NORTH BAYSHORE CIRCULATION STUDY

Final Report

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1. Executive Summary

The North Bayshore Precise Plan (NBPP), adopted in 2014 and amended in 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 reduced single-occupancy vehicle (SOV) trips into and out of the area. A cap on the number of peak-hour vehicles has been established, and volumes are measured semiannually.

The North Bayshore Circulation Feasibility Study (Circulation Study), identified as an implementation strategy in the NBPP, has focused on the gateway traffic impacts of various strategies to reduce SOV trips, including potential additional infrastructure as well as policies to further reduce vehicle trips and meet TDM goals. The Circulation Study has analyzed the full development of the Precise Plan and does not specifically address incremental development phases.

A primary focus of the study was to identify and evaluate additional strategies needed to maintain compliance with the NBPP gateway trip cap policies. New strategies are needed since, with the increased number of jobs and residents in the Precise Plan, the current policy to achieve a 45% SOV rate was determined to be insufficient to meet the gateway trip cap target. Potential strategies explored and discussed in this report include:

- Updated Priority Transportation Improvements to support increased use of non-SOV modes, improve traffic operations and add limited gateway capacity.
- Review of gateway trip cap policies and development of potential revisions, including an update of estimated gateway capacity.
- Analysis of reduced SOV strategies including traffic simulations.
- Review of NBPP modal strategies (active transportation, transit, transportation demand management) that support SOV reductions; development of potential improvement strategies.
- Feasibility of congestion pricing as a potential tool to help reduce gateway vehicle traffic.

The impact of COVID-19 on North Bayshore traffic has created uncertainty regarding the effectiveness and need for these strategies due to the potential impact of remote work and greater commute flexibility. The actual impacts on travel patterns may not be known for several years. Where practical and prudent, the Study has recommended phasing in or deferring some strategies and improvements while monitoring the post-pandemic travel conditions, with a final recommendation that the Circulation Study be updated in three to five years.

In addition to recommendations approved by the City Council on June 8, 2021 (Priority Transportation Improvements, pedestrian and bicycle plans), proposed Circulation Study implementation strategies and policy recommendations include:

1. Modify gateway trip cap policies to revise the time period and locations for compliance and update gateway capacity estimates as follows:

    a. Continue the twice-yearly gateway monitoring program in order to track post-COVID traffic and compliance trends. The monitoring should measure peak period trips in both directions at each gateway, as well as mode share trends.

    b. Expand the monitoring program, as new growth occurs, to better understand characteristics of peak traffic, use of non-SOV modes, and trip characteristics of new residents.

    c. Measure compliance by comparing actual trips with the gateway capacity for the three-hour peak period, as opposed to just the peak hour.

    d. Measure compliance by combining the Shoreline and Rengstorff gateways. The San Antonio gateway should continue to be measured separately.

    e. Adjust the Shoreline and Rengstorff gateway capacities as the new infrastructure projects are completed.

2. Develop new financial-based penalties for noncompliance with individual project vehicle trip caps and/or the gateway trip cap.

3. Establish a lower SOV rate in the range of 35% to 40% for both existing and future employees on any new development. The transportation analysis of individual developments should determine any strategies, in addition to the lower SOV rate, that are needed to help achieve compliance with the trip cap.

4. In the near term, complete the design and construction of the Priority Transportation Projects already in process as quickly as possible. For the major Priority Transportation Improvements not yet started, advance the planning and initial design phases through the Capital Improvement Program (CIP) to prepare them to move into construction when needed.

5. Proceed with the next planning phase for the Rengstorff Connector project, including the Caltrans Project Approval and Environmental Documentation (PAED) process for the Rengstorff interchange component (recently funded through the VTA Measure B program). Planning work will take approximately two years,

during which time the City can review post-COVID conditions and better understand the project requirements and costs prior to making a final decision to proceed with design and construction of this project.

6. Plan and advocate for expanded public transit service so that North Bayshore is designated as a transit-rich area, and work with VTA and the MTMA on strategies for service expansion.

7. Defer a decision on a congestion pricing program while monitoring other Bay Area tolling activities, gathering information about potential impacts, and establishing traffic thresholds or other factors that could support future implementation.

8. Update the NBPP to reflect approved Circulation Study recommendations, including:

    - Priority Transportation Improvements
    - Gateway Trip Cap policies
    - Bicycle and pedestrian policies and plans
    - Implementation policies, including issuance of building permits and financial penalties for TDM noncompliance
    - TDM requirements for development
    - Revise language regarding trip caps and compliance to retain the broad policies and remove specifics of monitoring and operations

9. Update the Circulation Study in three to five years to review transportation strategies and confirm specific gateway trip cap policies.

2. Introduction and Background

Land Use Context

The North Bayshore Precise Plan (NBPP), adopted in 2014 and amended in 2017, describes the plan for future growth in the area and the expected character of future development. Currently, the North Bayshore Area (Figure 1) is primarily an employment area, with a small amount of residential and commercial/entertainment uses. Key firms, with a current workforce of about 25,000 employees, include Google, Microsoft, and Intuit.

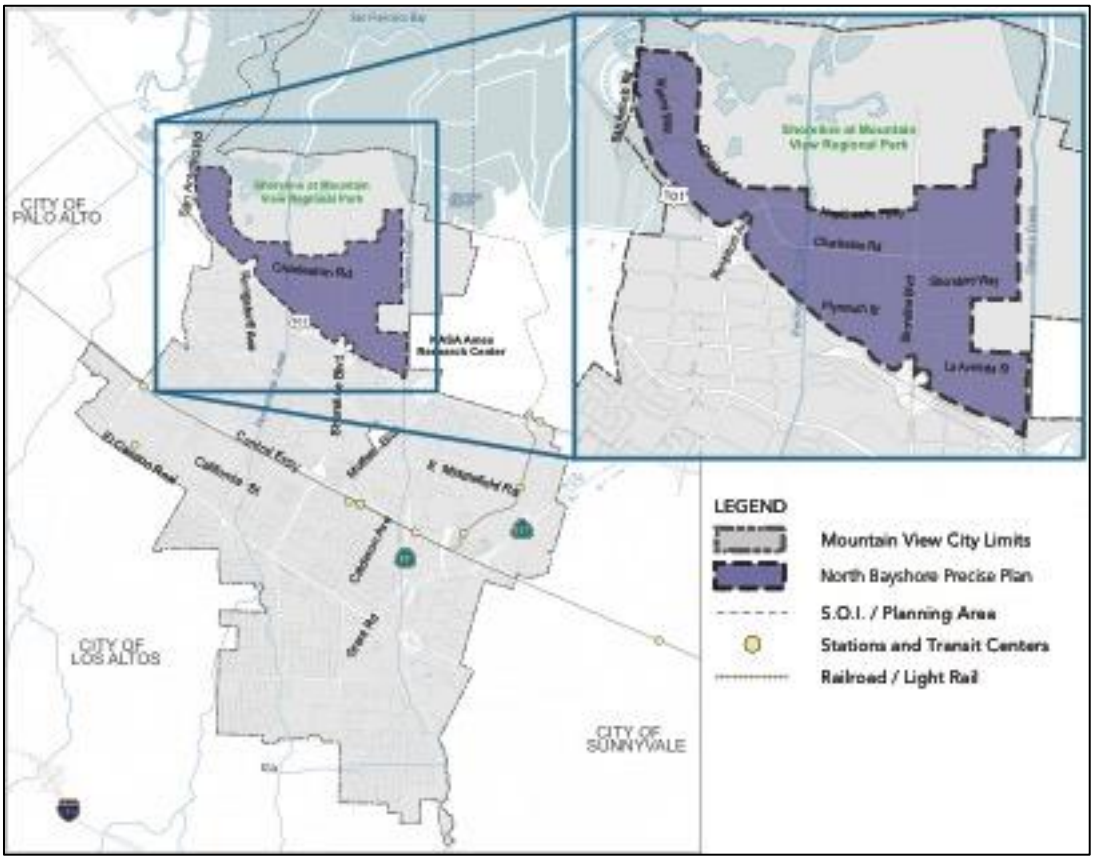

Figure 1: North Bayshore

North Bayshore is bordered by the Shoreline at Mountain View Regional Park and Stevens Creek, which limit vehicle access to three gateways across U.S. 101. These gateways are Shoreline Boulevard, Rengstorff Avenue, and San Antonio Road.

The NBPP envisions substantial commercial and residential growth in North Bayshore while minimizing additional vehicle capacity through the three gateway corridors. Some growth has been approved with several projects under construction. When fully

developed, the Precise Plan will support 10.4 million square feet of office space, up to 9,850 residential units and a significant amount of supporting retail and entertainment uses. The future North Bayshore service population is approximately 41,700 employees and 18,000 residents.

The NBPP also established a Bonus Floor Area Ratio (FAR) process to allocate the remaining office space in the plan. Development of Master Plans for specific areas of North Bayshore was also encouraged. In response, the City developed a Master Plan for the Gateway Area, a key development area identified in the NBPP. The Gateway Master Plan envisions up to 500,000 square feet of office space and up to 1,200 residential units. The plan also includes retail and entertainment uses and urban design elements designed to create a highly walkable core.

On March 23, 2021, the City Council approved a NBPP nonresidential Bonus FAR requalification request of 1.3 million square feet from Google. This was accompanied by review of the Google Preliminary North Bayshore Master Plan for office, housing, open space, and other uses located on over 122 areas of their property within and outside the Gateway Master Plan area. Google submitted a formal Master Plan application in September 2021.

Collectively, the Gateway Master Plan and the Google Master Plan provide the framework for the full development of the NBPP.

2017 Precise Plan Transportation Implementation Actions

The 2017 Precise Plan also includes several recommended follow-up transportation implementation studies (see Table 1). All were identified as short- term projects. These include studies of potential gateway improvements (a new bridge over Stevens Creek and a Charleston Road connection under U.S. 101), as well as strategies to reduce single-occupant vehicle (SOV) trips.

