
Description	Transit bridge with two travel lanes; separate pedestrian/bicycle bridge with at-grade connections to Stevens Creek Trail.	Clear-span bridge with two travel lanes; Class II bike lanes and sidewalk on both sides.	Combined transit and pedestrian/bicycle bridge; two travel lanes on the bridge, Class II bike lanes and sidewalks with at-grade connections to Stevens Creek Trail.
Key Stakeholders	PG&E, Valley Water, NASA, Google		
Preliminary Cost Estimate	$69 million	$73 million	$59 million
Key Benefits	As transit bridge is separate from pedestrian/bicycle bridge, no conflicts for transit bridge at the trail crossings.	Clear-span structure over creek and trails minimizes impacts. Provides opportunity for "signature span" or "gateway structure."	Lower, shorter bridge structure reduces cost and overall footprint. Potential fewer visual and biological impacts compared to Alternatives 1 and 2.
Key Concerns and Questions	Pedestrian/bicycle bridge impacts the existing trail requiring realignment both sides of the creek. Wider impact area because of two separate bridges.	Visual and biological impacts would be more than the other two alternatives with lower profiles. Nonstandard structure type (tied arch or suspension) may increase the uncertainty of cost and schedule.	Requires raising existing trail to the same level as proposed bridge on both sides of the creek. Creates potential conflicts between bikes and buses. Requires modification of creek berms.
Issues Needing Future Resolution	• Easement or other appropriate agreement required between the City and NASA. • Further design refinement needed to understand impacts to the Bayview Campus parking and transit center on the east side, to the NASA wind tunnel, and to creek flow and operation. • Impacts to PG&E lines and tree farm.		

Figure 4: La Avenida Bridge Alternatives

Alternative 1: Separate Transit and Bike/Pedestrian Bridges
(Pedestrian/Bicycle Bridge Direct Connection to Trail)

Alternative 2: High-Level Clear Span Combined Bridge
(Indirect Connection to Trail)



Alternative 3: Lower-Level Combined Bridge
(At-Grade Crossing of Trail)

Table 4: La Avenida Bridge Alternatives

Alternative	**1**	**2**	**3**
Description	Transit bridge with two travel lanes and separated pedestrian/bicycle bridge with at-grade connections to Stevens Creek Trail.	Clear span bridge with two travel lanes; Class II bike lanes and sidewalk on both sides.	Combined transit and pedestrian/bicycle bridge; two travel lanes on the bridge, Class II bike lanes, and sidewalk on both sides with connections to Stevens Creek Trail.
Key Stakeholders	PG&E, Valley Water, NASA, Army, Microsoft		
Preliminary Cost Estimate	$48 million	$63 million	$61 million
Key Benefits	As transit bridge is separate from pedestrian/bicycle bridge, there are no conflicts for transit bridge at the trail crossings.	Clear-span structure over creek and trails minimizes impacts. Provides opportunity for "signature span" or "gateway structure."	Lower, shorter bridge structure reduces cost and overall footprint. Potential fewer visual and biological impacts compared to Alternatives 1 and 2.
Key Concerns and Questions	Wider impact area because of two separate bridges. Duplicates pedestrian/bicycle bridge being developed by Google.	Visual and biological impacts would be more than the other two alternatives with lower profiles. Nonstandard structure type (tied arch or suspension) may increase the uncertainty of cost and schedule.	Requires raising existing trail to the same level as proposed bridge on both sides of the creek. Creates potential conflicts between bikes and buses. Requires modification of creek berms.
Issues Needing Future Resolution	• Impacts to Army property and NASA/Ames • Analysis of creek flow and Valley Water operations		

Recommendations for Stevens Creek Bridge Alternatives

Next steps for this proposed project include more detailed engineering and

environmental studies. **To narrow the options needing further study, staff recommends that only the Charleston corridor options be pursued.** The reasons include:

- Charleston best serves current and planned transit operations. La Avenida has limited benefit for transit operations since it does not directly connect to the Charleston Transit Corridor.

