



Redwood City Grade Separation Study

Summary Report

Peninsula Corridor Joint Powers Board (JPB)

Project number: WD No. 9919
Contract No. 17-J-S-069

October 24, 2022

FINAL

Quality Information

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Revision History

Revision	Revision date	Details	Authorized	Name	Position
1	7/7/2022	Draft			
2	9/9/2022	Draft Final			
3	10/6/2022	Final			
4	10/24/2022	Final			

Distribution List

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1. Executive Summary

The Redwood City Grade Separation Study, funded by the San Mateo County Transportation Authority (SMCTA), evaluates grade separations in Redwood City (City) to reduce pedestrian, bicycle, and motor vehicle conflicts with trains and to decrease traffic delays, which are expected to be exacerbated in the future due to growth in vehicle traffic, greater frequency of Caltrain service, and the eventual addition of high-speed rail.

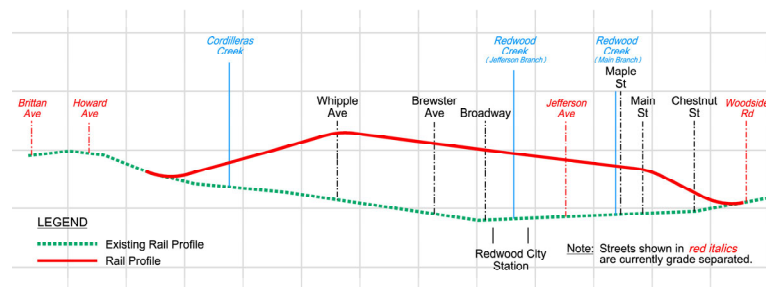
On October 23, 2018, the Peninsula Corridor Joint Powers Board (JPB), the SMCTA, and the City signed a Memorandum of Understanding (MOU) to complete a planning study within the limits of the City. All parties recognized the importance of reducing the impacts of existing and future train service on safety and traffic at the six at-grade railroad crossings within the City limits (Whipple Avenue, Brewster Avenue, Broadway, Maple Street, Main Street, and Chestnut Street).

In May 2019, Caltrain, in cooperation with the City of Redwood City, initiated the Redwood City Grade Separation Study (Project). The study began by assessing the alternatives presented in a 2009 study by SMCTA that identified an initial range of technically feasible alternatives, referred to as the 2009 Footprint Study. The Footprint Study also discussed the incorporation of a new four-track station to replace the existing two-track station at approximately the same location as the existing station. The Caltrain Business Plan's 2040 Long Range Service Vision reaffirmed the need for a four-track station hub in the mid-peninsula, ideally Redwood City, to facilitate transfers between express and local trains.

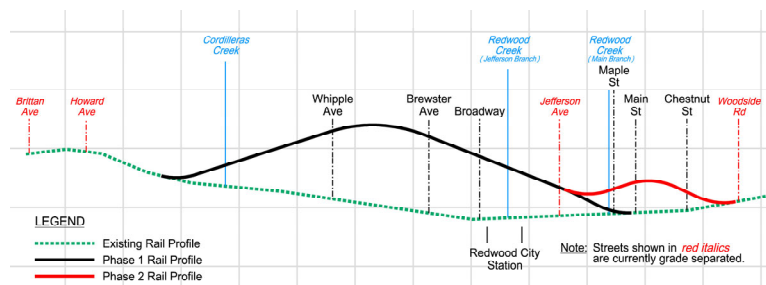
An initial evaluation concluded that lowering the tracks was not a favorable option because of the existing rail's vertical alignment (profile) within the City limits (among other reasons). In late 2020, the complete evaluation presented four Build Alternatives to the public via a virtual town hall, all of which included elevating the tracks. The details are provided at <https://www.rwctransitplan.com/Archive/>.

In this Summary Report, a Build Alternative refers to an alternative that proposes to construct grade separations at the selected locations in the City. The No-Build Alternative proposes no improvements within the Project limits and is used for comparison purposes only to show how future (2045) traffic would be affected if the project is not constructed. All four alternatives assume a four-track hub station between Brewster and Broadway, which would be constructed with the grade separation project. The four Build Alternatives presented in late 2020 are as follows:

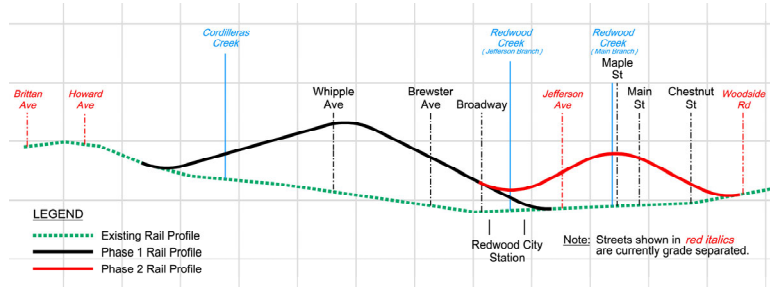
Alternative 1: Grade separation of all six existing at-grade crossings by raising the tracks between Howard Avenue in San Carlos and Woodside Road in Redwood City.



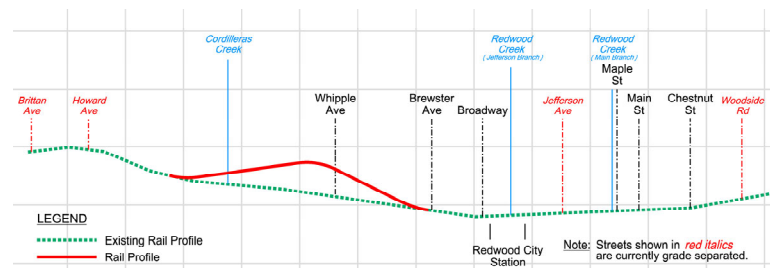
Alternative 2: Similar to Alternative 1, a Citywide raise of the tracks to grade separate all six existing at-grade crossings, except done in two phases, with the northern crossings (Whipple, Brewster, and Broadway) in Phase 1 (shown in black in the image below) and the southern crossings (Maple, Main, and Chestnut) in Phase 2 (shown in red). Reconstruction of the Jefferson Avenue Overcrossing (OC) would be completed in Phase 1.



Alternative 3: This alternative is similar to Alternative 2, except the reconstruction of the Jefferson Avenue OC would be deferred to Phase 2. In addition, to keep Broadway open to vehicular traffic, the road would have to be lowered about 17 feet, creating significant impact to adjacent properties.



Alternative 4: This alternative is a grade separation of Whipple Avenue only (via a partial raise of the tracks and a partial lowering of Whipple Avenue, El Camino Real, and Stafford Street). All other rail crossings (Brewster Avenue, Broadway, etc.) would remain at-grade.

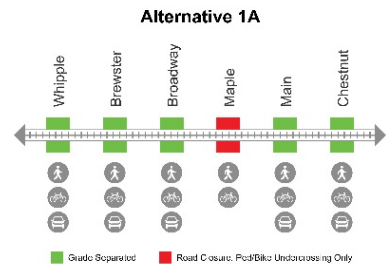


Feedback from the public was collected about the four Build Alternatives in 2021. Based on the public’s feedback and a conceptual engineering analysis, the City and Caltrain came to the following conclusions:

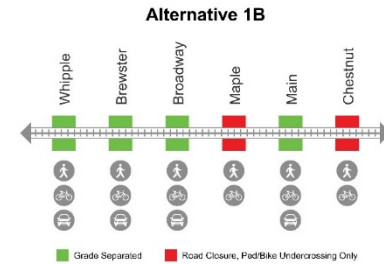
- With increased Caltrain service and implementation of a four-track station, Whipple Avenue, Brewster Avenue, and Broadway would be grade separated and open to all modes (vehicles, bikes, and pedestrians). Keeping Broadway open to motor vehicles was desirable to maintain access to the Downtown and provide convenient bus service to the new station.
- Any grade separation at Maple Street would be for pedestrians and bicyclists only because lowering Maple Street to provide vertical clearance under the tracks for motor vehicles would result in significant physical and environmental impacts to Redwood Creek (Main Branch).
- If all six crossings were to be grade separated, the public expressed a preference to complete them all at once (versus in two phases). In addition, a phased approach was not desirable as this would result in some throw-away costs, more impact to the community, such as longer construction times (two separate construction contracts, potentially decades apart), and a higher cost overall.
- Of the three southern crossings, Main Street carries the most traffic, so it would stay open to all modes.

With consideration of these conclusions, the Project Development Team (PDT) presented the following three Build Alternatives to the public in May 2022 for final consideration. Details are provided at <https://www.rwctransitplan.com/>.

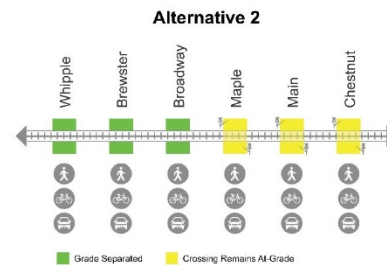
Alternative 1A: Citywide raise of the tracks with grade separations at all six rail crossings, Maple Street would be closed to motor vehicles and grade separated for pedestrians and bicyclists only.



Alternative 1B: Same as Alternative 1A, except Chestnut Street would also be grade separated for pedestrians and bicyclists only.



Alternative 2: Raise of the tracks with grade separations in the northern segment of the City (at Whipple Avenue, Brewster Avenue, and Broadway only). The three rail crossings in the southern segment of the City would remain as they are, as at-grade railroad crossings.



In May 2022, the virtual town hall was updated, and the City expanded upon the previous year's outreach to focus on obtaining input from the southern neighborhoods adjacent to the southern crossings because of the low response rate in the southern segment of the City during the initial outreach in 2021. To help with this, a bilingual, in-person, as well as online, outreach effort was launched.

Results from this outreach indicated that respondents support grade separating Chestnut Street for all modes (Alternative 1A was favored over Alternative 1B) and do not support separating it for bikes and pedestrians only (Alternative 1B) or keeping them as at-grade railroad crossings (Alternative 2). As a result, the PDT recommends Alternative 1A be studied further in the next phase of the project.

The City will share these findings and recommendation with the City Council in the fall of 2022 to help inform council's selection of a preferred alternative(s). Environmental scoping and preliminary engineering will come in the next phase of the project after a preferred alternative(s) is formally selected and funding is secured.

2. Introduction

The Redwood City Grade Separation Study (Project) proposes to improve existing safety and traffic operational issues and to decrease expected future traffic delays across the City due to growth in vehicle traffic, greater frequency of Caltrain service, and the eventual addition of high-speed rail to the Peninsula corridor.

In addition, the need for the Project is further emphasized by the City's planned Transit District within the Downtown area, which supports relocation of the transit center to the north to provide space for a four-track transfer station, a new bus depot, and improved multimodal connections.

The Project is studying railroad grade separations at all six of the City's existing at-grade railroad crossings, which are (from north to south):

- Whipple Avenue (milepost [MP] 24.72)
- Brewster Avenue (MP 25.04)
- Broadway (MP 25.21)
- Maple Street (MP 25.64)
- Main Street (MP 25.71)
- Chestnut Street (MP 25.88)

On October 23, 2018, JPB, SMCTA, and the City signed an MOU to complete a Planning Study within the limits of the City. All agencies recognized the value of exploring grade separations to improve safety and traffic operations at the railroad crossings across the City.

In May 2019, Caltrain, in cooperation with the City, initiated the Redwood City Grade Separation Study, which will conclude with the completion of this Summary Report. The Summary Report describes and evaluates several Build Alternatives that eliminate various at-grade railroad crossings in the City, and provides a recommendation for a preferred alternative to be studied further.

3. Background

Existing Conditions

Caltrain Corridor

The Caltrain commuter rail runs north and south between San Francisco and Gilroy. The JPB manages the Caltrain commuter rail operations on the San Francisco Peninsula corridor. Before the COVID-19 pandemic in early 2020, Caltrain operated 92 passenger trains each weekday (both directions combined) and 36 trains each Saturday and Sunday.

In addition to Caltrain service, Union Pacific Railroad (UPRR) operates freight trains in the corridor. Approximately six UPRR freight trains run daily for five days per week; generally, the UPRR freight trains operate at night, when Caltrain is not in operation, but they also run at other times of the day when Caltrain can accommodate them.

Two main tracks exist within the approximate 2-mile corridor between Howard Avenue in the City of San Carlos and Woodside Road (State Route [SR] 84) in Redwood City: the northbound track (MT-1) and the southbound track (MT-2). Just north of Woodside Road, a spur track turns northeast of MT-1 and traverses the center of Chestnut Street east of Heller Street. Just south of Woodside Road, there is a rail yard with as many as five spur tracks: four east of MT-1 and one west of MT-2.

From the perspective of a southbound train, the track alignment enters a left-turning curve with a radius of approximately 9,000 feet about 0.4 mile south of Howard Avenue and across Cordilleras Creek. This curve enters a tangent about 0.1 mile north of Whipple Avenue, and the alignment remains on a tangent throughout Redwood City's limits into the rail yard south of Woodside Road.

From the north, the track descends from a crest between Brittan Avenue and Howard Avenue in San Carlos on a maximum grade of 0.8 percent and reaches a low point near Broadway and the existing Caltrain station before ascending into the southern segment of Redwood City south of Woodside Road (see Figure 1).

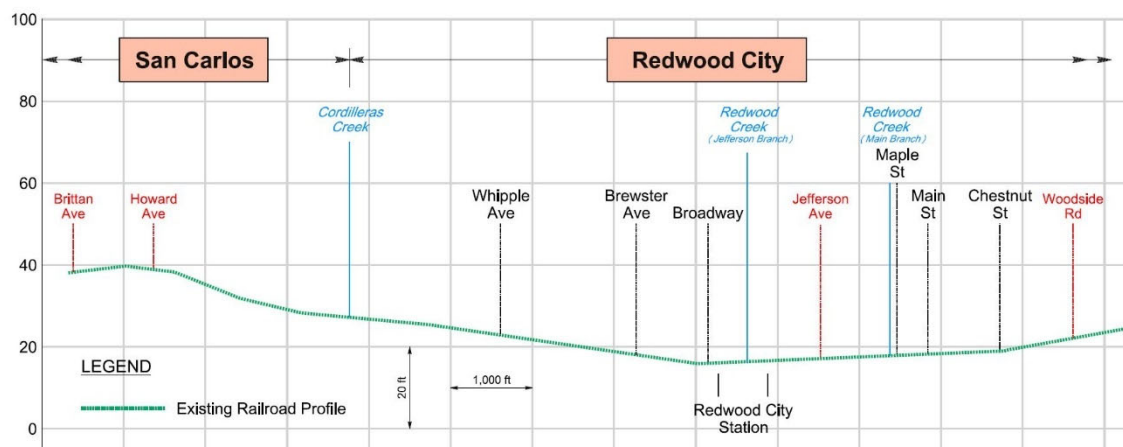


Figure 1: Existing Rail Profile

Notes:

1. The existing track profile is exaggerated (scaled) 50 times on the vertical axis.
2. The streets shown in red (Brittan, Howard, etc.) are currently grade separated.

Whipple Avenue, Brewster Avenue, Broadway, Maple Street, Main Street, and Chestnut Street are at-grade railroad crossings. Jefferson Avenue (undercrossing) and Woodside Road (overhead) are grade separated.

Adjacent Transportation Facilities & Development Projects

There is significant development activity adjacent to the rail corridor in Redwood City, which underscores the importance of advancing planning and preliminary design work for grade separations and the downtown hub station. Redwood City and Caltrain have been coordinating with prospective development projects that could be affected by future grade separations to minimize potential future conflicts and grade separation costs if the grade separations and future four-track station are to advance. A list of approved development projects along the corridor is provided below (listed in order, from north to south), along with a preliminary assessment of how they could interact with a grade separation project.

1180 Main Street: The project site is west of the rail corridor, between the Maple Street and Main Street at-grade crossings. Vehicular access to underground parking for the site is from Elm Street, between Main and Lathrop Streets. Most of the site utilities are in Elm Street, as are many of the “back-of-house” services like garbage collection. Meetings with the owner’s engineering and architecture teams established general support for the grade separation project and an interest in activating Maple Street as an open plaza should it be closed to vehicular traffic. Lowering the grade of Elm Street would potentially eliminate access to the site and have significant utility costs. The public has shown support for keeping Elm Street at grade if Main Street is depressed below grade, thus eliminating vehicular access between Main Street and Elm Street. Construction of this office development is substantially complete. Future design efforts should consider the use of the multi-use path between the building and the rail right-of-way to improve connectivity for people walking and biking.

South Main Mixed-Use Project (Elco Yards): The multi-block project site is west of the rail corridor, between the Main Street and Chestnut Street at-grade crossings. Beech Street provides vehicular access to some of the underground parking and includes utilities and “back-of-house” services. Meetings with the owner’s engineering and architecture teams established general support for the grade separation project. However, there was concern that lowering the grade of Beech Street would potentially eliminate access to underground parking for one building and have significant utility costs. If Chestnut Street were closed to vehicular traffic, there would be limited opportunities to activate the resulting space and to provide Pacific Gas and Electric Company (PG&E) access to electrical services on the Chestnut frontage, near the tracks, would be challenging. Construction of this mixed-use development started in June 2022 and is expected to last roughly 3 years. Future design efforts should consider maintaining PG&E access on Chestnut, the Fire Department’s ability to protect buildings and life safety from a depressed Main Street, and the use of the multi-use path between the building and the rail right-of-way to improve connectivity for people walking and biking.