Table 1: Transportation Implementation Actions

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 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.
Decrease SOV Rate Feasibility Study	Prepare a study that analyzes the feasibility of decreasing the SOV rate below 45% for office uses in North Bayshore.

These studies were envisioned to be an update of the North Bayshore transportation strategy first developed in the 2013 Shoreline Transportation Study and embedded in the original 2014 North Bayshore Precise Plan (e.g., 45% SOV rate, dedicated bus lanes, public shuttles, realignment of the U.S. 101/Shoreline off-ramp, etc.).

The North Bayshore Circulation Study has combined these individual elements into a single study. This effort has focused on the feasibility of the Stevens Creek Bridge and the Charleston Road undercrossing proposals, identified new transportation improvements and analyzed strategies for complying with the SOV and gateway vehicle requirements in the NBPP.

The NBPP also identified Congestion Pricing as a potential strategy to help manage gateway vehicle trip demand. On December 20, 2020, the Council added a feasibility study of Congestion Pricing into the scope of the Circulation Study.

The following sections highlight the key issues and conclusions from the Circulation Study. The study explored future transportation needs, potential infrastructure improvements and modal shift and other strategies to address the North Bayshore vehicle trip performance measures.

3. North Bayshore Transportation Conditions

Pre-COVID Transportation Conditions

To track progress in meeting the North Bayshore SOV target and to measure compliance with the gateway trip cap, the NBPP established a gateway-monitoring program. Vehicle volumes and mode shares at the gateways have been measured semiannually since 2015.

In early 2020, prior to COVID-19 conditions, gateway monitoring showed that peak traffic volumes were approaching gateway capacity, particularly on Shoreline Boulevard in the morning and Rengstorff Avenue in the afternoon. At the same time, the single-occupancy vehicle (SOV) rate averaged 56%, which is around what it has been over the past five years, indicating little progress towards the 45% target.

The current SOV rate varies by employer. Google (with nearly 90% of the jobs) has achieved an SOV rate below 50%, relying on a strong TDM program and a large fleet of commute and local shuttles. Other companies (Intuit and Microsoft) have historic SOV rates over 75%. Transit services operated by VTA and the Mountain View Transportation Management Association (MTMA) serve a relatively small share of commute trips.

The most recent monitoring report, conducted in February 2020, also determined the degree of peak traffic congestion by mapping the vehicle back-ups in the a.m. and p.m. peaks as shown in Figure 2.

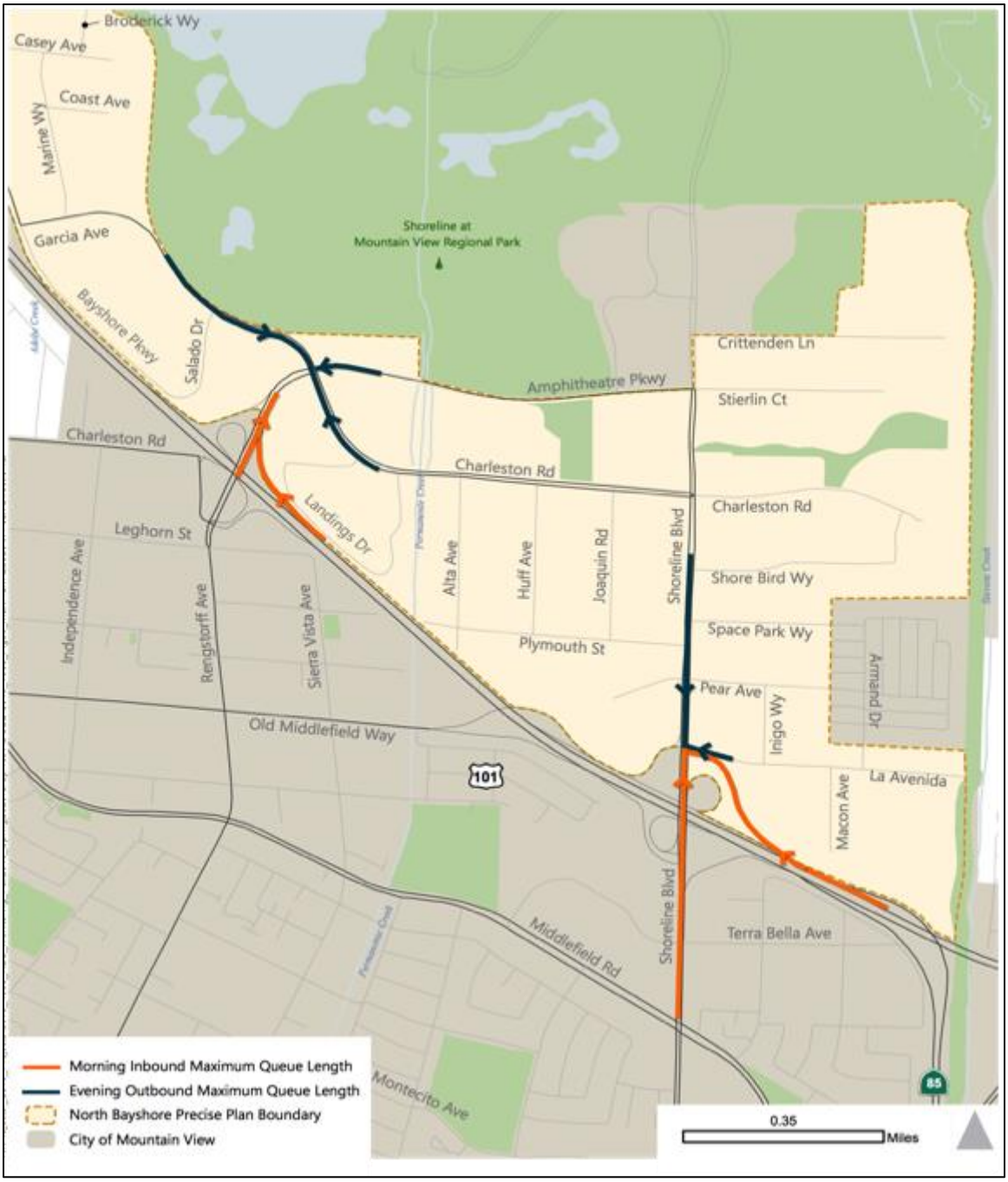

Figure 2: Maximum Queue Lengths

Source: North Bayshore Transportation Monitoring Report (2020)

Current Transportation Improvements

Priority Transportation Improvements were identified in the NBPP to both help meet gateway capacity needs and to help achieve the mode shift goals. Six key projects are in design or construction. These include:

- Shoreline Boulevard Reversible Bus Lane and protected bike lanes between Middlefield Road and Pear Avenue;
- Plymouth Street/Space Park Way realignment and Bus Lane extension and cycle track from Pear Avenue to Plymouth Street/Space Park Way;
- U.S. 101/Shoreline Off-Ramp Realignment;
- Charleston Transit Boulevard and protected bike lanes; and
- U.S. 101 at Shoreline Boulevard Bicycle/Pedestrian Bridge and cycle track extension to Pear Avenue.

Current Development Projects

Several office developments have been approved since the adoption of the Precise Plan, and some are nearing occupancy (e.g., Microsoft, Charleston East). These projects are shown in Figure 3. These projects are required to achieve a 45% SOV requirement and will be annually monitored for compliance.

The Sobrato Mixed-Use project, located along Inigo Way, adds office space but also includes up to 635 new housing units and a 150-unit affordable housing component. These units will likely be the first new residential development in North Bayshore.

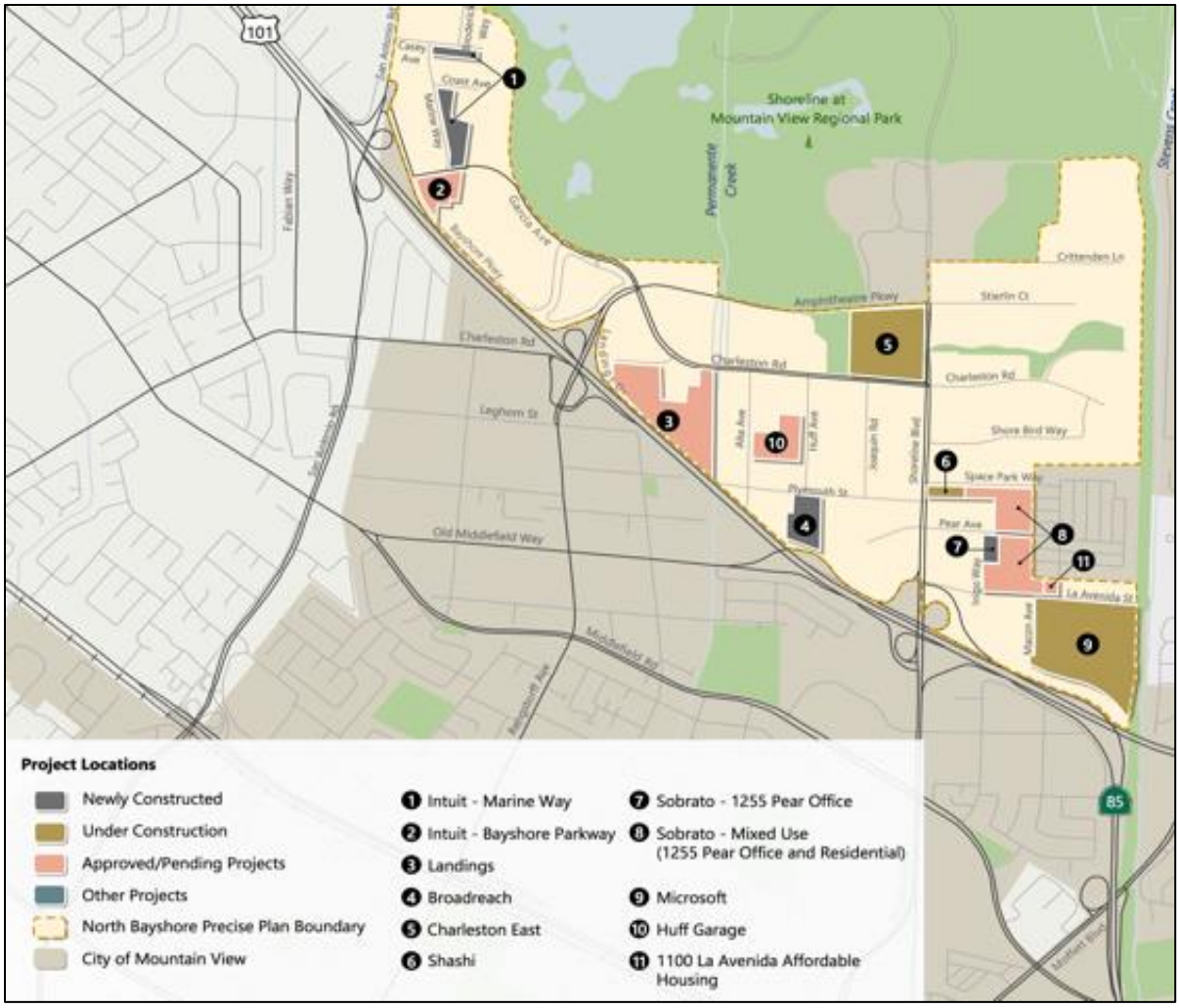

Figure 3: Approved Development Projects

Source: North Bayshore Transportation Monitoring Report (2020)

