

California Rail Electrification - 2022 Update

By John Benson

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1. Introduction

"The person who follows the crowd will usually go no further than the crowd. The person who walks alone is likely to find himself in places no one has ever seen before."

- Albert Einstein

I live in a state where we frequently walk alone, and this includes our current High-Speed Rail (HSR) project. However we still continue to make progress on the initial 171-mile segment through our Central Valley. Also making progress are the Northern California connector projects that will initially connect HSR into BART, ACE and the other commuter rail systems in the San Francisco Bay Area. For more information on these see the 2021 update described and linked below, Sections 5 & 6.

California Rail Electrification - 2021 Update: *This paper will use portions of a similar paper I posted in 2019, but contain enough new information to justify posting as a new comprehensive report. We (California) continue to move forward at a slow, steady pace. As in many things, we do not do this because we choose to, but because we must.*

The California High Speed Rail System (HSR) is an important part of our state's efforts to reduce our greenhouse gas emissions. Currently, there is a huge amount of travel between the San Francisco Bay Area and the Los Angeles Area, and this is exclusively by auto or airlines. Although there are efforts to reduce the greenhouse gas from both of these transports, a viable rail system (powered by 100% renewable energy) between these two areas will contribute mightily to this effort.

<https://energycentral.com/c/ec/california-rail-electrification-2021-update>

The latest news is that the initial 171 Mile segment of HSR appears to be fully funded. See section 2 for more information.

2. HSR Phase 1 Funding

After wrangling over the future of California's high-speed rail, state lawmakers plan to release a critical batch of money to finish a bullet train in the Central Valley while also establishing an inspector general to audit the beleaguered project and authorizing billions of dollars in new money for rail plans across the state.¹

The agreement, included in a budget trailer bill that passed the Legislature on Wednesday night and signed by Gov. Gavin Newsom Thursday, ends a year-plus deadlock in Sacramento on how to spend the last chunk of \$4.2 billion in bond funds for high-speed rail, which voters approved in 2008. Gov. Gavin Newsom wanted to march forward with laying track in Central Valley farmland and eventually connecting

¹ Eliyahu Kamisher, East Bay Times, "California budget ends high-speed rail standoff, sends billions to other projects," June 30, 2022, <https://www.eastbaytimes.com/2022/06/30/california-budget-ends-high-speed-rail-standoff-sends-billions-to-other-projects/>

Bakersfield to Merced, but leading Democratic lawmakers blasted the Central Valley link and sought to reroute transit funds closer to their constituents in urban centers.

California's unprecedented \$97.5 billion budget surplus allowed the state to do both. The budget nearly solidifies the 171-mile Central Valley link — now projected to see a bullet train around 2030. It also increases state funding for rail plans to \$3.65 billion this year, which could potentially send money to financially strapped Bay Area projects such as Caltrain electrification and BART to downtown San Jose. Another \$4 billion is planned for transit infrastructure through 2025, although that money has yet to be allocated...

As part of the agreement, lawmakers established an independent inspector general's office with wide-ranging powers to audit the California High-Speed Rail Authority, which has seen its cost estimates explode in recent years. The inspector general will be appointed by the governor from a short list of candidates selected by a legislative committee...

2.1. Extended Projects

One of the projects that is likely to nab some of the state funds is Caltrain's delayed electrification project. It is scheduled to replace its loud diesel trains in 2024 with sleek electric trains if the agency can find \$410 million to bridge its funding gap. A bill ensuring \$260 million for the project was cast aside in negotiations, but advocates remain hopeful.

"This money is going to keep us on track to do something that will be the first electrified commuter railroad in California," said Casey Fromson, who has led Caltrain's efforts to secure state funding. "We're so close to the finish line."

Author's comments: Note the "...first electrified commuter railroad..." There are a huge number of electrified light-rail commuter rail-lines in California, including BART, and other light rail systems in LA, San Diego and Sacramento. The distinction here is "railroad" vs. "light rail." The Caltrain system currently uses diesel-electric locomotives on full-sized tracks. The above project will add an overhead catenary electric system and (eventually) lose the diesels.

Also, the bucket of money for Bay Area projects has yet to be allocated, but it sounds like Caltrans electrification has a pretty high priority. Also note that the Caltrain route from Gilroy to San Francisco is part of the HSR Northern Segment, which will probably be the next in line for completion after the Central Valley Segment, so the HSR Authority will be helping to fund the electrification and track upgrades required to support HSR rolling-stock.