Aside from these individual projects, the City is actively working to amend its Downtown Precise Plan (DTPP) to create a separate Transit District within the DTPP area that would both facilitate increased, transit-supportive development and update the transportation network to support relocation of the transit center to the north to provide space for a four-track transfer station, a new bus depot, and improved multimodal connections. The DTPP plan amendments and subsequent Environmental Impact Report are expected to be considered by the City Council in the fall of 2022.

City Streets

Whipple Avenue

Whipple Avenue, the northern-most railroad crossing in the City, is in a combined commercial/residential area that serves as one of the main east-west connectors in the entire City. Based on the Federal Railroad Administration (FRA) US Department of Transportation (DOT) Crossing Inventory Form (dated February 28, 2022), the Annual Average Daily Traffic (AADT) at this crossing is estimated at 36,000 vehicles based on 2014 data.

Whipple Avenue is a four-lane arterial with a posted speed limit of 25 miles per hour (mph). At the at-grade rail crossing, which is approximately 170 feet east of El Camino Real and 60 feet west of Stafford Street, there are six lanes and a variable-width (8 to 12 feet) curbed median as follows: Four lanes in the westbound direction (a left-turn lane onto southbound El Camino Real, two through lanes, and a right turn lane onto northbound El Camino Real) and two through lanes in the eastbound direction. Whipple Avenue is striped for bicyclists, and a sidewalk exists on both sides of the road (see Photo 1).



Photo 1: Whipple Avenue, Looking West from Stafford Street

Brewster Avenue

Brewster Avenue is approximately 0.3 miles south of Whipple Avenue in a combined commercial/residential area. Based on the FRA DOT Crossing Inventory Form (dated February 28, 2022), the AADT at this crossing is estimated at 9,000 vehicles based on 2014 data.

Brewster Avenue is a four-lane collector with a posted speed limit of 30 mph between Main Street and El Camino Real. At the at-grade rail crossing, which is approximately 100 feet east of Perry Street and 100 feet west of Arguello Street, there are four lanes (two in each direction) and a 2-foot-wide curbed median. Brewster Avenue is striped for bicyclists, and a sidewalk exists on both sides of the road (see Photo 2).



Photo 2: Brewster Avenue, Looking East from Perry Street

Broadway

Broadway, which is approximately 900 feet south of Brewster Avenue, is in the heart of downtown Redwood City, in a combined commercial/residential area. Based on the FRA DOT Crossing Inventory Form (dated February 28, 2022), the AADT at this crossing is estimated at 10,000 vehicles based on 2014 data.

Broadway is a two-lane collector with an assumed speed limit of 25 mph. At the at-grade rail crossing, which is approximately 175 feet east of the Perry/California Street intersection and 60 feet west of Arguello Street, there are

four lanes and a 2-foot wide, curbed median on the west side of the tracks as follows: two lanes in the westbound direction (one through lane and a right turn lane onto northbound Perry Street) and two lanes in the eastbound direction (one through lane and right-turn lane onto southbound Arguello Street). Broadway is striped for bicyclists east of Arguello Street, and a sidewalk exists on both sides of the road (see Photo 3).



Photo 3: Broadway, Looking East from California Street

Jefferson Avenue

Jefferson Avenue is a four-lane arterial with a posted speed limit of 30 mph that traverses under the tracks via an undercrossing structure, constructed in the late 1990s, that is approximately 350 feet east of Franklin Street and 300 feet west of Middlefield Road (see Photo 4).



Photo 4: Jefferson Avenue, Looking West from Middlefield Road

Maple Street

Maple Street is approximately 950 feet south of Jefferson Avenue and is in a combined commercial/residential area. Based on the FRA DOT Crossing Inventory Form (dated February 28, 2022), the AADT at this crossing is estimated at 5,000 vehicles based on 2014 data.

Maple Street is a two-lane collector with a posted speed limit of 25 mph. At the at-grade rail crossing, which is approximately 300 feet east of the Franklin/Lathrop Street intersection and 250 feet west of Main Street, there are two lanes (one lane in each direction) and a 2-foot wide, curbed median on the east side of the tracks. Pennsylvania Avenue runs parallel to the tracks and intersects Maple Street about 30 feet east of the rail crossing. The skew angle between Maple Street and the tracks is moderate (approximately 28 degrees). Maple Street is striped for bicyclists west of the tracks, and a sidewalk exists on both sides of the road (see Photo 5).



Photo 5: Maple Street, Looking West from Pennsylvania Avenue

Redwood Creek (main branch) crosses under Maple Street in a box culvert structure approximately 100 feet west of the tracks and under the tracks just north of Maple Street (see Photo 6).



Photo 6: Redwood Creek, Looking East from Maple Street

Main Street

Main Street is approximately 400 feet south of Maple Street and is in a combined commercial/residential area. Based on the FRA DOT Crossing Inventory Form (dated February 28, 2022), the AADT at this crossing is estimated at 7,000 vehicles based on 2014 data.

Main Street is a two-lane collector with prima facie speed limit of 25 mph. At the at-grade rail crossing, which is approximately 100 feet east of Elm Street and 250 feet west of Cassia Street, there are two lanes (one lane in each direction) and a 2-foot wide, curbed median on the west side of the tracks. Pennsylvania Avenue runs parallel to the tracks and intersects Main Street about 30 feet east of the rail crossing. The skew angle between Main Street and the tracks is severe (approximately 64 degrees). Main Street is not striped for bicyclists, and a sidewalk exists on both sides of the road (see Photo 7).



Photo 7: Main Street, Looking West from Pennsylvania Avenue

Chestnut Street

Chestnut Street is approximately 900 feet south of Main Street and is in a combined commercial/residential area. Based on the FRA DOT Crossing Inventory Form (dated February 28, 2022), the AADT at this crossing is estimated at 6,400 vehicles based on 2021 data.

Chestnut Street is a two-lane collector with a posted speed limit of 25 mph. At the at-grade rail crossing, which is approximately 350 feet east of Shasta Street and 400 feet west of Heller Street, there are two lanes (one lane in each direction) and a variable width (5 to 16 feet) curbed median. Pennsylvania Avenue runs parallel to the tracks and intersects Chestnut Street about 30 feet east of the rail crossing. The skew angle between Chestnut Street and the tracks is slight (approximately 9 degrees). Chestnut Street is striped for bicyclists, and a sidewalk exists on both sides of the road (see Photo 8).



Photo 8: Chestnut Street, Looking West from Pennsylvania Avenue

Table 1 summarizes the AADTs for the six at-grade crossings within the City.

Table 1: AADTs of At-Grade Crossings Within Redwood City

Location	Motor Vehicles
Whipple Avenue (MP 24.72)	36,000
Brewster Avenue (MP 25.04)	9,000
Broadway (MP 25.21)	10,000
Maple Street (MP 25.64)	5,000
Main Street (MP 25.71)	7,000
Chestnut Street (MP 25.88)	6,400

Notes:

1. All AADTs are from the FRA Inventory Report, which is based on 2014 data, except for Chestnut Street, which is based on 2021 data.
2. Pedestrian and bicycle volume data are not known at this time and will be determined in the environmental phase of the project.

Future Conditions

Caltrain Corridor

After the Peninsula Corridor Electrification Project (PCEP) is complete and electrified trains are in service, which is expected to occur by 2024, the weekday train volume is projected to be 114 passenger trains. The PDT has coordinated with Caltrain regarding the future electrification and has received contract drawings of the Overhead Contact System (OCS) foundations and pole layouts.

Under the Caltrain Business Plan, Caltrain developed three long-range service scenarios (Baseline, Moderate, and High Growth) to illustrate the different choices for how the railroad could grow over time. These scenarios built off the existing projects and policy commitments in the corridor. In Fall 2019, the JPB adopted the Moderate Growth Scenario as the Long-Range Service Vision, but did not preclude the High Growth Scenario because it could be pursued at some point in the far future in tandem with other major regional transit projects. Under the Moderate

Growth Scenario Caltrain has identified a potential need for a four-track segment at Redwood City Station. Under the High Growth Scenario (adopted as “do not preclude”) Caltrain has identified a potential need for a four-track station at Redwood City. The adopted Service Vision includes approximately 400 trains per day (268 Caltrain trains plus 130 high-speed rail trains per day) by 2040.

The conceptual designs of the grade separations in Redwood City accommodate a four-track station per the requirements of the Long-Range Service Vision. Caltrain is planning to perform additional analysis to investigate the infrastructure needs under the High Growth Scenario in Redwood City.

Dumbarton Corridor

In 2018, the San Mateo County Transit District (District) kicked off a process with Cross Bay Transit Partners, LLC (Facebook and Plenary Americas) to evaluate the technical and financial feasibility of a transit project along the Dumbarton Rail Corridor that would connect the Caltrain corridor at Redwood City to the East Bay. In Spring 2020, the project was put on hold due to the global pandemic. Through a partnership with Facebook, the effort was concluded at a milestone that compiled and documented the pre-environmental work of the alignment and technology options under consideration. This effort built on community coordination and included public outreach in March 2021. Caltrain and Redwood City staff met with District staff to discuss a number of potential Dumbarton transit alternatives and how such alternatives could integrate with grade separations and a four-track station in Redwood City. A preferred Dumbarton Rail Corridor alternative was not selected, but the alternatives studied to date through the Exclusive Negotiating Agreement (ENA) partnership were memorialized for future consideration.

In August of 2021 the partnership with Cross Bay Transit Partners, LLC (owned by Plenary Americas) concluded, and the ENA was not renewed. The District continues to work with its regional partners to determine next steps and funding opportunities for the Dumbarton Rail Corridor project to move forward. The project is listed in Plan Bay Area 2050 in its 2036–2050 time horizon for implementation, and the project is eligible for Regional Measure 3 (RM3) funds. The District continues to be open to private-sector leadership to help advance delivery of a project that would use the Dumbarton rail bridge; however, to date no viable option has been presented.

Additional coordination with the District is needed as transit continues to be contemplated along the Dumbarton rail bridge.

Transit District

The City is considering amendments to the General Plan and DTPP to create a Transit District which plans for shopping, jobs and housing with a new transit center for trains and buses in the heart of Downtown. The draft amendments include:

- Land redevelopment of the Transit Center and Sequoia Station properties
- Shifting the location and adding space for a new Transit Center with four sets of tracks
- Circulation improvements associated with potential grade separations to ensure adequate vehicular, bicycle and pedestrian connections.

Part of this work included visioning for the new Transit Center. The Caltrain 2040 Long Range Service vision specifies a minimum of 8 Caltrain trains per hour per direction and will require a four track mid-peninsula hub station to support growth and facilitate transfers.

Given the strong ridership, high land use densities today and in the future, as well as the potential to connect to a future Dumbarton Service, Redwood City has been identified as an ideal location for a potential mid-peninsula four-track hub station. As such, Caltrain, Redwood City, and SamTrans coordinated on a station area planning study to determine the spatial and connectivity needs of a future relocated and expanded four-track station and Redwood City Transit Center, which informed the Transit District planning process, and will aid the City in short-term land use decisions. This was a proof-of-concept effort and additional work will be completed on the station as the design plans advance. By analyzing and identifying the future Transit Center needs ahead of surrounding development, Caltrain and the City can ensure that ample space is preserved for all modes and ensure that access can be designed to support land use. This study builds off the work of the Redwood City Grade Separation study and assumes the current Caltrain station would be relocated from its current at-grade position south of Broadway to a larger aerial station north of Broadway.

Consideration of these amendments and the associated environmental review will be made by the City Council of Redwood City in fall 2022.

Adjacent Transportation Facilities & Development Projects

There are multiple proposed, but not yet approved, development projects adjacent to the rail corridor in Redwood City. Should these projects be approved, future design work will need to consider their space and access needs. A list of active development projects that have not yet been approved is provided below (listed from north to south), along with a preliminary assessment of how they could interact with a grade separation project:

1125 Arguello Street: The project site is east of the rail corridor and south of the Whipple Avenue at-grade crossing. During construction of the grade separation project, landscaping between the project buildings and the rail corridor could potentially be affected by construction of shoofly (temporary) tracks.

651 El Camino Real (“American Legion”): The project site is west of the rail corridor, north of the Brewster Avenue at-grade crossing, and contiguous with the SamTrans-owned bus yard. Property adjacent to the rail corridor at the rear of the project site could be needed to construct the grade separation project and hub station. The project is part of the “Gatekeeper Projects,” which require amendment to the DTPP to be built as conceptually envisioned. Discussions between the developer, the City, Caltrain, and SamTrans will explore opportunities to protect additional right-of-way for a future transit project while facilitating the development of market-rate and affordable housing, a new American Legion Post, and supportive services for veterans.

901 El Camino Real (“AutoZone”): The project site is adjacent to El Camino Real and Caltrain-owned property at the existing transit center, and the developer also has rights to a parcel on Broadway adjacent to the rail corridor and the transit center. The project is part of the “Gatekeeper Projects,” which require amendment to the DTPP to be built as conceptually envisioned. Discussions between the developer, the City, and Caltrain are exploring the potential of a land swap that would transfer property that could be affected by the grade separation project for part of the transit center’s parking lot. If realized, the land swap would also implement changes to the street grid north of James Avenue envisioned in the DTPP. These changes would improve access to and from the transit center.

Sequoia Station: The project site is west of the rail corridor between Jefferson Avenue and James Street. The property is adjacent to the rail corridor at the rear of the project site, and a portion of the property would be needed to construct the grade separation project and hub station. The project is part of the Transit District and requires amendment to the DTPP to be built as conceptually envisioned. Discussions between the developer, the City, and Caltrain have established the land that would be needed to accommodate the grade separation and hub station project. The developer is proposing to dedicate this land for future transit purposes with potential interim uses that would activate the space until grade separations and a hub station are built.

1201 Main Street: The project site is east of the rail corridor and south of the Main Street at-grade crossing. Buildings on the site would need to respect the 15-foot setback from the JPB right-of-way required by the City’s zoning code, at least above grade, and additional right-of-way along Main Street could be needed to construct the Main Street grade separation. Discussions between the developer, the City, and Caltrain will establish opportunities to protect needed right-of-way for a future transit project while facilitating the development of the mixed-use project.

Aside from these individual projects, the City is planning to replace the DTPP with a new, larger precise plan area tentatively called “Central Redwood City.” This planning effort will build on the policies and recommendations from the Transit District to advance transit-supportive development and implementation of the new transit center.

City Streets

As previously mentioned, in conjunction with visioning and planning for the Transit District and hub station, the City and Caltrain completed a proof-of-concept study to confirm the feasibility of shifting the transit center to the north. This work studied multi-modal access to the transit center, operational feasibility for bus service, and space needs for various access modes at the transit center. The City also completed a series of surveys to collect feedback from the community on their priorities for the future transit center and Transit District. The recommendations from this study, which were incorporated into the DTPP amendments that created the Transit District, are discussed below.

Brewster Avenue

Brewster Avenue will provide direct access to the transit center for people walking and on bikes and in cars and buses, including vertical access to the elevated train platforms. As such, the preferred street cross section includes protected Class IV bike lanes, four 10-foot wide travel lanes, and ample sidewalks to connect El Camino Real and the transit center. Future design efforts will need to consider the design of the Class IV bike lanes and passenger loading to discourage drop-off and pickup from happening in the travel lanes beneath the elevated station, which could create conflicts between cyclists and pedestrians and backups in the travel lanes.

Perry Street

Perry Street could be one of the primary streets providing bus access to the transit center. This street could be converted to one-way, northbound operation to accommodate sawtooth bus bays and vehicular circulation. Future design efforts will need to consider access needs for the private properties across the street from the transit center.

James Avenue

The role of James Avenue will transition over time from being a primary bus route to being a key active transportation connection to the transit center. A two-way cycle track is proposed along James Avenue between El Camino Real and the Caltrain railroad right-of-way, along with 12-foot-wide sidewalks and three travel lanes that are each 10 to 11 feet wide.

Previous Studies

This section provides a summary of the key findings and conclusions from the previous studies that informed this Summary Report.

Grade Separation Program Footprint Study (2009)

A Project Report for SMCTA's Footprint Study Program was prepared by BKF in September 2009. The purpose of the report was to identify all technically feasible alternatives for a "stand-alone" (isolated) grade separation at each of the City's six at-grade rail crossings. Citywide "track elevated" and "track depressed" alternatives were also evaluated. An assessment of this memo (Attachment H) was developed by AECOM (dated February 27, 2020), and was used as an initial basis of the alternatives studied for this Project. A summary of the assessment is included in Section 5.

Caltrain/California HSR Blended Operations Analysis (March 2012)

The report presented the results of a detailed operational analysis of multiple "blended system" solutions for accommodating future Caltrain commuter rail and high-speed rail (HSR) services on the Caltrain corridor between San Jose and San Francisco. The solutions are based on the two services sharing rail tracks along most segments of the corridor.

The key findings from the simulation model and associated operations analysis are as follows:

- A blended operation on the Caltrain corridor where Caltrain and high-speed trains are sharing tracks is conceptually feasible.
- An electrified system with an advanced signal system and electric trains increases the ability to support future train growth in the corridor.
- The blended system without passing tracks for train overtakes can reliably support up to six Caltrain trains and two -high-speed rail trains per peak hour per direction.
- The blended system with passing tracks for overtakes can reliably support up to six Caltrain trains and four -high-speed rail trains per peak hour per direction.
- Supporting high-speed rail trains result in non-uniform Caltrain headways.
- Increasing speeds from 79 to 110 mph decreases travel times for both rail services.

The findings were viewed as "proof of concept" in analyzing the conceptual feasibility of blended operations. It was noted in the analysis that additional due diligence was needed to ensure that the findings provide sufficient reliability and flexibility for "real world" rail operations.