- Charleston connects directly to NASA/Ames and Google's Bayview campus. With planned housing near Charleston Road (as identified in the Shorebird area of the North Bayshore Precise Plan), the bridge can provide pedestrian and bike access to the new campus.

- The Charleston location provides for a new connection to the Stevens Creek Trail, while a connection currently exists at La Avenida.

- Google is planning a separate new pedestrian/bicycle bridge near La Avenida, so that element may not be needed at La Avenida.

In regard to the three Charleston alternatives, staff recommends the following priorities:

1. Alternative 1 ***(preferred alternative)***—Separate transit and pedestrian/bicycle bridges. This alternative provides a balance in addressing costs and concerns. It will provide a direct connection to the trail for pedestrians and bicycles while avoiding conflicts between trail users and transit that could occur with the at-grade crossing in Alternative 3. It also avoids the visual and biological impacts of the Alternative 2 clear span concept.

2. Alternative 3—Combined transit/pedestrian/bicycle bridge with at-grade trail crossings.

3. Alternative 2—Clear-span combined bridge with indirect trail access.

Additional preliminary design work would focus on the preferred alternative. However, it is recommended that a priority list be utilized in case further analysis shows the preferred alternative to have significant design issues.

Evaluation of Charleston Undercrossing

The potential undercrossing would cross under U.S. 101 from a point on Charleston Road to the west and connect to Landings Drive on the east. The initial design assumed

a direct route. However, that alignment conflicted with the existing Rengstorff Avenue overcrossing abutment structure. As a result, two alternative designs were explored, as illustrated in Figure 5 and Attachment 3. These options shifted the undercrossing to the north. One option provided four traffic lanes plus sidewalks and bike lanes. The other provided only two traffic lanes. Operationally, both options could allow for reversible auto or transit-only lanes.

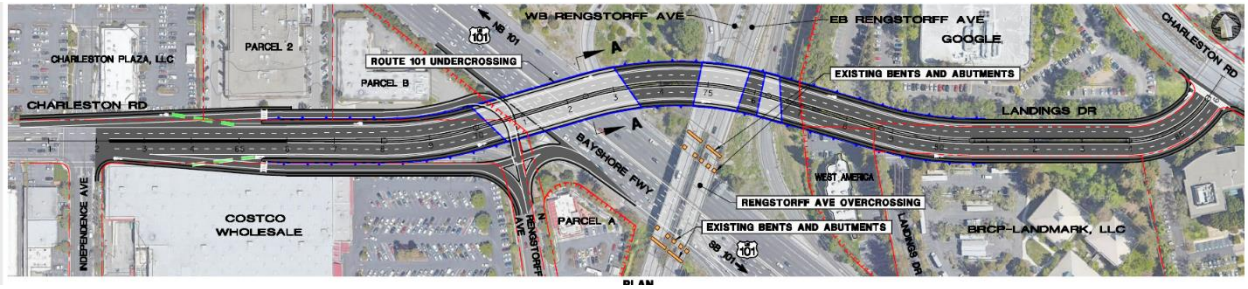
Analysis of these undercrossing alternatives revealed a critical limitation for both. The depth of the structure and the appropriate grades caused the entries to the undercrossing to be at locations that would be inefficient for the intended purpose of providing an alternative gateway. On the west side of U.S. 101, the entrance would be located west of North Rengstorff Avenue near the adjacent Costco store, which would inhibit access for vehicles using the Rengstorff Avenue/U.S. 101 interchange. In addition, new right-of-way would be required along Charleston Road, including along the Costco site.

On the east side, the undercrossing entrance would occur on Landings Drive east of the Landings frontage road. This would restrict access to the proposed Landings development and require a reconfiguration of the frontage road.

