



CALIFORNIA High-Speed Rail Authority

2025 SUPPLEMENTAL PROJECT UPDATE REPORT





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A worker ties rebar on the Tied Arch Bridge over State Route 43 in Fresno County.



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Mission: The California High-Speed Rail Authority (Authority) is responsible for planning, designing, building, and operating the first high-speed rail system in the nation. California high-speed rail will connect the megaregions of the state, contribute to economic development and a cleaner environment, create jobs, and preserve agricultural and protected lands.





The Conejo Viaduct, west of State Route 43 in Fresno County, will be 2,000 feet long when complete.

LETTER FROM THE CEO

“I see clearer now more than ever the potential for this transformational project, one that can reshape the state and our society for the better. I see a future by 2038 to 2039 when operations are already connecting the Central Valley to population centers and innovation hubs, offering new career opportunities, economic mobility, affordable housing, and a cleaner environment.”

When I stepped into the role of Authority CEO last September, I knew the path ahead would not be easy. But, leveraging my experience delivering high-speed rail and infrastructure megaprojects around the world, I was ready to step in and make significant changes. Having watched this project with great interest for over a decade, I knew California high-speed rail was at a crossroads and poised for visible momentum.

Major infrastructure projects of this scale inevitably face unforeseen challenges. No transformational project in U.S. history — from the Interstate Highway System to the Big Dig, the Northeast Corridor, or the Hoover Dam — has been completed without difficulties. California high-speed rail is not immune to these challenges.

Since its inception, this program has faced almost unprecedented hurdles, including a lack of continuous political support, insufficient jurisdictional authority, costly and duplicative regulatory requirements, and chronic underfunding. Despite these constraints, the Authority continues to advance the program with measurable results. No other true high-speed rail project in North America is under active

construction, let alone made as much tangible progress as California's. Today, we are preparing to procure the track, equipment, and materials required to launch the nation's first high-speed track and systems installation within the next year.

I see clearer now more than ever the potential for this transformational project, one that can reshape the state and our society for the better. I see a future by 2038 to 2039 when operations are already connecting the Central Valley to population centers and innovation hubs, offering new career opportunities, economic mobility, affordable housing, and a cleaner environment. A system that is efficient, sustainable, and equitable. A system that connects us to each other and to the world around us.

Moreover, I see — and this report outlines — a clear path to achieve commercial success at the earliest possible stage, ensuring the system begins generating compelling economic return and maximizing the value of California's investment.

At my direction, the Authority has undergone a holistic reassessment of the entire program. This effort encompassed a thorough review and evaluation of the:

- Organizational structure,
- Culture,
- Suitability of the design criteria,
- Scope of what was being built,
- Cost estimates,
- Procurement strategy,
- Ridership projections,
- Risks, and
- Overall delivery timeline of various projects within the program.

In this report, we present several paths to advance the program including the work already underway in the Central Valley and beyond to connect in the south to Northern Los Angeles County at Palmdale and in then north to the electrified Caltrain system via Gilroy. For each of these projects, we are including cost estimates, funding needs, and construction completion schedule, as well as projected ridership and revenue. These project segments include:

- Merced – Bakersfield
- Gilroy – Bakersfield
- Gilroy – Palmdale

As required by statute, the Authority is currently focused on completion of the 171-mile Merced – Bakersfield early operating segment (EOS) and is on track to complete that segment and begin operations by 2032. An extensive evaluation of the Merced – Bakersfield segment is provided in **Appendix B** to meet statutory requirements. Additionally, it incorporates recommendations from the Authority’s Office of the Inspector General.

Our business case findings for each segment are presented in Chapter 1 of this report. These scenarios and associated analyses are intended to support the Newsom Administration and California State Legislature’s discussions as they evaluate the next steps for the program, grounded in clearer visibility, improved oversight, and strengthened delivery strategy.

While I am encouraged by the long-term vision outlined in this report, I remain mindful that for the Authority to deliver a robust, commercially viable high-speed rail service with a high level of cost and schedule certainty, the structural and statutory limitations still impeding project delivery

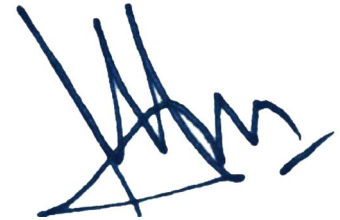


Authority CEO Ian Choudri speaks at the 2025 U.S. High Speed Rail Association's Annual Conference in Washington D.C.

must be addressed. Achieving that goal will require refinements to current statutory, regulatory, and funding frameworks that were not designed for a program of this complexity and scale. Without these adjustments, cost and schedule certainty will continue to be challenging to manage. Chapter 2 outlines specific actions that can be taken to provide the Authority with the tools, resources, and flexibility necessary to accelerate delivery and sequence infrastructure in a way that maximizes impact and return on the state's investment and create the conditions necessary to attract private capital and advance public private partnerships.

As we reach this critical juncture, we are faced with a choice: let the challenges of the past define the

program's future, or to meet this moment with the clarity, coordination, and commitment it demands. California's long-term mobility, housing, economic, and climate goals remain within reach, if supported by the right tools, the right partnerships, and a shared understanding of what success requires. While challenges remain, so too does the potential to deliver a modern transportation system worthy of the state's ambitions — one that reflects the scale, complexity, and promise of California itself. Let's go build it.



Authority CEO Ian Choudri

Right-Sizing the Program

Over the past six months, we have deliberated over input from stakeholders and the Legislature and have systematically re-evaluated project design criteria requirements to right-size the program from the bottom up. We have implemented difficult but necessary trade-off decisions to focus on the essential elements to deliver a high-quality, cost-effective rail system. The process included:

1. **Completing design reviews to minimize costs:** Throughout the review process, we focused on elements that directly contribute to functionality. Authority priorities going forward include ensuring affordability while maintaining operational excellence and safety standards.
2. **Making trade-off decisions for greater efficiency:** The Authority prioritizes elements that deliver maximum benefit at the lowest cost, allowing us to deliver an operating system sooner under budgetary constraints.
3. **Sequencing construction and making funding go further:** The re-envisioned phasing approach will facilitate efficient capital use by prioritizing geographical segments that contribute to program progression and boost ridership.
4. **Reviewing estimating methods for greater reliability (bottom-up):** The adoption of a bottom-up method to assess design, materials, and labor components of each scope element to provide a more informed estimate. The increased level of scrutiny provides more robust estimates that will be the foundation for strategic decision-making and stakeholder confidence.



Workers have placed the remaining 112 girders over the San Joaquin Valley Railroad for the Hanford Viaduct.

Statutory Requirements

The following tables provide a list of requirements for California High-Speed Rail Authority (Authority) Project Update Reports (PUR). The Authority has listed below the locations where the statutory requirements from both the March 2025 PUR and the supplemental August 2025 PUR have been satisfied. Additional clarification is provided for certain requirements where the Authority will provide more information in the 2026 Business Plan. A legal memo from the Authority's acting chief counsel is in **Appendix A**.

AB 95 - Statutory Requirements	March 2025 PUR Response to Requirements and Location / Page(s)	August 2025 PUR Response to Requirements and Location / Page(s)
(A) A summary describing the overall progress of the project.	CEO Letter: pages V to VII Chapter 2: pages 9 to 17	Appendix B: pages 37-50 Appendix E: pages 60-63
(B) The baseline budget for all project phase costs, by segment or contract, beginning with the California High-Speed Rail Program Revised 2012 Business Plan.	Chapter 3: pages 19 to 30	Appendix B: page 49
(C) The current and projected budget, by segment or contract, for all project phase costs	Chapter 3: pages 19 to 30	Appendix B: pages 41-42 Appendix C: pages 51-52
(D) Expenditures to date, by segment or contract, for all project phase costs.	Chapter 3: pages 19 to 30	Appendix B: pages 41-42 Appendix C: pages 51-52
(E) A comparison of the current and projected work schedule and the baseline schedule contained in the California High-Speed Rail Program Revised 2012 Business Plan.	Appendix D: page 55	Appendix D: page 59
(F) A summary of milestones achieved during the prior year and milestones expected to be reached in the coming year.	Chapter 2: pages 9 to 17	Appendix B: pages 37-50 Appendix E: pages 60-63
(G) Any issues identified during the prior two-year period and actions taken to address those issues.	Chapter 4: pages 33 to 40	
(H) A thorough discussion of risks to the project and steps taken to mitigate those risks.	Chapter 4: pages 33 to 40	Appendix F: pages 64-70

SB 198 - Statutory Requirements (Delivery Schedules)	March 2025 PUR Response to Requirements and Location / Page(s)	August 2025 PUR Response to Requirements and Location / Page(s)
(A) Completion of the 119-mile dual track segment from Madera to Poplar Avenue, which means Avenue 19 in the County of Madera to one mile north of the Tulare-Kern County line southward to north of Bakersfield, currently near Poplar Avenue.	*	Appendix B: pages 44-45
(B) Completion of right-of-way, planning, and advance engineering for extensions to Merced and Bakersfield.	*	Appendix B: pages 44-45
(C) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission, and the Authority that details the role of each in planning, constructing, and funding the connection in the City of Merced.	*	Appendix B: pages 46-47 More information will be available in the 2026 Business Plan.
(D) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission, and the Authority covering the planning, funding, and operation of the proposed high-speed rail services from Merced to Bakersfield and the Authority and approval for the San Joaquin Joint Powers Authority to contract for the operation of the high-speed rail services.	*	Appendix B: pages 46-47 More information will be available in the 2026 Business Plan.
(E) Provision of an updated cost estimate with a stated probability level, or levels, of its ongoing contracts and for the work it is funding and managing that is required to complete the Merced to Bakersfield segment extensions.	*	Appendix B: pages 41-42
(F) Completion of a funding plan that includes any additional federal funding awards for the Merced to Bakersfield segment.	*	Appendix B: pages 47-50
(G) Additional milestones required for the completion of the Merced to Bakersfield segment and the full Phase 1 System pursuant to subparagraphs (A) to (F), inclusive.	*	Appendix B: pages 44-45

*Indicates where previously the Authority stated in the 2025 March PUR it would update its cost and schedule estimates, as well as operating agreement schedules, ridership, and additional milestones required later this year with a supplemental report.

SB 198 - Statutory Requirements (Cost / Funding)	March 2025 PUR Response to Requirements and Location / Page(s)	August 2025 PUR Response to Requirements and Location / Page(s)
(A) Estimated and actual civil works costs of the Merced to Bakersfield segment.	*	Appendix B: page 42
(B) Estimated and actual right-of-way, acquisitions, utilities, and other third-party agreement costs.	*	Appendix B: pages 41-42
(C) Estimates of contract costs, including contingencies to cover change orders.	*	Appendix B: pages 41-42
(D) Other costs, estimated and actual, including, but not limited to, rolling stock, interim use, and stations.	*	Appendix B: pages 41-42
(E) Costs reported in a manner than can be comparable across reports.	*	Appendix B: pages 41-42
(F) Updates on the Authority's progress on achieving project milestones, as established in the project update report or the business plan adopted pursuant to Section 185033.	CEO Letter: pages V to VIII Chapter 2: pages 9 to 17	Letter from the CEO pages IX to XI Appendix B: pages 44-45 Appendix E: pages 60-63 Appendix I: pages 78-80
(G) Funding commitments beyond the Merced to Bakersfield segment, and spending to meet those commitments to date, including funding sources used to meet identified funding commitments.	Chapter 3: page 23	

*Indicates where previously the Authority stated in the 2025 March PUR it would update its cost and schedule estimates, as well as operating agreement schedules, ridership, and additional milestones required later this year with a supplemental report.



The Kimberlina Viaduct in Kern County will take high-speed trains over Kimberlina Road. It was completed in February 2023.

CHAPTER 1:

CONNECTING THE CENTRAL VALLEY TO SAN FRANCISCO AND LOS ANGELES COUNTY

Introduction

The California High-Speed Rail Authority (Authority) is pleased to provide early results from the holistic reassessment of the high-speed rail program.