Caltrain/HSR Blended Grade Crossing and Traffic Analysis (June 2013)

This was a follow-up report to the Caltrain/California HSR Blended Operations Analysis (March 2012) to analyze gate downtime and traffic circulation scenarios not evaluated in the Caltrain/California HSR Blended Operations Analysis.

The study provided information on simulated gate downtimes at all grade crossings associated with the prototypical schedule developed for the Caltrain/HSR Blended System Operations Analysis. In addition, the following five intersections were evaluated for traffic simulations, including Broadway/El Camino Real in Redwood City):

- 16th Street/7th Street/Mississippi Street (San Francisco)
- 25th Ave/ECR (San Mateo)
- 25th Ave/Delaware St (San Mateo)
- Broadway/El Camino Real (Redwood City)
- Churchill Ave/Alma St (Palo Alto)

The study concluded that there is not a direct linear relationship between train service level changes and gate downtime. The sample crossing traffic analysis indicated that local traffic is influenced by both number of gate events and downtime per gate event and additional general key findings cannot be made. It was noted in the that additional analysis was necessary.

4. Purpose and Need

There is a need for traffic safety and operational improvements at all six of the at-grade crossings in Redwood City. Grade separation structures serve that need by eliminating conflicts between train traffic and all other modes of transportation (motor vehicles, bicycles, and pedestrians).

As of June 30, 2022, the accident/incident history at these crossings provided by the FRA shows that 31 incidents have occurred since 1977, with the most recent one occurring at Chestnut Street on February 19, 2021. Of the 31 incidents, 14 resulted in at least one fatality, 3 resulted in an injury with no fatalities, and the remaining 14 resulted in no injuries (property/vehicle damage only).

Table 2 summarizes the incidents/accidents in the FRA database that have occurred at the six at-grade crossings since 1977.

Table 2: Rail Accident History (1977 through June 30, 2022)

Location	Total Number of Incidents	Fatalities	Injuries	No Injuries (Property Damage Only)
Whipple Avenue	8	2	2	4
Brewster Avenue	6	5	0	1
Broadway	0	0	0	0
Maple Street	2	0	0	2
Main Street	6	4	1	1
Chestnut Street	9	3	0	6
Total	31	14	3	14

Of the six at-grade railroad crossings, Whipple Avenue experiences the highest traffic demand and greatest congestion. Whipple Avenue provides access to US Highway 101 and the Redwood City Caltrain station via Arguello Street and El Camino Real. Broadway experiences the second highest traffic demand and provides access to the City's downtown area. All six streets also serve pedestrians and bicyclists.

Congestion at all six railroad crossings is expected to increase in the future, with growth in road traffic and an expansion of rail service. Under Caltrain's moderate growth scenario, the gate down time is expected to more than double in the future (2040) compared to the existing (2019) conditions. Providing a grade separation for all modes of travel at Whipple, Brewster, and Broadway would reduce travel times and vehicle queueing and improve east/west traffic flow in the northern segment of the City. Providing at least one grade separation for all modes of travel in the

southern segment of the City would provide similar benefits. An evaluation of the traffic conditions is discussed in more detail in Section 7 of this Summary Report.

The purpose of the Project is to:

- increase the safety of pedestrians, bicyclists, and motor vehicles by eliminating the conflict with the trains,
- improve traffic operations, and
- reduce queuing and improve east/west travel times for all modes in Redwood City.

In addition, the Project would provide the following secondary benefits:

- reduce overall traffic congestion and stop-and-go movements, which will result in a reduction of motor vehicle emissions.
- reduce train horn noise with the removal of any at-grade rail crossing. (Federal regulation requires locomotive horns be sounded for 15-20 seconds before entering all public grade crossings.)

5. Development of Alternatives

Railroad Design Criteria

The conceptual track design and temporary track work was designed in conformance with Caltrain Design Criteria Chapter 1 – Design Guidelines, Chapter 2 – Track, Chapter 3 – Station and Facilities, Second Edition. The Conceptual Engineering Design Criteria for this Project (see Attachment L) was reviewed by Caltrain staff in 2020.

The Third Edition of the Caltrain Design Criteria dated August 31, 2020 was not available prior to the conceptual engineering. As of September 2022, Caltrain is still in the process of updating the design criteria and the conceptual designs will need to be re-evaluated during the next phase. For example, it is expected that the minimum vertical clearance for roadway underpasses will be increased from 15'-6" to 16'-6" and spiral length equations for track alignments will be revised (among others changes). Changes in the design criteria could result in additional impacts to properties and possibly additional design variances.

Railroad Design Variances

The following design variances to Caltrain Design Criteria, Second Edition have been identified for the conceptual design:

- **Design speed of the mainline and station tracks between the Caltrain station and Jefferson Avenue:** Obtaining a design speed of 110 mph in this area of the track alignment would result in additional property acquisition from the development project at Sequoia Station (between James Avenue and Jefferson Avenue) and impact the recently constructed 'The Cardinal' (apartment complex) at One Franklin Street, which is located west of the tracks, just south of Jefferson Avenue, see Figure 2. The proposed alignment for all alternatives at this location, just south of the Caltrain station, has a design speed of 79 mph.
- **Distance from Point of Switch (PS) to Curve:** The distance from the PS to the curve (or spiral) (~ 50 feet) meets the absolute minimum tangent length of 15 feet but does not meet the preferred minimum tangent length of 100 feet, see Figure 2.

Additional design variances may be identified in the next phase when applying the Caltrain Design Criteria, Third Edition.

Design variances may potentially be approved by Caltrain on a case-by-case basis. To identify mitigations for any operational and maintenance impacts, the design variance review process may require additional supporting studies, such as power simulations for grades steeper than 1%. Depending on the complexity of the design variance request, the approval process can take anywhere from three to 12 months and still may result in a design variance rejection.

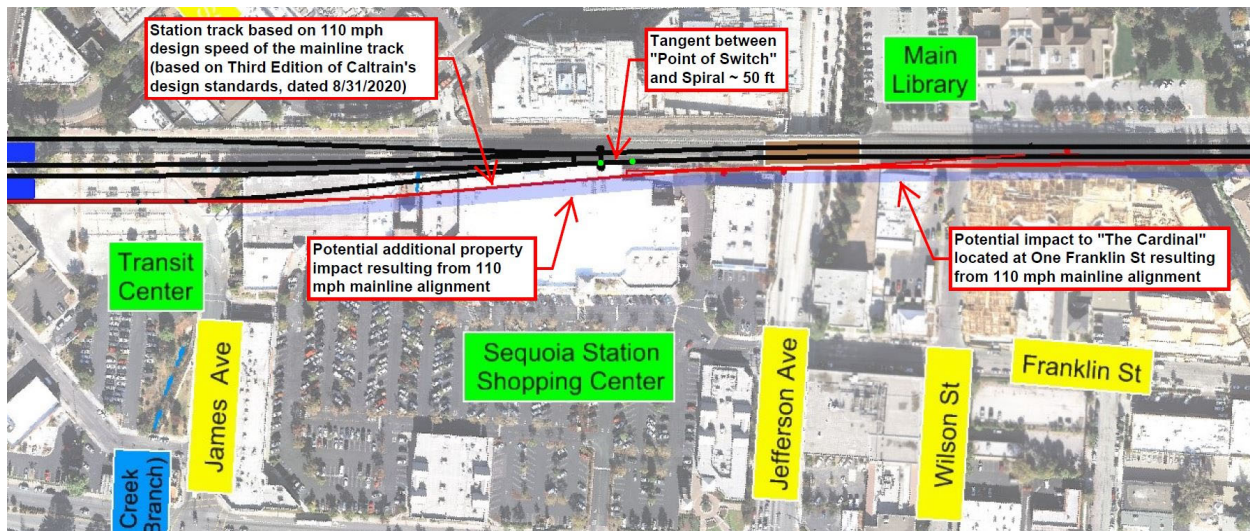


Figure 2: Track Alignment for a 110 mph Design Speed

Roadway Design Criteria

The roadway design criteria (lane widths, shoulder widths, sidewalk widths, taper lengths, stopping sight distance, etc.) for the project's alternatives were based on the 7th Edition of the Caltrans' Highway Design Manual, updated July 1, 2020.

The only exception to be applied is for the design of the sag vertical curves. Instead of designing for headlight sight distance, the sag vertical curves were designed for passenger comfort in lieu of headlight sight distance. The passenger comfort criterion for sag vertical curves reduces the overall project footprint and is commonly used for roadway underpasses. Since lighting will be provided, drivers will not have to rely on their headlights at night to see objects that lie ahead on the sag curve.

The Conceptual Engineering Design Criteria for this Project is included as Attachment L.

Assessment of 2009 Footprint Study

In 2009, the San Mateo County Transportation Authority (SMCTA) commissioned a Grade Separation Program Footprint Study (Footprint Study) to examine the feasibility and relative physical impacts of six possible grade separation alternatives (see list below) at each of the six at-grade crossings within the City for a total of 36 alternatives. The Footprint Study examined grade separating each crossing as an independent project by either raising or lowering the roadway or the rail or a combination.

The six possible alternatives at each crossing were as follows:

- Rail at-grade, roadway elevated
- Rail at-grade, roadway lowered
- Rail elevated, roadway at-grade
- Rail lowered, roadway at-grade
- Rail partially elevated, roadway partially lowered
- Rail partially lowered, roadway partially elevated

Two additional alternatives were also considered; one that grade separated all the crossings by raising the rail, the second separated all the crossings by lowering the rail. The Footprint Study did not consider any other combination, nor did it review closing any crossing in favor of another. These two alternatives, plus the aforementioned 36 brings the total number of alternatives to 38. Each of these alternatives had a 2-track and four-track option.

In February 2020, an assessment to review feasibility of the four-track alternatives contained in the 2009 Footprint Study was conducted. (See Attachment H.) Table 3 summarizes the findings of the Footprint Study for the four-track

alternatives. Of the 38 alternatives described above, 24 were considered infeasible and 14 were considered feasible. After review of the Footprint Study and current conditions and planning efforts, it was determined that all the alternatives that were categorized as infeasible are still so and the constraints that were presented in the Footprint Study are still present today.

Table 3: Footprint Study Findings Summary (Four-Track)

Crossing	Alt	Rail	Roadway	Property Impact	Utility Impact	Parking Impact	Street Impact	Project Cost (Million 2009\$)
Whipple Avenue	1	Existing Grade	Elevated	High	Med	High	High	\$188
	2	Existing Grade	Depressed	High	High	High	High	\$182
	A	Elevated	Existing Grade			a, b		
	B	Depressed	Existing Grade			a, b, c		
	3	Partially Elevated	Partially Depressed	High	Med	None	Med	\$278
	4	Partially Depressed	Partially Elevated	Med	High	None	Med	\$286
Brewster Avenue	5	Existing Grade	Elevated	High	High	High	High	\$346
	6	Existing Grade	Depressed	High	High	High	High	\$341
	C	Elevated	Existing Grade			b		
	D	Depressed	Existing Grade			a, b, c		
	E	Partially Elevated	Partially Depressed			b		
	F	Partially Depressed	Partially Elevated			b		
Broadway	7	Existing Grade	Elevated	High	High	High	High	\$324
	8	Existing Grade	Depressed	High	High	High	High	\$326
	G	Elevated	Existing Grade			b		
	H	Depressed	Existing Grade			a, b, c		
	I	Partially Elevated	Partially Depressed			b		
	J	Partially Depressed	Partially Elevated			b		
Maple Street	9	Existing Grade	Elevated	High	High	High	High	\$325
	10	Existing Grade	Depressed	High	High	High	High	\$331
	K	Elevated	Existing Grade			b, c		
	L	Depressed	Existing Grade			a, b, c		
	M	Partially Elevated	Partially Depressed			b, c		
	N	Partially Depressed	Partially Elevated			b, c		
Main Street	11	Existing Grade	Elevated	High	High	High	High	\$301
	12	Existing Grade	Depressed	High	High	High	High	\$298
	O	Elevated	Existing Grade			b, c		
	P	Depressed	Existing Grade			a, b, c		
	Q	Partially Elevated	Partially Depressed			b, c		
	R	Partially Depressed	Partially Elevated			b, c		
Chestnut Street	S	Existing Grade	Elevated			d		
	13	Existing Grade	Depressed	High	High	High	High	\$262
	T	Elevated	Existing Grade			b, c		
	U	Depressed	Existing Grade			a, b, c		
	V	Partially Elevated	Partially Depressed			b, c		

	W	Partially Depressed	Partially Elevated	b, c				
All Crossings	14	Elevated/ Partially Elevated	Existing Grade/ Partially Depressed	High	High	High	High	\$541
	X	Depressed	Existing Grade	a, b, c, d				

☐ = Infeasible Alternative

a=Cordilleras Creek Bridge constraint

b=Redwood City Caltrain Station & Jefferson Avenue Underpass constraint

c=SR 84 Overhead constraint

d=Chestnut Street spur track constraint

Source: Grade Separation Footprint Study (2009)

Note: These physical constraints (a thru d) were established by the 2009 study to avoid a ripple-effect of additional impacts. For example, if the SR 84 (Woodside Road) Overhead had to be reconstructed, the approach roadway on both sides of the tracks would also have to be reconstructed, which could impact adjacent structures, ramps, intersections, and any related utilities.

Internal Workshops

Three workshops with key staff from the City and Caltrain were hosted by the PDT on September 30, 2019, January 30, 2020 and November 10, 2020. The sessions were strategically convened to get input from and vet alternatives with these stakeholders at key milestones and before outreach. Discussion topics from each workshop is discussed in more detail below.

Each of the workshops had a two-part format with a larger stakeholder group for the first part of each session (morning through lunch) and then a smaller stakeholder group for the second session in the afternoon to debrief comments and input received. Attendees for the first sessions included representatives from Redwood City Departments (Office of the City Manager, Parks, Recreation and Community Services, Library, Fire, Police, Public Works, and Community Development and Transportation) and Caltrain Departments (Rail Planning, Government/Community Affairs, Rail Operations, and Engineering). The core group for the second session included those key PDT members that attended the regular PDT meetings (City Project Leadership, Caltrain project leadership, as well as key AECOM team members). Each session was hosted at the Redwood City's Public Works Office's large conference room (off-site from both Caltrain and the main City Hall offices).

Internal Workshop #1 (September 30, 2019)

Workshop #1 briefed attendees on the Project's history, purpose of the effort and project schedule. The connection between the six at-grade crossings and the Downtown Transit Center planning effort were also discussed. Attendees were asked to give feedback on opportunities and constraints related to their areas of expertise. Questions about funding, prioritization, implementation, adjacent land use, utility relocation, public safety and property impacts were among the many topics covered. Attendees also shared lessons learned and examples of grade separations they were familiar with as well as their hopes for the specific areas within the city. The opportunities identified included:

- Improved bicycle and pedestrian safety
- Improved travel times and reliability for all modes
- Opportunities for improved neighborhood connectivity and ground floor activity
- Reduction in train horn noise

Constraints articulated by the stakeholders included:

- Encroaching into development activity
- Huge structures that will become barriers if not treated properly, depending on which options are chosen
- Lack of through (east/west) connectivity
- Construction impacts and duration of construction activity
- Visual impacts

In the second session of the first workshop, the 2009 Footprint Study Assessment (Attachment H) was reviewed with the smaller stakeholder group and a few additional members of the Caltrain technical staff. Property impacts were

further delineated. Technical discussions regarding track width assumptions and temporary track needs and conforms, as well as Caltrain and Dumbarton Corridor planning efforts occurred. The review and public process for the Grade Separation Study was discussed and the following direction was formulated:

- Establish cost/benefit and other metrics to tell the story of what is ultimately presented to the public and what has been discarded
- Define advantages of grade separating multiple crossings
- The following four alternatives from the 2009 Footprint Study were identified as being worthy of further consideration:
 - Fully elevate Whipple Avenue (Rail remains at-grade)
 - Fully lower Whipple Avenue (Rail remains at-grade)
 - Hybrid at Whipple Avenue (Rail partially elevated, Whipple partially lowered)
 - Citywide Track Raise
- The following variations of the Citywide Track Raise were also considered.
 - Grade separate Whipple Avenue only as Phase 1 of future larger grade separation project for the three northern crossings (Whipple Avenue, Brewster Avenue, and Broadway)
 - Grade separate the three northern crossings at once (Whipple Avenue, Brewster Avenue, Broadway)
 - Grade separate the three southern crossings (Maple Street, Main Street, and Chestnut Street) as a project
 - Grade separate Whipple Avenue and Brewster Avenue and close Broadway to motor vehicles (keep it open to pedestrians and bicyclists)

The fully elevated and fully lowered Whipple Avenue alternatives were eliminated from consideration due to significant right of way impacts along El Camino Real, Stafford Street, and Whipple Avenue. The Hybrid at Whipple Avenue was studied further in Workshop #2 as the "grade separation of Whipple Avenue only".

Internal Workshop #2 (January 30, 2020)

The second workshop focused on two main topics: establishing a set of criteria to screen alternatives and vetting fifteen possible alternatives down to eight or fewer alternatives for further development. The fifteen alternatives included subtle differences in the shoofly concepts and were separated into these four categories:

- Citywide Track Raise (One Phase)
- Citywide Track Raise (Two Phases)
- Grade Separations of the Northern Crossings Only
- Grade Separation of Whipple Avenue Only

Details of the Evaluation Criteria discussion are included below in Section 5. The larger stakeholder group was able to identify and give reasons for narrowing the list of alternatives down to seven. The smaller stakeholder group reviewed and concurred with the input from the larger stakeholder group from the morning session and discussed the public presentation of the screening of the alternatives. The seven alternatives identified were:

- Two (2) versions of the citywide (one phase) track raise (Same rail profile, but two versions of the shoofly concept)

The shoofly concept that minimized property impacts was chosen, and this ultimately became known as "Alternative 1" in late 2020 when it was presented to the public in the first round of community outreach.