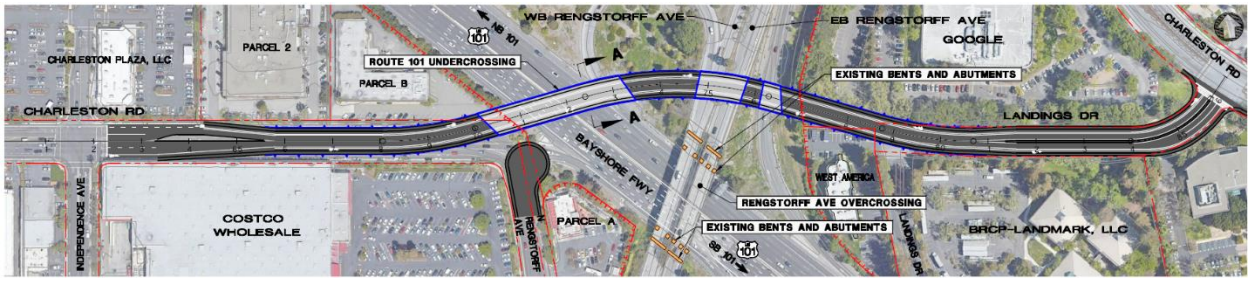
Due to these access problems and the estimated project cost ($130 million to $180 million), staff does not recommend proceeding with further development of the Charleston Undercrossing as a Precise Plan Priority Transportation Project.

Figure 5: Charleston Undercrossing Alternatives

Four-Lane Alternative



Two-Lane Alternative



Alternative Rengstorff Avenue Interchange Project

As an alternative to provide additional gateway capacity, the Circulation Study developed and evaluated a concept that would reconfigure the Rengstorff Avenue on- and off-ramps and would provide a new direct connection to the Landings frontage road (see Figure 6). The potential benefits of this concept include:

- Providing a new roadway connection to the Landings development and, if combined with a new frontage road bridge across Permanente Creek, to Plymouth Street, the Huff Avenue garage, and other employment sites along Plymouth Street. This connection would add capacity to the Rengstorff Gateway, potentially up to 1,000 peak hour vehicles.

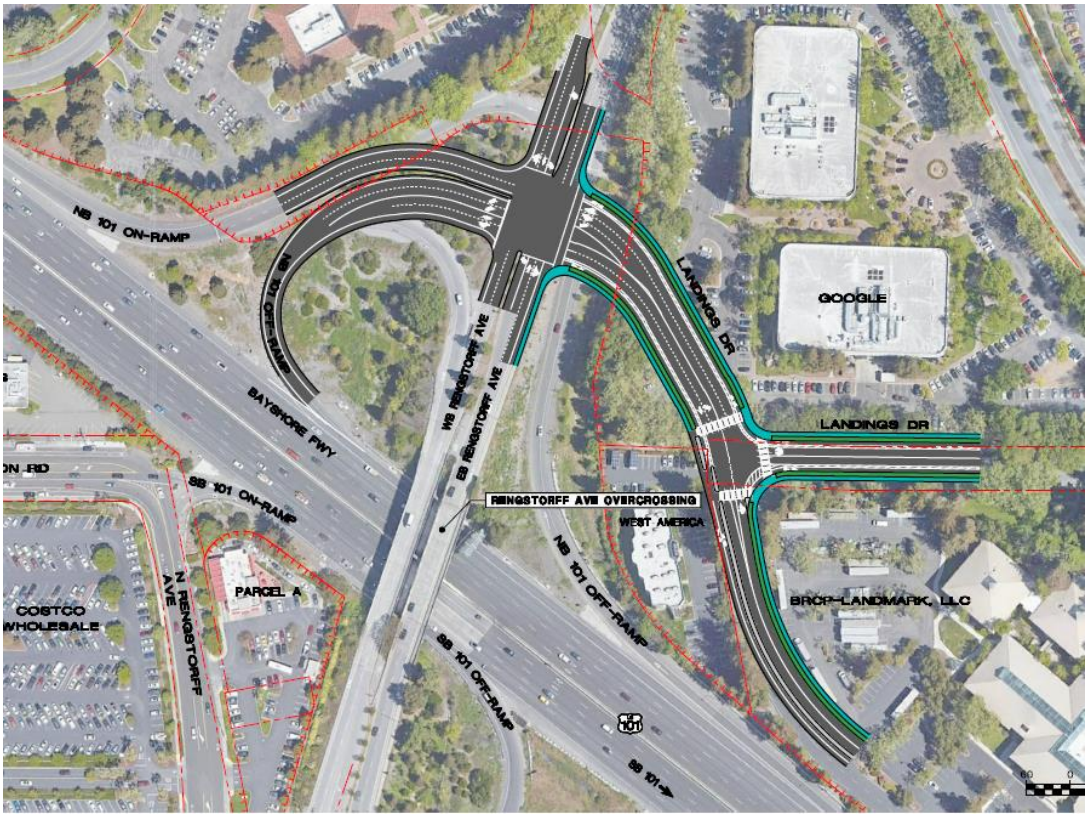
- Eliminating a merging problem on Rengstorff Avenue at the northbound U.S. 101 off-ramp that constricts traffic flow and impedes the ability of the Rengstorff Avenue/Charleston Road intersection to operate at full capacity.