The Authority reached a significant milestone with the first certification of an environmental document in the Northern California region and the first in the San Francisco Bay Area.²

On April 28, 2022, the Authority's Board of Directors unanimously certified the Final Environmental Impact Report/Environmental Impact Statement (EIR/EIS) and approved the approximately 90-mile San José to Merced project section.

This project section will connect Silicon Valley to the Central Valley, slashing travel times and improving mobility in both regions. The high-speed rail system will make the trip from San José to Fresno in just one hour, compared to three hours by car today.

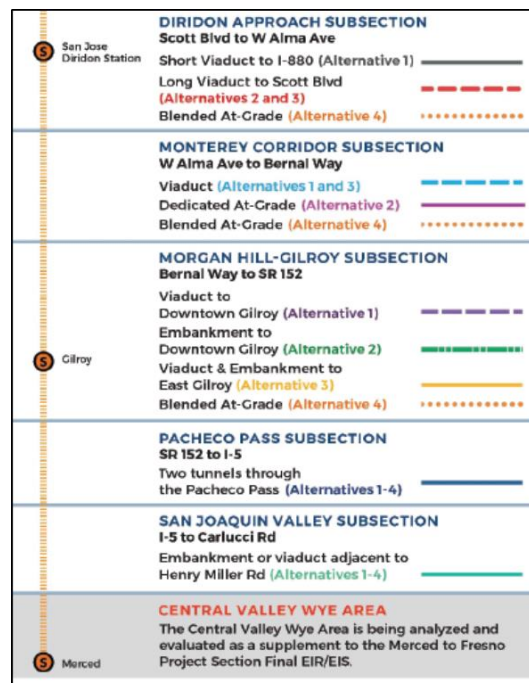
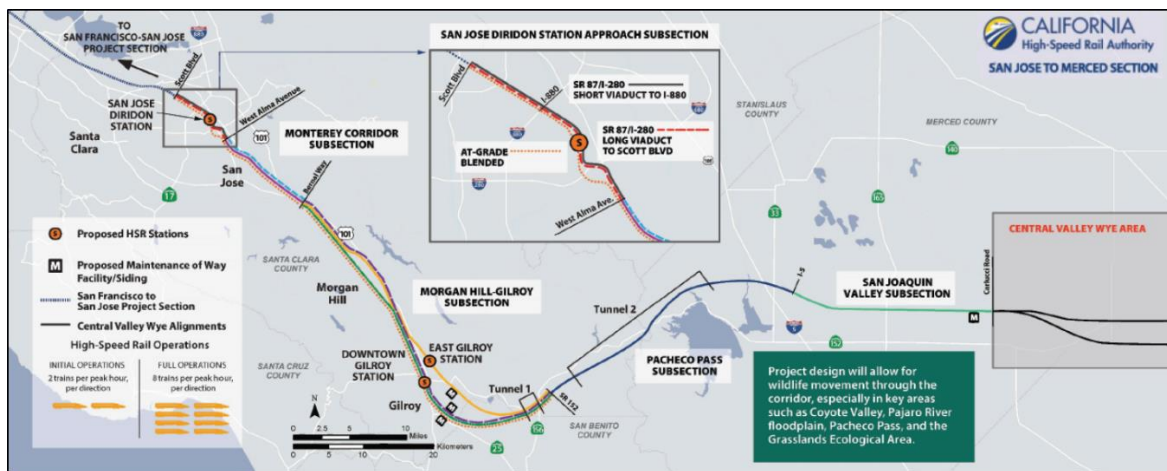
² California High Speed Rail Authority, Spring 2022 Quarterly Newsletter, "What's Happening in Northern California," <https://hsr.ca.gov/communications-outreach/info-center/regional-newsletters/>

This action completes the environmental clearance for nearly 400 miles of the high-speed rail project's 500-mile Phase 1 alignment from San Francisco to Los Angeles/Anaheim – including a contiguous stretch between Santa Clara County (San José) and Los Angeles County (Palmdale).

In approving this project section, the Authority Board of Directors selected Alternative 4. This alternative modernizes and electrifies the existing rail corridor between San José and Gilroy, allowing for high-speed rail and electrified Caltrain service. The alignment includes more than 15 miles of tunnels east of Gilroy through the Pacheco Pass in the Diablo Mountain Range.

The Board's certification of the San José to Merced Final EIR/EIS is a critical milestone that moves the project section closer to being "shovel ready" for when pre-construction and construction funding becomes available...