- Two (2) versions of the citywide (two phase) track raise (Same rail profile, but two versions of the shoofly concept)

The shoofly concept that minimized property impacts was chosen, and two versions of this concept ultimately became known as “Alternative 2” and “Alternative 3” in late 2020 when it was presented to the public in the first round of community outreach.

- Two (2) versions of the grade separations of the northern crossings only (Whipple/Brewster/Broadway) (Same rail profile, but two versions of the shoofly concept)

This concept was dropped prior to the first round of community outreach in late 2020 because it did not address the grade separations in the southern part of the City; however, this concept was ultimately reconsidered in the second round of community outreach in 2022 to allow residents in the southern neighborhoods weigh in on whether they preferred grade separations at Maple, Main, and Chestnut.

- Grade separation of Whipple Avenue only (Hybrid concept)

This ultimately became known as “Alternative 4” in late 2020 when it was presented to the public in the first round of community outreach.

Internal Workshop #3 (November 10, 2020)

Nearly ten months later, the final workshop was held after significant delays related to Covid-19 and the need to re-scope the public outreach strategy for the Project (e.g., virtual meeting versus in-person meetings). The final workshop recapped the project’s goals and summarized the input received from the first two workshops. The PDT also described how the alternatives were narrowed down to four. In preparation of the launch of the virtual townhall, one of the main goals of the workshop was to collect feedback from the stakeholders to ensure the presentation of the exhibits, related to the four alternatives, was complete and would be easy to understand by the public.

The stakeholders asked questions and provided feedback about the following topics, which led to refinements of the exhibits and introduction videos that were included in the virtual townhall room/website:

- Include additional cross sections, where needed.
- Provide clarity about the alternatives at Maple and Main, specifically pedestrian access.
- Include the pros and cons for each alternative and explain the citywide benefits.
- Consider access to the library during construction.
- Include information about the project schedule/timeline.
- Add photos of existing grade separations.
- Discuss next steps (upcoming survey, selection of a preferred alternative, etc.).

Evaluation Criteria

During Internal Workshop #2 on January 30, 2020, an initial list of evaluation criteria from recent grade separation projects was reviewed and elements that were unique to Redwood City were discussed. The potential evaluation criteria started with seven key categories: property impacts, cost, traffic impacts, constructability, environmental impacts, railroad operations, and maintenance. In addition, the stakeholder group at the workshop identified the following potential criteria for consideration: emergency response times, gate down time, bicycle and pedestrian access (including school crossings), easements, Union Pacific Railroad impacts, utility impacts and relocations, parking impacts and loss of parking.

Ultimately, Table 4 indicates the evaluation criteria that was developed collaboratively by the stakeholder group during the Internal Workshops (discussed above) and the criteria that was used to evaluate the alternatives. Of the criteria listed below the community identified reduction in delays and congestion, east/west ped/bike connectivity, and safety for all modes as the most important criteria. See Figure 10 for the Grade Separation Priorities Survey Question. While railroad operations and maintenance are not listed as part of the criteria, this was considered in the development of the alternatives. For example, temporary track alignments were studied to verify that Caltrain could maintain operations during construction.

Table 4: Evaluation Criteria

Traffic/Circulation	Environmental/ Socioeconomics	Right-of-Way & Access	Cost Funding
Reduction in Delays and Congestion*	Rail Noise	Property Acquisitions (Full or Partial)	Fundability and Phasing Opportunities
East/West Ped/Bike Connectivity*	Visual Impact of an Elevated Structure	Driveway and/or Pedestrian Entrance Impacts	—
Safety for All Modes*	Creek Impacts	—	—
Road Closures & Potential Change in Traffic Circulation	—	—	—

*Based on community feedback received, these are the most important criteria.

6. Alternatives

No-Build Alternative

The No-Build Alternative proposes no improvements within the project limits, and thus does not address the purpose and need of the project. The at-grade railroad crossings would remain as they exist today. The No-Build Alternative was evaluated from a traffic perspective in Section 7 (Summary of Traffic Conditions) to compare the traffic conditions comparison to the build alternatives.

If the No-Build Alternative is ultimately chosen or if there is a significant delay in the project, the City may consider relatively low-cost, near-term improvements, such as:

A four quadrant (quad) gate system. This system would have gate mechanisms on both sides of the tracks in both directions of the at-grade crossings. This would deter drivers from illegally driving their vehicles around lowered gates to cross the tracks before the train arrives.

Quiet zone designation application. Based on federal rule, local government agencies may acquire a quiet zone designation that would restrict the usage of train horns at railroad crossings which meet specified criteria. While these provide improvements from a noise perspective, they do not address the safety and operational needs of the project.

The No-Build Alternative will be evaluated further in the next phase of the project.

Studied Alternatives

As noted in the Section 5, many alternatives were screened and vetted beginning with an assessment of the 2009 Footprint Study, followed by three internal workshops that resulted in four Build Alternatives being developed and presented in the virtual town hall in late 2020. These initial four Build Alternatives are summarized as follows.

Alternative 1: Grade separation of all six existing at-grade crossings by raising the tracks throughout the City’s limits, from just north of Cordilleras Creek (south of Howard Avenue in San Carlos) to just north of Woodside Road.

Alternative 2: Similar to Alternative 1, a citywide raise of the tracks to grade separate all six existing at-grade crossings, except construction would be done in two phases with the northern crossings (Whipple, Brewster, and Broadway) in Phase 1 and the southern crossings (Maple, Main, and Chestnut) in Phase 2. Reconstruction of the Jefferson Avenue Overcrossing (OC) would be completed in Phase 1.

Alternative 3: Similar to Alternative 2, except the reconstruction of the Jefferson Avenue OC would be deferred to Phase 2. To keep Broadway open to vehicular traffic, the road would have to be lowered about 17 feet, creating significant impact to adjacent properties or Broadway would have to be closed to vehicular traffic which would create a significant impact to transit operations.

Alternative 4: Grade separation of Whipple Avenue only via a partial raise of the tracks and a partial lowering of the Whipple Avenue, El Camino Real, and Stafford St. All other rail crossings (Brewster Avenue, Broadway, etc.) would remain at-grade.

See Attachment A for the conceptual rail and roadway plans, profiles and typical sections of these four Build alternatives.

Feedback from the public was collected about these four Build alternatives in 2021. See Attachment K-1. Based on a conceptual engineering analysis and the public’s feedback, the City and Caltrain came to the following conclusions:

- With increased Caltrain service and implementation of a four-track station, Whipple Avenue, Brewster Avenue, and Broadway would be grade separated and open to all modes (vehicles, bikes, and pedestrians). Keeping Broadway open to motor vehicles was desirable to maintain access to the Downtown and to provide convenient bus service to the new station.
- Any grade separation at Maple Street would be for pedestrians and bicyclists only because lowering Maple Street to provide vertical clearance under the tracks for motor vehicles would result in significant physical and environmental impacts to Redwood Creek (Main Branch).
- If all six crossings were to be grade separated, the public expressed a preference to complete them all at once (versus in two phases). In addition, a phased approach was not desirable as this would result in some throw-away costs, more impact to the community, such as longer construction times (two separate construction contracts, potentially decades apart), and a higher cost overall.
- Of the three southern crossings, Main Street carries the most traffic, so it would stay open to all modes.

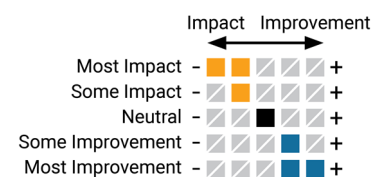
As part of the proof-of-concept Transit Center Planning exercise, the project team developed 13 different transit center options as well as a set of evaluation criteria to screen out infeasible or incompatible options as they related to a variety of components such as grade separation compatibility, multi-modal access, and bus operations. Alternatives 1 and 3 (ped/bike access only at Broadway) were included in the exercise because their designs captured the full range of potential impacts associated with potential grade separations in the future station area. Based on the initial screening, six options were carried forward for further analysis. Of the six remaining transit center options, six were compatible with Alternative 1 and two were compatible with Alternative 3. After further evaluation and analysis of the six remaining transit center options, none of the preferred options were found to be compatible with Alternative 3 because the closure of motor vehicles at Broadway would limit bus circulation around the future four-track station. As a result, Alternative 3 was eliminated from further consideration in the study due to incompatibility with potential future bus needs.

Alternative 4 grade separates Whipple Avenue only, and requires an at-grade, four-track station at Brewster and Broadway. Since the CPUC would likely not approve a four-track at-grade crossing, the Brewster Avenue and Broadway crossings would have to be closed to motor vehicle traffic. This alternative was eliminated from further consideration in the study due to the access and mobility challenges that would be introduced by the closures of both Brewster and Broadway, the limited community support to only grade separate Whipple Avenue, and the strong community desire to grade separate both Brewster and Broadway.

These conclusions resulted in refinement of Alternatives 1 and 2 and the elimination of Alternatives 3 and 4.

Evaluation Matrix

Based on the Evaluation Criteria (see Section 5), an evaluation matrix was developed for the four alternatives (Alternatives 1-4) initially studied from October 2020 – May 2021. The matrix is included in Attachment E. A color-coded rating system based on qualitative and quantitative assessment of the specific impact or improvement was utilized to evaluate the alternatives. The color-coded system is shown to the right indicating relative levels of impact with orange squares and relative levels of improvement in blue squares.



Refined Alternatives

As a result of the first round of public outreach (January – May 2021) and the conclusions noted above, the PDT presented the following three Build alternatives to the public in May 2022 for final consideration.

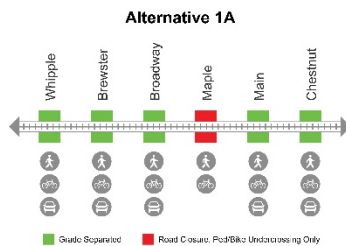
Alternative 1A: A citywide raise of the tracks with grade separations for all modes at all six rail crossings. Maple Street would be closed to motor vehicles, and grade separated for pedestrians and bicyclists only.

Alternative 1B: Same as Alternative 1A, except Chestnut Street would be grade separated for pedestrians and bicyclists only. This would allow some properties fronting Chestnut Street to remain as-is.

Alternative 2: A citywide raise of the tracks with grade separations in the northern segment of the City; at Whipple Avenue, Brewster Avenue, and Broadway only. The three rail crossings in the southern segment of the City would remain as-is, as an at-grade railroad crossing.

See Attachment B for the conceptual rail and roadway plans, profiles and typical sections of these three Build alternatives. Engineering design features, right-of-way, and utilities associated with the final three Build alternatives are discussed in this section. Advantages and disadvantages of each alternative are summarized in Table 8.

Alternative 1A



Alternative 1A proposes to raise the railroad from approximately 0.2 miles south of Howard Avenue in San Carlos to just north of Woodside Road in Redwood City, and to construct grade separation structures for all modes of travel at Whipple Avenue, Brewster Avenue, Broadway, Main Street, and Chestnut Street. A grade separation structure for pedestrians and bicyclists only is proposed at Maple Street.

Table 5 shows a summary of how much the rail would be raised at each crossing location.

Table 5: Summary of Track Raise (Alternatives 1A & 1B)

Location	Amount of Track Raise (ft)	Amount of Roadway Lowering (ft)
Whipple Avenue	23.0	0.0
Brewster Avenue	24.3	0.0
Broadway	24.1	0.0
Jefferson Avenue	19.5	0.0
Maple Street	16.3	0.0
Main Street	14.9	16.5
Chestnut Street	6.4	14.5*

* Roadway lowering at Chestnut for Alternative 1A only.

The road profiles at Whipple Avenue, Brewster Avenue, and Broadway could essentially remain as-is. The pavement delineation on all three streets could be modified slightly to improve accommodations for bicycle and pedestrian access to the new station, and an 8-foot-wide median is proposed on Whipple Avenue to accommodate a bridge column for a 2-span, 130-foot long, railroad structure. A 2-span structure at Whipple reduces the structure depth, which avoids lowering of the road. Single span (90-foot long) railroad structures are proposed at Brewster Avenue and Broadway.

A four-track, elevated station with a platform length of 875 feet is proposed from just south of Brewster Avenue to just south of Broadway.

The Jefferson Avenue OC would be reconstructed to accommodate the proposed rail profile, a raise of approximately 19.5 feet. Due to the track raise, and thus, excess vertical clearance, Jefferson Avenue could be raised to approximately its original elevation.

Maple Street would be closed to motor vehicles; however, a 20-foot wide by 42-foot-long pedestrian/bicycle tunnel/undercrossing (UC) structure is proposed at this location. The finished grade elevation of the bottom of the tunnel would be approximately the same as the existing elevation of Maple Street. A plaza area is proposed on the

west side of the tracks between the Franklin/Lathrop Street intersection and the tunnel. See Attachment I for conceptual renderings of the Maple Street Pedestrian/Bicycle UC.

The lane configuration of Main Street would essentially remain as-is except as noted below. The profile of Main Street would be lowered for a total length of about 740 feet and lowered a maximum of approximately 15 feet to provide the standard vertical clearance of 15'-6" under a railroad structure. The maximum grade on Main Street would be approximately 8%. Vehicular access to Pennsylvania Avenue would be removed. Additionally, vehicular access to Elm Street would be removed to avoid impacts to nearby development projects on the west side of the tracks currently under construction. The intersections at Beech Street and Cassia Street would be lowered slightly to accommodate the revised profile of Main Street.

Elevated sidewalks on each side of Main Street are proposed; however, the sidewalk on the west side of Main Street would not be ADA accessible. To maintain pedestrian access to the buildings between Beech and Cassia (currently under construction), the sidewalk on the west side of Main Street would remain at-grade between Beech and Elm. To provide access under the railroad structure, stairs are provided just north of Elm. An at-grade access path would be provided on the west side of the tracks between Maple and Main.

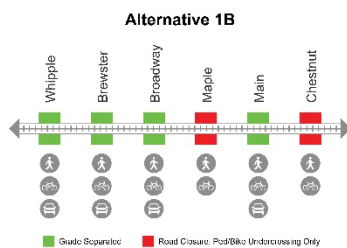
A relatively wide (20-foot) median is proposed on Main Street to accommodate a bent cap with a 30-degree skew to support a 2-span, 220-foot-long railroad bridge. A larger skew angle would reduce the median width; however, Caltrain and Union Pacific Railroad (UPRR) would likely not approve a structure with a skew angle greater than 30 degrees. See Attachment I for conceptual renderings of the Main Street UC.

The lane configuration of Chestnut Street could remain as-is, but with improved accommodations for bicyclists. The profile of Chestnut Street would be lowered for a total length of about 665 feet and lowered a maximum of approximately 14.5 feet to provide the standard vertical clearance of 15'-6" under a railroad structure. The maximum grade on Chestnut Street would be approximately 8%. Vehicular access to Pennsylvania Avenue would be removed, and the intersection at Shasta Street would be lowered slightly to accommodate the revised profile of Chestnut Street.

Elevated sidewalks would be provided on each side of Chestnut Street; however, the sidewalk on the north side of would not be ADA accessible. To maintain pedestrian access to Building E South of the South Main Mixed-Use Project, the sidewalk on the north side of Chestnut Street would remain at-grade on the south side of the building, east of Main Street. To provide access under the railroad structure, stairs are proposed just west of the railroad structure. An at-grade access path would be provided on the west side of the tracks between Chestnut and Cedar St.

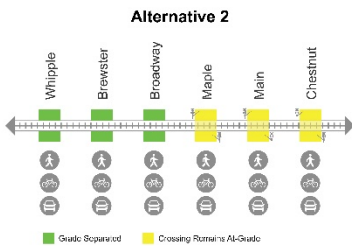
An 11-foot median is proposed on Chestnut Street to provide room for a left turn pocket onto southbound Shasta Street, and to accommodate a center pier/column to support a 2-span, 65-foot-long railroad bridge. See Attachment I for conceptual renderings of the Chestnut Street UC.

Alternative 1B



Alternative 1B is identical to Alternative 1A, except at Chestnut Street. Chestnut Street would be closed to motor vehicles; however, a 20-foot wide by 42-foot-long pedestrian/bicycle (UC) structure is proposed at this location, similar to the UC at Maple Street. The finished grade elevation of the bottom of the tunnel would be approximately 10 feet below the existing elevation of Chestnut Street. A 140-foot long, plaza area is proposed on the west side of the tracks between the commercial driveway on the south side of Chestnut Street and the tunnel. See Attachment I for conceptual renderings of the Chestnut Street Pedestrian/Bicycle UC. Compared to Alternative 1A, this alternative would avoid the potential acquisition of two parcels (See Table 7).

Alternative 2



Alternative 2 proposes to raise the railroad from approximately 0.2 miles south of Howard Avenue in San Carlos to just south of Maple Street in Redwood City, and construct grade separation structures for all modes of travel at Whipple Avenue, Brewster Avenue, and Broadway. Maple Street, Main Street, and Chestnut Street would remain as they are today, as at-grade railroad crossings. This alternative is equivalent to Phase 1 of Alternative 2 that was presented in the first round of outreach in 2021. Table 6 shows a summary of how much the rail would be raised at each crossing location.

Table 6: Summary of Track Raise (Alternative 2)

Location	Amount of Track Raise (ft)	Amount of Roadway Lowering (ft)
Whipple Avenue	23.1	0.0
Brewster Avenue	26.0	0.0
Broadway	21.3	4.0
Jefferson Avenue	9.6	0.0
Maple Street	0.8	N/A
Main Street	0.0	N/A
Chestnut Street	0.0	N/A

N/A = Not applicable, at-grade crossing will remain.