Three high-speed rail business case scenarios have been developed and are presented in this chapter, including updated cost estimates, ridership and revenue projections, and funding requirements:

- **Merced – Bakersfield (Project Underway):** Complete the current statutorily required segment under design and active construction. The 171-mile high-speed rail line would enhance service in the Central Valley.
- **Gilroy – Bakersfield:** Build high-speed rail infrastructure extending from the Central Valley to Gilroy and collaborate with Caltrain and other partners to enhance the Gilroy to San Jose rail corridor to allow for continuous service from San Francisco to Bakersfield.
- **Gilroy – Palmdale:** Build an expanded high-speed rail infrastructure from Gilroy to Palmdale that supports continuing service to San Francisco and connects with Metrolink in Palmdale and could utilize the High-Desert Corridor to connect to Brightline West in Victor Valley.

The Authority has \$28.16 billion in capital funding, which includes an estimated \$5.5 billion from Cap-and-Invest through 2030 and retention of federally awarded funds. The Governor's Fiscal Year (FY) 2025 to 2026 budget proposal includes extending the Cap-and-Invest program through 2045 with at least \$1.0 billion in annual funding for the Authority. This would provide at least \$15 billion in additional funding for the program, bringing the Authority's total capital funding to \$43.16 billion. See **Table B.3** in **Appendix B** for a detailed account of program funding and sources. For purposes of this report, the Authority included the \$4.0 billion in federal funding, currently the subject of litigation, as part of its total capital funding figures.

The Authority's overarching goal is to construct a commercially viable high-speed rail system as quickly as possible with the available financial resources, while making meaningful progress to completing Phase 1. A strong focus is placed on asset commercialization and other ancillary revenues that could augment future revenue from passengers but could also be initiated before operations start. Each scenario presented in this chapter includes a range of estimated net income from ancillary revenue sources. See **Appendix J** for more information.

Scenario 1: Merced – Bakersfield (Project Underway)

The Merced - Bakersfield scenario, as shown in **Exhibit 1.0**, is now estimated to cost \$36.75 billion. See **Table B.2** in **Appendix B** for details on the scope cost categories. By resequencing work, refining design criteria, and adopting innovative engineering methods, the Authority was able to offset \$14.28 billion in cost increases, which is a cost savings of 30 percent. Without the program reassessment, scope increases, inflation (bringing prices from 2022 to 2024) and added cost and contingency for the Central Valley would have increased the Merced – Bakersfield segment costs to approximately \$51 billion. See more about “Cost-Saving Opportunities” in **Appendix B**. In addition, risks are outlined in **Appendix F**, such as ongoing tariff and trade wars¹.

The Authority is set to complete the 119-mile Central Valley Segment (CVS) currently under construction and the Merced and Bakersfield extensions within the original schedule envelope and prior to 2033, with an updated revenue service start date of January 1, 2032. See **Exhibit B.0** in **Appendix B** for a detailed 119-mile CVS and Merced and Bakersfield extension project schedules.

Recent ridership and revenue modeling shows 1.6 million to 2.2 million in ridership annually based on eight round trips per day of high-speed rail only

service. This service would generate a passenger revenue of \$39.28 million to \$55.6 million, as shown in **Table 1.0**. Ancillary revenue (e.g. parking, retail, advertising, and broadband) is projected to be approximately \$16 million to \$34 million. However, the operation and maintenance costs are forecasted to be between \$120.6 million and \$122.1 million annually.

These estimates indicate that this specific scenario would not achieve a positive profitable outcome as it would result in a recovery ratio of 45 percent to 74 percent annually. Based on these projections, the Merced – Bakersfield corridor operating as a standalone high-speed rail line with transfer connections to other rail services would not be able to cover its total operational expenses. The Authority will continue to explore contracting for service by a third-party, such as the San Joaquin Joint Powers Authority, which provides service in the Central Valley, as an alternative option.

Assuming a baseline of at least \$1.0 billion per year in Cap-and-Invest program funding through 2045, as contained in the Governor’s proposal, the Merced – Bakersfield segment will no longer have a budgetary funding gap. However, the Authority will need to work with the Administration and Legislature to solve the timing of future cash receipts with capital expenses to maintain its proposed schedule. See **Appendix G** for more details on financing methods and assumptions.

A full Merced – Bakersfield analysis can be found in **Appendix B**.

Exhibit 1.0: Merced – Bakersfield Service Map**Table 1.0:** Merced – Bakersfield 2030 Financial Outlook (\$ in millions)

Passenger Revenue*	Ancillary Revenue Net Income	Operations and Maintenance	Recovery Ratio
\$39.28 to \$55.60	\$15.99 to \$34.02	\$120.60 to \$122.10	45.27% to 74.31%

Note: Figures are in 2024 tax dollars

*Passenger revenue is based on projected annual high speed rail ridership figures of 1.6 million to 2.2 million. These projections are for high-speed service and do not consider other projections from connecting services, which would be expected to see their revenue and ridership increase (in the case of the San Joaquin Joint Powers Agency) due to connecting with the high-speed rail segment.

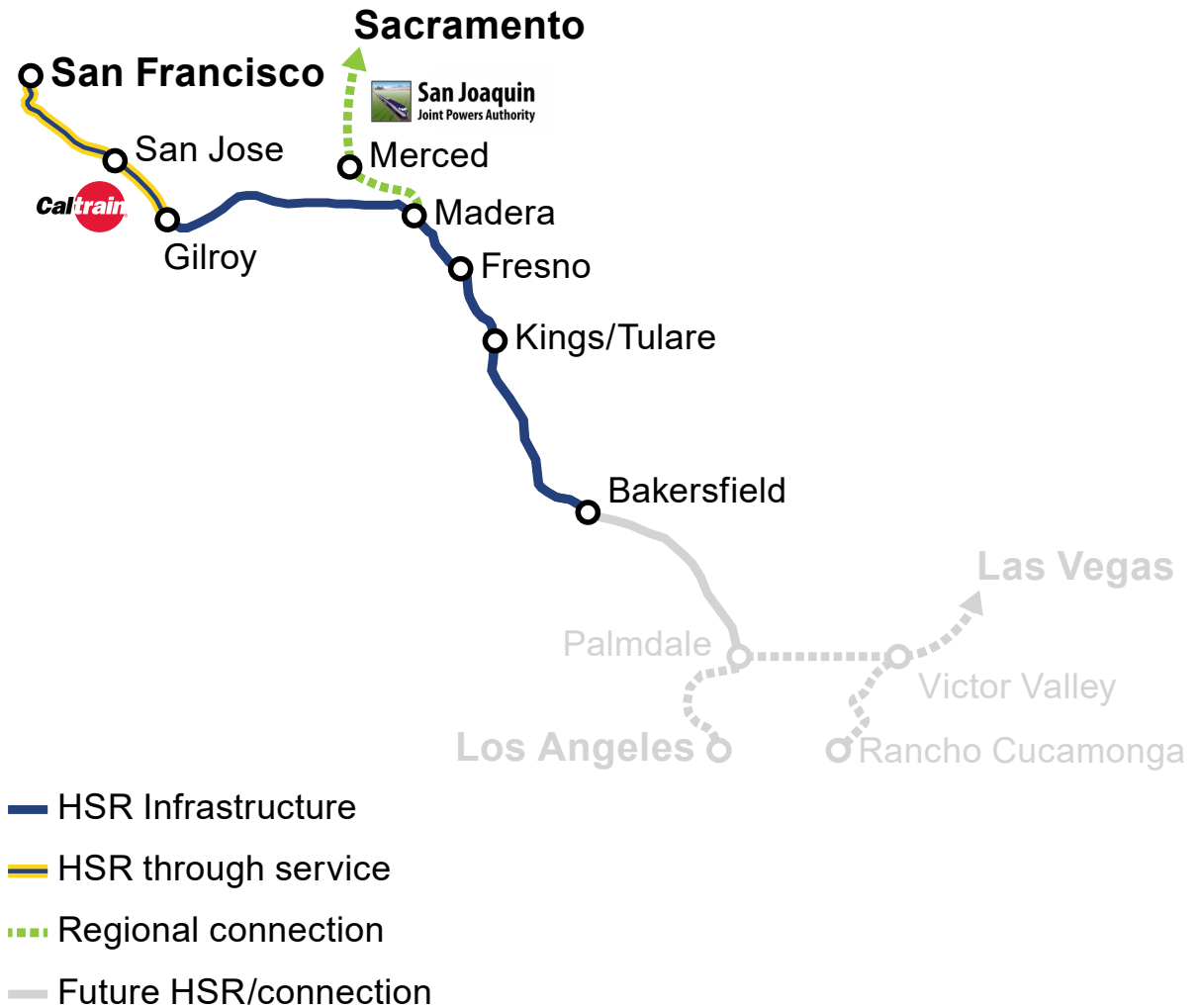
Scenario 2: Connecting San Francisco to Bakersfield (Gilroy – Bakersfield)

Under this scenario, the Authority would sequence construction to leverage Central Valley infrastructure while extending the high-speed rail system north and west to Gilroy. High-speed trains would continue to San Francisco, utilizing existing Caltrain infrastructure and a coordinated state solution to connect to the section from San Jose to Gilroy. Construction can be started on this extension while work on the section from the Central Valley Wye to Bakersfield is underway. Direct high-speed rail service to San Francisco will have substantial ridership and revenue impact, providing the opportunity for commercial success, and based on feedback through industry engagement, would be a transformative opportunity to engage the private sector through potential public-private partnership (P3) delivery models.

As shown in **Exhibit 1.1**, the Gilroy – Bakersfield scenario includes building high-speed rail infrastructure to Gilroy and Bakersfield. This scenario would also rely on improvements between Gilroy and San Jose and on Caltrain electrification to run hourly through service to San Francisco.

The Gilroy – Bakersfield scenario is expected to attract ridership ranging from 8.71 million to 11.83 million, which would bring in \$623.72 million to \$882.93 million in passenger revenue each year, as shown in **Table 1.1**. Ancillary revenue is projected to be around \$89 million to \$196 million. Based on operating and maintenance costs of \$419.19 million to \$435.47 million, the recovery ratio is estimated to be between 164 percent and 257 percent.

This segment is estimated to cost \$54.4 billion and would be operational by early 2038. See **Table C.0** and **Exhibit C.0** in **Appendix C**. To help fund this segment, the state could re-sequence the Merced extension. These savings could be reallocated toward building the system to Gilroy.

Exhibit 1.1: San Francisco – Gilroy – Bakersfield Service Map**Table 1.1:** San Francisco – Gilroy – Bakersfield 2040 Financial Outlook (\$ in millions)

Passenger Revenue*	Ancillary Revenue Net Income	Operations and Maintenance	Recovery Ratio
\$623.72 to \$882.93	\$88.74 to \$196.03	\$419.19 to \$435.47	163.61% to 257.39%

Note: Figures are in 2024 tax dollars.

*Passenger revenue is based on projected ridership of 8.71 million to 11.83 million annually.

Scenario 3: Connecting San Francisco to Los Angeles County via the Central Valley (Gilroy – Palmdale)

This scenario would increase the scale and impact of the system with a further extension of high-speed rail infrastructure to Palmdale. As with the second scenario, the Authority would leverage Central Valley infrastructure, extend the high-speed rail system to Gilroy, and rely on other improvements between Gilroy and San Francisco. Two hourly high-speed trains would operate from San Francisco to Palmdale, one as a limited-stop express. With the High Desert Corridor, one train per hour would continue to Victor Valley, where passengers could connect with Brightline West service to Rancho Cucamonga and Las Vegas. At Palmdale, trains could connect with a Metrolink/Surfliner express service to Los Angeles and San Diego, transforming the system from a regional corridor into a truly statewide service, as shown in **Exhibit 1.2**.

With enhanced service and connectivity to both San Francisco and Los Angeles, this modeling shows ridership would increase to 12.46 million to 17.94 million, significantly increasing passenger revenue to \$1.1 billion to \$1.6 billion annually, as shown in **Table 1.2**. Ancillary revenue is projected to be around \$110 million to \$254 million. The operating and maintenance costs would be between \$602 million and \$635 million, resulting in a recovery ratio of 191 percent to 314 percent. This revenue stream would be instrumental to the state's efforts to fund and complete the full Phase 1 high-speed rail system.