See the figures below:



Caltrain received its first new electric trains that will replace the current diesel fleet as part of the Peninsula Corridor Electrification Project (PCEP), which the Authority is helping to fund.

In April, two self-propelled Electrical Multiple-Unit (EMU) trains arrived from a manufacturing facility in Utah. The new Stadler-built EMUs are state-of-the-art vehicles with enhanced amenities that will provide a superior level of service to riders on the Caltrain corridor for many years to come...

A retired AEM-7 electric locomotive from Amtrak's Northeast Corridor arrived in December. The repurposed locomotive will support testing of the overhead catenary system currently under construction.

In addition to reducing diesel emissions by 97% by 2040, the electric trains will improve Caltrain's system performance, enabling faster and more frequent service, paving the way for the introduction of high-speed trains.

2.2. Other Funding

The California project, which estimates travel time between San Francisco and Los Angeles will be less than three hours, also receives about \$1 billion annually from the state's Cap and Trade program, a de facto carbon tax on major emitters of greenhouse gasses. While the Build Back Better infrastructure money was never approved, there's a pool of other new federal money California can tap for future needs.³

"We identified out of the infrastructure bill six different programs that we can compete in for different project elements," Kelly⁴ told Forbes. "Those six different pots total about \$70 billion over the next five years."

2.3. Rolling Stock

Orders for the first trains could go out as soon as next year. Companies including Siemens, which has a passenger-train factory in Sacramento, and Alstom, which builds them at East Coast plants, both have Amtrak contracts and will likely compete for California's business.

"There's several other train manufacturers, from around Asia and the world, building high-speed trains," Kelly said. "There's no shortage of suppliers..."

2.4. Future Considerations

Merced, the northern terminus of the first phase, will tie into an existing regional commuter train linking to Sacramento and the Bay Area, though a high-speed connection isn't likely until the late 2030s. Including service to San Francisco, San Jose and Los Angeles, the California High-Speed Rail Authority estimates that 50 million riders will use the system annually, generating about \$3.4 billion of fare revenue.

Construction work in Fresno has clogged downtown streets and will be a headache for its nearly 530,000 residents for at least another year. While the Central Valley region is known mainly as the center of the state's vast agriculture industry, Fresno's population is rising in the wake of the Covid pandemic as its relatively affordable housing and cost of living draw Californians able to work remotely. High-speed rail, particularly if and when