Gateway Impacts of Current Projects

Traffic scenarios conducted in the Circulation Study have shown that the combination of previously approved office trips and completion of the current infrastructure projects will result in reaching capacity at the Shoreline Boulevard and Rengstorff Avenue gateways in the next few years, assuming existing traffic returns to pre-COVID conditions and there is limited progress in reaching the SOV targets.

At this time, it is difficult to predict post-COVID new-normal conditions. There may be a period of time when traffic demand remains below the early 2020 conditions. However, as employers reopen, even with lower office density and greater work from home, it is possible that traffic congestion may return to earlier levels. Employers will want to make

productive use of their full building spaces, and it is possible they will require most employees to be present on certain days to maximize workplace collaboration.

Alternatively, there may be permanent changes in peak demand as a result of more remote work and greater allowed flexibility in commute travel.

Another factor is reduced transit use and increased vehicle use as a result of the pandemic. Projects approved with a 45% SOV requirement (such as Microsoft) may have difficulty achieving that target in the near term. Continued gateway monitoring will be needed to track traffic levels through the gateways and progress on mode share reductions.

Potential Trip Reduction Strategies

The Precise Plan envisions a highly walkable community, with many employees living nearby or arriving by transit or other nonvehicle modes. This vision would be supported by limits on vehicles traveling into or out of North Bayshore.

The Gateway Master Plan and the proposed Google Master Plan are defining the NBPP final development phase. Remaining NBPP development over the next 10 to 20 years will include up to 1,550,000 square feet of office space and over 9,000 new housing units. This development will be supported by completion of the planned street and greenway system and complemented by expanded local-serving retail.

The additional planned office will add over 6,000 employees, in addition to the approximately 10,000 employees from already-approved office projects. New housing will also add peak-period vehicle trips. Without offsetting actions to reduce existing and future vehicle trips, these new trips will exceed the gateway capacity. Offsetting actions, already planned for in the NBPP, include full implementation of the vehicle trip reduction strategies, including:

- Reduce existing and approved vehicle trips by meeting or bettering the 45% SOV mode share target;
- Internalize commute trips through the development of new housing;
- Complete the walkable street network and separated bike facilities called for in the NBPP; and
- Complete Priority Transportation Improvements now under development to improve roadway operations and add gateway capacity.

The Circulation Study results to date, however, show that new vehicle reduction and other strategies will be needed to supplement these existing efforts to meet the gateway vehicle trip cap policies. Potential new strategies include:

- Require future office development to further reduce SOV mode share below 45%, potentially as low as 35%;
- Shift a portion of existing and future trips out of the peak period through flexible work scheduling, including an increase in remote work;
- Minimize parking supply through a District Parking strategy;
- Provide additional Priority Transportation Improvements, primarily at the Rengstorff Avenue gateway; and
- Potentially manage gateway trips with Congestion Pricing.

The following sections of the Circulation Study provide an analysis, discussion and recommendations regarding specific elements of this enhanced transportation strategy, including:

- Transportation infrastructure and Priority Transportation Improvements
- Strategies to comply with the gateway trip cap requirements
- Other mobility strategies to support increased use of transit and active transportation modes
- Traffic operations issues, impacts and strategies

4. Transportation Infrastructure

The Priority Transportation Improvements identified in the NBPP are key projects that benefit North Bayshore development and support key policies such as the mode shift target and gateway trip cap requirements.

One objective of the Circulation Study was to review and update the remaining projects and identify any appropriate new projects. The initial step for this objective was to evaluate a potential U.S. 101 undercrossing at Rengstorff Avenue and a transit/pedestrian/bicycle bridge across Stevens Creek, both of which were identified in the 2017 NBPP for further feasibility analysis.

The results of the evaluation were provided at a City Council Study Session on May 12, 2020 and, based on Council direction, further evaluation of both projects was dropped. However, the study continued to review a new Stevens Creek pedestrian/bicycle-only bridge and a modified U.S. 101/Rengstorff Avenue Ramp Realignment project. The analysis of the original and revised projects is provided in Appendix A.

New Priority Transportation Improvements

The Circulation Study has further analyzed the current Priority Transportation Improvement list and identified projects, including those that expand on the original list to support the build-out of the NBPP. On June 8, 2021, the City Council approved the following additions to the Priority Transportation Improvements:

- **Shoreline Reversible Bus Lane Extension from Plymouth Street/Space Park Way to Charleston Road**—This project will close a gap in the bus lane on Shoreline Boulevard, providing a direct connection to the Charleston Road bus lanes. With public and private bus service expected to significantly increase, this extension will reduce merging conflicts with regular traffic lanes.

- **U.S. 101/Rengstorff Avenue Ramp Realignment and Frontage Road Extension from Rengstorff Avenue to Landings Drive (Rengstorff Avenue Connector project)**—These combined projects will realign the northbound U.S. 101/Rengstorff Avenue ramps and provide a new access road into North Bayshore by constructing a connection from Landings Drive to the new Rengstorff Avenue ramp signal. These improvements would connect to an existing Priority Transportation Improvement that extends the Landings Drive frontage road across Permanente Creek to connect with Plymouth Street. Combined, these improvements would create a new east-west connection between Rengstorff Avenue and Shoreline Boulevard (see Figure 4).

A preliminary analysis of the Rengstorff Connection project has been conducted, including analysis with the VISSIM simulation model. This analysis indicated potential value in improving operations along the Rengstorff Gateway by reducing bottlenecks and leveraging the already planned frontage road. Other benefits of this project include:

- Diversion of vehicle traffic from the Charleston Transit Boulevard, improving conditions for both transit operations and the bicycle and pedestrian use of the Charleston Transit Boulevard.

- Elimination of 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.

- Improved safety for bicycles and pedestrians by reducing conflicts with high-speed on- and off-ramp traffic along Rengstorff Avenue.

- Enhances throughput on the Rengstorff Gateway without widening Rengstorff Avenue, helping with compliance of the gateway trip cap.

Figure 4: Rengstorff Connector Project

- **Bus Lane Enhancements**—This project will create a new connection from the bus lane to southbound U.S. 101 and potentially to State Route 85, which will further support the effectiveness of the Shoreline Bus Lane.

- **Stevens Creek Trail Connections**—Permanent, all weather, Americans with Disabilities Act (ADA)-compliant connections from the North Bayshore Green Loop to the Stevens Creek Trail will help expand active transportation use. Google is proposing to construct two connections at Charleston Road and Shorebird Way as part of the Master Plan. This project provides a third connection to the retention basin trail.

- **Congestion Pricing Implementation**—Should a decision be made to implement congestion pricing, this project will purchase and install detection equipment and other related infrastructure.

- **Stevens Creek Bicycle/Pedestrian Bridge at Charleston Road**—Originally included in the plan as part of a potential transit bridge, a bike and pedestrian bridge would provide an improved connection to new housing and office development at NASA/Moffett Field.

- **La Avenida Bicycle/Pedestrian Bridge over Shoreline Boulevard at La Avenida**—This project would extend the planned U.S. 101 bike and pedestrian bridge across Shoreline Boulevard onto La Avenida. It would connect to protected bike lanes on La Avenida and the Stevens Creek Trail and would also reduce pedestrian and bicycle traffic delays at the Shoreline Boulevard/La Avenida intersection.

In addition, several projects listed as Priority Transportation Improvements in the 2017 NBPP have been partially completed, are incorporated into other projects, or will be completed through approved or expected development. These projects have been dropped from the recommended revised list of Priority Transportation Improvements.

A map and list of the recommended revised list of the Priority Transportation Improvements are provided in Figure 5 and Table 1, respectively. This list includes the projects from the 2017 NBPP that are not yet completed and the new projects described above. The projects are also grouped into recommended 5-year, 10-year, and 20-year timelines based on an assessment of project needs that best support planned phases of development.

In approving this revised list on June 8, 2021, the City Council stated their intent that this list was to be a living document that would be reviewed periodically and revised as needed.