The road profiles at Whipple Avenue and Brewster Avenue could essentially remain as-is. The pavement delineation on Whipple, Brewster, and Broadway could be modified slightly to improve accommodations for bicycle and pedestrian access to the new station, and an 8-foot-wide median is proposed on Whipple Avenue to accommodate a bridge column for a 2-span, 130-foot long, railroad structure. A 2-span structure at Whipple reduces the structure depth, which avoids lowering of the road. Single span (90-foot long) railroad structures are proposed at Brewster Avenue and Broadway.

The profile of Broadway would be lowered for a total length of about 330 feet and by a maximum of approximately 4 feet to provide the standard vertical clearance of 15'-6" under the 90-foot, single span, railroad structure. The maximum grade on Broadway would be approximately 3%. The intersections at Perry/California Street, and Arguello Street would be lowered slightly to accommodate the revised profile of Broadway.

A four-track, elevated station with a platform length of 875 feet is proposed from just south of Brewster Avenue to just south of Broadway.

The Jefferson Avenue OC would be reconstructed to accommodate the proposed rail profile, a raise of approximately 9.6 feet. Due to the track raise, and thus, excess vertical clearance, Jefferson Avenue could be raised.

Maple Street would be raised slightly (0.8 feet) to accommodate the elevated rail profile. The profiles of Main Street and Chestnut Street would not be modified. To increase the safety of these at-grade crossings in the future, quad gates could be installed. This is described in more detail under the No-Build Alternative.

Caltrain Operations During Construction

Alternatives 1A, 1B, and 2 will require two temporary (shoofly) tracks to maintain Caltrain service during construction. In some areas, particularly in the vicinity of the new four-track station, the existing tracks can be used during construction. It is anticipated that some of the existing OCS poles, west of the tracks, may require relocation to the east side of the rail corridor to construct the new facility, which could potentially require the acquisition of some private properties. The shoofly tracks for Alternative 1A and 1B extend the full limits of the project; from Howard

Avenue in San Carlos to the SR 84 Overhead in south Redwood City. The limits of the shoofly tracks for Alternative 2 will not extend as far south. They will end just south of Main Street.

Construction staging and potential impacts to existing infrastructure facilities will be looked at in more detail in the next (environmental) phase of the project. For example, the following will be evaluated further for the preferred alternative:

- Construction of the new Jefferson Avenue OC. This will be challenging due to its proximity to two buildings on each side of the rail corridor: the Box, Inc. building at 900 Jefferson Avenue on the east side of the tracks, just north of Jefferson Avenue, and 'The Cardinal' (apartment complex) at One Franklin Street on the west side of the tracks, just south of Jefferson Avenue. Cross sections of a potential staging concept for the Jefferson Avenue OC are provided in Attachment J.
- Service of Caltrain's Redwood City station throughout the various stages of construction.
- Temporary OCS pole configurations to maintain electrified train service during construction.

Right-of-Way

Property impacts were evaluated for each of the three alternatives; however, additional evaluation and approvals (finalization of permanent and shoofly track alignments, and surveys of buildings and parcels, for example) must occur in the Preliminary Engineering/Environmental Document and/or Final Design phase to determine the property impacts more accurately. As a result, the following is noted for discussion and budgetary planning purposes only, and all potential impacts noted below are subject to change.

The horizontal alignment for all three alternatives north of Jefferson Avenue is virtually identical, and some potential property acquisitions are likely on the west side of the railroad corridor due to the track alignment being shifted west slightly and flared out (widened) to the west to accommodate a four-track station between Brewster Avenue and Broadway. On the east side of the rail corridor, some temporary construction easements and potential property acquisitions are likely to accommodate shoofly tracks during construction. Table 7 summarizes the potential private property acquisitions anticipated for the project. See Attachment C for the Right-of-Way Impact exhibits for each alternative.

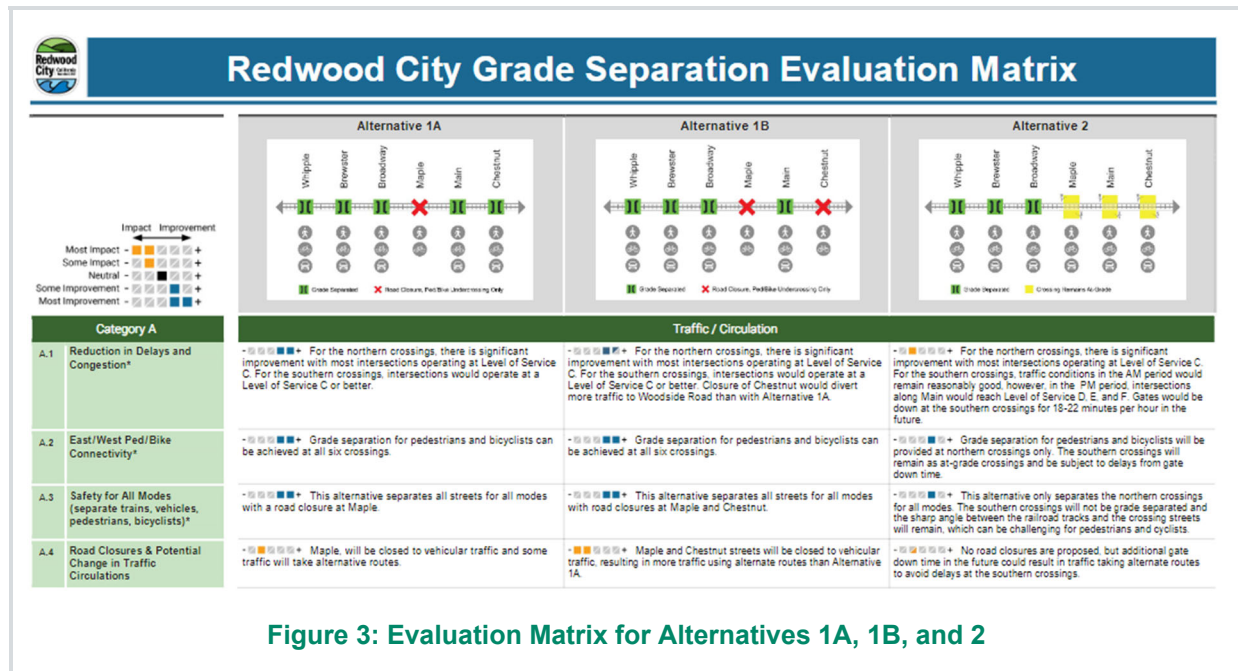
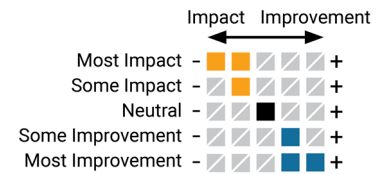
Table 7: Summary of Potential Permanent Private Property Acquisitions

Address/Location	Side of Rail Corridor	Partial or Full Acquisition	Alternative		
			1A	1B	2
651 El Camino Real	West	Partial	✓	✓	✓
Sequoia Station	West	Partial	✓	✓	✓
797 Arguello Street	East	Full	✓	✓	✓
775 Arguello Street	East	Full	✓	✓	✓
715 Arguello Street	East	Full	✓	✓	✓
701 Arguello Street	East	Full	✓	✓	✓
965 Brewster Street	West	Full	✓	✓	✓
2421 Broadway	East	Full	✓	✓	✓
1104 Main Street	East	Full	✓	✓	✓
1112 Main Street	East	Full	✓	✓	✓
307 Beech Street	East	Full	✓	✓	
315 Beech Street	East	Full	✓	✓	
306 Beech Street	East	Full	✓	✓	

Address/Location	Side of Rail Corridor	Partial or Full Acquisition	Alternative		
			1A	1B	2
303 Cedar Street	East	Full	✓	✓	
300 Cedar Street	East	Full	✓	✓	
305 Chestnut Street	East	Full	✓	✓	
312 Chestnut Street	East	Full	✓		
301 Pine Street	East	Full	✓		
Total # of Parcels			18	16	10

Evaluation Matrix

Based on the Evaluation Criteria (see Section 5), an evaluation matrix was developed to evaluate the relative performance of Alternative 1A, 1B, and 2 studied from January 2022 – June 2022. This matrix is included in Attachment F (see Figure 3). A color-coded rating system based on qualitative and quantitative assessment of the specific impact or improvement was utilized to evaluate the alternatives. The color-coded system is shown to the right indicating relative levels of impact with orange squares and relative levels of improvement in blue squares.



A high-level summary of the impacts and improvements of Alternatives 1A, 1B, and 2 is illustrated in Table 8 considering all six grade crossings: Whipple, Broadway, Brewster, Maple, Main and Chestnut.

Table 8: Impacts and Improvements of Alternatives 1A, 1B, and 2

Alternatives 1A and 1B	Alternative 2
+Reduces delays at crossings	-Congestion and delays increase
+Reduces train horn noise	-Continued train horn noise
+Improves connectivity	-Potential conflicts between trains and vehicles/bikes/peds
-Requires some roadway closures	+No roadway closures required
-Greatest visual impact due to length of elevated structure	+Least visual impact due to shorter elevated structure
-Greatest number of potential property impacts	+Fewest number of potential property impacts
-Most expensive to build	+Least expensive to build

7. Summary of Traffic Conditions

For the traffic operational analysis, Existing (2019, pre-COVID) and three Future (2045) Build scenarios (Alternatives 1A, 1B, and 2) were considered. To help simplify the evaluation of the alternatives the study area was divided into two sub-areas with Jefferson Avenue serving as the dividing line between the North Area and the South Area. The North Area includes the Whipple Avenue, Brewster Avenue, and Broadway at-grade crossings, and the South Area includes the Maple Street, Main Street, and Chestnut Street at-grade crossings. Traffic exhibits including Average Daily Traffic (ADT), Level of Service (LOS), and change in traffic patterns can be found in Attachment G-1 and G-2.

Table 9 below summarizes the features of the three build alternatives. In the North Area the alternatives are all the same, each of the three crossings (Whipple Avenue, Brewster Avenue, and Broadway) would be grade separated for all modes.

In the South Area, for Alternative 1A the Maple Street crossing would be closed to vehicles, but open for pedestrians and bicycles, and the Main Street and Chestnut Street crossings would be grade separated for all modes (vehicles, pedestrians and bicyclists). Alternative 1B would involve a grade separation for all modes at the Main Street crossing, and closure of both the Maple Street and Chestnut Street crossings to vehicles, but open to pedestrians and bicycles. The grade separation of Main Street in both Alternatives 1A and 1B would require that Elm Street be closed at Main Street, making this segment of Elm Street a cul-de-sac with access only from Lathrop Street. Alternative 2 would have all three crossings (Maple, Main, and Chestnut Streets) remain as at-grade crossings.

Table 9: Summary of Crossing Features of the Build Alternatives (1A,1B, & 2)

Alternative	North Area			South Area		
	Whipple Avenue	Brewster Avenue	Broadway	Maple Street	Main Street	Chestnut Street
1A - Main / Chestnut Grade Separated, Maple Closed*	Grade separated for all modes	Grade separated for all modes	Grade separated for all modes	Closed to vehicles, ped/bike crossing only	Grade separated for all modes	Grade separated for all modes

Alternative	North Area			South Area		
	1B - Main Grade Separated, Maple / Chestnut Closed*	Grade separated for all modes	Grade separated for all modes	Grade separated for all modes	Closed to vehicle, ped/bike crossing only	Grade separated for all modes
2 - All Grade Separated	Grade separated for all modes	Grade separated for all modes	Grade separated for all modes	At-Grade	At-Grade	At-Grade

* Elm Street would be closed at Main Street under this alternative

Under the Existing (2019, pre-Covid) conditions all these crossings would remain at-grade and the number of trains per hour would remain at 2019 levels (10 trains per hour). For year 2045 conditions it was assumed that the train volume would increase to 24 trains per hour, resulting in increased gate down times. Year 2045 traffic volumes were estimated assuming a 0.5% annual increase in traffic for the North Area and a 1.0% annual increase in traffic for the South Area for the years 2019 to 2045. The higher growth rate assumption for the South Area was based on the amount of proposed development planned for the area near the crossings and because the streets in the north area have less capacity to accommodate additional traffic growth. Using Synchro/SimTraffic tools, traffic conditions associated with the existing conditions and the three build alternatives were analyzed in terms of vehicular delay and queue impacts on 11 nearby study intersections. Delay was evaluated using a LOS methodology during the AM and PM peak hours of travel. LOS D is considered by Redwood City as an acceptable LOS (in the downtown Area, LOS E is considered acceptable).¹

LOS E and F are considered “adverse conditions” outside of downtown. Intersections operating at LOS E indicate conditions where traffic volumes are close to capacity and LOS F characterizes conditions where traffic demand exceeds available capacity, with slow speeds (stop-and-go), long delays (over 60 seconds) and significant queueing at signalized intersections.

While increases in queue lengths with traffic/train volume growth are common for at-grade crossings, it is not desirable to see the queue lengths become extensive and start spilling over or blocking intersections beyond the intersections adjacent to the rail crossings. The traffic conditions assessment used these principles and methodology.

Existing (2019, Pre-COVID)

Existing traffic conditions (2019, pre-COVID) are illustrated on Figure 4 for both AM and PM peak hour conditions. Grade crossing gate down times of 8 minutes per hour (10 trains per hour) were experienced under existing conditions in 2019.

In the North Area, the Whipple Avenue/El Camino Real intersection was at LOS E in the AM peak hour and LOS D in the PM peak hour. Long queues are common in both the eastbound and westbound directions on Whipple Avenue. At the other study intersections LOS conditions of C and D were noted, and general congestion is experienced in this area during both peak hours, with the PM peak hour being worse than the AM peak hour approaching El Camino Real.

¹ City of Redwood City - RWC Moves Appendix F - Redwood City Transportation Analysis Manual, July 21, 2020

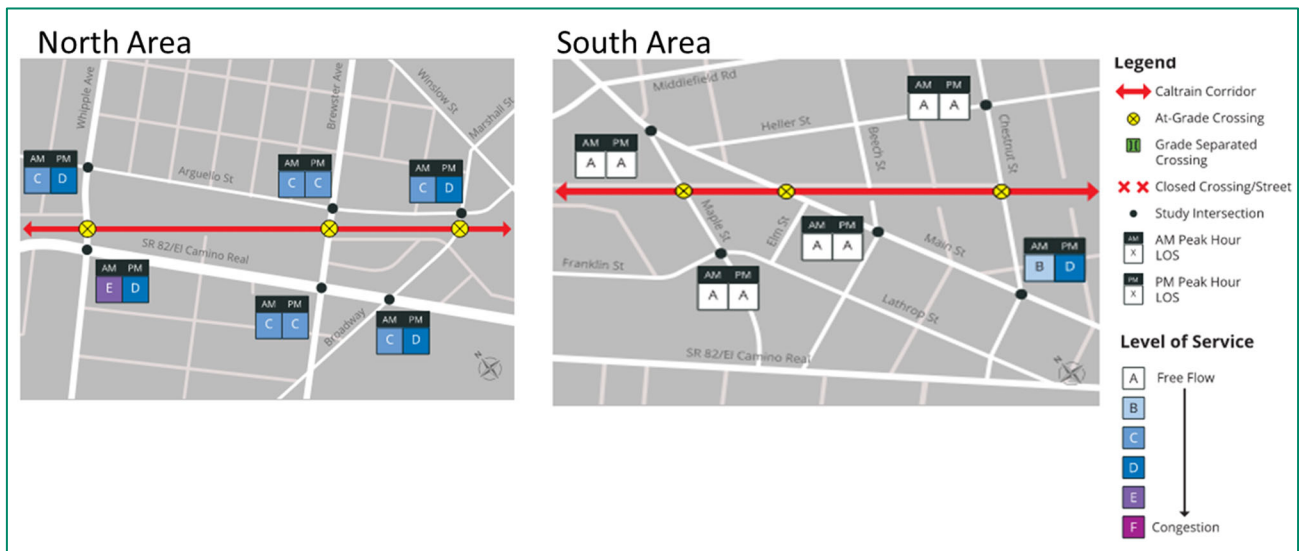


Figure 4: Existing (2019, Pre-Covid) Traffic Level of Service

In the South Area, in 2019 traffic conditions were very good in both peak hours for all the study intersections. The one exception was the Chestnut Street/Main Street intersection which experienced a LOS D in the PM peak hour.