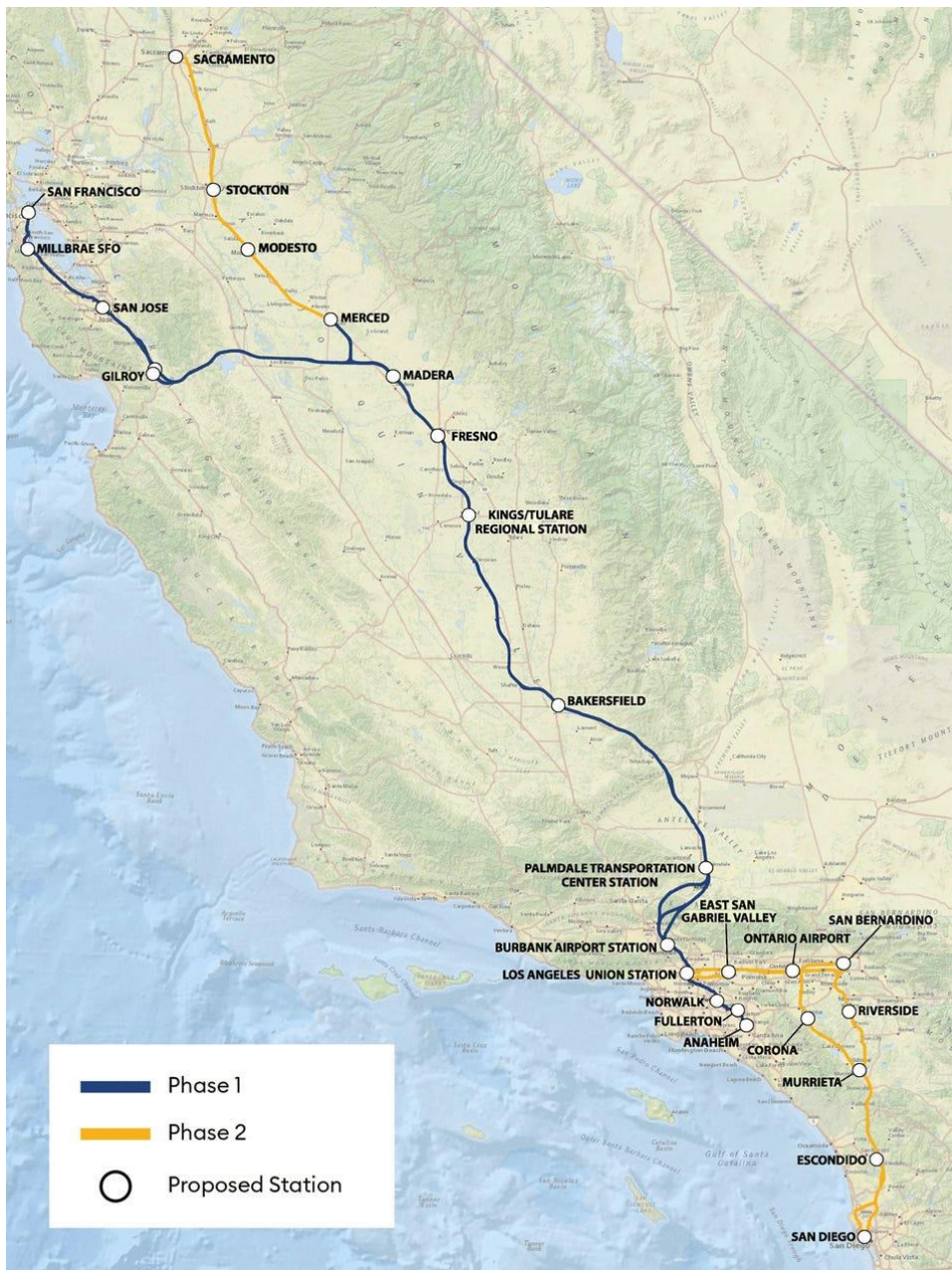
³ Alan Ohnsman, Forbes, "California Bullet Train Gets \$4.2 Billion Green Light For First Phase While Bigger Challenges Loom, July 16, 2022, <https://www.forbes.com/sites/alanohnsman/2022/07/16/california-bullet-train-gets-42-billion-green-light-for-first-phase-while-bigger-challenges-loom/>

⁴ Brian Kelly, CEO of the California High-Speed Rail Authority

the system links to San Francisco and Los Angeles, will make it even more appealing, Fresno Mayor Jerry Dyer said.

Author's Comment: Fresno had a population of over half a million in the 2020 Census. Bakersfield is another large city along the first HSR Central Valley Segment with a population of over 400,000. Other significant cities along the HSR initial segments include Merced (86K), Madera (66K) and Tulare (69K). See the map below.

“This has stimulated a lot of interest in terms of venture capitalists and others who have expressed an interest to come in and develop in Fresno,” he said. “But it’s important on our end that we not allow people to come in and buy buildings and land bank—to wait for the development to occur—but to develop now, in anticipation of high-speed rail.”



Ballooning costs and funding snafus aside, monumental engineering challenges also loom. These include tunneling through the San Gabriel and Tehachapi mountain ranges in the south and Pacheco Pass in the north. The system also has to be built to withstand the state's infamous earthquakes.

California is tapping global expertise in those areas, such as Japanese engineers who've overcome similar geographic challenges. A technical advisory panel made up of international experts will review and provide input on California's design criteria.

It's likely that the next segment will be built to connect Merced to San Jose, Kelly⁴ said. "How and when we do the next segments beyond the (Central) Valley will come down to where funding is most available," he said. "Our job is to get it ready to go and then when funding is there, we will be ready to move. It looks like the Bay Area would be first now, but we'll have to see how it all shakes out."

2.5. ACE and Valley Link

There are two projects that will initially (around 2030) connect the primary commuter rail systems in the San Francisco Bay Area to HSR. Both of these (subsection title systems) are described thoroughly in "California Rail Electrification - 2021 Update," which described and linked in the Introduction. However, there has been some significant progress in both of these as described below.

2.5.1. ACE

ACE (Altamont Corridor Express) will be extended to connect to the Merced HSR Station. *The ACE Ceres-Merced Extension Project will complete the project-level environmental clearance for the ACE extension to Merced associated with the Valley Rail Program. The Draft Environmental Impact Report (EIR) for the Project was published on April 22, 2021 and was available for public review and comment until June 7, 2021. The Final EIR was published on November 19, 2021. The EIR for the ACE Ceres-Merced Extension Project was certified, and the Proposed Project was approved by the San Joaquin Regional Rail Commission Board of Directors at its December 3, 2021 Board meeting.*⁵

Per the current schedule ACE Service to Merced should be completed by 2025.