The Gilroy – Palmdale scenario is estimated to cost \$87.12 billion and would be operational in early 2038. See **Table C.2** and **Exhibit C.1** in **Appendix C**. To help fund this segment, the state could re-sequence the Merced extension. These savings could be reallocated toward building the system to Gilroy.

In addition, there may also be opportunities to pursue mutually beneficial operational upgrades with existing rail operators — such as potential improvements along the Union Pacific corridor in the north and with Metrolink and LOSSAN services in Southern California — that could enhance current service for existing riders while creating infrastructure that the Authority could leverage in the future.

Exhibit 1.2: San Francisco – Gilroy – Palmdale Service Map**Table 1.2:** San Francisco – Gilroy – Palmdale 2040 Financial Outlook (\$ in millions)

Passenger Revenue*	Ancillary Revenue Net Income	Operations and Maintenance	Recovery Ratio
\$1,109.35 to \$1,641.23	\$110.40 to \$253.70	\$602.48 to \$635.52	191.93% to 314.52%

Note: Figures are in 2024 tax dollars.

*Passenger revenue is based on ridership projections of 12.46 million to 17.94 million annually.

Delivery of Merced Extension

The Authority has generated financial outlooks for both Gilroy – Bakersfield and Gilroy – Palmdale that include construction of the full Merced extension, as shown in **Exhibit 1.3** and **Exhibit 1.4**. Ridership and revenue figures for each outlook are slightly higher; however, operating and maintenance costs increase more than revenue.

Gilroy – Bakersfield with Merced Extension

With the delivery of the Merced extension under the Gilroy – Bakersfield scenario, the Authority expects ridership to range from 8.77 million to 11.91 million annually, which would result in similar passenger revenue of \$626 billion to \$886 billion, as shown in **Table 1.3**. Ancillary revenue is projected to be around \$92 million to \$202 million. However, the operation and maintenance costs increase to \$441 million to \$457 million, reducing the recovery ratio to between 157 percent and 246 percent.

This segment is estimated to cost \$58.1 billion and would be operational by early 2038. See **Table C.1** and **Exhibit C.0** in **Appendix C**.

Exhibit 1.3: San Francisco – Gilroy – Merced – Bakersfield Service Map**Table 1.3:** San Francisco – Gilroy – Bakersfield (including Merced) 2040 Financial Outlook (\$ in millions)

Passenger Revenue*	Ancillary Revenue Net Income	Operations and Maintenance	Recovery Ratio
\$626.03 to \$886.20	\$91.90 to \$202.00	\$441.55 to \$457.90	156.79% to 246.45%

Note: Figures are in 2024 tax dollars.

*Passenger revenue is based on ridership projections of 8.77 million to 11.91 million annually.

Gilroy – Palmdale with Merced Extension

With the delivery of the Merced extension under the Gilroy – Palmdale scenario, the Authority expects ridership to range from 12.52 million to 18.02 million annually, which would result in similar passenger revenue of \$1.1 billion to \$1.6 billion, as shown in **Table 1.4**. Ancillary revenue is projected to be around \$114 million to \$260 million.

However, the operation and maintenance costs increase to \$625 million to \$658 million, reducing the recovery ratio to between 186 percent to 304 percent.

This segment is estimated to cost \$90.85 billion and would be operational by early 2038. See **Table C.3** and **Exhibit C.1** in **Appendix C**.

Exhibit 1.4: San Francisco – Gilroy – Merced – Palmdale Service Map



Table 1.4: San Francisco – Gilroy – Palmdale (including Merced) 2040 Financial Outlook (\$ in millions)

Passenger Revenue*	Ancillary Revenue Net Income	Operations and Maintenance	Recovery Ratio
\$1,111.69 to \$1,640.70	\$113.60 to \$259.70	\$625.00 to \$658.12	186.18% to 304.06%

Note: Figures are in 2024 tax dollars.

*Passenger revenue is based on ridership projections of 12.52 million to 18.02 million annually.

Gilroy – San Jose Improvements

Successful implementation of the Gilroy – Bakersfield and Gilroy – Palmdale scenarios will depend on a coordinated state solution to access and improve the Union Pacific rail line between Gilroy and San Jose. Building on past investments in Caltrain electrification, and in partnership with regional agencies, a joint improvement and

electrification of the rail line will be necessary to enable high-speed rail service to reach San Jose and San Francisco. The Authority is prepared to work with state and regional partners to define the extent of the improvements and the additional costs not included in the scenarios, which may range from \$3.0 billion to \$6.0 billion.

Connecting California's Population Centers by Early 2038

The Authority has outlined a plan to connect San Francisco to Northern Los Angeles by early 2038. By strategically focusing on building high-speed rail segments from Gilroy to Bakersfield and Gilroy to Palmdale, the Authority aims to have these operational within the next 15 years, with a target operational date of 2038.

In a preliminary assessment conducted by the Authority, various scenarios have been presented to the state Legislature and the Newsom Administration to achieve this goal. Detailed project schedules have been included in **Appendix C**. Once completed, high-speed rail will revolutionize transportation in California, allowing riders to travel seamlessly from San Francisco to the Central Valley and beyond.



Rendering: This future blended corridor in San Mateo will feature Caltrain and high-speed rail.

Conclusion

The Authority is statutorily obligated to prioritize delivery of the Merced – Bakersfield segment and plans to do so unless otherwise directed by the Legislature. Nonetheless, completing the Gilroy – Palmdale segment would provide statewide rail service to a majority of Californians and promises the highest return on investment for the state; and completing the Gilroy – Bakersfield scenario is a cost-effective way to achieve profitable commercial operations at the earliest possible opportunity with less additional funding needed. The Gilroy – Bakersfield scenario would attract substantial ridership and generate positive net proceeds. A profitable operation could create considerable opportunities for engaging with the private sector through a P3 delivery model.

With more constrained state funding, the Authority recommends the state prioritize subsequent expansions to areas with greater population, ridership, and revenue potential — supporting long-term system sustainability. Our analysis finds that extending the high-speed rail system northward to connect with the Bay Area offers comparative advantages — including strong origin-destination markets, significant potential to bolster ridership and revenue, and opportunities to capitalize on existing and planned infrastructure enhancements along the Caltrain corridor, including electrification, which has received substantial financial support from the Authority.

Our efforts should also continue to build on strategic investments already made (Caltrain) while pursuing new, mutually beneficial opportunities with existing operators. This could include potential partnerships to advance Union Pacific corridor improvements in the north, as well as partnerships in Southern California with Metrolink and LOSSAN to support infrastructure upgrades that the Authority could utilize in the future. This approach benefits both the Authority and existing operators, along with the riders and communities they serve today, while laying the groundwork for future high-speed rail operations.

Table 1.5 provides the cost estimate, funding needed without factoring in the proposed \$15 billion in Cap-and-Invest program funding through 2045, and 40-year cumulative net operating profit / loss for each of the buildout scenarios. A detailed discussion of the annual funding needs and state financing opportunities can be found in Chapter 3. A summary of a benefit-cost analysis of the buildout scenarios can be found in **Appendix K**.

Table 1.5: Buildout Cost, Funding Needed, and Net Operating Profit / Loss Scenarios (\$ in billions)

Buildout Scenario	Cost*	Funding Needed**	40-year Net Operating Profit / Loss***
Merced – Bakersfield	36.75	8.59	-3.8
San Francisco – Gilroy – Bakersfield	54.38	26.22	+47.5
San Francisco – Gilroy – Bakersfield (including Merced)	58.10	29.94	+45.9
San Francisco – Gilroy – Palmdale	87.12	58.96	+98.1
San Francisco – Gilroy – Palmdale (including Merced)	90.85	62.69	+96.8

*Construction cost estimates include a P65 level of contingency.

**Funding needed is derived from existing funding of \$28.16 billion and does not include a proposed incremental augmentation of at least \$15 billion from Cap and Invest and the reserved funds needed for Capital Outlay Support and Administration costs.

***Cumulative operating profit/loss are based on a service start year of 2032 for Merced – Bakersfield; other scenarios assumed to start operations by early 2038, if built using financing against long-term state funding.

California High-Speed Rail Environmental and Economic Benefits

The California high-speed rail system will form the backbone of the state’s zero-emission transit network and is currently the largest greenhouse gas (GHG) reduction project in the state’s GHG investment portfolio. Avoided air pollutant emissions due to high-speed rail operation can save more than 400 air pollution related deaths and avoid hundreds of thousands of cases of asthma over a 50-year operational period².

In the meantime, the Authority’s construction equipment fleet is among the most advanced in terms of air pollution emissions control and fuel efficiency, producing 62 percent less emissions than a typical California construction fleet. Through a Voluntary Emissions Reduction Agreement, the Authority has provided more than 200 zero-emission vehicles to local agencies, thereby reducing more emissions than our construction fleet produces.

The project also drives statewide economic growth and job creation. Since the high-speed rail project began, it has generated nearly \$22 billion in economic output, which encompasses direct, indirect, and induced benefits.

Table 1.6 and **Table 1.7** provide an overview of the forecasted emissions reduction benefits including vehicle miles traveled (VMT) and flights avoided, as well as the economic output to date.



The Avenue 56 Grade Separation in Tulare County was completed in June 2025 and spans a length of 219 feet.

Table 1.6: Emissions Avoided by Year

Year	Scenario	Annual VMT Avoided (Miles)	Annual GHG Emissions Reduced Due to VMT Avoided (MTCO ₂ e)	Annual Air Flights Avoided	Annual GHG Emission Reduced Due to Flights Avoided (MTCO ₂ e)	Total Annual GHG Emissions Avoided (MTCO ₂ e)
2030	Merced – Bakersfield	236,377,620	71,717	664	4,860	76,577
2040	SF – Gilroy – Bakersfield	826,012,491	231,269	5,810	42,538	273,807
2040	SF – Gilroy – Bakersfield (including Merced)	843,936,739	236,288	5,801	42,475	278,762
2040	SF – Gilroy – Palmdale – Victorville	1,440,138,157	403,214	14,334	104,954	508,168
2040	SF – Gilroy – Palmdale – Victorville (including Merced)	1,460,735,967	408,981	14,312	104,791	513,772

Table 1.7: Economic Output and Job Years

Scenario	Total Economic Output During Construction (\$ in billions)	Employment Creation (Job Years)
Merced – Bakersfield	\$65.95	284,000
Gilroy (SF) – Bakersfield	\$88.31	380,000
Gilroy (SF) – Bakersfield (including Merced)	\$94.49	407,000
Gilroy (SF) – Palmdale	\$132.11	569,000
Gilroy (SF) – Palmdale (including Merced)	\$138.01	594,000



Visitors review a high-speed rail map at the San Francisco Earth Day Festival.

CHAPTER 2:

POLICY AND FUNDING CHANGES TO ACCELERATE PROJECT DELIVERY

Introduction

The Authority has identified policy changes that would help address our most pressing project delivery challenges. The Authority's vision to deliver an efficient, sustainable, and equitable high-speed rail system is attainable with a supportive policy environment that enables effective and timely implementation. Recently enacted statutory enhancements as well as subsequent policy and funding changes can help advance the planning, design, and construction of high-speed rail.

Stable and Secured Funding

The ongoing challenge of inconsistent, stop-and-go funding has hindered progress, resulting in delays and escalating costs. The project stands at a crucial juncture. It is essential to examine long-term financing approaches that improve predictability and reduce volatility, allowing for more consistent capital planning that supports uninterrupted program advancement.