Future (2045) No-Build Alternative

If no improvements are made by 2045, due to background traffic volume growth (14% in the North Area and 30% in the South Area) and increased train volumes (24 trains per hour), conditions would worsen at the study intersections. Figure 5 shows the LOS estimates for both AM and PM peak hour conditions. The following intersections would experience a LOS of E or F in the year 2045:

- North Area
 - Whipple Avenue & Arguello Street – LOS F in PM peak hour
 - Marshall Street & Arguello Street – LOS F in PM peak hour
 - Whipple Avenue & El Camino Real – LOS F in the AM peak hour and LOS E in the PM peak hour
 - Broadway & El Camino Real – LOS E in the PM peak hour
- South Area
 - Main Street & Maple Street – LOS E in the PM peak hour
 - Main Street & Chestnut Street – LOS F in the PM peak hour

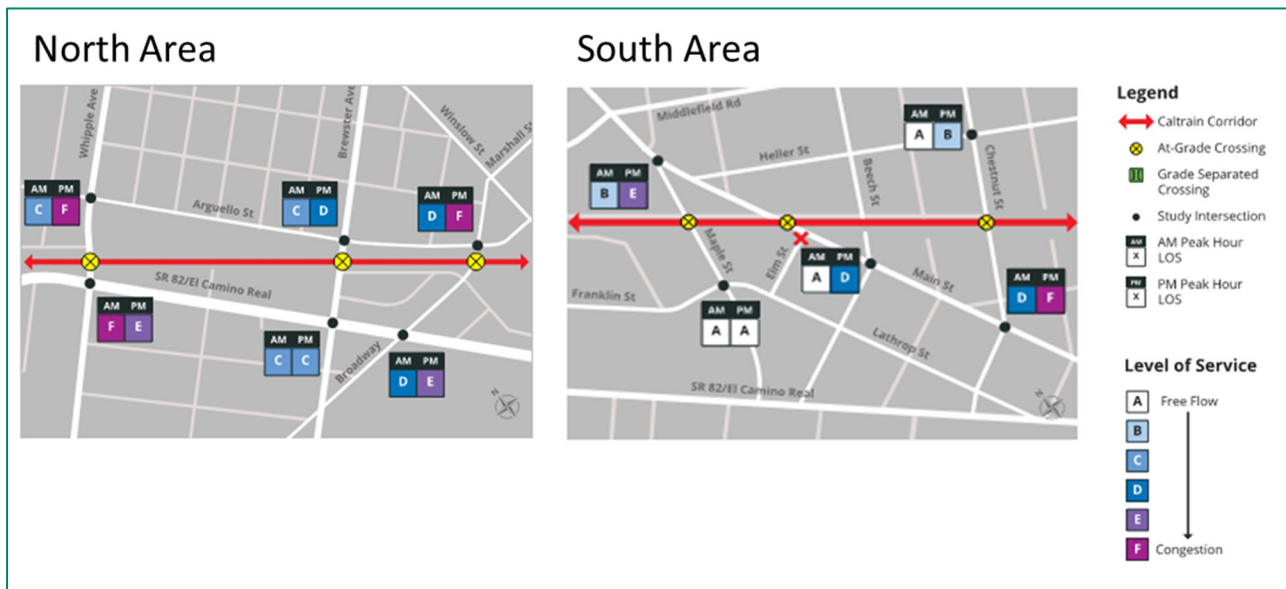


Figure 5: Future (2045) No Build Traffic Level of Service

Grade crossing gate down times would increase to 18-22 minutes per hour under Caltrain's moderate growth scenario. Significant queuing would occur in the North Area on Whipple Avenue, El Camino Real, Broadway, and Arguello Street. In the South Area queuing could be expected on Main Street and a portion of Maple and Chestnut Streets.

Future (2045) Build Alternatives

The future year 2045 evaluation of the three build alternatives generally resulted in improved traffic conditions as compared with the 2045 No-Build Alternative. In the North Area, traffic conditions would be the same for all three alternatives since for each alternative Whipple Avenue, Brewster Avenue, and Broadway would all be grade separated. In the North Area, traffic conditions at four of five study intersections would improve to acceptable conditions and the Brewster Avenue/El Camino Real intersection would remain at an acceptable LOS C for both the AM and PM peak hours. Queuing would also be reduced in comparison with the 2045 No-Build Alternative. Grade separations at each of the three crossings would eliminate delays due to crossing gate down times.

Some mitigations were required in the South Area due to road closures and the associated diverted traffic, which are noted in the following discussions.

Alternative 1A: Main/Chestnut Grade Separated, Maple Closed

Figure 6 presents the estimated LOS conditions for Alternative 1A. Conditions in the North Area would be as noted above.

In the South Area, there would also be a significant improvement in traffic LOS conditions. All intersections would operate at LOS C or better in both the AM and PM peak hours. However, in order to accomplish this, there would have to be some mitigation of traffic conditions at the Main Street/Beech Street intersection. The mitigations include a new traffic signal, and eastbound right, northbound left and southbound right turn lanes at the Main/Beech intersection.

The closure of Maple Street to vehicles would cause traffic to divert to Lathrop and Main Streets in order to access another crossing location such as the grade separated crossings at Main or Chestnut Streets. The traffic level of service at the Maple/Lathrop Streets intersection would deteriorate to a LOS C during the PM peak hour as compared with a LOS A in the no-build alternative. Grade separations at Main and Chestnut Streets would eliminate delays due to crossing gate down times.

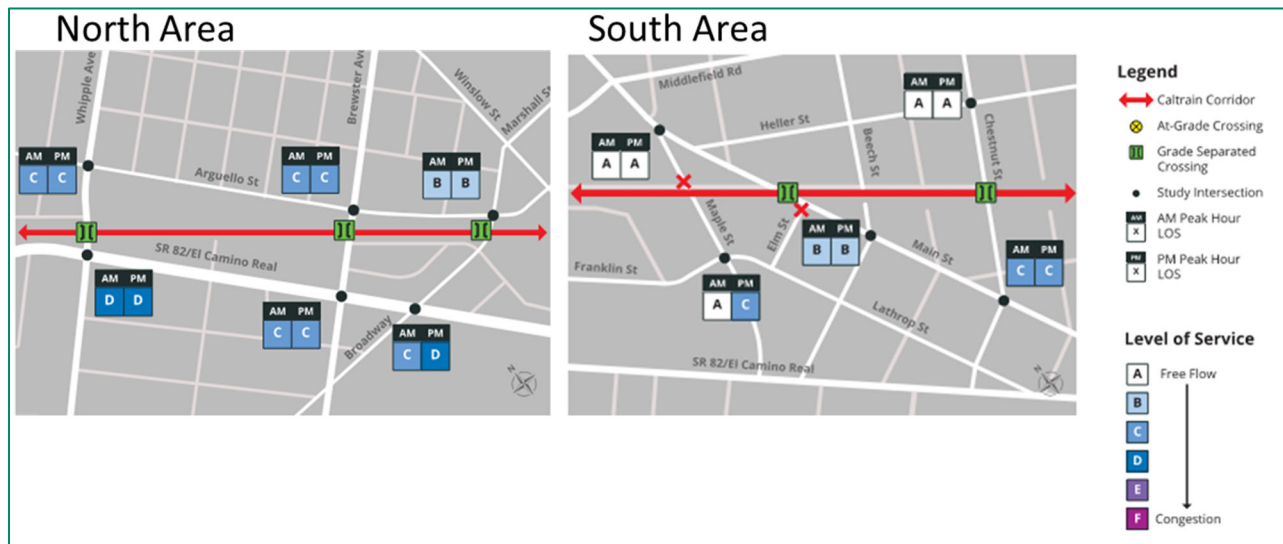


Figure 6: Future (2045) Build Traffic Level of Service – Alternative 1A

Alternative 1B: Main Grade Separated, Maple/Chestnut Closed

Figure 7 presents the estimated LOS conditions for Alternative 1B. Conditions in the North Area would be as noted above.

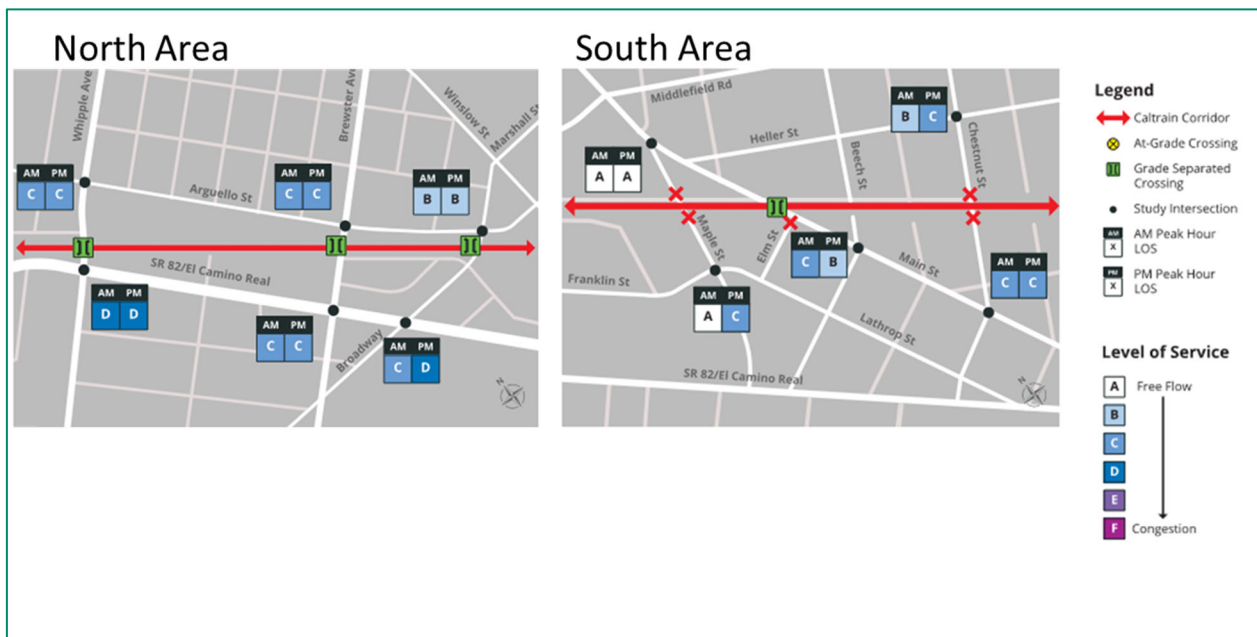


Figure 7: Future (2045) Build Traffic Level of Service – Alternative 1B

In the South Area, there would also be a significant improvement in traffic LOS conditions. All intersections would operate at LOS C or better in both the AM and PM peak hours. However, in order to accomplish this, there would have to be some mitigation of traffic conditions at the Main Street/Beech Street intersection. The mitigations include a new traffic signal, and eastbound right, northbound left and southbound right turn lanes at the Main/Beech intersection. These are the same mitigations as those required for Alternative 1A in the South Area.

Closing both the Maple and Chestnut rail crossings would divert traffic to Main Street. Generally, there would be an improvement in intersection traffic conditions as compared to the no-build alternative. However, conditions at the

Main/Beech Streets intersection would deteriorate slightly in the AM Peak hour from a LOS A in the no-build conditions to LOS C. Similarly, conditions at the Heller/Chestnut streets intersection would deteriorate from a LOS A in the no-build condition to a LOS B in the AM peak hour and a LOS C in the PM peak hour.

A grade separation at Main Street would eliminate delays due to crossing gate down time at this location.

Alternative 2: Southern Crossings At-Grade

Figure 8 presents the estimated LOS conditions for Alternative 2. This alternative is the same as Alternatives 1A and 1B in the North Area. Traffic conditions at four of five North Area study intersections would improve to acceptable conditions and the Brewster Avenue/EI Camino Real intersection would remain at an acceptable LOS C for both the AM and PM peak hours. Queuing would also be reduced in comparison with the 2045 No-Build Alternative. Grade separations at each of the three crossings would eliminate delays due to crossing gate down times.

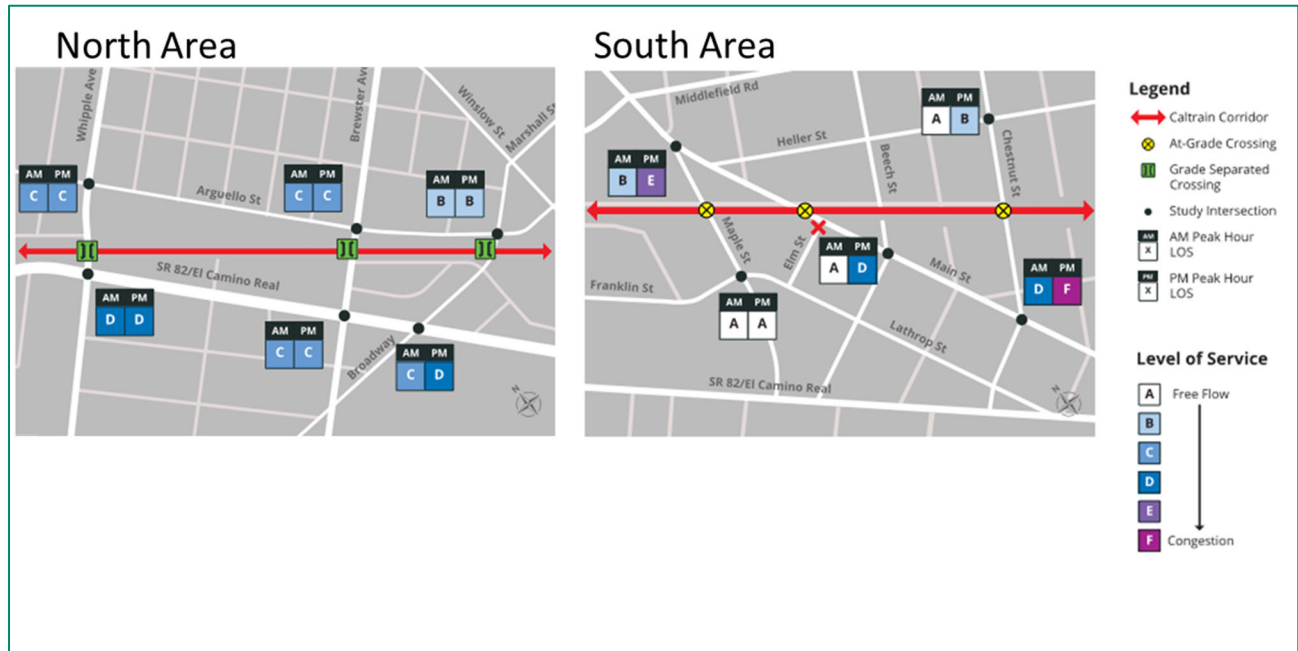


Figure 8: Future (2045) Build Traffic Level of Service – Alternative 2

In the South Area this alternative is the same as the No-Build 2045 Alternative as none of the crossings would be grade separated. The following intersections would experience a LOS of E or F in the year 2045:

- Main Street & Maple Street – LOS E in the PM peak hour
- Main Street & Chestnut Street – LOS F in the PM peak hour

Traffic Study Conclusions

In the North Area, the fully grade separated element of Alternatives 1A, 1B, and 2 provides for the best future traffic conditions, essentially eliminating all traffic delays due to the existing at-grade crossings and improving overall traffic conditions for the study area.

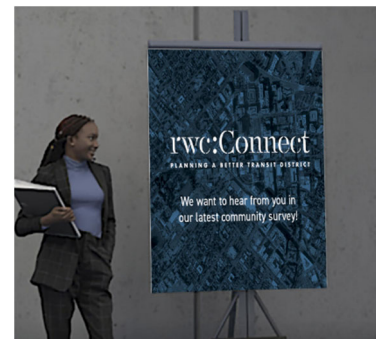
In the South Area, Alternative 1A with the identified mitigations results in LOS levels that are slightly better than mitigated Alternative 1B. However, both Alternatives 1A and 1B with the mitigation would improve intersection LOS levels to LOS C or better at all five study intersections, which is a better service level than the City’s standard of LOS D. Alternative 2 provides no improvement in the South Area and is the worst of the three alternatives in this respect.

8. Public Outreach/Involvement

The public outreach effort involved conveying the concepts and impacts of each alternative in an easy-to-understand manner to all stakeholders, including local businesses and the residential community. The major stakeholders in the Project include the City of Redwood City, Caltrain, property owners, area businesses and residents as well as the larger community who commutes through or shops in the nearby business districts, and downtown Redwood City. Due to the Covid-19 pandemic, much of the public outreach was conducted virtually where project alternatives were presented, questions answered, and feedback received from elected officials, residents, and business owners. The outreach was conducted in two phases, October 2020 to May 2021 and January 2022 to June 2022. Key components of the outreach included:



- An interactive Project website (www.redwoodcity.org/transitplan) provided background information including visual simulations and a variety of topical videos, as well as the opportunity to participate in surveys and sign up for e-blast updates.
- Project newsletter in the first phase of outreach (versions in Spanish and English), which provided the following:
 - Introduction to the Project (highlighting the grade separation study and Redwood City's general planning efforts).
 - Links to a YouTube video highlighting why the Project is needed and asking for feedback on what criteria should be considered.
 - Promotion of the virtual community meeting and the website.
 - A postage paid survey tear-off and link to the project website.
- Online surveys to collect contact info and ask about preferred strategies, including a bilingual handout specific to the crossings at the southern end of the City
- Virtual question and answer sessions
- Door to door canvassing and pop-ups (in Spanish and English) to educate the community about the Project and solicit feedback on preferred strategies in a face-to-face setting
- Facebook ads promoting the online survey and project webpage
- Social media promotion (#rwcconnect, @RedwoodCity) on Caltrain and all City channels, Nextdoor, and via neighborhood associations
- Portable Changeable Message Sign (PCMS) boards posted near the railroad crossings and by the transit center
- QR codes placed on outreach materials and neighborhood sidewalks for quick access to online survey
- In addition, notifications, presentations, and updates were given to the following stakeholders:
 - Council-Appointed Transportation Advisory Committee (12/8/2020, 6/8/2021, 9/14/2021, 12/14/2021, 6/14/2022)
 - City Council Transportation and Mobility Sub-Committee (11/19/2020, 9/2/2021, 10/7/2021, 5/26/2022, 9/1/2022)
 - City Council (1/25/2021)
 - Redwood City-San Mateo County Chamber of Commerce, Transportation and Housing Committee (11/12/2020, 11/4/2021, 6/7/2022)
- Neighborhood Associations



- Leadership Meeting (12/3/2020)
- Downtown and Roosevelt Neighborhood Associations (2/18/2021)
- Centennial Neighborhood Association (3/25/2021)
- Palm Park Neighborhood Association (5/25/2021)
- Other Organizations
 - Rotary Club (4/13/2021)
 - San Mateo County Economic Development Association (SAMCEDA) and Chamber Coffee Talk (1/12/2021)
 - Business Roundtable (2/23/2021)
- Property Owners (properties adjacent to the corridor which has a mailing list of 5500 addresses)
- Planned developments, such as 1125 Arguello, 651 El Camino Real, 1180/1190 Main, South Main Mixed-Use Project, 1201 Main Street, and Sequoia Station
- Redwood City Departments (Office of the City Manager, Parks, Recreation and Community Services, Library, Fire Department, Police Department, Public Works, and Community Development & Transportation)
- Caltrain Departments (Rail Planning, Government/Community Affairs, Rail Operations, and Engineering)

October 2020 to May 2021 (Alternatives 1 through 4)

Outreach activities to gather community feedback for this Project was originally intended to be a combination of using online engagement tools and in-person interactions by going to where people already gather such as the transit center, and school board meetings, to name a few. However, the Covid-19 pandemic beginning in February/March 2020 required that the outreach strategy be modified. Thus, the public outreach shifted to a virtual town hall-like website (<https://www.rwctransitplan.com/Archive/>) to present various alternatives for railroad grade separations (see Figure 9). The website portrayed a 3D environment of a community meeting room and consisted of various materials about the alternatives, including exhibits and informational videos in addition to a welcome video by the mayor and a project background video by Redwood City's Transportation Manager.