Figure 5: North Bayshore Priority Transportation Improvements

Table 1: North Bayshore Priority Transportation Improvements—Approved 2021 Update

ID # on Map	Project	Est. Cost ($ millions)*
5-Year Projects		
1	Charleston Transit Boulevard (Phases 2/3)	43.3
2	Plymouth/Space Park Connection	59.5
3	U.S. 101 at Shoreline Bicycle/Pedestrian Bridge	30.3
4	U.S. 101 Shoreline Off-Ramp Realignment	31.4
5	Shoreline Corridor Bus Lane—Middlefield to Pear	22.1
6	Frontage Road from Landings Drive to Permanente Creek	3.6
7	Transit Center Upgrades, incl. Grade Separation *(not on map)*	5.0
8	Congestion Pricing Implementation *(not on map)* (New)	5.0
10-Year Projects		
9	Shoreline Corridor Cycle Track (North of Plymouth)	19.9
10	Bus Lane Extension from Plymouth/Space Park to Charleston (New)	4.9
11	Frontage Road Extension—Permanente Creek to Plymouth	50.1
12	Rengstorff to Landings Drive (new connection) (New)	50.2
13	U.S. 101/Rengstorff Ramp Realignment (New)	22.0**
14	Bus Lane Enhancements (New)	5.5
15	Stevens Creek Trail Connections (New)	1.1
20-Year Projects		
16	Garcia-CRAG to Bayshore/San Antonio Protected Bikeways	4.9
17	Rengstorff-CRAG across U.S. 101 to Leghorn Protected Bikeways and Sidewalk (requires bridge replacement)	20.0**
18	San Antonio-Bayshore to U.S. 101 Protected Bikeways and Sidewalk (requires bridge replacement)	20.0**
19	Amphitheatre-Shoreline to CRAG—Cycle Track and Widen to 4 lanes	10.3
20	Stevens Creek Bicycle/Pedestrian Bridge at Charleston (New)	36.6
21	La Avenida Bicycle/Pedestrian over Shoreline (New)	40.9

* Cost is escalated to year of construction.
** Matching funds for Federal or State grant funding.

5. Gateway Trip Cap Strategy

Background

The original 2014 Precise Plan established a trip cap at the combined three gateways in the a.m. inbound and p.m. outbound three-hour peak periods. The purpose of the trip cap was to ensure that vehicle trips associated with new projects would not exceed the capacity at each gateway. The cap was established at 18,850 vehicles in the a.m. and 16,630 in the p.m. The original intent was to measure compliance across all three gateways in the peak period. Subsequently, however, the Council narrowed that to compliance at each gateway and then later just the peak hour at each gateway.

Through the 2017 Precise Plan, which added housing, the trip cap was converted to a two-way measure. That was based on the idea that outbound housing trips in the morning would reduce inbound capacity (by taking away green time). The result was that inbound trip capacity was reduced, even before any housing trips were added. The new cap was used starting with the 2017-18 monitoring reports. The 2017 Precise Plan also exempted residential projects from having to demonstrate compliance with the trip cap.

In 2018, the monitoring showed that the new trip cap was exceeded on Shoreline Boulevard. Following additional Council discussion, direction was provided to consider both the original 2014 one-way trip cap and the 2017 revised two-way trip cap in the regular monitoring reports, which is what was provided in the 2019 and 2020 reports. The February 2020 report included peak traffic conditions pre-COVID-19. Monitoring showed that peak traffic was at or above capacity on Shoreline Boulvard in the morning and on Rengstorff Avenue in the afternoon.

On June 8, 2021, Council approved a further modification to focus trip cap compliance on the one-way peak direction only (i.e., inbound in the morning, outbound in the afternoon). While future housing trips may possibly impact peak direction trips, any impact is uncertain and may not occur for several years. Gateway capacity can be adjusted in the future if needed to reflect any capacity impact.

Trip Cap Policies and Recommended Revisions

The Circulation Study has a primary focus on the gateway trip cap policies and potential compliance since that policy is the most effective way to manage vehicle trips in North Bayshore. As discussed above, analysis of the trip cap included the potential for planned or future transportation infrastructure projects to impact gateway capacity.

To consider revisions to trip cap policies, it is useful to consider how traffic operates. On any given roadway, as peak vehicle demand approaches the capacity of the roadway, vehicles will back up and travel times will extend. The actual traffic volume will not substantially exceed capacity, but drivers may change their travel to avoid the resulting delays. Those changes could include traveling at a different time, using a different route or taking a different mode.

Potential changes to the Trip Cap Policy address several issues defining the trip cap and measuring compliance. Recommended changes for these are discussed below:

- Trip cap monitoring—the twice-yearly gateway monitoring program should continue in order to track post-COVID traffic and compliance trends. The monitoring should measure peak-period trips in both directions at each gateway, as well as mode share trends.

- Trip cap definition and compliance—Two changes are recommended in addition to the previously approved recommendation to monitor compliance based on the one-way peak direction:

    1) Compliance should be measured by comparing actual trips with the gateway capacity for the three-hour peak period, as opposed to just the peak hour.

    2) Compliance should be measured by combining the Shoreline and Rengstorff gateways. The San Antonio gateway should continue to be measured separately.

    These two adjustments allow the trip cap to more closely reflect actual travel patterns and provide additional compliance flexibility.

- Trip cap enforcement—currently, if the cap is reached on two successive monitoring periods, North Bayshore development is considered out of compliance and penalties, such a restriction on commercial building permits, may be implemented. This could lead to unintended consequences of delaying or preventing achieving the housing and complete neighborhoods vision of the NBPP.

    An alternative approach that focuses more on the TDM effectiveness of approved projects is recommended. Higher financial penalties could help encourage SOV compliance as well as funding other modal strategies by the MTMA or others.

- Gateway capacities—since the gateway capacities were first established in 2014, there have been no substantial changes to North Bayshore gateway streets. However, several projects will be completed in the near future. These projects (such as the US 101/Shoreline Boulevard Ramp Realignment) will add capacity and may

also modify the current capacity. The Precise Plan states that the City Council may adjust the trip cap in the future to respond to changes in conditions, as new infrastructure projects are completed.

The Circulation Study conducted an independent assessment of current capacity estimates and developed future estimated capacities associated with the Priority Transportation Improvements. This report (Appendix B) provides the recommended capacity adjustments specifically for the Shoreline and Rengstorff gateways (see Tables 2 and 3). No changes are proposed for the San Antonio gateway at this time. The report also recommends the revisions discussed above to use the peak period and combine the Shoreline and Rengstorff gateways.

The gateway capacities for future infrastructure can be used for the transportation analysis of development proposals. Their use for compliance would only occur when projects are completed.

Table 2: Recommended a.m. Gateway Capacity

Trip Cap Factor & Adjustments	AM Inbound Vehicle Trips					
	Shoreline		Rengstorff		Shoreline + Rengstorff	
	Peak Hour	Peak Period	Peak Hour	Peak Period	Peak Hour	Peak Period
Current Trip Cap (2014)	2,490	6,720	2,960	7,990	5,450	14,710
Recommended Trip Cap (Peak Period Adjustment = 3X Peak Hour)	No change	7,470	No change	8,880	No change	16,350
Shoreline Bus Lane + NB RT at Pear Ave + Plymouth/Space Park Realignment (+100 peak hr.; +300 peak period)	2,590	7,770			5,550	16,650
Shoreline/US 101 NB Off-Ramp Realignment (+620 peak hr.; +1,860 peak period)	3,210	9,630			6,170	18,510
CRAG Intersection Turn Lanes (No Change)			2,960	8,880	6,170	18,510
Rengstorff/US 101 NB Ramp Realignment at Landings Frontage Road (+740 peak hr.; +2,220 peak period)			3,700	11,100	6,910	20,730
All Improvements Combined	3,210	9,630	3,700	11,100	6,910	20,730

Source: Gateway Trip Cap Study for the North Bayshore Area, Hexagon Transportation Consultants

Table 3: Recommended p.m. Gateway Capacity

Trip Cap Factor & Adjustments	PM Outbound Vehicle Trips					
	Shoreline		Rengstorff		Shoreline + Rengstorff	
	Peak Hour	Peak Period	Peak Hour	Peak Period	Peak Hour	Peak Period
Current Trip Cap (2014)	2,730	7,380	2,090	5,630	4,820	13,010
Recommended Trip Cap (Peak Period Adjustment = 3X Peak Hour) (+290 for Rengstorff in peak hour)	No change	8,190	2,380	7,140	5,110	15,330
Shoreline Bus Lane + NB RT at Pear Ave + Plymouth/Space Park Realignment (No Change)	2,730	8,190			5,110	15,330
Shoreline/US 101 NB Off-Ramp Realignment (+290 peak hr.; +870 peak period)	3,020	9,060			5,400	16,200
CRAG Intersection Turn Lanes (+360 peak hr.; +1,080 peak period)			2,740	8,220	5,760	17,280
Rengstorff/US 101 NB Ramp Realignment at Landings Frontage Road (+340 peak hr.; +1,020 peak period)			3,080	9,240	6,100	18,300
All Improvements Combined	3,020	9,060	3,080	9,240	6,100	18,300

Source: Gateway Trip Cap Study for the North Bayshore Area, Hexagon Transportation Consultants

Strategies for Trip Cap Compliance with New Development

Previously, the analysis of trip cap compliance for proposed new office developments added estimated new vehicle trips to existing trips and compared those trips to the gateway capacity. Currently, however, there is uncertainty about the potential post-COVID characteristics of peak vehicle traffic.

As a result, it is difficult to provide a definitive analysis and recommendations regarding strategies for achieving the gateway trip cap. Instead, the study has identified several factors and options that may determine the needed strategies. These include:

- Remote work impacts—currently office space occupancy is still low (estimated at 25% in the Bay Area and probably lower in North Bayshore), but companies are anticipating a return to work in early 2022. What is in question is how that return translates to peak vehicle demand. Factors in play include:
  - The continuing or permanent impact of remote work—How will office space be used on a daily basis (e.g., dedicated or "hot" desks)?
  - How much flexibility will companies allow, or workers demand, in terms of commute travel? Previously, nearly all commutes occurred in the peak periods. How many trips will shift to off-peak hours or just a few days a week?

- Office space impacts—It can be expected that new office space will be fully utilized. Will remote work mean that new space may be phased over a longer time period?
- Transit and car pool use—Will COVID result in more single-occupant vehicle commutes, potentially offsetting other benefits of remote work?

While remote work and greater commute travel flexibility may benefit trip cap compliance, actual impacts may not be known for several years and cannot be assumed at this time. Ongoing gateway monitoring will help determine the benefit, if any.

- SOV reductions—The Precise Plan SOV target of 45% for new office projects does not appear to sufficiently reduce vehicle trips to meet the trip cap. This is due, in part, to the added residential, retail and entertainment trips expected in the peak period, especially the p.m. peak. However, new North Bayshore residents could help further reduce the gateway SOV rate, to the extent that they also work in North Bayshore and primarily walk or bike to work.