As part of the FY 2025 to 2026 state budget, Governor Gavin Newsom proposed extending the Cap-and-Invest program to 2045 with an annual allocation of at least \$1.0 billion for high-speed rail. This proposal guarantees at least \$1.0 billion a year for 15 years for the program.³ Currently, the Authority receives 25 percent of the quarterly auction proceeds, which has been subject to market volatility. A secured, stable source of funding would provide an opportunity for the Authority to convert future revenues into immediate capital and expedite project delivery. See **Appendix G** for anticipated financing methods. Additionally, secured funding from the Cap-and-Invest program would allow the Authority to explore federal loan programs like Railroad Rehabilitation and Improvement Financing (RRIF) and Transportation Infrastructure Finance and Innovation Act (TIFIA) over the long term, and make the project more attractive to private sector investment and partnership opportunities.

In addition to the above strategies, the Authority remains committed to maximizing grant opportunities by actively pursuing federal, state, and local grants for infrastructure development, environmental sustainability, and transportation innovation to further support the project. The Authority will also support the grant funding efforts of partner organizations in the state for shared benefit projects.

Regulatory Streamlining

On June 30, 2025, the Governor signed Senate Bill 131, which contained targeted California Environmental Quality Act (CEQA) streamlining for high-speed rail stations and maintenance facilities by reducing environmental review requirements. This action will lead to faster project implementation, lower costs, and minimized delays, facilitating the timely development of essential infrastructure while ensuring environmental considerations are addressed.

Additional streamlined regulatory authority could significantly accelerate timelines and reduce costs for the project, such as clean power interconnection. The California high-speed rail project will be powered by clean energy. This approach aims to reduce reliance on the traditional power grid, lower operating costs, and meet the project's commitment to 100 percent

Secured funding from the Cap-and-Invest program would allow the Authority to explore federal loan programs like Railroad Rehabilitation and Improvement Financing (RRIF) and Transportation Infrastructure Finance and Innovation Act (TIFIA) over the long term, and make the project more attractive to private sector investment and partnership opportunities.

renewable energy. To help streamline the project's energy procurement, reduce delays associated with environmental review, and accelerate the integration of clean energy solutions, the Legislature could enact legislation for a CEQA exemption for clean power interconnection.

Authority Challenges Federal Grant Funding Decision

In 2010 and 2011, FRA awarded the Authority two grants under the 2010 Consolidated Appropriation Act (FY10 Grant) totaling \$928.62 million. More recently, in December 2023, the Authority was awarded nearly \$3.1 billion from the Biden Administration through the Federal-State Partnership for Intercity Passenger Rail Grant Program (FSP Grant). For all the federal grants, the FRA and the Authority entered into Cooperative Agreements to memorialize the funded project scope, funding commitments, and responsibilities.

In June 2025, under the Trump Administration, the Federal Railroad Administration (FRA) completed a federal grant compliance review and, on July 16, 2025, issued a decision to terminate the cooperative agreements for the Federal State Partnership and FY 10 grants — even though no fraud, waste, or abuse was identified. On July 17, 2025, the Authority filed a lawsuit in federal court challenging FRA's decision to terminate the grant funding, asserting that the termination violates the Administrative Procedure Act because it was arbitrary and capricious, and the asserted reasons were pretextual, reflecting the Trump Administration's hostility to California and the high-speed rail program. Since then, the Authority and the FRA have reached agreement that the obligated and contingent funds under both cooperative agreements will not be transferred to another grantee, except through a new Notice of Funding Opportunity, while litigation is pending.

Targeted Environmental Streamlining to Support Timely Clean Energy Delivery

A more tailored and scalable environmental review process for energy infrastructure, such as solar, wind, battery storage, and related interconnection facilities that directly support the system's electrification needs, could help align clean energy development with the project's construction and operational milestones.

Rather than applying a one-size-fits-all approach, this strategy would maintain appropriate environmental review while allowing the use of existing CEQA streamlining tools, such as tiering from certified programmatic environmental impact

reports (EIRs), focused or supplemental EIRs, and clearly defined review timelines. These tools can be scaled to match the complexity and environmental context of each project, ensuring that the level of analysis is appropriately tailored to the project's scope and potential impacts.

Accelerating delivery of clean power infrastructure is essential to maintaining the system's long-term sustainability and achieving California's broader climate goals. Other high-speed rail systems internationally have demonstrated the benefits of early and coordinated energy planning — often supported by streamlined regulatory frameworks that enable rail and energy components to proceed in parallel.

This approach would directly advance California's climate goals by promoting the use of clean energy for transportation electrification, while also reducing long-term operating costs, improving project feasibility, and encouraging private and public investment in sustainable infrastructure.

Globally, leading high-speed rail systems have embraced similar clean energy strategies. For example:

- **Spain's Renfe Alta Velocidad Española system** sources nearly all its electricity from renewable energy, much of it solar and wind.
- **France's Train à Grande Vitesse network** has moved toward contracts with renewable energy providers and has begun exploring on-site solar generation along right-of-way corridors.
- **Japan's Shinkansen** operators are investing in carbon neutrality through renewable energy procurement and energy efficiency improvements across its network.

California has a unique opportunity to build on these models by integrating clean energy at the outset, rather than retrofitting later. A CEQA exemption limited to project-serving interconnection infrastructure would not only facilitate timely deployment of renewable resources but also reinforce the state's leadership in climate-aligned infrastructure delivery.

A balanced, flexible CEQA strategy would allow California to advance critical infrastructure in a timely and environmentally responsible manner, reinforcing the state's leadership in delivering clean, integrated transportation systems.

Maximizing Shared Benefits Through Streamlined Clean Energy Delivery

Aligning clean energy development with the high-speed rail project's construction and operational milestones presents an opportunity not just to reduce long-term costs and ensure system sustainability, but to deliver broader, lasting benefits to the regions where this infrastructure is built.

By streamlining environmental review for clean energy projects such as solar, wind, battery storage, and interconnection facilities, California can enable timely deployment of renewable power that serves both the rail system and the surrounding communities. These facilities can generate surplus electricity during off-peak rail operations, allowing excess clean energy to flow into the local grid. This improves grid reliability and supports community-level decarbonization.

In addition to enhancing energy resilience, these projects stimulate local economic development through job creation, infrastructure investment, and improved air quality. Regions hosting clean energy systems would benefit not only from the near-term construction activity such as installation of solar arrays, wind turbines, and battery storage, but also from long-term operational advantages.

For example, solar and wind facilities built to power high-speed rail operations can continue generating electricity during periods of low train demand, such as during overnight winds or bright midday hours. This surplus power can be stored in batteries or fed into the regional grid to support nearby communities, schools, hospitals, and businesses. In rural or under-resourced areas,

this added clean energy capacity can help reduce reliance on diesel generators or aging transmission infrastructure, improve local grid stability, and lower energy costs.

Moreover, upgraded substations and interconnection points developed for the rail system can serve as shared assets — enabling future community solar projects or microgrids, and attracting additional clean tech investment to the area.

These are tangible, lasting benefits that extend beyond rail operations and help ensure that communities hosting infrastructure are true partners in California’s clean energy and transportation future.

Streamlining Environmental Permitting for Timely Delivery

California high-speed rail is projected to eliminate more than a hundred million tons of greenhouse gas (GHG) emissions by shifting travelers from cars and airplanes to trains powered with 100 percent renewable energy. However, a project of this magnitude will inevitably have environmental impacts.

The Authority prioritizes protecting California’s unique natural systems and landscapes, completing extensive environmental studies, and committing to building a high-speed rail system with minimal environmental impact. Environmental stewardship is embedded throughout the project, making this the largest infrastructure project in the nation to make environmental preservation a core part of its scope with efforts to preserve natural systems that go

well beyond state and federal legal requirements. These efforts include integrating wildlife corridors into infrastructure design, implementing large-scale habitat conservation initiatives, conserving water resources, planting trees, and safeguarding California’s agricultural heritage.

Even with these measures, certain permit conditions and practices have repeatedly slowed construction and added costs along the Central Valley’s linear corridor. For example, some permits require extensive measures to avoid any impact to individual animals, leading to prolonged surveys and monitoring that leads to inefficient construction practices, prolonged biological surveys, and costly monitoring requirements. If construction in a habitat area pauses for more than 30 days, as can easily happen along a long linear site, permit conditions require new surveys for individual protected animals before construction resumes.

The Authority recommends the state explore opportunities to streamline environmental review and species protection in a way that balances important protections with the practical realities of delivering a project of this magnitude. This approach could focus on developing more nimble regulatory tools and permit frameworks tailored to the unique circumstances of high-speed rail—a long, linear infrastructure project crossing multiple habitat types and jurisdictions.

Such efforts could include establishing permit provisions that account for extended construction timelines and allowing for adaptive management practices that reduce the need for repetitive biological surveys when work temporarily pauses. This could also include programmatic agreements or multi-year biological opinions that address

recurring species protection requirements across the alignment, rather than project-by-project or site-by-site reviews. By aligning regulatory requirements more closely with the project's scale and phasing, the state can help ensure sensitive habitats and species remain protected, while also facilitating steady, efficient construction progress. This approach would safeguard natural resources while supporting timely, cost-effective delivery of one of the most consequential climate and transportation investments in the nation.

Provision of Dedicated Court Resources

The timely disposition of property acquisition cases is critical to maintaining progress on the high-speed rail project and controlling overall delivery costs. Historically, judicial capacity has not kept pace with the volume and complexity of parcel acquisitions required for a project of this scale. In 2015, for instance, the assignment of only a single visiting retired judge to Kings County nearly halted adjudication, causing significant delays and resource inefficiencies.

What is most urgently needed is not final resolution of compensation, but the timely and impartial issuance of orders of possession — legal determinations that allow construction to proceed while final valuation is adjudicated. When these orders are delayed, the impacts ripple across project schedules, increase mobilization and holding costs, and divert resources away from construction activities.

With nearly 2,300 parcels required for the initial 119-mile segment and an estimated 530 for the extensions to Merced and Bakersfield, the need for reliable, efficient adjudication processes remains

high. Moreover, as the project advances toward future segments in the Central Valley and beyond that need will only grow.

State level policy changes such as dedicated procedural tracks for infrastructure-related acquisitions, or a regional or centralized forum model could help streamline case handling and reduce delays, such as dedicated court resources in the counties where the properties are located.

Third-Party Streamlining

Reliable coordination with third parties such as railroads, utility providers, and local agencies is essential to keeping the high-speed rail project on time and on budget. However, recurring delays related to reviews, approvals, agreements, and permitting, often stemming from inconsistent engagement or lack of adherence to schedules, continue to disrupt right-of-way acquisition, utility relocation, and overall construction sequencing.

While targeted mitigation efforts have improved some outcomes, the current framework still lacks the predictability and enforceability necessary to manage a project of this scale. In many cases, timelines are treated as aspirational rather than binding, allowing slippage that compounds over time and increases costs. Additionally, some entities routinely pass costs to the Authority with little scrutiny, further straining limited project resources.

What's needed is a more structured and accountable framework that ensures all parties operate under clear, enforceable expectations, including:

- Defined and binding timelines for reviews, approvals, and deliverables that can be tracked and enforced,

- Mandatory participation in coordination meetings and transparent progress reporting,
- Streamlined permitting pathways that reduce procedural redundancies and encourage timely action,
- Cost containment policies that prevent unchecked cost transfers to the Authority, and
- Clear escalation and oversight mechanisms to identify and resolve bottlenecks early.

These policy improvements would not only help ensure third-party performance aligns with project timelines but also create the predictability and accountability necessary for successful delivery. Ultimately, reducing uncertainty and delay will protect public investment and facilitate more consistent progress across all segments of the program.

Aligning Project Delivery with Revenue and Ridership Potential

Senate Bill (SB) 198, enacted in 2022, prioritized construction of the 171-mile Merced – Bakersfield early operating segment (EOS) and imposed a \$500 million cap on Authority expenditures outside the Central Valley.