Figure 9: Archived Site – October 2020 to May 2021

A strategic decision was also made to add content related to the redevelopment of the Transit Center to the virtual website and create a newsletter (see Attachment K-1) that provided information about why the Transit Center Design and the Grade Separation Study were important. A survey was also included with the newsletter that was mailed to the community and placed online via the City's social media pages in October and November 2020 (see Figure 10). The key feedback gathered for the Grade Separation Study was identifying the community's priorities for the evaluation criteria. The top three priorities per the survey were the following (see Table 4):

- Reduction in delays and congestion
- East/west ped/bike connectivity
- Safety for all modes



- 1. Please mark your top **THREE** priorities for grade separations | Marque sus **TRES** prioridades principales para separaciones de grado**
- a. Improve connections for people walking and biking | *Mejorar las conexiones para las personas que caminan y andan en bicicleta*
- b. Increase traffic safety | *Incrementar la seguridad vial*
- c. Minimize construction impacts (parking removal, street closures, etc.) | *Minimizar los impactos de la construcción (eliminación de estacionamientos, cierres de calles, etc.)*
- d. Minimize permanent impacts to existing properties (residential and commercial) | *Minimizar los impactos permanentes a las propiedades existentes (residenciales y comerciales)*
- e. Minimize visual impacts of grade separation(s) | *Minimizar los impactos visuales de la (s) separación (es) de grado*
- f. Reduce rail/horn noise | *Reducir el ruido del rail / bocina*
- g. Reduce traffic congestion | *Reducir la congestión del tráfico*

Figure 10: Grade Separation Priorities Survey Question

Three virtual question and answer sessions were held on December 9, 2020; January 13, 2021; and February 3, 2021 to respond to questions from the community on the Grade Separation Study. Examples of the topics discussed included project need, schedule, height of the railroad track for each alternative, traffic impacts (see Section 7 for more details), costs and funding.

Between January 8 and May 3, 2021, input was collected from the community on four alternatives (see Section 6 for more details):

Alternative 1: Grade separation of all six existing at-grade crossings by raising the tracks between Howard Avenue in San Carlos and Woodside Road in Redwood City.

Alternative 2: Similar to Alternative 1, a Citywide raise of the tracks to grade separate all six existing at-grade crossings, except done in two phases, with the northern crossings (Whipple, Brewster, and Broadway) in Phase 1 and the southern crossings (Maple, Main, and Chestnut) in Phase 2 Reconstruction of the Jefferson Avenue Overcrossing (OC) would be completed in Phase 1.

Alternative 3: Similar to Alternative 2, except the reconstruction of the Jefferson Avenue OC would be deferred to Phase 2. In addition, to keep Broadway open to vehicular traffic, the road would have to be lowered about 17 feet, creating significant impact to adjacent properties.

Alternative 4: Grade Separation of Whipple Avenue Only (via a partial raise of the tracks and a partial lowering of Whipple Avenue, El Camino Real, and Stafford Street). All other rail crossings (Brewster Avenue, Broadway, etc.) would remain at-grade.

During that time a 13-question survey (see Attachment K-1) was conducted and about 400 unique responses were received regarding these options. The general feedback was that there was strong support for separating more than one street from the tracks and there was a willingness to close one or more at-grade crossings. Lastly, the most important streets to grade separate are Whipple, Brewster, Broadway, and Main. Below is a summary of the feedback collected where the northern crossings include Whipple, Brewster, and Broadway and the southern crossings include Maple, Main, and Chestnut:

- 90% of respondents support separating one or more streets from the Caltrain tracks
- 72% are open to closing one or more cross streets, if people walking and biking can still cross the tracks (e.g., via a tunnel under the tracks)
- Priority streets to separate assuming Whipple will be grade separated were, Brewster (80%), Broadway (75%), Main (55%)
- 45% of respondents support a citywide project, where all six at-grade crossings are grade separated
- Most important of the northern crossings to separate was Whipple (85% of respondents supported)
- Most important of the southern crossings to separate as Main (56% of respondents supported)

January 2022 to June 2022 (Alternatives 1A, 1B, and 2)

More outreach was conducted from January 2022 to June 2022 with a focus on obtaining more feedback from the communities that could benefit and/or be impacted by grade separations in the southern end of the City (Maple, Main, and Chestnut). Another purpose of the outreach was to provide an update on how the alternatives were narrowed down since the previous outreach effort (Alternatives 1 through 4).

The updated virtual town hall (<https://www.rwctransitplan.com/>), shown in Figure 11, consisted of various materials about the alternatives, including updated exhibits and updated informational videos, similar to the previous phase. Since closure of Maple and Chestnut were being considered, traffic analysis results were also presented (see Section 7 for more details). In addition, conceptual renderings of the alternatives (see Attachment I) were prepared to assist the stakeholders in visualizing what the alternatives could look like in the future.

The alternatives presented during this outreach effort (see Section 6 for more details) included:

Alternative 1A: Citywide raise of the tracks with grade separations at all six rail crossings, Maple Street would be closed to motor vehicles and grade separated for pedestrians and bicyclists only.

Alternative 1B: Same as Alternative 1A, except Chestnut Street would also be grade separated for pedestrians and bicyclists only.

Alternative 2: Raise of the tracks with grade separations in the northern segment of the City (at Whipple Avenue, Brewster Avenue, and Broadway only). The three rail crossings in the southern segment of the City would remain as they are, as at-grade railroad crossings.



Figure 11: Active Site – January 2022 to June 2022 (Southern Crossing Alternatives)

A bilingual survey was conducted online and in-person to gather more feedback from the community living in the southern area of Redwood City (see Attachment K-2). Figure 12 is a sample of the background information provided to respondents to help understand what alternatives were being considered, what they could look like, and what the traffic impacts could be. After reviewing the background information, respondents were asked to rate how much they agreed with each of three statements on a scale of 1 to 6 with 1 being “Strongly No” and 6 being “Strongly Yes” (see Figure 13). In addition to being able to complete the survey online via a QR code, Nuestra Casa (a non-profit organization with a mission to uplift Latino families in the mid-Peninsula through community education and engagement activities) canvassed neighborhoods and attended pop-up events to solicit in-person responses to the survey. Nuestra Casa staff, who completed project-specific training in advance, participated in the following events:

- Maple Street and El Camino Real on May 19, 2022, from 2pm - 5pm (Canvassing)
- Community Health Fair on May 21, 2022, from 10am - 4pm (Pop-up)
- Rise City Church (Food Distribution) on May 22, 2022, from 2pm - 5pm (Pop-up)
- Broadway/Highway 84 on May 28, 2022, 1pm - 4pm (Canvassing)



**CONECTANDO REDWOOD CITY :
ESTUDIO DE SEPARACIÓN DE GRADOS, ENCUESTA DE CRUCES DEL SUR**



¿POR QUÉ ESTUDIAMOS LAS SEPARACIONES DE GRADO?

Se avanza un mejor servicio de trenes a lo largo del corredor de Caltrain. Para mejorar la seguridad y reducir la congestión del tráfico, la ciudad está explorando la mejor manera de separar las carreteras de las vías del tren (lo que se conoce como separaciones a nivel). Redwood City está estudiando cruces específicos: Whipple, Brewster y Broadway en el norte, y Maple, Main y Chestnut en el sur. En esta fase, estamos trabajando para determinar cuál de las opciones viables de separación de grados se prefiere para que el proyecto pueda avanzar al siguiente nivel de desarrollo y buscar financiamiento.

Para 2040, las proyecciones de crecimiento regional muestran que habrá 1.2 millones de personas adicionales viviendo y trabajando en un radio de 2 millas de las estaciones de Caltrain, un aumento del 40 % con respecto a la actualidad. Para satisfacer las futuras necesidades de transporte de la región y mantener un equivalente a 5.5 carriles de tráfico de autopista fuera de las carreteras, Caltrain está trabajando para asegurarse de que su servicio y sistema estén listos. El Centro de Redwood City ha sido identificado como la ubicación preferida para una estación central con cuatro vías, donde paren tanto los trenes locales como los trenes expresos, y los pasajeros puedan hacer transbordo entre trenes. Para construir la estación central, todos los cruces del norte (Whipple, Brewster y Broadway) tendrían que estar separados por niveles. En Whipple y Brewster, las vías estarían completamente elevadas sobre las carreteras, y en Broadway se levantarían las vías y se bajaría ligeramente la calzada.

Caltrain actualmente opera 10 trenes por hora y las puertas de cruce cerradas durante aproximadamente 8 minutos por hora. En el futuro, habrá 24 trenes por hora y las puertas de cruce podrían estar cerradas entre 18 y 22 minutos por hora. El aumento de trenes creará demoras adicionales para cualquiera que cruce las vías si permanecen como están hoy. El enfoque de esta encuesta está en los cruces temporarios del sur (Maple, Main y Chestnut) porque hay más opciones para las separaciones a nivel que pueden aumentar la seguridad para todos las modalidades, reducir el tráfico y el ruido de los silbatos de los trenes, y respaldar la infraestructura sostenible en nuestra comunidad.



Periodo	Numero de trenes por hora (servicio de hora pico entre semana)
Hoy	10
Futuro	24

¿CUÁL ES EL CALENDARIO Y CUÁNTO COSTARÁN LAS SEPARACIONES DE GRADO?

Las separaciones de nivel suelen tardar entre 7 y 10 años en planificarse, diseñarse y construirse. Esto supone que tenemos financiación en cada etapa del proyecto. Actualmente estamos en las primeras etapas de este proceso. Identificamos diseños factibles y ahora estamos determinando qué prefiere la comunidad. Los costos del proyecto se desarrollarían en base a esas retroalimentaciones. Sin embargo, podemos mirar separaciones de grado recientes en el área como referencia. Los proyectos para separar un solo cruce de ferrocarril podrían costar cientos de millones de dólares, mientras que un proyecto que separe los seis cruces de ferrocarril podría costar más de \$1,000 millones.

¿QUÉ SE ESTÁ CONSIDERANDO PARA LOS CRUCES FERROVIARIOS DE MAPLE, MAIN Y CHESTNUT?

Para los cruces del sur, la ciudad estudió lo que es factible. Las opciones se han reducido en función de los aportes de la comunidad y una revisión de ingeniería que consideró el tráfico, el medio ambiente, la economía social, los impactos en la propiedad y el acceso, y los costos. Las opciones factibles de separación de cruces se resumen a continuación con una breve descripción y una ilustración de cómo podría verse la calle:

Calle Maple: Abierta solo para peatones y bicicletas [no vehículos]

La calle Maple estaría cerrada a los vehículos motorizados porque bajar la calle afectaría el arroyo vehicular. La calle Maple permanecería abierta para las personas que caminan y andan en bicicleta con un camino dedicado debajo de las vías. La calle podría realizarse como un espacio público abierto similar al que se muestra a continuación.



Calle Main: Abierta a todos, vehículos, bicicletas y peatones

Dado que la calle Main tiene más tráfico que otras calles cercanas, permanecería abierta para todos (vehículos, bicicletas y peatones). Como se puede ver a continuación, la separación propuesta tendría a los vehículos cruzando por debajo de las vías y un espacio separado para las personas que caminan y andan en bicicleta. La calle Elm ya no se conectaría con la calle Main y se convertiría en un callejón sin salida.



Alternativa 1A para la calle Chestnut: Abierto a todos, vehículos, bicicletas y peatones

Una opción lo mantendría abierto para todos los usuarios. Al igual que el plan para la calle Main, la separación propuesta tendría a los vehículos cruzando por debajo de las vías y un espacio separado para las personas que caminan y andan en bicicleta. Esta opción ofrece la mayor reducción de retrasos en el cruce de las vías, mantiene la conectividad entre las vías para las personas que conducen y desliza la menor cantidad de tráfico a rutas alternativas. El acceso a algunos de los hogares y negocios podría cambiar potencialmente. Las vías temporales necesarias mientras se construye la separación a nivel podrían afectar potencialmente las propiedades en el lado de la bahía de las vías. Esta opción sería la más cara de construir.



Alternativa 1B para la calle Chestnut: Abierto solo para peatones y bicicletas [sin vehículos]

Otra opción para la calle Chestnut sería cerrar la calle a los vehículos motorizados pero mantenerla abierta para las personas que caminan y andan en bicicleta, como el plan para la calle Maple. Esta opción brinda un cruce seguro y conveniente para personas que caminan y andan en bicicleta, pero desviaría el tráfico de vehículos a rutas alternativas. Las vías temporales necesarias mientras se construye la separación a nivel podrían afectar potencialmente las propiedades en el lado de la bahía de las vías. Esta opción sería un poco menos costosa de construir.



Figure 12: Background Survey Information (in Spanish)

SURVEY

For this survey, we are just focusing on what could happen at the Maple, Main and Chestnut railroad crossings.

1. I want Chestnut to be fully separated from the railroad tracks and for Chestnut to remain open to vehicles, bicycles, and pedestrians.

1 2 3 4 5 6
 ← Strongly No Strongly Yes →

2. I think closing Chestnut to vehicles and creating a pedestrian and bicycle path is okay.

1 2 3 4 5 6
 ← Strongly No Strongly Yes →

3. I don't want any separated crossings in the south part of the city (Maple, Main and Chestnut). I am okay waiting 18-22 minutes per hour at these railroad crossings when there are more trains.

1 2 3 4 5 6
 ← Strongly No Strongly Yes →

4. How old are you?

a. Under 14
 b. 15-24
 c. 25-34
 d. 35-44
 e. 45-54
 f. 55-64
 g. 65 and older

5. What language do you usually speak at home?

a. English
 b. Spanish
 c. Other

6. Neighborhood: _____




Figure 13: Southern Crossings Survey

Nuestra Casa’s efforts resulted in over 600 people being approached with information about the Project and 300 surveys (Spanish – 209, English-88, Other-3) were administered. During the interactions it was noted that many families are not aware of the City’s future plans for grade separations. Some survey respondents expressed that future changes could make life in the City better while others had concerns about gentrification and increased rents.

Survey responses were also gathered online. The total number of survey responses received (online, canvassing, and pop-up) was about 500, with 54% of surveys completed by respondents who speak English at home and 44% by respondents who speak Spanish at home. Overall, the respondents were supportive of fully grade separating Chestnut to all modes (Alternative 1A). Specifically, on a scale of 1-6, where 1 is “Strongly No” and 6 is “Strongly Yes” Alternative 1A scored 4.6 and Alternative 1B scored 2.9. Also, local residents did not prefer the Chestnut crossing being only opened to pedestrians and bicycles.

The overall response for keeping the southern crossings as at-grade crossings (Alternative 2) was not supported and scored 2.3. However, neighborhoods closest to the southern crossings did have higher scores for keeping the at-grade crossings as is, but still did not support the option. See Attachment K-2 for a summary of the survey.

9. Costs and Funding

The current Project is funded through SMCTA's Measure A (voter-approved half-cent sales tax for countywide transportation projects and programs) and a contribution provided from local City funds.

Capital Outlay Project and Support Estimate

Table 10 summarizes order of magnitude construction, right-of-way, utility, and support cost estimates for each Build Alternative. Capital outlay project cost estimates for each alternative are included in Attachment D.

Construction includes the cost of materials and labor to place the infrastructure; structures, retaining walls, pavement, tracks and OCS (permanent and temporary), etc. It also includes a percentage of the aforementioned items to account for the following:

- Minor Items (15% of the construction subtotal) to account for smaller, less significant items that were not tallied previously, such as fencing, station facilities, architectural treatments, etc.
- Mobilization (10%) to account for the contractor to set up a field office and assemble/disassemble construction equipment.
- Additions (15%) to account for items that cannot be predicted or calculated, such as removal of unsuitable material, or increases in asphalt content needed for the pavement. It also includes overhead costs incurred by the contractor, also referred to as Time-Related Overhead (TRO).
- Contingencies (30%) to account for unforeseen items that will be determined later when more detailed engineering is complete. As engineering progresses during future phases of the project and more details become known, a smaller contingency will be used.

Right of Way includes costs for the temporary use of, and the potential permanent acquisition of property. Utility includes the cost to relocate and/or protect utilities needed to construct the project's (temporary and permanent) infrastructure, such as relocation of overhead power poles and underground lines (water, gas, electric, sewer, communication, etc.).