  One strategy would be to require a lower SOV rate in the range of 35% to 40% for both existing and future employees on any new development, such as the Google Master Plan. The lower rate could partially rely on a substantial number of internalized trips once housing is fully developed. A reduced SOV requirement would ensure that their TDM program would need to meet trip targets regardless of the level of internalization.

  While this reduced SOV rate seems reasonable and necessary, further analysis will be needed to determine the actual rate needed to meet the trip cap and how other factors will impact the rate. The transportation analysis of individual developments should determine any strategies, in addition to the lower SOV rate, that are needed to help achieve compliance with the trip cap.

- Gateway operational and capacity improvements—Implementation of the Priority Transportation Improvements provide multiple benefits towards trip cap compliance. Some projects help achieve greater transit and active transportation use. Others add gateway capacity and/or provide operational benefits that help utilize the available capacity. Completing these projects will help achieve NBPP goals, but some of the longer-term (10- and 20-year) projects may be challenging to fully fund.

  The most impactful project is the Rengstorff Avenue Connector project, which combines several individual Priority Transportation Improvements to provide an alternative connecting route from Rengstorff Avenue along Landings Drive connecting to Plymouth Street.

This project can improve operation of the Charleston Transit Corridor, active transportation conditions, and gateway throughput. However, the cost for the full project will exceed $100 million and will require substantial right-of-way acquisition, Caltrans support, and a crossing of Permanente Creek. If pursued, completion of the entire connector is probably up to 10 years away.

The project could be delivered in phases with a focus first on the new roadway connection from Rengstorff Avenue to the new Landings Drive frontage road, which will be upgraded as part of the Landings office development. This segment will need to be coordinated with the Caltrans ramp realignment project and may take five to seven years to deliver at a cost of approximately $70 million. This project phase will improve active transportation conditions along Rengstorff Avenue, improve gateway throughput, and divert some traffic off of the Charleston Corridor.

- Congestion Pricing—This is another potential tool that is discussed in a separate section of this report. Congestion Pricing involves charging for gateway access and could help reduce vehicle trips in order to meet the trip cap.

Trip Cap Analysis

While it may take several years to determine the right combination of the above strategies, the Circulation Study evaluated a representative scenario to better understand the potential tradeoffs. This analysis was based on the estimated gateway demand and capacity with the full development of the Precise Plan.

Key assumptions are summarized in Appendix C. They include a 35% SOV target, all of the Priority Transportation Improvements and a return to pre-COVID traffic conditions. These assumptions were also used in the VISSIM traffic simulations summarized in a later section of this report. The analysis also focused on the Shoreline and Rengstorff gateways since there were limited changes at the San Antonio gateway.

Results of this analysis are shown in Table 4. Key conclusions include:

- With these assumptions, vehicle trips are expected to be in compliance with the trip cap in the a.m. peak period. However, trips may exceed the cap in the p.m. peak period, particularly on Shoreline Boulevard.
- The Rengstorff gateway performs adequately with the Rengstorff Connector project, but would be over capacity without that project.
- Additional operational improvements are needed to support demand on southbound Shoreline Boulevard in the afternoon. Alternatively, other demand management strategies may be needed.
- Peak hour vehicle trips at all gateways (including San Antonio Road) would increase to about 8,000 trips in the a.m. (a 26% increase) and over 7,500 in the p.m. (a 42% increase).

The above scenario represents one potential outcome that can be analyzed for future North Bayshore traffic impacts. However, the trip cap could also be maintained through other strategies such as even lower SOV targets, a substantial shift of vehicle trips out of the peak period and possibly through congestion pricing.

Table 4: Gateway Analysis—Shoreline and Rengstorff Only

			Shoreline + Rengstorff Traffic Volumes and Capacity Additional Reduced TDM with Rengstorff/ Frontage Road Project			
			AM		PM	
	SOV Rate	% Trips on Shoreline / Rengstorff	3 Hour Peak Period (8:00-11:00 AM)	Peak Hour (9:00 -10:00)	3 Hour Peak Period (4:00-7:00 PM)	Peak Hour (5:00 - 6:00)
Existing Volume (2020 Count)	56%		13,350	4,960	11,900	4,430
SOV Trip Reduction	42%		3,338	1,240	2,975	1,108
Adjusted Existing Volume			**10,013**	**3,720**	**8,925**	**3,323**
New Developments						
Intuit Phase 2	55%	30%	149	55	146	54
Shashi	45%	100%	170	63	159	59
Charleston East	35%	98%	932	345	843	312
Microsoft	45%	100%	1,308	484	1,146	424
Sobrato Phase 2	45%	99%	505	187	428	158
Landings	35%	98%	1,035	383	717	265
Trips from Approved Development			4,100	1,517	3,429	1,272
Trips fom Precise Plan Build-out	35%	98%	2,019	747	1,936	716
Retail and Entertainment Trips			405	150	541	200
Peak Direction Housing Trips			1,332	493	3,195	1,182
Adjusted Future Volume			**17,869**	**6,627**	**18,026**	**6,693**
Estimated Capacity						
Current Capacity			16,350	5,450	14,460	4,820
* Adjusted Capacity					870	290
* Bus Lane Project			300	100	0	0
* Shoreline Ramp Realignment			1,860	620	870	290
* CRAG Turning Lanes			0	0	1,080	360
* Rengstorff & Frontage Road			2,220	740	1,020	340
Total Future Capacity			20,730	6,910	18,300	6,100
Available Capacity			**2,861**	**283**	**274**	**-593**

Notes:

1 SOV Current Rate	56%
2 SOV Projected Rate	42%
3 Housing Units	9,850
6 Office (1000 sq. ft.)	1,550

* Source: Gateway Trip Cap Study for the North Bayshore Area Hexagon Transportation Consultants 2021

6. Modal Strategies

A key strategy for achieving the Precise Plan transportation goals is to greatly enhance alternative modes, including public transit, active transportation and other Transportation Demand Management (TDM) programs. The Precise Plan has strong facilities and programs, particularly for cyclists and pedestrians who are envisioned to take most of the internal commute and other trips. Transit use has benefited from Google's commuter shuttle services, but broader public use has been limited. Following are key observations and recommended improvements for these modal strategies.

Bicycle and Pedestrian Facilities and Programs

The NBPP identifies a bicycle and pedestrian network that helps reduce auto use and supports the creation of a highly walkable and bikeable community. It also identifies street typologies that serve specific land use and mobility needs in North Bayshore. The typologies include Gateway Boulevards (e.g., Shoreline Boulevard), Neighborhood Streets, Access Streets, and Service Streets. Each includes traffic lanes, sidewalks, and bicycle provisions designed to best accommodate the roadway functions.

The Circulation Study included an evaluation of the current NBPP bicycle and pedestrian programs and facilities. The full report on this evaluation and recommendations is provided in Appendix D. The study included:

- An evaluation of current and future bicycle and pedestrian plans, including an estimate of future Bicycle Level of Traffic Stress (BLTS) and Pedestrian Quality of Service (PQOS);

- An estimate of future pedestrian and bicycle use resulting from increased jobs and housing and meeting NBPP mode share targets (minimum 10% of commute trips); and

- Identification of potential locations where additional capacity may be needed.

A key conclusion of the study is that, when fully developed, the NBPP pedestrian and bicycle facilities will be highly supportive of the North Bayshore vision and will serve high future bicycle and pedestrian volumes.

The study also included recommendations that would enhance the current plan. Approved by the City Council on June 8, 2021, the revisions to the planned pedestrian and bicycle facilities include:

- Modify sidewalk width on Access Streets from 5' to 6'.
- Ensure that sufficient bicycle capacity is provided on Charleston Road and Shorebird Way east of Shoreline Boulevard through a combination of protected bikeways and cycle tracks. These improvements should be included in the Google Master Plan.
- Ensure better bicycle connections to the east (NASA) and west (Palo Alto). Planned bicycle bridges across Stevens Creek will provide the NASA connections. Palo Alto connections should be identified through the next phase of the Valley Transportation Authority (VTA) study of the U.S. 101/San Antonio freeway interchange.
- Implement additional protected intersections, primarily along Shoreline Boulevard.
- Provide the option on Gateway Boulevards to construct two-way protected bikeways (i.e., cycle tracks) only on one side of streets and provide a one-way protected bikeway on the other side. Currently, the NBPP calls for two-way cycle tracks on both sides. However, the study determined the additional capacity with two-way cycle tracks on both sides of the street is not needed. This strategy is already reflected in current designs for the protected bikeways on Shoreline Boulevard and Charleston Road.
- Explore strategies to address capacity constraints along Stevens Creek and Permanente Creek Trails, including improvements to parallel routes.

Transit Strategies

A high level of transit use is essential for achieving NBPP goals. However, to date, nearly all transit use has been through private company-operated shuttles, primarily by Google. While these programs have been successful in reducing peak-period auto use, more publicly available transit service will be needed to support the planned North Bayshore population and to help further reduce commute vehicle trips. Transit is also a critical element for achieving low auto ownership since not all trip destinations will be located in North Bayshore.

Currently, the only public transit service available is VTA Line 40, operating all day every 30 minutes, and the MVgo shuttles with about 15 trips each in the a.m. and p.m. peak periods. (see Figure 6). Pre-COVID, MVgo operated about five to seven more trips in each peak period. This level of service does not provide North Bayshore with a high-quality transit corridor, which requires 15-minute service from 7:00 a.m. to 10 a.m. and 4:00 p.m. to 7:00 p.m., as well as 20-minute frequency the rest of the day.

North Bayshore would benefit from designation as a transit-rich area. According to State legislation, this is defined as the area within one-half-mile of a high-quality bus corridor. While not sufficient today, higher-frequency service would allow essentially all of North Bayshore to become a transit-rich area and qualify for existing and future State programs and incentives that would help with the development of housing and supporting facilities.