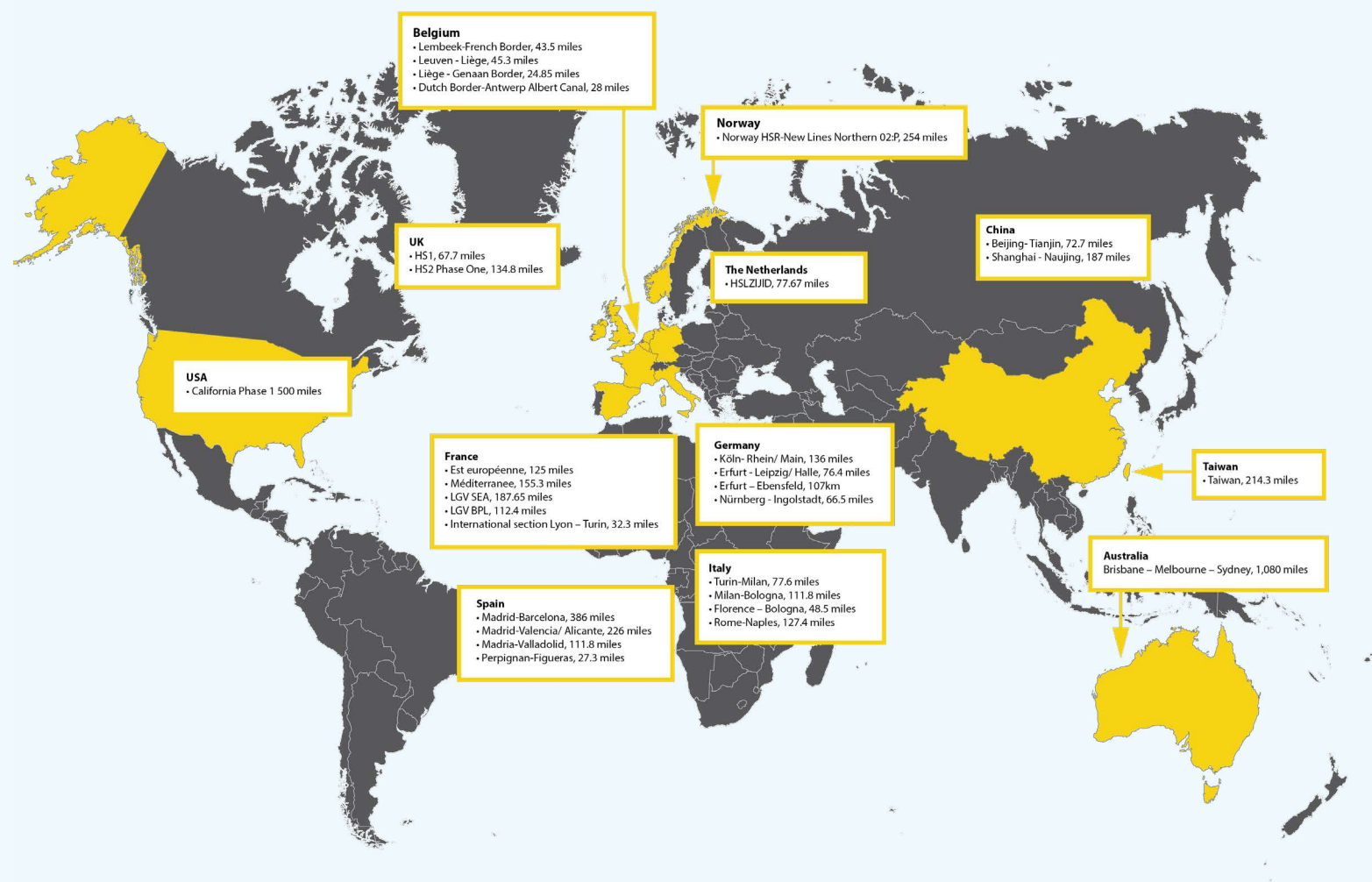
While this focus has facilitated progress on the EOS, it is critical that the project be responsive to evolving funding opportunities, market dynamics, and ridership potential. As outlined in Chapter 1, the Gilroy - Bakersfield scenario and the Gilroy - Palmdale scenario both demonstrate significantly higher ridership and revenue outcomes. Advancing construction in these corridors would not only

accelerate mobility benefits across the state but also generate greater revenue streams that could be reinvested in the system and improve the project's attractiveness to private capital.

Based on industry feedback, this increased revenue potential could also attract private investment. The Authority's June 26, 2025, Request for Expressions of Interest for public-private partnerships yielded 31 responses from a wide range of industry participants. Consistent industry engagement had highlighted the critical nature of stable funding, emphasizing how a credible state backstop allows the private sector to invest at scale, accelerating project delivery, and unlocking international expertise and innovation aligned with shared goals and shared accountability. The Authority will continue to evaluate significant potential for commercialization and monetization opportunities that can generate additional funding for project delivery.

To provide flexibility for project sequencing and unlock private sector engagement, the Legislature could modify SB 198 to remove or adjust the current spending cap outside the Central Valley. This would allow the Authority to sequence projects in a way that maximizes statewide benefits, unlocks private investment, and delivers a more robust and financially sustainable high-speed rail system.

High-Speed Rail Projects Worldwide: Challenges and Insights



SOURCE: UK.GOV

Table 2.0: International High-Speed Rail Projects

Project	Cost per Mile (2025 Prices, in millions)	Total Years to Plan and Build	Route Length	Miles of Tunneling	Environmental & Geographic Constraints
Spain Madrid –Barcelona	~\$75	16 years	385 miles	32 miles	Mountain ranges, archaeological sites
HS1 (UK)	~\$202	9 years	68 miles	25 miles	Urban density, River Thames crossing, protected landscapes, wetlands, archeological and cultural heritage sites
Taiwan High-Speed Rail	~\$134	17 years	214 miles	31 miles	Typhoons, earthquakes, narrow corridor
California High-Speed Rail	~\$212	15 years	500 miles (Phase 1)	50 miles	Wetlands, farmland, seismic zones, CEQA & NEPA
HS2 (UK)	~\$613	24 years	140 miles	30 miles	Ancient woodlands, urban tunneling, political opposition
Beijing – Shanghai High-Speed Rail	~\$61	7 years	819 miles	50 miles	High land acquisition pressure, river crossings, flood plains

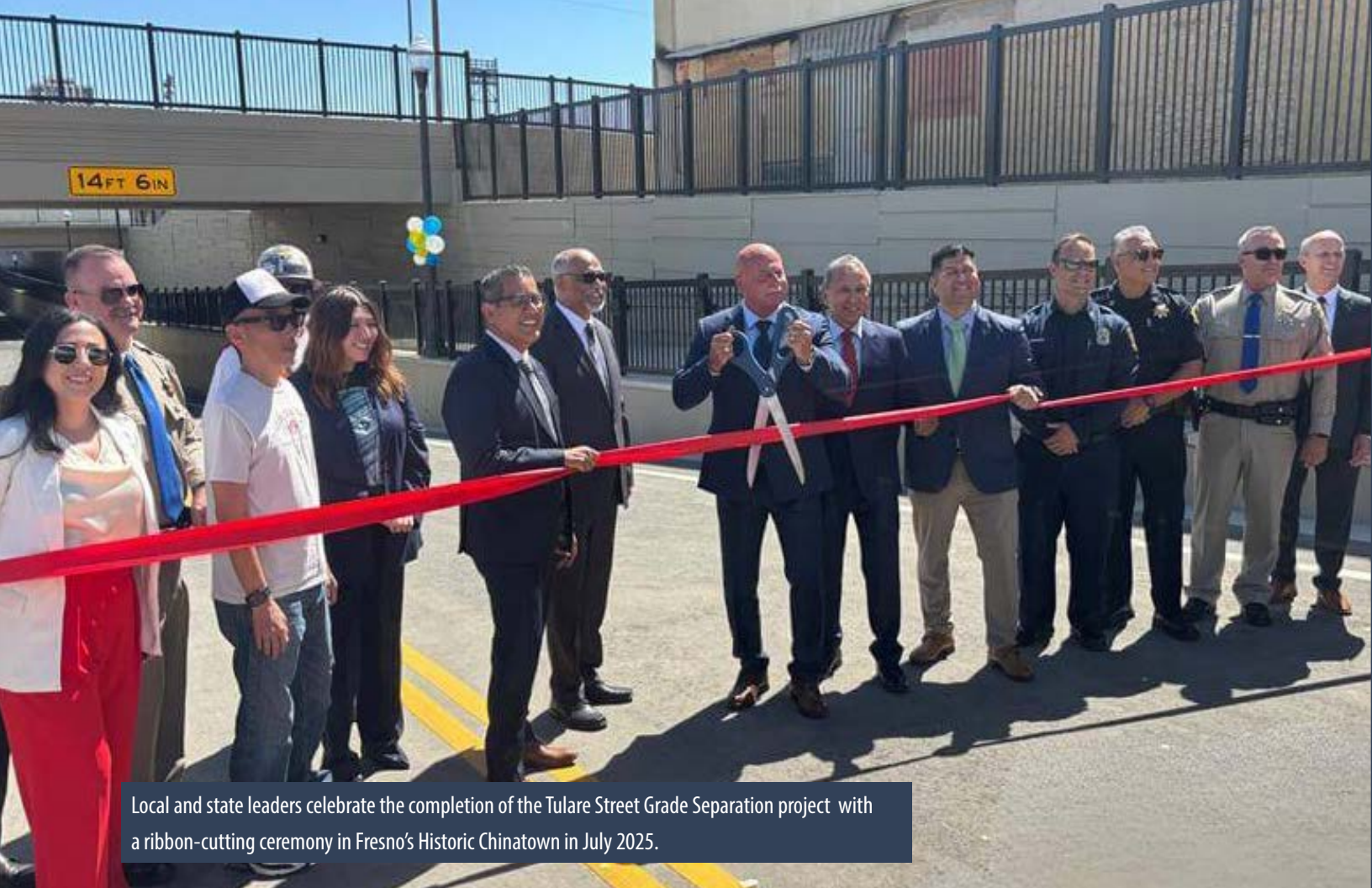
High-speed rail projects around the world represent long-term investments that are typically sponsored by national governments. While these projects share similar objectives, they differ greatly in geography, political context, environmental regulation, and engineering requirements. The most critical factor for the successful development and delivery of high-speed rail is strong political support combined with a firm funding commitment.

China's success in implementing high-speed rail has been largely due to centralized planning, the establishment of consistent technical standards, and standardized approaches, all supported by robust national funding. In Europe, countries like France and Spain also have benefited from strong governmental commitment and effective planning processes. In contrast, California's project experienced fluctuating levels of support at the national level, impacting the project's momentum and has funding stability.