- Improving bicycle and pedestrian safety by reducing conflicts with high speed on- and off-ramp traffic.

A preliminary analysis of this ramp realignment concept has been conducted, including analysis with the VISSIM simulation model. This analysis indicated potential value in improving the operation and capacity of the Rengstorff Gateway. More study will be needed to confirm the project feasibility and benefits, including close coordination with Caltrans. A preliminary cost estimate for the project is $15 million to 25 million, not including private property east of the new intersection that will need to be acquired.

Based on this preliminary evaluation, staff recommends that the Rengstorff Ramp Realignment project be considered as a Priority Transportation Project.

Figure 6: Rengstorff Avenue Ramp Realignment Concept



RECOMMENDATION

Staff seeks input and direction from the City Council regarding following questions:

1. Does Council support staff's recommendation to focus further development on the Charleston alignment for the proposed Stevens Creek Bridge and not pursue the La Avenida alignment?

2. Does Council support the proposed preferred alternative and staff priorities for the Charleston bridge alternatives?

3. Does Council support staff's recommendation to drop the Charleston Undercrossing as a Precise Plan Priority Transportation Project and substitute the proposed U.S. 101/Rengstorff Avenue Ramp Realignment project?

NEXT STEPS

Based on Council comments and direction, City staff and the consultant team will further develop the North Bayshore Circulation and Feasibility Study for additional Council discussion later in the year. That work will include:

- Evaluation of additional scenarios related to the full development of the Precise Plan and identification of a potential transportation strategy that may include lowering the 45 percent SOV requirement, enhanced TDM programs, and/or congestion pricing in addition to transit and active transportation improvements.

- Evaluation of the potential long-term impacts of COVID-19 shelter-in-place orders on transportation strategies and operations, including increased telecommuting, social distancing on transit vehicles, and other possible changes to commuter behavior.

- Completion of the gateway infrastructure evaluation, including additional conceptual design for the Stevens Creek Bridge alternatives at Charleston Road.

- Coordination with VTA and Caltrans to further evaluate the U.S. 101/Rengstorff Avenue Ramp Realignment project through a new study initiated by VTA.

PUBLIC NOTICING

In addition to the City's standard agenda posting and postings on social media, e-mail notifications were sent to the stakeholders, Mountain View Transportation Management Association, Santiago Villa, and the Audubon Society.

DSC-MAF/TS/6/CAM/939-05-12-20SS/200191

Attachments:
1. Charleston Bridge Alternatives
2. La Avenida Bridge Alternatives
3. Charleston Undercrossing Alternatives