Goals for improved transit service include:

- Support compliance with NBPP SOV and trip cap goals.
- Improve public transit through North Bayshore and to downtown with frequent all-day service (at least 15 minutes).
- Designate the area as having high-quality transit.
- Enhance the quality of transit with improved facilities and dedicated lanes.

Expanded transit service, such as more frequent VTA service and expanded MTMA service, will be particularly important for serving the planned residential community, which is planned for low levels of parking and auto utilization. Additional dedicated funding will likely be needed to support expanded service.

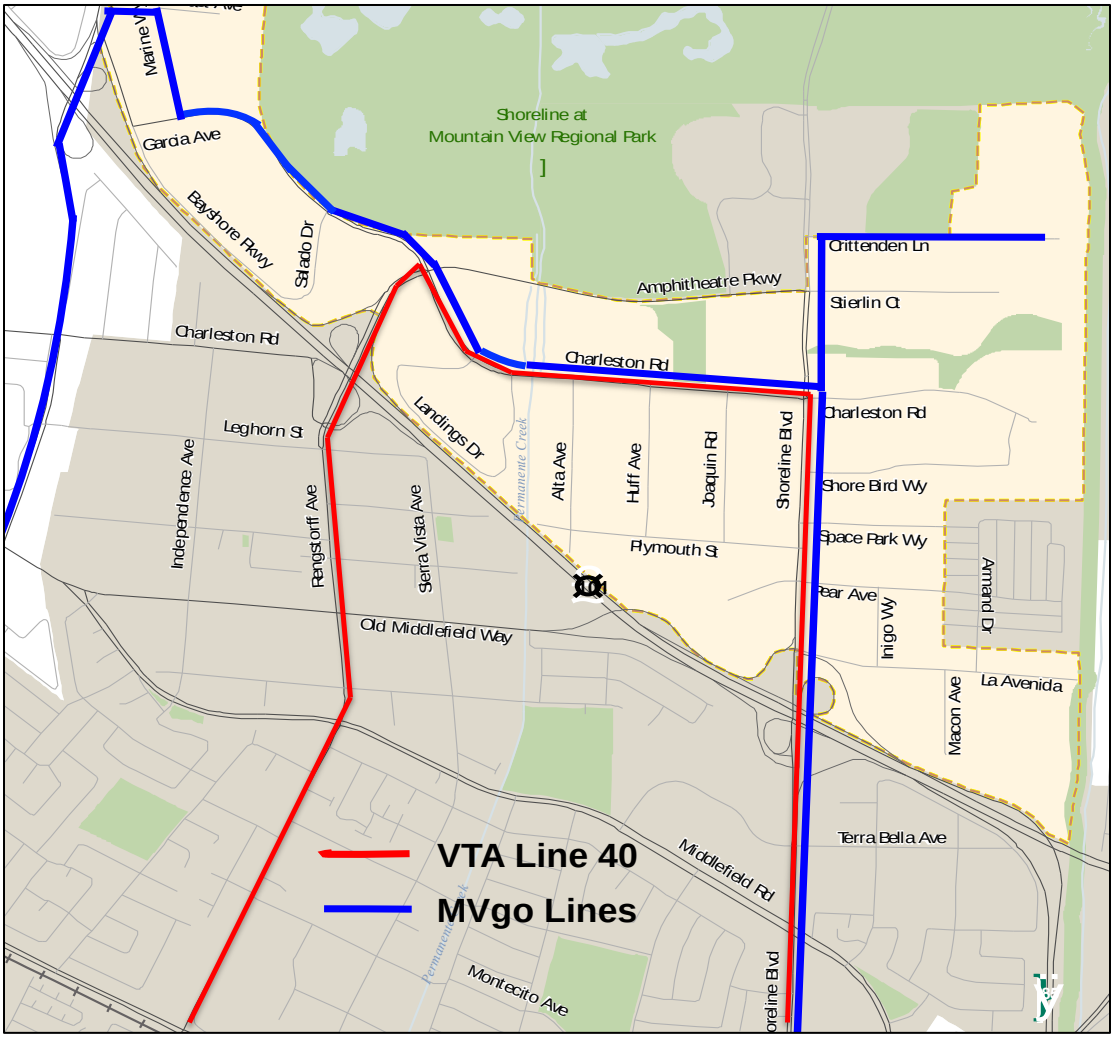

Figure 6: Current Public Transit Service

Recommended transit strategies include:

- Integrate and expand the MVgo and Community Shuttle services, including an all-day frequent downtown connection.
- Work with VTA to increase Line 40 service frequency.
- Explore a potential VTA/MTMA connection to the NASA/Bayshore light rail station.
- Advocate for express/limited-stop light rail service from the BART Milpitas station.
- Work with MTC on a potential future regional bus program and with VTA on development of the State Route 85 corridor transit service.

TDM Strategies

TDM programs, administered by individual employers along with the MTMA, are an essential component for NBPP efforts to lower the SOV rate. They include

complementary programs supporting other modal strategies. The NBPP developed TDM Guidelines for both office and residential projects that have been required for already-approved projects. However, future projections for vehicle demand, including impacts of the Google Master Plan, will require updates to the current guidelines. The Circulation Study consultant team reviewed these guidelines and provided proposed updates (Appendix E). Key proposals are discussed below.

Program Strategies—The guidelines identify procedures for defining the trip cap for individual projects and specific strategies to meet the SOV target. With the need to meet a lower SOV rate, these procedures will need modifications. In particular, they should provide greater focus on peak demand and the impact of remote work and commute flexibility and how those factors impact the project trip cap calculation. The TDM program also needs to strengthen efforts supporting increased active transportation modes, particularly in consideration of the planned residential growth.

District parking also will require additional analysis and may need specific TDM strategies to support effectiveness of that approach. TDM programs should identify a paid parking or parking cash-out option that could be pursued if other strategies do not achieve the SOV target.

Implementation of district TDM programs should also be more specifically supported in individual development TDM requirements. District programs would be implemented by the MTMA, but will need additional resources and a coordinated approach among North Bayshore employers.

Monitoring and Enforcement—Significant adjustments in the monitoring of individual trip caps and TDM effectiveness will be needed to support future projects. Traditional vehicle trip monitoring at driveways will not be sufficient with the district parking approach. Instead, an independent survey of employee commute modes will be required, likely combined with additional traffic monitoring.

Currently, failure to meet driveway trip limits is enforced through fines that would be transmitted to the MTMA. It will be important that fines are set at a level that will lead to TDM effectiveness rather than encouraging companies to just pay the fine. Another option is to tie fines to levels of success in lowering SOV rates. Revisions to the TDM Guidelines should review and update the enforcement policies and penalties.

7. Congestion Pricing Feasibility Study

Background

The NBPP includes a provision for considering congestion pricing as a tool for managing the gateway trip cap. The following section from the NBPP Mobility Element describes congestion pricing and considerations for potential implementation:

- Congestion pricing involves charging motorists a user fee to drive in specific, congested areas during periods of peak demand to help eliminate or reduce related delays to acceptable levels. The net revenues generated can be used to fund transportation improvements to support shifts in travel behavior, such as transit service, roadway improvements, and bicycle and pedestrian projects. The congestion pricing system can be designed to exempt certain people or vehicles, as necessary. For example, license plate recognition can exempt North Bayshore residents or Shoreline at Mountain View visitors.

- If the North Bayshore employer TDM program requirement and trip cap do not reduce the number of vehicle trips to less than the established a.m. peak period vehicle trip cap, the City may implement a congestion pricing system. Before implementing congestion pricing, further study and community outreach will be required.

The Circulation Study has studied the feasibility of congestion pricing as a potential tool for managing vehicle traffic entering and exiting North Bayshore. This feasibility study explored the potential design of this tool and explored its benefits and impacts. Results of the study are summarized below, with more detail in Appendices F and G.

The study identified a balance of several goals for congestion pricing to succeed. These include congestion reduction, economic development, equity, and health and the environment.

The congestion pricing feasibility study modeled different pricing levels and their resulting potential for trip reduction. A key assumption was that a system in Mountain View would, to the extent possible, integrate with existing Bay Area Toll Authority (BATA) infrastructure to minimize City administrative requirements.

Before and after the technical evaluation, the study team conducted stakeholder interviews with North Bayshore employers and others who could be impacted by congestion pricing. The scenarios evaluated in the feasibility study were informed by these conversations and designed to be potentially successful, while attempting to minimize adverse impacts identified by stakeholders.

Scenario Evaluation

After an initial screening, four scenarios were selected for more detailed evaluation (Figure 7). These scenarios were based on a cordon pricing approach, with variations in pricing direction, time of day, and the inclusion of focused discounts. All scenarios assumed exemptions for North Bayshore residents and transit vehicles. The evaluation also tested the sensitivity of factors such as the success in lowering the baseline SOV rate and travel behavior elasticity.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4
Pricing type	Cordon pricing			
Pricing direction	Inbound	Inbound	Peak directional (inbound in AM, outbound in PM)	Peak directional (inbound in AM, outbound in PM)
Pricing parameters	**AM peak only** (8:00 - 11:00 AM)		**Peak periods only** (8:00 - 11:00 AM and 4:00 - 7:00 PM)	
Day of week	Weekdays			
Discounts	None	- Low-income drivers (50% discount) - HOV 2+ (carpool, 100% discount) - HOV 3+ (TNC, 100% discount)	None	- Low-income drivers (50% discount) - HOV 2+ (carpool, 100% discount) - HOV 3+ (TNC, 100% discount)
Exempt vehicles	Vehicles registered to pricing zone residents, public and private transit vehicles, emergency vehicles.			

Figure 7: Congestion Pricing Scenarios

Conclusions Regarding a Potentially Suitable Program

The evaluation identified a potentially suitable congestion pricing program that may best balance the identified goals. The program includes:

- Pricing only inbound a.m. trips between 8:00 a.m. and 11:00 a.m. on weekdays.
- Residents and transit vehicles are fully exempt.
- Further study of possible discounts (e.g., carpools, low-income drivers).
- A per-trip charge in the range of $5 to $13 to keep trips below the trip cap.
- A likely SOV trip rate reduction of 2% to 5%.