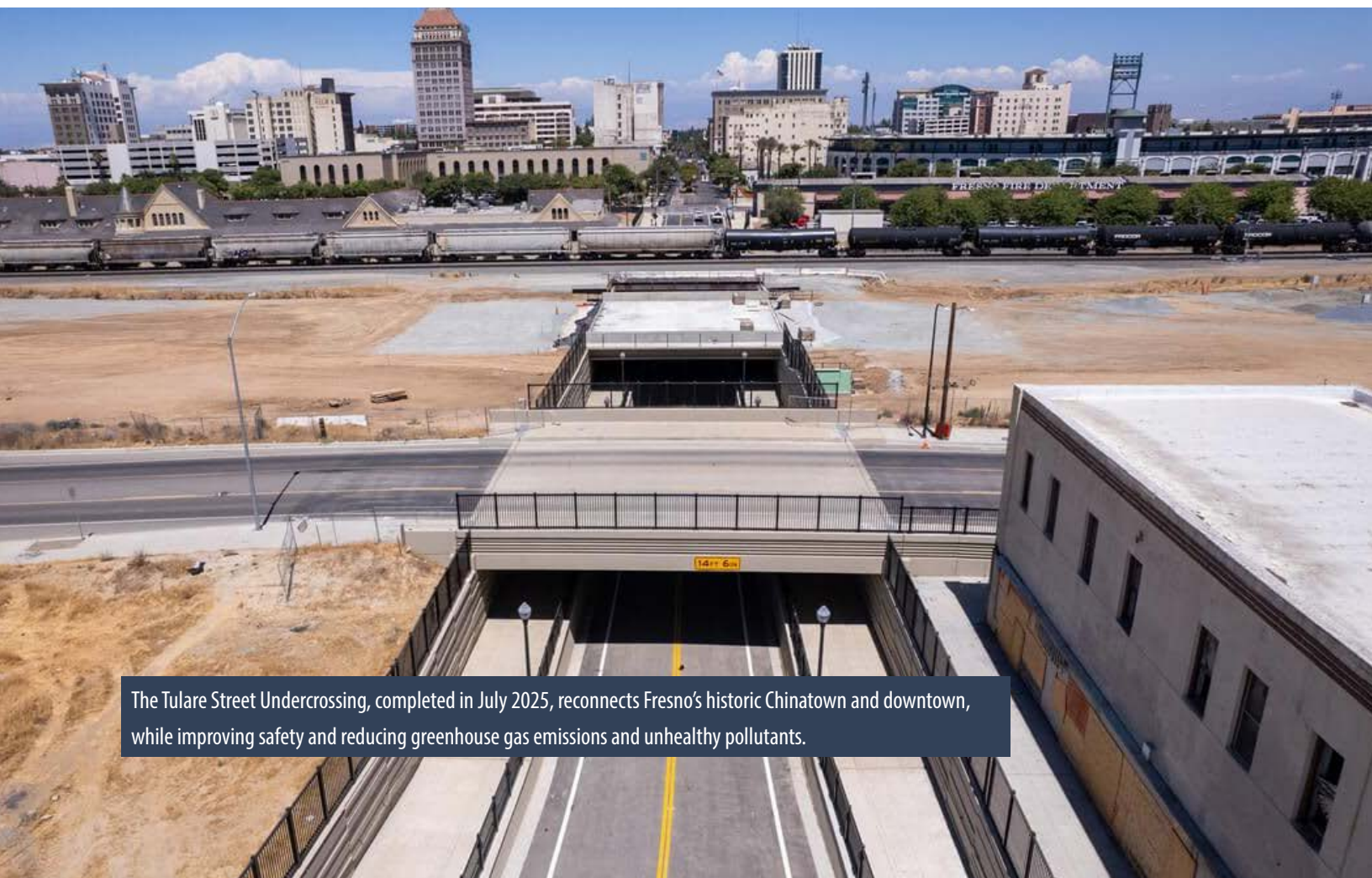
Projects in regions such as California, Japan, and the UK have also taken longer to complete due to challenging terrain, varied land uses, extensive environmental mitigation, and heightened public scrutiny.

By drawing lessons from international counterparts, the Authority can better understand its own challenges and identify opportunities for strong and sustained government commitment to building the nation's first true high-speed rail system.

See **Appendix H** for more details.



Local and state leaders celebrate the completion of the Tulare Street Grade Separation project with a ribbon-cutting ceremony in Fresno's Historic Chinatown in July 2025.



The Tulare Street Undercrossing, completed in July 2025, reconnects Fresno's historic Chinatown and downtown, while improving safety and reducing greenhouse gas emissions and unhealthy pollutants.

CHAPTER 3:

FUNDING TO DELIVER CALIFORNIA HIGH-SPEED RAIL

Introduction

The Authority's current funding, coupled with the Governor's proposal to dedicate at least \$1.0 billion annually from the Cap-and-Invest program to high-speed rail through 2045, is projected to be sufficient to complete the 171-mile Merced – Bakersfield early operating segment and begin operations within the Authority's schedule window.

While extending the project to Gilroy – Bakersfield and Gilroy – Palmdale would deliver a more immediately transformative high-speed rail system to California, it would also require a new funding commitment from the state combined with other public and private funding sources. Long-term stable state funding could attract private sector interest and enable potential partners to finance construction, avoiding stop-and-go delays and saving time and money.

The Authority examined potential long-term funding scenarios (**Table 3.0**), each of which have different overall costs to the state. Combined, stable state funding along with legislative changes to SB 198 and other streamlining measures as discussed in Chapter 2 and **Appendix G** will enable the Authority to successfully build a financially sustainable high-speed rail system for California.

Funding

Stable, long-term funding is essential for the Authority to deliver the high-speed rail scenarios on an accelerated schedule as outlined in Chapter 1. Much like a homeowner taking out a mortgage, the state has several funding options available, each with different timelines and total repayment costs.

Table 3.0: Buildout Cost, Funding and Profit Scenarios (\$ in billions)

Buildout Scenario	Total Cost*	Funding Needed**	Annual Funding Commitment***				40-year Net Operating Profit^
			2045 (15 years)	2050 (20 years)	2060 (30 years)	2075 (45 years)	
San Francisco – Gilroy – Bakersfield	54.38	26.22	2.29	1.98	1.63	1.39	+47.5
San Francisco – Gilroy – Bakersfield (including Merced)	58.10	29.94	2.58	2.22	1.83	1.56	+45.9
San Francisco – Gilroy – Palmdale	87.12	58.96	5.10	4.37	3.60	3.06	+98.1
San Francisco – Gilroy – Palmdale (including Merced)	90.85	62.69	5.39	4.61	3.80	3.24	+96.8

* Construction cost estimates include a P65 level of contingency.

** Funding needed during construction period. Funding needed is derived from existing funding of \$28.16 billion but does not include proposed incremental \$15.0 billion from Cap and Invest or the reserved funds needed for Capital Outlay Support and Administrative costs.

*** Annual Funding Commitment includes debt service and is dependent on the source(s) of revenue pledge offered by the state and its level of credit enhancement, as well as prevailing market conditions.

^ Cumulative operating profit for the buildout scenarios assumes an operational start date of early 2038, if built using financing against long term state funding.

The state could structure new funding over a period of 15 to 45 years, which could be used to support both “PayGo” expenditures through 2038, as well as financing program covering both the principal construction costs and the interest accrued over time. Each scenario presents distinct tradeoffs. A 15-year repayment schedule minimizes interest accumulation but requires the highest annual payments. At the other end of the spectrum, a 45-year repayment period offers the lowest recurring payments but has the highest total cost due to accumulated interest.

In the scenarios presented in **Table 3.0**, payment amounts vary significantly across the four annual funding commitment periods. For example, financing the Gilroy – Bakersfield segment over 15 years would cost \$2.29 billion per year, compared to \$1.63 billion per year over a 30-year term. While interest can accumulate, the Authority has tools available to reduce these expenses and maximize long-term savings.

The Authority also evaluated the potential cumulative returns from the first 40 years of high-speed rail operating profits under each funding scenario, ranging from \$45.9 billion to \$98.1 billion. As the scenarios demonstrate, building additional sections of Phase 1 and expanding the network to connect major population centers will generate significant incremental revenue and positive cash flow. This revenue, among other options available to the state, could be monetized through a P3 operating concession.

Public-private partnerships (P3), made possible with committed state funding, would allow the Authority to tap into private financing and enable accelerated construction and delivery of high-speed rail service. Costs and schedules described

in this report are contingent on affirmative state action on funding and on streamlining construction as described in Chapter 2.

Private investors and industry partners are more likely to engage and partner to deliver the California high-speed rail project if the state demonstrates a long-term funding commitment. Such a commitment could encourage the private sector to offer additional financing and equity investment in exchange for operational rights. Strong public funding signals to the private sector that the program's future is stable and that project risks are at acceptable levels. Leveraging P3 funding and financing could help the Authority accelerate buildout of the system.

Detailed capital cost and revenue tables for Gilroy – Bakersfield and Gilroy – Palmdale are in **Appendix C**. Each scenario includes a capital cost option for delivery of the Merced extension.

Conclusion

California leaders have a historic opportunity to provide the tools, resources, and flexibility to deliver a modern, integrated transportation system. Without state action on long-term funding and removal of obstacles as outlined in this chapter to improve project construction efficiency, there are no guarantees the faster delivery and cost savings laid out in this report could be achieved. With Legislative action, expanding the California high-speed rail program beyond the Central Valley will generate substantial ridership, enabling profitable operations. Connecting profitable service to San Jose, San Francisco, and the broader Bay Area economic hub is within reach by early 2038 and will demonstrate high-speed rail's potential as a catalyst for improved economic, environmental, and quality of life outcomes for Californians.

California leaders have a historic opportunity to provide the tools, resources, and flexibility to deliver a modern, integrated transportation system.

What is a Public-Private Partnership?

A public-private partnership (P3) is a collaborative, contractual arrangement between a government entity (federal, state, or local) and a private organization used as a proven innovative mechanism for public infrastructure projects. P3 partnerships bring together the strengths of public and private participants to share risks, access expertise, and improve cost efficiencies. Below are examples of P3 projects in California and the United States.

California	Rest of the U.S.
■ Presidio Parkway (San Francisco) ■ Long Beach Civic Center ■ Long Beach Court Building ■ UC Merced	■ Moynihan Station (New York City) ■ Eagle P3 Rail Project (Denver, Colorado) ■ New Terminal 1 at JFK ■ Major Bridges Project (Pennsylvania DOT)



Presidio Parkway in San Francisco (SOURCE BAY AREA COUNCIL)



Located in Kings County, the Hanford Viaduct will allow high-speed trains to cross over Grangeville Boulevard, San Joaquin Valley Railroad, and State Route 198.

APPENDICES

Appendix A: 2025 Project Update Report Statutory Requirements and Legal Memo

Note from California High-Speed Rail Chief Counsel

DATE: August 15, 2025

TO: File

FROM: Thomas Fellenz, Acting Chief Counsel

SUBJECT: Review of Supplemental 2025 Project Update Report

As part of the process of following the statutory requirements for producing the Authority's supplemental 2025 Project Update Report, I have reviewed the supplemental 2025 Project Update Report and Appendix. The Authority's cost and schedule estimates, update on operating agreements, ridership and additional milestones required, have been revised and provided in this report. I confirm that other elements required pursuant to CA Public Utilities Code section 185033 are included therein as indicated in the following tables.

A handwritten signature in brown ink that reads "Thomas C. Fellenz". The signature is fluid and cursive, with the first name "Thomas" and last name "Fellenz" clearly legible, and "C." as a small initial.

Thomas Fellenz
Acting Chief Counsel
California High-Speed Rail Authority

The California High-Speed Rail Authority prepares a biennial report to the California State Legislature on the status of the program. This report, which is submitted in odd-numbered years, is known as the Project Update Report.

The requirements for submission of a biennial Project Update Report were updated in June 2015 (AB 95) and require that on or before March 1, 2017, and every two years thereafter, the Authority provide a Project Update Report, approved by the Secretary of Transportation, to the budget committees and the appropriate policy committees of both houses of the Legislature. AB 95 added a new Section 185033.5 to the Public Utilities Code to specify the information that Project Update Reports are required to provide to the Legislature.

The requirements for submission of a biennial Project Update Report were updated again in June 2022 (SB 198). SB 198 added a new Section 185033.7 to the Public Utilities Code to specify additional information that Project Update Reports and Business Plans are required to provide to the Legislature.

The Authority is also required to prepare and submit business plans to the Legislature, also on a biennial basis, in even-numbered years. Together, these two reports fulfill the requirements of Government Code 16724.4 which relates to annual reporting requirements associated with voter approved bond measures.

As set forth in Section 185033.5, "On or before March 1, 2017, and every two years thereafter, the Authority shall provide a project update report, approved by the Secretary of Transportation and consistent with the criteria in this section, to the budget committees and the appropriate policy

committees of both houses of the Legislature, on the development and implementation of intercity high-speed train service pursuant to Section 185030. The report, at a minimum, shall include a program wide summary, as well as details by project section, with all information necessary to clearly describe the status of the project, including, but not limited to, all of the following:

- (A) A summary describing the overall progress of the project.
- (B) The baseline budget for all project phase costs, by segment or contract, beginning with the California High-Speed Rail Program Revised 2012 Business Plan.
- (C) The current and projected budget, by segment or contract, for all project phase costs.
- (D) Expenditures to date, by segment or contract, for all project phase costs.
- (E) A comparison of the current and projected work schedule and the baseline schedule contained in the California High-Speed Rail Program Revised 2012 Business Plan.
- (F) A summary of milestones achieved during the prior two-year period and milestones expected to be reached in the coming two-year period.
- (G) Any issues identified during the prior two-year period and actions taken to address those issues.
- (H) A thorough discussion of risks to the project and steps taken to mitigate those risks."