2.5.2. Valley Link

Valley Link is currently planned to run from the North Lathrup Station, where it will connect with ACE to the Dublin-Pleasanton BART Station (see map below). The following is a recent development regarding funding for this project.

*Today, the Tri-Valley – San Joaquin Valley Regional Rail Authority (Authority) announced that the Federal Transit Administration (FTA) has approved entry of the Valley Link Rail Project Phase 1 into Project Development of the Capital Investment Grants (CIG) Program.*⁶

⁵ <https://acerail.com/merced-extension-eir/>

⁶ https://www.valleylinkrail.com/files/ugd/95df9a_3f0c5377258549589b3221644de73e50.pdf

“Acceptance of Valley Link in to the CIG program marks a key milestone in advancing this transformational project forward,” said Veronica Vargas, Chair of the Authority Board of Directors. “This is the first, but critical step, in positioning Valley Link to compete for federal funding during a time when once-in-a-generation transit funding is available on the federal level.”

The 26-mile Valley Link Rail Project Phase 1 between the Dublin/Pleasanton Bay Area Rapid Transit (BART) station in Alameda County and the Mountain House station in San Joaquin County, will connect tens of thousands of Northern San Joaquin Valley workers to the Tri-Valley at the center of the Northern California Megaregion – one of the fastest growing and economically significant areas in the state of California.

“The Valley Link project has the potential to help thousands of commuters get out of traffic and more quickly back to their homes and families,” Senator Alex Padilla said. “The San Joaquin Valley and Bay Area have become increasingly linked as more Californians live in one region and work in another. I look forward to continuing to work with the Federal Transit Administration to support this vital project, reduce pollution and congestion, and improve quality of life in the region.”

Congressman Eric Swalwell said, “I am so pleased that the Tri-Valley Cities’ Valley Link project was approved by the Federal Transit Administration. This will start the process for designing and operating a critical link between BART and the Altamont Corridor Express (ACE). Approval of this project could translate to 30,000 fewer cars on the road each day. By reducing congestion and improving air quality, this would be the biggest climate rescue project ever in the Tri-Valley.”



“I’m incredibly excited that Valley Link was approved by the Federal Transit Administration, a huge step forward in getting this project across the finish line,” said Congressman Josh Harder. “Right now, commuters in Tracy and across the Valley have no choice but to spend hours a day stuck in traffic and away from their families. Valley Link will save our workers the stress, time, and money that comes from these ridiculously long commutes. I can’t wait to see it up and running.”

“Valley Link will provide congestion relief to more than 100,000 daily commuters now traversing through the Altamont/I-580 Corridor. I thank Senator Padilla and Representatives Swalwell, Harder, DeSaulnier and McNerney for their support of Valley Link as a priority for federal funding and recognize this Valley Link delegation for their continued leadership in advancing this important Megaregional project,” said Chair Vargas.

The FTA approval of Valley Link into the CIG pipeline follows the March 23, 2022 unanimous adoption of Valley Link as part of the regional project priorities for the CIG Program by the Metropolitan Transportation Commission (MTC), the transportation planning, financing and coordinating agency for the nine-county San Francisco Bay Area.

Author's comment: I currently believe that Valley Link will be completed by the mid-2030s, but I haven't been able to find a project schedule.

2.6. Direct BART Linkage

Note that the end-point of the San Jose to Merced future segment is the Caltrain Diridon Station (see map in subsection 2.1). BART is in the midst of a two-phase expansion into San Jose. Phase I included two stations and the final (southernmost) station, Berryessa, in San Jose has been completed.

Phase II will construct a five-mile subway tunnel through downtown San José, as well as stations on 28th Street (in Little Portugal near the Five Wounds Church), in Downtown San José, and at Diridon Station.⁷

Which project will get to Diridon Station first? Both are very challenging projects, and I would guess the first to get there will be in the late 2030s.

3. Progress on the Southern Linkage

There are two reasons why the San Jose to Merced Segment will probably be the next segment implemented after the Central Valley Segment. The first (covered above) is that about half of this segment already has a commuter line, and this line is currently being electrified and otherwise prepped to co-host the HSR.