Restricting the pricing to the morning peak period would target the hours with the greatest percentage of office commuters and, at least partially, mitigate impacts to noncommute trips.

A definitive conclusion about discounts was not made since more information is needed regarding the number of eligible trips and how they would be affected by pricing. There are also administrative challenges related to integration of a Mountain View system with Bay Area Express Lanes, and questions about enforcement roles and responsibilities.

The technical evaluation, along with stakeholder discussions, identified several issues, concerns, and challenges that should be considered. These include:

- Some employer concerns (Microsoft and Intuit, particularly) that pricing will be an obstacle to attracting employees. North Bayshore is home to the primary Silicon Valley offices for those firms.
- The impact on lower-income service workers, especially at major companies.
- The impact on event attendees at the Computer History Museum and on Shoreline Regional Park users.
- The effect on hiring restaurant and retail workers, many of whom likely need to arrive when pricing is in effect.
- Potential challenges leasing future service and retail spaces (e.g., grocery stores and pharmacies) to support the residential population.
- Impacts on construction workers.

Costs and Financing Opportunities

Capital costs to implement congestion pricing at the three gateways are estimated at $30 million. These costs include physical infrastructure for roadside detection as well as administrative provisions, likely through a contract with BATA or VTA. Because congestion pricing provides a revenue stream, it may be possible to finance the capital costs.

Operating costs for administering the program, processing payments, and enforcement are estimated at $7 million annually. A greater number of discounts and exemptions would likely increase costs, due to increased processing costs. Expected revenue would be at least $12 million and could be substantially higher.

As a result, the evaluation estimated congestion pricing would break even in three to eight years, at which point cumulative net revenue would have exceeded capital[1] and operating costs, and be available to fund other programs, potentially directed at mode-shift programs or equity strategies. Funding these types of programs could also occur at program outset, although this possibility would depend on the financing approach used.

[1] Financing costs were not included in this analysis.

Implementation Issues/Next Steps

Implementation of congestion pricing can take four to six years to get legal approval, develop administrative agreements, and construct physical structures. Thus, a decision to proceed will need to be made well in advance of the date the program is intended to begin operating.

While congestion pricing in North Bayshore appears to be feasible, its value may depend on other factors, such as post-COVID traffic conditions, the pace of new development, the success of further SOV reduction efforts, and progress on Priority Transportation Improvements. Congestion pricing for an area (as opposed to typical bridge and highway tolling) is also new in the United States, so Mountain View will need to learn from the experiences of other communities.

As a result of the feasibility study, it is recommended that further development of a North Bayshore congestion pricing program be deferred as the following tasks are pursued:

- Expand monitoring and surveys to better understand potential program impacts on peak-hour and peak-period trips that are not serving major employers.

- Closely track experiences with congestion pricing in the Bay Area and elsewhere to better understand the tool's effectiveness, potential equity programs, and challenges.

- Monitor gateway trip cap compliance and SOV reduction progress as new development occurs and post-pandemic travel patterns emerge to determine when or if additional planning for congestion pricing should occur.

8. Traffic Simulation Analysis and Findings

Background

During 2019 and 2020, the Circulation Study consultant team led by TJKM Transportation Consultants, developed and calibrated a traffic simulation model (VISSIM model), evaluated existing conditions and conditions with existing approved projects, and supported the analysis of the Google Landings project and Gateway Master Plan. The Circulation Study modeling was based on the allocation of Precise Plan trips to the Transportation Analysis Zones (TAZ) used in the Mountain View Travel Demand Model (Figure 8).

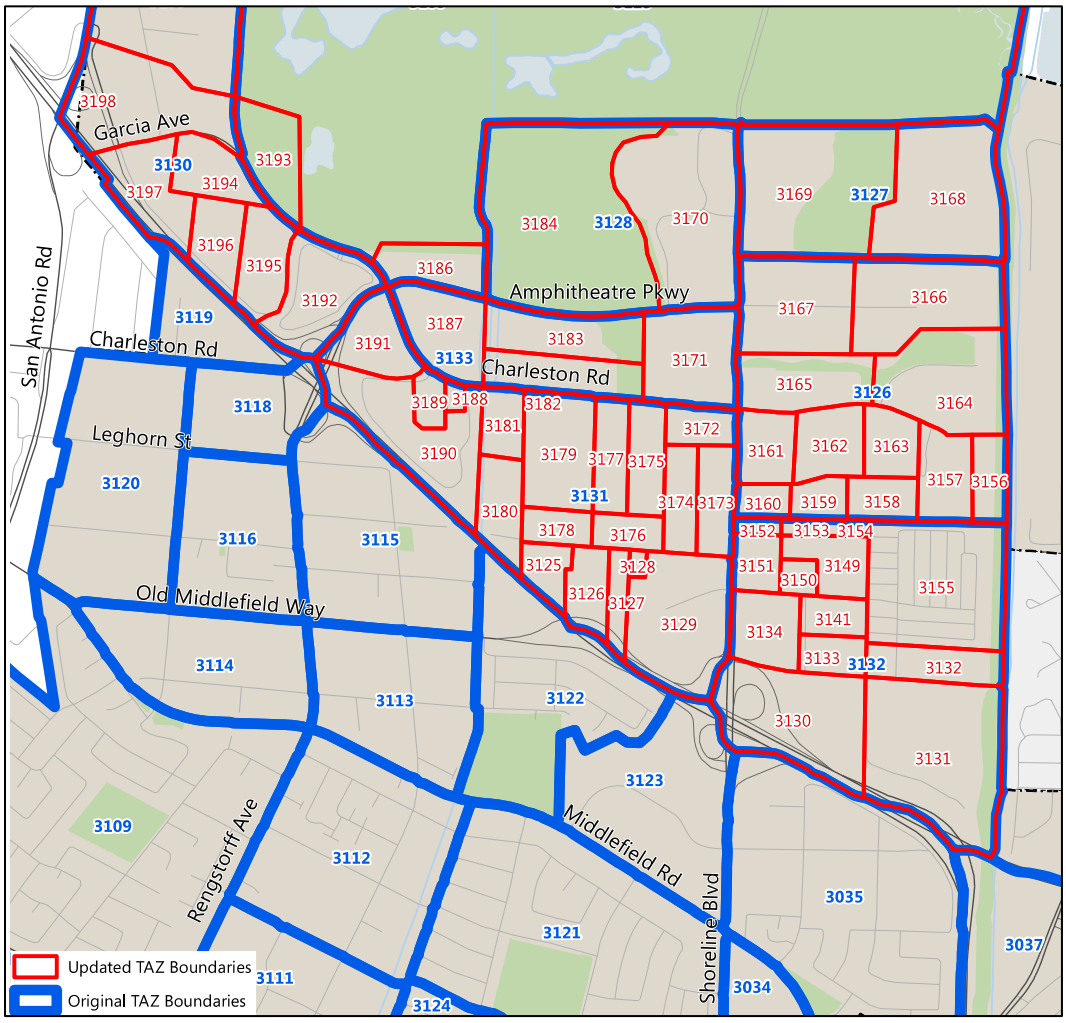

Figure 8: TAZ Zones

Initial simulations revealed that, without additional infrastructure and/or stronger TDM programs, full development of the Precise Plan office and residential plan would likely

result in significant peak gateway and internal traffic congestion. In response, additional Precise Plan scenarios were developed and tested. In part, these scenarios relied on proposals from Google for implementation of their North Bayshore Master Plan.

The VISSIM simulation model provides a better understanding of how the traffic flows on multiple streets and intersections interact and where key bottlenecks are located. The model also provides several performance measures, including level-of-service, travel times, average speeds and system delay.

Precise Plan Scenarios

For the Precise Plan scenarios, two options were modeled, each of which simulated traffic flows in the three-hour a.m. and p.m. peak periods. The two scenarios differed only by the inclusion in Scenario 2 of the Rengstorff Connector project (Ramp Realignment/Landings Frontage Road Extension), as discussed previously. Both scenarios are based on the full build-out of the Precise Plan as further detailed in the Gateway Master Plan and the proposed Google Master Plan. Key assumptions for both scenarios include:

- Baseline traffic volumes were based on 2019 (pre-COVID) conditions.
- New commute traffic was assumed to occur in the three-hour peak periods.
- New office space (1.55 million square feet) would achieve a 35% SOV rate. This would be achieved by an increase in the active transportation mode to 20%, based on residential development and internalized trips.
- Existing and previously approved Google offices would also achieve a 35% SOV rate.
- Other approved office would achieve their required SOV target (e.g. 45% for Microsoft).
- District parking is included as identified in the Gateway and Google Master Plans. Distribution of parking trips is based on Google's analysis.
- The roadway system is modified to reflect the Gateway and Google Master Plans.
- All other Priority Transportation Improvements are included.

Key Observations and Findings

Results of the VISSIM simulation modeling show that, even with the SOV reductions and additional infrastructure, both scenarios result in a decline in key performance indicators compared to existing conditions. For example, average a.m. vehicle speed declines from 16 miles per hour to 9 to 11 miles per hour and daily vehicle hours of delay increases for 750 to over 2,000. Scenario 2 (with the Rengstorff Project) generally performs better than Scenario 1.

Both scenarios show that the total demand for vehicle trips cannot be fully accommodated in the three-hour peak period. A likely outcome is that approximately 10% of the maximum trip demand would shift outside of the peak periods.