Senate Bill 198 - Delivery Schedules

In 2022, SB 198 modified the requirements for the information that is to be included in the Project Update Report. SB 198 added a new Section 185033.7 to the Public Utilities Code, and this new section specified that a set of delivery schedules be added to the Project Update Report.

As set forth in Section 185033.7“(b) (1), As part of the project update report that is due on or before March 1, 2023, pursuant to Section 185033.5, the authority shall develop schedules related to the delivery of all of the following tasks:

(A) Completion of the 119-mile dual track segment from Madera to Poplar Avenue, which means Avenue 19 in the County of Madera to one mile north of the Tulare-Kern County line southward to north of Bakersfield, currently near Poplar Avenue.

(B) Completion of right-of-way, planning, and advance engineering for extensions to Merced and Bakersfield.

(C) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail Commission, and the authority that details the role of each in planning, constructing, and funding the connection in the City of Merced.

(D) Completion of an agreement or agreements between the state, the San Joaquin Joint Powers Authority, the San Joaquin Regional Rail

Commission, and the authority covering the planning, funding, and operation of the proposed high-speed rail services from Merced to Bakersfield and the authority and approval for the San Joaquin Joint Powers Authority to contract for the operation of the high-speed rail services.

(E) Provision of an updated cost estimate with a stated probability level, or levels, of its ongoing contracts and for the work it is funding and managing that is required to complete the Merced to Bakersfield segment extensions.

(F) Completion of a funding plan that includes any additional federal funding awards for the Merced to Bakersfield segment.

(G) Additional milestones required for the completion of the Merced to Bakersfield segment and the full Phase 1 System pursuant to subparagraphs (A) to (F), inclusive.

(2) The delivery schedules developed pursuant to paragraph (1) shall be included and updated in each subsequent business plan adopted pursuant to Section 185033 and project update report prepared pursuant to Section 185033.5.”

Senate Bill 198 - Cost and Funding

In 2022, SB 198 modified the requirements for the information that is to be included in the Project Update Report. SB added a new Section 185033.7 to the Public Utilities Code, and this new section specified that a set of cost and funding requirements be added to the Project Update Report.

As set forth in Section 185033.7 “(c) (1), In order to demonstrate reasonable likelihood of adequate funding to complete the Merced to Bakersfield segment, the authority shall provide all of the following information in the project update report that is due on or before March 1, 2023, pursuant to Section 185033.5:

(A) Estimated and actual civil works costs of the Merced to Bakersfield segment.

(B) Estimated and actual right-of-way, acquisitions, utilities, and other third-party agreement costs.

(C) Estimates of contract costs, including contingencies to cover change orders.

(D) Other costs, estimated and actual, including, but not limited to, rolling stock, interim use, and stations.

(E) Costs reported in a manner than can be comparable across reports.

(F) Updates on the Authority’s progress on achieving project milestones, as established in the project update report or the business plan adopted pursuant to Section 185033.

(G) Funding commitments beyond the Merced to Bakersfield segment, and spending to meet those commitments to date, including funding sources used to meet identified funding commitments.

(2) The information specified in paragraph (1) shall be included and updated in each subsequent business plan adopted pursuant to Section 185033 and project update report prepared pursuant to Section 185033.5.”

Appendix B: Merced – Bakersfield Ridership, Revenue, Cost and Schedule

Analysis

This appendix addresses statutory requirements related to the Merced – Bakersfield project segment. In the **March 2025 Project Update Report** (PUR), the California High-Speed Rail Authority (Authority) committed to releasing an updated project schedule including the new procurement sequencing plan, updated capital costs that incorporate revised engineering and financial assumptions, and updated ridership and revenue figures based on the refined model.

speeds up to 220 miles per hour. This 171-mile EOS was never intended to operate as a stand-alone system; rather, it was designed to demonstrate the early benefits of high-speed rail while the broader statewide network was being built. That vision depended on improved connecting services, such as Altamont Corridor Express (ACE) and San Joaquins, to deliver passengers to and from Merced.

The Authority conducted an updated analysis to reassess the value of the proposed Merced – Bakersfield segment. The resulting updated projections are shown in **Table B.0**.

Ridership and Revenue

The original strategic vision for the Merced – Bakersfield high-speed rail early operating segment (EOS) assumed the availability of supporting infrastructure necessary to run hourly service at

Table B.0: Merced to Bakersfield 2030 Net Proceeds Outlook (\$ in millions)

Passenger Revenue*	Ancillary Revenue Net Income	Operations and Maintenance	Recovery Ratio
\$39.28 to \$55.60	\$15.99 to \$34.02	\$120.60 to \$122.10	45.27% to 74.31%

Note: Figures are in 2024 tax dollars.

*Passenger revenue is based on projected annual high speed rail ridership figures of 1.6 million to 2.2 million. These projections are for high-speed service and do not consider other projections from connecting services, which would be expected to see their revenue and ridership increase (in the case of the San Joaquin Joint Powers Agency) due to connecting with the high-speed rail segment.

This updated analysis underscores the need to consider alternative delivery options for the high-speed rail system.

Although the original vision for Merced – Bakersfield is not projected to be self-sustaining under current conditions, the 171 miles of infrastructure in the Central Valley provide a strong foundation for improving statewide rail connectivity and are essential for future system expansion. Improving existing services through temporary utilization of this completed segment could significantly increase ridership and revenue while reducing short-term operating and maintenance costs.

Innovative approaches have the potential to improve cost recovery, reduce emissions, and strengthen the state's ability to support rail service financially. The Authority looks forward to collaborating with the California State Transportation Agency (CalSTA) and other state partners to identify the most effective strategies to achieve an interconnected, efficient, and financially sustainable rail network for California. Findings and updates from these discussions are expected to be included in a future Business Plan.

Cost-Saving Opportunities

The Authority is dedicated to maximizing resource efficiency in project delivery, leveraging existing expertise and investments to optimize the use of limited resources and funds, as outlined in the March 2025 PUR.

Recognizing the importance of aligning the project's scale with realistic expectations and current economic conditions, the Authority's new leadership has prioritized efforts to optimize and streamline all elements of the high-speed rail design requirements and sequencing of delivery. This approach ensures the Authority avoids over-designing or over-building while maintaining the essential performance and safety standards of the system and delivering assets sooner.

The Authority's primary goal is to complete the current construction packages and progress quickly to track laying, rail systems, and operations. With 119 miles of civil works nearing completion, advanced design taking place on extensions and stations, and the railhead construction project close to completion, the Authority is well positioned to achieve this goal.

Management strategies to ensure the Authority remains on track to meet this goal include:

- **Initial Track Infrastructure:** Near-term schedule and cost savings can be realized by using an optimized track schematic, under which track configuration is determined based on delivering full operational utility while reducing costly redundancies.
- **Station Development:** By adopting a phased approach to station development, the Authority optimizes costs and schedule while prioritizing the fundamental functions of the rail system. This building block approach enables future expansion and customization of stations in response to increasing demand. The Authority will work with relevant stakeholders to adopt a phased approach to station development as the system expands.

- **Alignment Optimization:** The Authority strategically optimized the alignments in the Merced and Bakersfield extensions to enhance both construction efficiency and scheduling. This optimization was carefully designed to minimize impacts on utility and business relocations, thereby reducing costs and facilitating project advancement. Such efforts reflect a commitment to delivering effective infrastructure while managing potential disruptions and conserving resources. While certain changes will require review of previously identified environmental impacts and designs, the overall change does not adjust the environmental footprint and limits modifications to areas within the original footprint.
- **Redesign of Elevated Structures:** A redesign of the elevated structures in the Bakersfield extension was done, resulting in lowering the sections of viaducts and eliminating elevated structures for innovative crossing solutions. This modification significantly reduced construction times and costs while maintaining the necessary performance and safety standards.
- **Construction Package (CP) Completion:** Under new leadership, the Authority is implementing a detailed forensic approach to evaluate all open change order claims related to two civil contracts, CP 1 and CP 2-3, in the Central Valley. This aims to reach fast resolutions to close out remaining risks and open issues. The Authority set a deadline of December 2026 for completion of CP 1 and CP 2-3 for all work necessary to get track laying moving sooner.
- **Multiple Award Task Order Contract (MATOC):** Implementation of a MATOC, a type of Indefinite Delivery Indefinite Quantity bench contract, allows the Authority to utilize a pool of small and large business contractors on a task order basis. By leveraging a MATOC, the Authority can access highly qualified and readily available experts to support a collection of projects and tasks, which is essential for large programs such as high-speed rail. This will also allow a more streamlined approach to procure a wide range of construction with flexibility and efficiency, ensuring competitive pricing while supporting local small businesses along the alignment.
- **California Environmental Quality Act (CEQA Exemptions):** On June 30, 2025, Governor Gavin Newsom signed Senate Bill 131, which contained targeted CEQA streamlining for high-speed rail stations and maintenance facilities, streamlining the approval process by reducing environmental review requirements. This action will lead to quicker project implementation, lower costs, and minimized delays, facilitating the timely development of essential infrastructure while still ensuring environmental considerations are addressed. Additionally, with less risk and shorter project timelines, developers can more confidently invest in the project.
- **Bottom-Up Estimating Methodology:** To improve accuracy and robustness, the Authority completed a bottom-up estimation using more precise engineering estimates of build quantities, unit costs related to geographical areas of construction, and clearer definitions of work scopes based on construction completed so far. All work packages were broken out with

clear definitions of work scopes, assumptions, cost basis, and estimation references. This realistic and optimized estimate incorporates efficiencies from the Authority's revised early works program, direct procurement initiative, and the revised Design Criteria Manual (see **Appendix I**). This bottom-up estimation will provide a more robust baseline to monitor, evaluate, and control any future estimation updates, tracing them back to changes in assumptions, scopes, or unit costs. The Authority believes the current bottom-up cost estimation lends greater confidence in the costs developed for this update.

■ **Additional Legislative Support Measures:**

As outlined in Chapter 2, the Authority recommends additional project acceleration measures that would create more certainty for project delivery timelines.

Capital Cost Estimates

The Merced – Bakersfield segment is now estimated to cost \$36.75 billion. Through resequencing work, refining design criteria, and adopting innovative engineering methods, the Authority was able to offset \$14.28 billion in cost increases, which is approximately a 30 percent cost-savings. Without the program reassessment, scope increases, inflation (bringing prices from 2022 to 2024) and added cost and contingency for the Central Valley would have increased the Merced – Bakersfield segment costs to approximately \$51 billion. Despite these management improvements, there are new risks impacting cost estimates, including ongoing tariff and trade wars. For example, just recently the Trump Administration unveiled 50 percent tariffs on copper products but not on the raw material itself.¹ Reciprocal tariff rates continue to evolve and deadlines for trade deals constantly changing has created uncertainty for future prices.

The 2024 Business Plan estimated the cost to deliver the Merced – Bakersfield segment at \$35.3 billion at a confidence level of 65 percent. It's important to note the 2024 Business Plan carried over numbers from the 2023 PUR without any updates.

In addition, the Authority changed its methodology for capital costs estimating. The Authority used a bottom-up methodology to create more certainty in the cost estimate (before risk and inflation). This approach, using more precise engineering estimates of build quantities, unit costs related to geographical areas of construction, and clearer definitions of work scopes, provides a higher degree of certainty in the cost elements of the project. This will allow the Authority to better manage delivery within the stated budget values given the confidence level. With improved estimates, the Authority is now setting its project budgets at a confidence level of 30 percent, while maintaining an overall program-wide budget at the 65 percent confidence level.

To manage risk and reduce costs, the Authority is deploying multiple strategies, including:

- Direct procurement of key commodities,
- Early acquisition of priority right-of-way and utility relocations,
- Use of smaller contracts for early works, and
- Exploration of private sector delivery models to accelerate track installation.

Table B.1 provides a detailed cost breakdown of the 119-mile Central Valley Segment (CVS) currently under construction, and **Table B.2** provides a detailed cost breakdown of the Merced – Bakersfield segment.