The second reason is the Tehachapi Mountains. The first southern segment is the Bakersfield to Palmdale project section. This connects the Central Valley to the Antelope Valley, closing the existing passenger rail gap over the Tehachapi Mountains. The approximately 80-mile corridor has proposed stations in Bakersfield and at the Palmdale Transportation Center...⁸

This is probably the most difficult segment in of the entire HSR Project.

The origin of the name Tehachapi may come from the Kawaiisu language, derived from the word "tihachipia" translated as "hard climb"...⁹

The Tehachapis form a geographic, watershed, habitat, and rain shadow divide separating the San Joaquin Valley to the northwest and the Mojave Desert to the southeast. The Tehachapis' crest varies in height from approximately 4,000–8,000 feet (1,200–2,400 m). They are southeast of Bakersfield and the Central Valley, and west of Mojave and the Antelope Valley.

⁷ <https://www.sanjoseca.gov/your-government/departments/transportation/transit/bart-silicon-valley>

⁸ <https://hsr.ca.gov/high-speed-rail-in-california/project-sections/bakersfield-to-palmdale/>

⁹ https://en.wikipedia.org/wiki/Tehachapi_Mountains

The range runs southwest to northeast connecting the Southern Sierra Nevada range on their northeast with the San Emigdio Mountains on the west and Sierra Pelona Mountains on the southwest.

The segment of Interstate 5 that climbs over these mountains is known as The Grapevine. In spite of the Tehachapis forming the northwest edge of the Mohave Desert, The Grapevine generally needs to be closed a few times each winter due to snowfall. See mage below.

The next segment after the Bakersfield to Palmdale segment is the Palmdale to Burbank segment. This is not nearly as mountainous as the prior segment. Burbank is in the San Fernando Valley, and it's a straight shot to LA's Union Station from there.



There are two major projects in Southern California. Both of these projects prepare local infrastructure for the HSR System as well as providing immediate benefits.¹⁰

3.1. Union Station Upgrade

In the April HSR Board Meeting the Project Management and Funding Agreement for the Link US project April Board Meeting was the approved. This project will help to transform LA Union Station into a modern transit and mobility hub. Key components include a new

¹⁰ California High Speed Rail Authority, Spring 2022 Quarterly Newsletter, "Southern California News," <https://hsr.ca.gov/communications-outreach/info-center/regional-newsletters/>

platform for high-speed rail, new rail communications, signals and tracks, and run-through tracks that will replace the one way/stub end tracks station. There is a goal of completing this project prior to the 2028 Olympics. When these improvements are complete, trains will no longer need to back out of the station, but will instead proceed on new tracks over the 101 Freeway.

Note: for more information on the Southern California projects see reference 2 above, Southern California News, LaDonna's Corner.

3.2. Rosecrans and Marquardt Avenues Grade Separation

A June 2 Groundbreaking was held on a new grade separation where construction is happening at the corner of Rosecrans and Marquardt Avenues in the city of Santa Fe Springs. The grade separation will elevate the road above the railroad right of way so vehicle and pedestrian traffic below is not disrupted. Currently Rosecrans and Marquardt is a t-intersection with a diagonal rail crossing through the center. By elevating the road above the railroad, vehicles and pedestrian traffic will no longer be disrupted by trains passing through.

Benefits of this grade separation include:

- Improved safety – With 22 vehicle and train crashes from 2013-2015 that resulted in six injuries and four deaths, something had to be done about this hazardous rail crossing. Creating separate paths for vehicle and pedestrian traffic has proven to be safer for some communities.
- Reduced noise – Trains use their horn as a safety signal to communicate that they will be passing through intersections. This is not necessary with grade separations because trains do not converge with local traffic.
- Decrease in traffic congestion – For many years, the Rosecrans/Marquardt intersection has been an at-grade railroad crossing. Every time a train passed through, traffic would have to wait, which led to increased backup and travel times.
- Reduction in greenhouse gas (GHG) emissions – Idling vehicles release one pound of carbon dioxide every 10 minutes. The new high-speed rail will help eliminate emissions and help reduce the number of vehicles on the road.

The California High-Speed Rail Authority (Authority) has invested \$77 million in Proposition 1A funds towards the grade separation at Rosecrans/Marquardt. In April 2020, the Authority Board approved a preliminary funding plan that detailed the release of the Proposition 1A funds that were appropriated by the California Legislature pursuant to Senate Bill (SB) 1029, which was signed into law in 2012.

The project is expected to be completed by 2023.