The analysis also shows that there is an increase in gateway trips by more than 2,000 trips in the peak period, so some increase in congestion is not surprising. A summary of key measures for each scenario is provided in Tables 5 and 6. Other key observations include:

- Travel time increases and congestion delay are greater on Shoreline Boulevard than on Rengstorff Avenue, potentially indicating that some drivers may find it attractive to shift to Rengstorff Avenue.
- The p.m. peak period congestion increases more than the a.m. peak period. This is due, in part, to the increase in p.m. residential trips.
- While Scenario 2 (with the Rengstorff Project) improves performance overall, the additional roadway connection along Landings Drive/Plymouth Street is particularly beneficial to the operation of the Charleston Transit Corridor. Travel times on Charleston Road are reduced by 5 to 10 minutes. With Scenario 1, there are five level-of-service (LOS) F intersections, while those intersections are mostly reduced to LOS B/C with Scenario 2.
- The Shoreline Bus Lane provides substantial travel time savings (more than 10 minutes), while the Charleston Bus Lanes also provide travel time and operational benefits that are more significant with Scenario 2.
- The District Parking garage at the Shoreline Amphitheatre adds a significant amount of traffic on Amphitheatre Parkway and Shoreline Boulevard north of Charleston Road. This traffic adds to congestion on Shoreline Boulevard, but better balances traffic demand at the Charleston Road/Rengstorff Avenue/Amphitheatre Parkway/Garcia Avenue (CRAG) intersection by increasing through movements compared to turning movements.

The consultant report (Appendix C) summarizes the model assumptions and provides detailed performance metrics comparing the scenarios against the existing (pre-COVID) conditions and against each other.

Table 5: a.m. Peak Hour Performance Measures (VISSIM Analysis)

	Corridor Travel Time (min) (9-10 AM Peak Hour)						North Bayshore Total (AM Peak Period)			
	Rengstorff NB Middlefield to Charleston	**Shoreline NB** Middlefield to Crittendon	**Shoreline NB Bus Lane** - Middlefield to Space Park	**Charleston EB** Bayshore to Shoreline	**Charleston WB** Shoreline to Bayshore	**Charleston EB Bus Lane** - Landings to Shoreline	Average Speed (mph)	Gateway Volume	LOS E/F Locations	Total Delay (Vehicle-Hrs)
Existing Conditions	8.9	12.4	-	6.3	5.4	6.0	16.4	16,953	38%	760
Baseline Scenario	15.9	15.1	3.7	16.7	6.4	-	5.0	15,429		3,650
Precise Plan Scenario 1 Without Rengstorff	7.5	19.8	2.1	9.7	27.7	7.3	9.1	18,861	29%	2,115
Precise Plan Scenario 2 With Rengstorff	6.9	15.2	2.1	6.9	5.8	6.7	10.8	19,413	16%	2,085
Difference PP 1 to Existing	-1.4	7.4	-	3.4	22.3	1.3	-7.3	1,908	-9%	1,355
Difference PP 2 to Existing	-2.0	2.8	-	0.6	0.4	0.7	-5.6	2,460	-22%	1,325
Difference PP 2 vs. PP 1	-0.6	-4.6	0.0	-2.8	-21.9	-0.6	1.7	552	-13%	-30

Table 6: p.m. Peak Hour Performance Measures (VISSIM Analysis)

	Corridor Travel Time (min) (5:00 to 6:00 PM Peak Hour)						North Bayshore Total (PM Peak Period)			
	Rengstorff SB Charleston to Middlefield	**Shoreline SB** Crittendon to Middlefield	**Shoreline SB Bus Lane** - Space Park to Middlefield	**Charleston WB** Shoreline to Bayshore	**Charleston EB** Bayshore to Shoreline	**Charleston WB Bus Lane** - Shoreline to Landings	Average Speed (mph)	Gateway Volume	LOS E/F Locations	Total Delay (Vehicle-Hrs)
Existing Conditions	6.1	11.3	-	6.0	5.0	6.0	12.9	14,787	18%	1,278
Baseline Scenario	4.4	16.2	2.9	10.5	15.3	9.1	7.1			2,555
Precise Plan Scenario 1 Without Rengstorff	9.6	20.0	3.4	7.6	14.7	12.1	6.7	15,309	40%	3,105
Precise Plan Scenario 2 With Rengstorff	5.3	19.1	3.1	5.4	15.6	11.5	7.5	18,279		2,725
Difference PP 1 to Existing	3.5	8.7	-	-0.6		5.5	-6.2	522	22%	1,827
Difference PP 2 to Existing	-0.8	7.8	-	-0.6	10.6	5.5	-5.4	3,492		1,447
Difference PP 2 vs. PP 1	-4.3	-0.9	-0.3	-2.2	0.9	-0.6	0.8	2,970		-380

9. Conclusions and Recommendations

Implementation Strategies

The gateway trip cap is the key to managing vehicle traffic in North Bayshore. However, as noted above, COVID-19 has created uncertainty regarding future traffic impacts. The Circulation Study has identified potential strategies if pre-COVID conditions return. Alternatively, increased remote work and flexible work hours could reduce peak traffic demand, at least in the near term, such that some of these strategies could be deferred until, or if, needed.

Due to this uncertainty, the City should closely monitor traffic conditions while continuing to advance potential strategies that may be needed as new office and residential development is completed and traffic approaches pre-COVID demand. Specific actions that can be taken in the next few years include:

- Continue gateway trip monitoring (in spring and fall) to track traffic volumes and single-occupant-vehicle (SOV) rates; consider temporarily deferring compliance enforcement in order to understand post-COVID commute patterns.
- Develop new monitoring programs for residential development that can better define resident characteristics, such as trip internalization, and demand for school, retail, and other services.
- As initial development of the Google and Gateway Master Plans occur, ensure that key segments of the roadway and active transportation networks are completed as early as possible. Examples are the Shoreline cycle track at least to the Shorebird/Green Loop and the Inigo Way extension to Charleston Road.
- Complete the design and construction of the Priority Transportation Projects already in process as quickly as possible. For the major Priority Transportation Improvements not yet started, advance the planning and initial design phases through the Capital Improvement Program to prepare them to move into construction when needed.
- Develop strategies and secure additional resources to strengthen the services and programs provided by the MTMA. With a significant new residential population, MTMA services will be increasingly needed to support the walkable and low auto ownership communities envisioned in the NBPP. A stronger partnership with the City may also be desired.

- Closely track experiences with congestion pricing in the Bay Area and elsewhere to better understand the effectiveness, equity programs, and other issues with this strategy.
- Identify strategies, including funding advocacy with VTA and other agencies, to increase public transit frequency and accessibility.

Recommendations

In summary, the Circulation Study has shown that current Precise Plan policies for managing vehicle trips will not be sufficient if, or when, traffic conditions approach or return to pre-COVID levels. The study has identified several strategies that, in some combination, can ensure that gateway vehicle trip limits are not exceeded. These strategies include stronger TDM programs, new infrastructure, and Congestion Pricing.

Since the future level of peak traffic may not be known for several years, a firm plan for addressing trip cap compliance can be deferred. In addition to recommendations approved by the Council on June 8, 2021, the Circulation Study recommends several actions that can be taken in the interim to better prepare for later decisions as the pace of new development requires. Ongoing monitoring programs would determine the timing of one or more of the potential trip cap strategies. These recommendations include:

1. Modify gateway trip cap policies to revise the time period and locations for compliance and update gateway capacity estimates as follows:

    a. Continue the twice-yearly gateway monitoring program in order to track post-COVID traffic and compliance trends. The monitoring should measure peak-period trips in both directions at each gateway, as well as mode share trends.

    b. Expand the monitoring as new growth occurs to better understand characteristics of peak traffic, use of non-SOV modes, and trip characteristics of new residents.

    c. Measure compliance by comparing actual trips with the gateway capacity for the three-hour peak period, as opposed to just the peak hour.

    d. Measure compliance by combining the Shoreline and Rengstorff gateways. The San Antonio gateway should continue to be measured separately.

    e. Adjust the Shoreline and Rengstorff gateway capacities as the new infrastructure projects are completed as shown in Tables 2 and 3.

2. Develop new financial-based penalties for noncompliance with individual project vehicle trip caps and/or the gateway trip cap.

3. Establish a lower SOV rate in the range of 35% to 40% for both existing and future employees on any new development. The transportation analysis of individual developments should determine any strategies, in addition to the lower SOV rate, that are needed to help achieve compliance with the trip cap.

4. In the near term, complete the design and construction of the Priority Transportation Projects already in process as quickly as possible. For the major Priority Transportation Improvements not yet started, advance the planning and initial design phases through the Capital Improvement Program (CIP) to prepare them to move into construction when needed.

5. Proceed with the next planning phase for the Rengstorff Connector project, including the Caltrans Project Approval and Environmental Documentation (PAED) process for the Rengstorff Avenue interchange component (recently funded through the VTA Measure B program). Planning work will take approximately two years, during which time the City can review post-COVID conditions and better understand the project requirements and costs prior to making a final decision to proceed with design and construction of this project.

6. Plan and advocate for expanded public transit service so that North Bayshore is designated as a transit-rich area, and work with VTA and the MTMA on strategies for service expansion.

7. Defer a decision on a congestion pricing program while monitoring other Bay Area tolling activities, gathering information about potential impacts, and establishing traffic thresholds or other factors that could support future implementation.

8. Update the NBPP to reflect approved Circulation Study recommendations, including:

    - Priority Transportation Improvements
    - Gateway Trip Cap policies
    - Bicycle and pedestrian policies and plans
    - Implementation policies including issuance of building permits and financial penalties for TDM noncompliance
    - TDM requirements for development
    - Revise language regarding trip caps and compliance to retain the broad policies and remove specifics of monitoring and operations

9. Update the Circulation Study in three to five years to review transportation strategies and confirm specific gateway trip cap policies.

APPENDICES

A. Evaluation of Alternatives and Feasibility Report, BKF Engineers
B. Gateway Trip Cap Study for the North Bayshore Area, Hexagon Transportation Consultants
C. Technical Memorandum Summarizing Results for Google Master Plan Scenario Analysis, TJKM Transportation Consultants
D. Bicycle and Pedestrian Capacity Analysis Results for 2040 and Infrastructure Recommendations, Alta Planning and Design
E. North Bayshore TDM Guidelines Peer Review, Alta Planning and Design
F. North Bayshore Congestion Pricing Feasibility Study Summary, Nelson\Nygaard Consulting Associates
G. North Bayshore Congestion Pricing Feasibility Study Final Report, Nelson\Nygaard Consulting Associates

All appendices are available at MountainView.gov/NorthBayshoreCirculationStudy.