Support includes fees to complete the final engineering and environmental studies that will be required in subsequent phases of the project. It also includes right of way services, flaggers needed to protect workers during construction activities adjacent to live tracks, and construction administration (preparation of change orders, requests for information, etc.) by the construction management firm.

Table 10: Capital Outlay Project and Support Estimate

Cost Estimate (Values shown in Millions)					
Alternative	Construction*	R/W & Utility*	Support*	Escalation*^	Range #
1A	\$300	\$195	\$133	\$241	\$800 to \$950
1B	\$286	\$169	\$126	\$223	\$700 to \$900
2	\$247	\$103	\$108	\$176	\$550 to \$700

* Rounded to the nearest million in 2021 dollars.

^ Based on an escalation rate of 3% per year until the estimated mid-point of construction (2032)

Range is based on +/- 10%, rounded to the nearest \$50M.

The level of detail available to develop these capital outlay project estimates is only accurate to within the above ranges and is useful for long-range planning purposes only.

Potential Funding Sources

Funding for transportation and other major infrastructure projects has been increasingly difficult to obtain due to limited availability of funds as well as the greater demand and competition for the funding that is available. Moreover, the funding environment is highly volatile as changes in federal administration priorities and the economy can affect the type and availability of funds. For instance, energy price fluctuations can alter gasoline-tax funding, while changes in administration priorities can re-orientate project selection criteria. Additionally, many funding partners will only evaluate “shovel ready” projects for funding.

Together, these factors support a recommendation of proceeding with the Preliminary Engineering/Environmental Document phase of the project as the capital funding strategy is developed, refined, and implemented.

There are three major categories of potential project funding sources discussed below for the Project. Additional funding opportunities may become available if/when the Transit District improvements are considered in conjunction with the grade separations improvements.

Federal

On November 15, 2021, President Joseph R. Biden signed the Infrastructure Investment and Jobs Act (IIJA) (Pub. L. 117-58), also known as the “Bipartisan Infrastructure Law” (BIL) that provides generational investment in America’s intermodal transportation system which will provide unprecedented Federal funding for transportation improvement projects in America.

Bay Area transportation projects large and small could move from plan to completion with competitive grant funding from the 2021 BIL which authorizes \$140 billion in new grant funding for which Bay Area surface transportation projects can compete. Of this, roughly \$100 billion is guaranteed, with the rest dependent on allocations from future federal spending bills. The U.S. Department of Transportation (USDOT) will distribute funds over five years through more than two dozen targeted competitive grant programs including the Infrastructure for Rebuilding America (INFRA), Rebuilding American Infrastructure with Sustainability and Equity (RAISE) and National Infrastructure Project Assistance (MEGA) grants programs. These are nationally competitive grants and are expected to offer an annual call for applications.

The INFRA grant program has completed four rounds of funding and awarded both large (\$45M for a City of Seattle) and small (\$5M for Tukwila, WA) grants for their grade separation and railroad safety projects. One grade separation project was awarded INFRA funding (\$19M for Chicago, IL) by the FY2021 INFRA funding round. The INFRA program is specifically focused on projects where the local sponsor is majorly invested and well-positioned for the project’s construction and completion. The last INFRA funding opportunity submission deadline was May 23, 2022. Although no announcement for a Fiscal Year (FY) 2023 round has occurred there is a total of \$7.25B in dedicated INFRA grant funding for the FY2022 to FY2026.

The RAISE grant program awards funding on a competitive basis for projects that have a significant or local regional impact. The RAISE program incorporates many of the prior federal transportation grant funding program criteria and requirements with a greater focus on infrastructure that will make a positive impact on the country by considering projects that result in improvements in racial equity, reductions in climate change impacts and their ability to create jobs. The maximum grant award under the RAISE program is \$25M and the submission deadline for its second funding round was April 14, 2022. Although no specific FY 2023 commitments have been made, there is currently \$7.5B in authorized RAISE grant funding for the FY2022 to FY2026. The new MEGA transportation grant program awards funding on a competitive basis to support large, complex projects that are difficult to fund by other means and likely to generate national or regional economic, mobility, or safety benefits. The MEGA program incorporates most of the INFRA and RAISE criteria and requirements. No maximum grant award under the MEGA program is specified and the submission deadline for its first funding round was May 23, 2022. Although no announcement for a Fiscal Year (FY) 2023 round has occurred there is a total of \$5B in dedicated MEGA grant funding for the FY2022 to FY2026.

There are two federal grant programs that are more specifically targeted to address rail-related infrastructure improvements. The new Railroad Crossing Elimination (RCE) grant program is designed to award funding on a competitive basis to fund highway-rail or pathway-rail grade crossing improvement projects that focus on improving the safety and mobility of people and goods. There are no predetermined maximum dollar thresholds for individual REC awards, but no more than 20% of the grant funds available (\$114.6M) will be awarded for projects in any single State.

The submission deadline for its first funding round is October 4, 2022. Although no announcement for a Fiscal Year (FY) 2023 round has occurred there is a total of \$600M/year in dedicated RCE grant funding for the FY2022 to FY2026 of which \$500M/year is guaranteed.

As provided by Title 23, United States Code, Section 130 (23 U.S.C. 130), the Railroad-Highway Grade Crossing Program, also known as the Section 130 Program, provides federal funds for the elimination of hazards at existing at-grade highway-rail crossings, including grade crossing elimination through roadway closure and safety improvements. However, to date, Section 130 funding in California has only been used to fund at-grade improvements given the amount of funding available. This project could be eligible for the proposed closure of the at-grade crossing (e.g., Alternatives 1A and 1B) and/or improvements at the at-grade crossings to remain (e.g., Alternative 2).

California apportionment of the Section 130 Program is approximately \$16M per year and the maximum federal reimbursement level may be up to 100% of project work to eliminate the identified hazards at an eligible crossing. This program is administered centrally from Caltrans Headquarters on a statewide basis. Caltrans formed the Railroad Grade Crossing Safety Branch, within the Division of Rail and Mass Transportation and is tasked with implementing this program. Caltrans is responsible for funding, contracting and oversight of the Section 130 projects.

California apportionment of federal funds from the Surface Transportation Program / Congestion Mitigation and Air Quality Improvement Program and other FAST Act Programs are now distributed across the nine Bay Area Counties through the One Bay Area Grant Program (OBAG).

The third round of One Bay Area Grant funding (OBAG 3) was adopted by the Metropolitan Transportation Commission in January 2022 and includes more than \$750 million in federal funding from 2023 to 2026 for projects located within the Bay Area region's nine counties. Additional funds are anticipated from the 2021 Bipartisan Infrastructure Law (BIL) and will be programmed through the OBAG 3 framework after regional apportionment amounts are made available. OBAG 3 funds will be targeted to address critical climate and focused growth goals of Plan Bay Area 2050, and used to coordinate and deploy strategies that are best suited for regional implementation. As a result, the majority of OBAG 3 funds are likely to be disbursed for climate initiatives, transformation transit projects, multimodal operational improvements, Complete Streets and active transportation projects oriented to bicycle access and walkability, but also include streetscape improvements, road diets, or transit elements. It is also expected that Priority Development Areas, Priority Conservation areas and other new growth areas will be favored for funding.

Generally, the maximum federal reimbursement ratio for projects in non-rural areas is 80%, although it can be lower. Non-federal funding is required to cover the other 10% or more of the development cost for the project. If a project uses multiple counter measures which have different maximum federal reimbursement ratios, the lowest ratio applies. Among the various federal funds identified for this project, the maximum reimbursement ratio is 80%, and as such state and/or regional funding will be required and is identified below. Furthermore, the federal government increasingly favors projects that leverage financial support from other agencies and/or the private sectors.

The federal government also offers two loan assistance programs for transportation projects similar to the Redwood City Grade Separation Project. The DOT sponsored Transportation Infrastructure Finance and Innovation Act (TIFIA) provides low-cost credit assistance for qualified projects of regional and national significance in the form of direct loans, loan guarantees, and standby lines of credit. However, given the requirements to qualify and restrictions in use of the loan funding, TIFIA lending is best suited in conjunction with other funding mechanisms that can obtain investment grade ratings (e.g., from dedicated sales revenues).

The Railroad Rehabilitation & Improvement Financing (RRIF) program, established by the Transportation Equity Act for the 21st Century can be used to obtain federal loans to refinance debt for railroad projects. However, loan recipients must be able to secure the loan to offset the loan default risk. RRIF also favors projects that result in economic revitalization and safety improvements. It also provides a limited number of large loans (averaging \$165M) for major railroad redevelopment projects.

The aforementioned funding programs require the project to be included on one or more of the following agency's lists or programs. Getting the project included on these is an important next step for the project.

- California Public Utility Commission's (CPUC's) Grade Separation Fund Priority List
- MTC's Transportation Improvement Program (TIP) which will ensure the project is listed on the Federal Statewide Transportation Improvement Program (FSTIP)

The next call for grade separation projects by the CPUC will be issued in the Commission Investigation proceeding in July 2023, with nominations for the program due in October 2023, which will be used to establish the Priority List for FY 2024-25 and 2025-26. !

Caltrans prepares the FSTIP every two years in cooperation with the Metropolitan Planning Organizations, such as the MTC, and the Regional Transportation Planning Agencies in California. The FSTIP is a federally mandated document that includes phases of capital and non-capital transportation projects prioritized to receive federal funding

under Titles 23 and 49 of the United States Code. The next Draft TIP will be developed in late 2022. The next TIP and FSTIP is expected to be approved by the MTC and Caltrans respectively in 2023.

State

Successful project development will require obtaining substantial state funding irrespective whether any federal contribution can be obtained for the project. Section 190 of the California Streets and Highway Code requires the State to include \$15M in its annual budget for grade separation projects on state highways and local streets. This Grade Separation Program (GSP) is jointly administered by Caltrans and the CPUC. The CPUC develops a highway-rail Grade Separation Priority List of projects that would receive allocations from Caltrans in each two-year funding cycle. The City is expected to nominate this project for the Priority List in 2023 prior to the application deadline in October.

In addition to the Section 190 funds, a potential state funding source is the California High Speed Rail Authority (CHSRA) through Prop 1A, which has made substantial funding contributions to key grade separation projects and has committed up to 50% of total project funds for other grade separation projects in San Mateo County. However, the maximum individual project funding is \$5 million. Furthermore, the lack of passing track or other project-related changes at the location requiring grade separation for its operations makes a CHSRA funding contribution unlikely.

The State Road Repair and Accountability Act (SB1) was passed in 2017 and provides annual funding for numerous transportation programs and purposes. SB1's major competitive funding opportunities include the Solutions for Congested Corridors Program, Trade Corridor Enhancement Program, Local Partnership Program and Active Transportation Program. The project may be expected to be best aligned with the Road Maintenance and Rehabilitation Program through its Local Street & Road Funding Program. Its 2020-2021 Program has \$1.1B in funding. The annual total funding amounts allocated to individual counties and cities are based on a set formula. County and city governments can use its allocated funds at its discretion for any of its eligible projects. A city or county must submit to the California Transportation Commission an adopted list of projects proposed to be funded with these funds by May 1st each year. The Commission then reviews of the project submissions and adopts the List of Eligible Cities and Counties generally by the end of October. Future funding cycles are anticipated.

Regional/Local

Significant regional and local funding contribution will also be necessary. San Mateo County's Measure A provides the Grade Separation category with a 15 percent share of the sales tax revenue collected. Similarly, Measure W provides the Grade Separation category with a 2.5 percent share of the sales tax revenue collected. SMCTA currently estimates approximately \$180M will be available through the grade separation program for the remaining 13 years of Measure A and \$68 million for the 30-year life of Measure W. SMCTA's Board adopted policy for grade separations requires sponsor agencies to provide 50% of the total project cost and funding allocations are only provided on a phase-by-phase basis. Furthermore, construction and right of way allocations will not be made until the Preliminary Engineering/Environmental Document phase has been completed and the cities have a viable funding plan with committed funding to match the SMCTA's investment.

The SMCTA Board has adopted guiding principles and framework to establish a pipeline of grade separation projects eligible for receiving most of these funds. The Project is not currently included in that pipeline of eligible grade separation projects. For SMCTA funding, projects have to have been accepted into the agency's grade separation pipeline for Measure A funds. However, up to \$5 million in Measure A funding is available for the planning of other grade separations in San Mateo County that are not included in the project pipeline list. A decision on the use of SMCTA's Measure W grade separation funds is pending the JPB's grade separation study.

As a result, Redwood City will also need to contribute to the project's design and construction either from general or other local funds. Potential contributions to the project may also be obtained from future development projects that may adversely impact traffic operations at the at-grade rail crossings in the southern segment of the City. To supplement City General Funds and other local contributions, it could be worthwhile to investigate the potential for some limited project funding support from innovative funding mechanisms, including transportation impact fees and value capture funding if other future project-related development (e.g., transportation-oriented residential or retail development) can be expected to occur.

Other tax-based potential local funding sources (e.g., increased parcel, add-on sales or transient occupancy taxes) would require citywide voter approval. It is recommended that estimated local share for funding the project's development should be added to the City's Transportation Impact Fee Program when it is next updated. Further analysis of the applicable funding program requirements, their funding potential and likelihood of success will be necessary to develop and implement an effective funding strategy to obtain the capital funding required for future project development.

10. Caltrain Coordination

All railroad involvement has been coordinated with Caltrain. Caltrain's planners (Melissa Reggiardo and David Pape) have managed the project, attended monthly project meetings, and participated in the public outreach workshops. Other Caltrain staff (Daniel Krause, Bin Zhang, Rick Bartholomew) have reviewed the project's Design Criteria in 2019 and early 2020.

See Section 11 for staff who have reviewed this Summary Report.

11. Project Reviews

The following personnel reviewed the Draft Summary Report in July 2022.

Name / Title	Agency or Firm
David Pape / Principal Planner, Rail Planning	Caltrain
Melissa Reggiardo / Manager, Rail Planning	Caltrain
Lori Low / Government & Community Affairs Officer	Caltrain
Jessica Manzi / City Transportation Manager	City of Redwood City
Bin Zhang / Deputy Director, Infrastructure Engineering	Caltrain
Hilda Lafebre / Deputy Director, Program Management & Environmental Compliance	Caltrain
Brian Fitzpatrick / Director, Real Estate and Property Development	Caltrain
Nadine Fogarty / Deputy Director of TOD, Rail Planning	Caltrain
Peter Skinner / Director, Grants and Fund Management	Caltrain

12. Project Personnel

Name / Title	Agency or Firm
David Pape / Principal Planner, Rail Planning	Caltrain
Melissa Reggiardo / Manager, Rail Planning	Caltrain
Lori Low / Government & Community Affairs Officer	Caltrain
Jessica Manzi / City Transportation Manager	City of Redwood City
Eileen Goodwin / Community Outreach Liaison	Apex Strategies
Bill Hurrell / Traffic Engineer	CDM Smith
Millette Litzinger / Project Manager	AECOM
Peter DeStefano / Project Engineer	AECOM

13. Recommendation and Next Steps

Based on input received from the public over two rounds of outreach in 2021 and 2022, and because it satisfies the purpose and need of the project, the PDT recommends Alternative 1A be studied further in the next phase (Preliminary Engineering & Environmental phase) of the project. Alternative 1A is recommended for the following reasons:

- Maximizes the number of crossings to be grade separated. It will grade separate five (5) of the six (6) east/west crossings for all modes of travel thereby improving safety, traffic congestion and connectivity. Only Maple Street will be closed to motor vehicles; however, it will remain open for pedestrians and bicyclists.
- Avoids impact to Redwood Creek with closure of Maple Street to motor vehicles.
- Construct all grade separations as one project and not split into two phases which will lower the overall construction costs and duration of construction.
- Minimizes impacts to the recently completed development projects along the rail corridor.
- Is compatible with the City's and Caltrain's Transit Center planning effort.

To finalize this Planning Study, the City and its Councilmembers will adopt a preferred alternative.

Next steps should include:

- Getting the project on the following lists to help the City and Caltrain position itself for future funding opportunities
 - California Public Utility Commission's (CPUC's) Grade Separation Fund Priority List
 - MTC's Transportation Improvement Program (TIP)
 - Federal Statewide Transportation Improvement Program (FSTIP)
- Seeking additional funding from sources identified in Section 9
- Integrating the Redwood City hub station together with the grade separation project to be studied as one project in the next phase (environmental and preliminary engineering)

14. Attachments

Attachment A: Rail & Roadway Engineering Exhibits (Alternatives 1, 2, 3, and 4)

Attachment B: Rail & Roadway Engineering Exhibits (Alternatives 1A, 1B, and 2)

Attachment C: Right-of-Way Impact Exhibits (Alternatives 1A, 1B, and 2)

Attachment D: Order-of-Magnitude Cost Estimates (Alternatives 1A, 1B, and 2)

Attachment E: Evaluation Matrix (Alternatives 1, 2, 3, and 4)

Attachment F: Evaluation Matrix (Alternatives 1A, 1B, and 2)

Attachment G-1: Traffic Exhibits (Alternatives 1, 2, 3, and 4)

Attachment G-2: Traffic Exhibits (Alternatives 1A, 1B, and 2)

Attachment H: 2009 Footprint Study Assessment

Attachment I: Renderings for the Southern Crossings (Alternatives 1A and 1B)

Attachment J: Cross Sections of a Potential Staging Concept of the Jefferson Avenue OC

Attachment K-1: Grade Separation Study – 2020/2021 Outreach Materials

Attachment K-2: Grade Separation Study Southern Crossing – 2022 Outreach Materials

Attachment L: Conceptual Engineering Design Criteria

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Project Engineer

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