Table B.1: 119-Mile CVS Capital Cost Estimates (in millions, YOES)

Scope Element	BP 2024*	2025 PUR Estimate	Expenditures**
Central Valley Segment			
Central Valley Construction	10,118	11,334	8,241
Central Valley Right-of-Way	1,941	1,857	1,533
State Road Projects (SR99 & SR46)	397	468	316
Track & Systems	3,813	2,238	23
Commodities		507	0
Project Reserve	46	46	0
Interim Use	162	162	54
Unallocated Contingency	410	318	0
Subtotal Central Valley Segment Construction:	16,886	16,930	10,166
Project Development, Management, and Support	177	177	177
Program Wide Support and Other	1,199	2,091	910
Total Central Valley Segment:	18,262	19,198	11,253

*BP 2024 was shown with a higher level of contingency compared to the 2025 PUR estimate, which is shown with a more commercially reasonable contingency level.

**"Total Expended" shown above is through May 2025 (based on the Capital Outlay Budget and Expenditures Report July 2025).

Table B.2: Merced – Bakersfield Capital Cost Estimates (in millions, YOE\$)

Scope Element	BP 2024*	2025 PUR Estimate	Expenditures**
Merced to Bakersfield			
Central Valley Segment	18,262	19,198	11,253
Project Development Balance	127	127	127
Merced Extension	3,563	3,177	85
Merced Extension Utility Relocation	333	336	0
Merced Extension Right-of-Way	565	555	2
Bakersfield Extension	2,618	3,135	64
Bakersfield Extension Utility Relocation	149	396	0
Bakersfield Extension Right-of-Way	492	739	3
Stations	1,237	1,051	52
Track & Systems Balance	3,025	1,302	0
Commodities Balance		176	0
Solar and Utility Interconnection	230	75	0
Trainsets (6 total)	561	465	0
Maintenance Facility and Driving Simulator	418	373	0
Program Wide Support and Contingency Balance	1,396	1,550	555
Subtotal Merced to Bakersfield:	32,976	32,654	12,141
Project Development Balance (Phase 1)	559	543	523
Program Wide Support and Other	490	2,254	330
Bookend	1,298	1,298	819
Total:	35,323	36,750	13,813

*BP 2024 was shown with a higher level of contingency compared to the 2025 PUR estimate, which is shown with a more commercially reasonable contingency level.

**"Total Expended" shown above is through May 2025 (based on the Capital Outlay Budget and Expenditures Report July 2025).

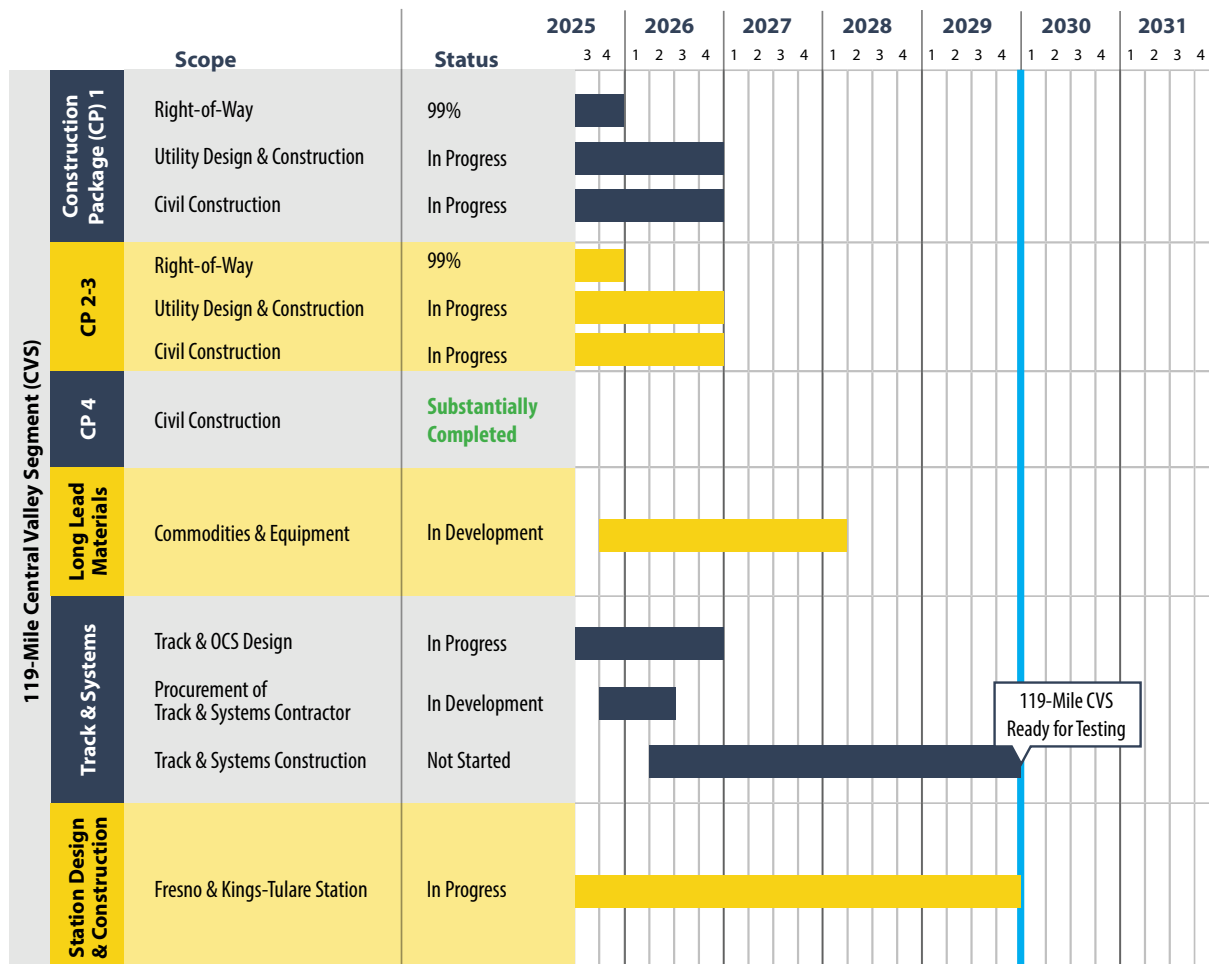
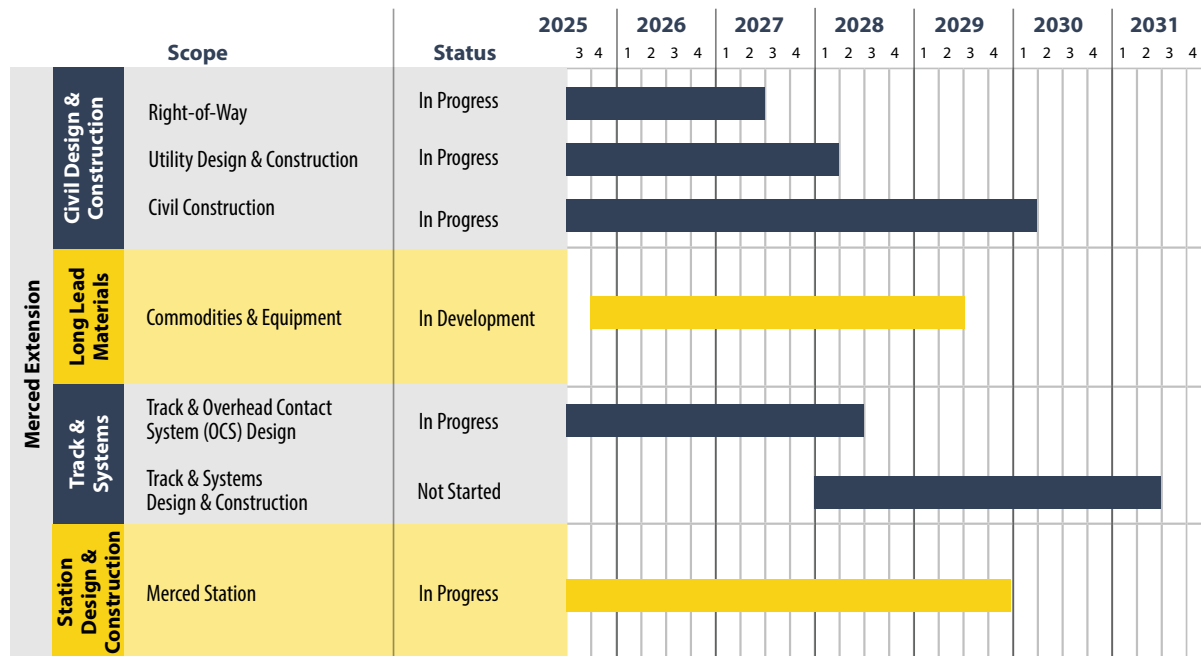
119-Mile Central Valley Segment and Merced – Bakersfield Extension Project Schedule

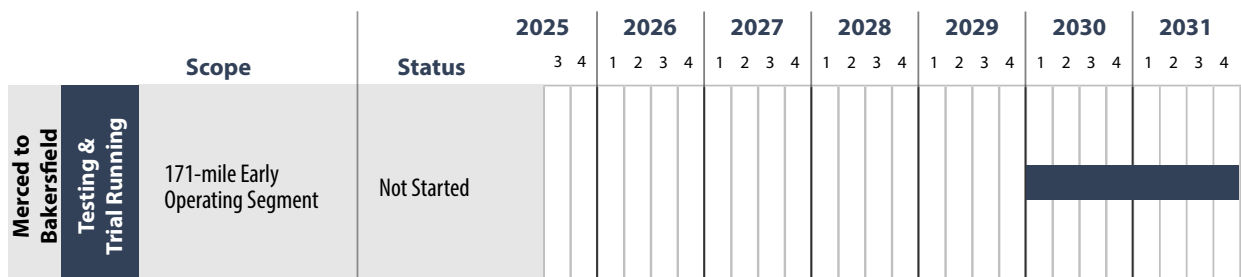
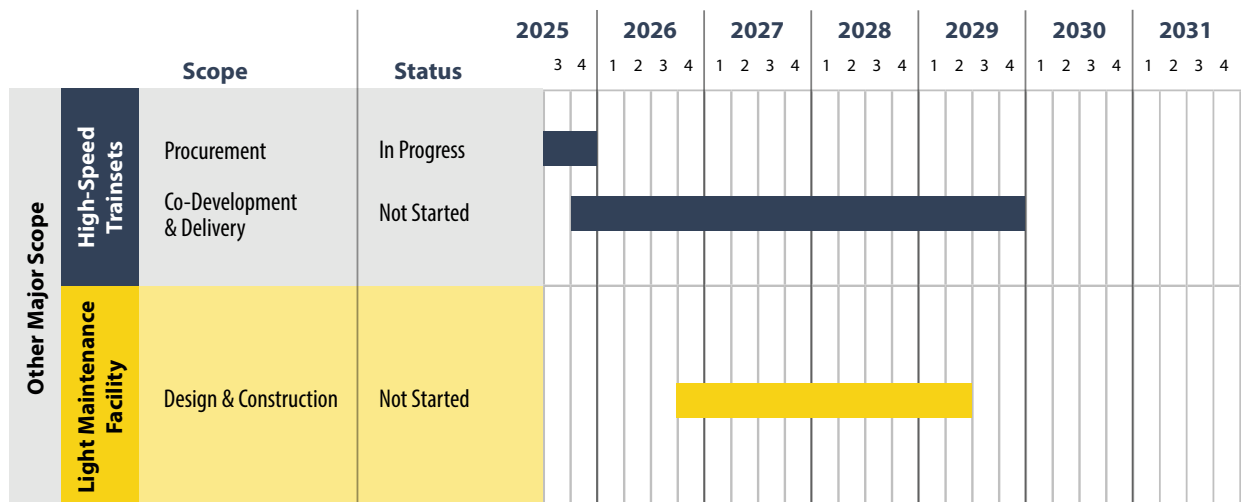
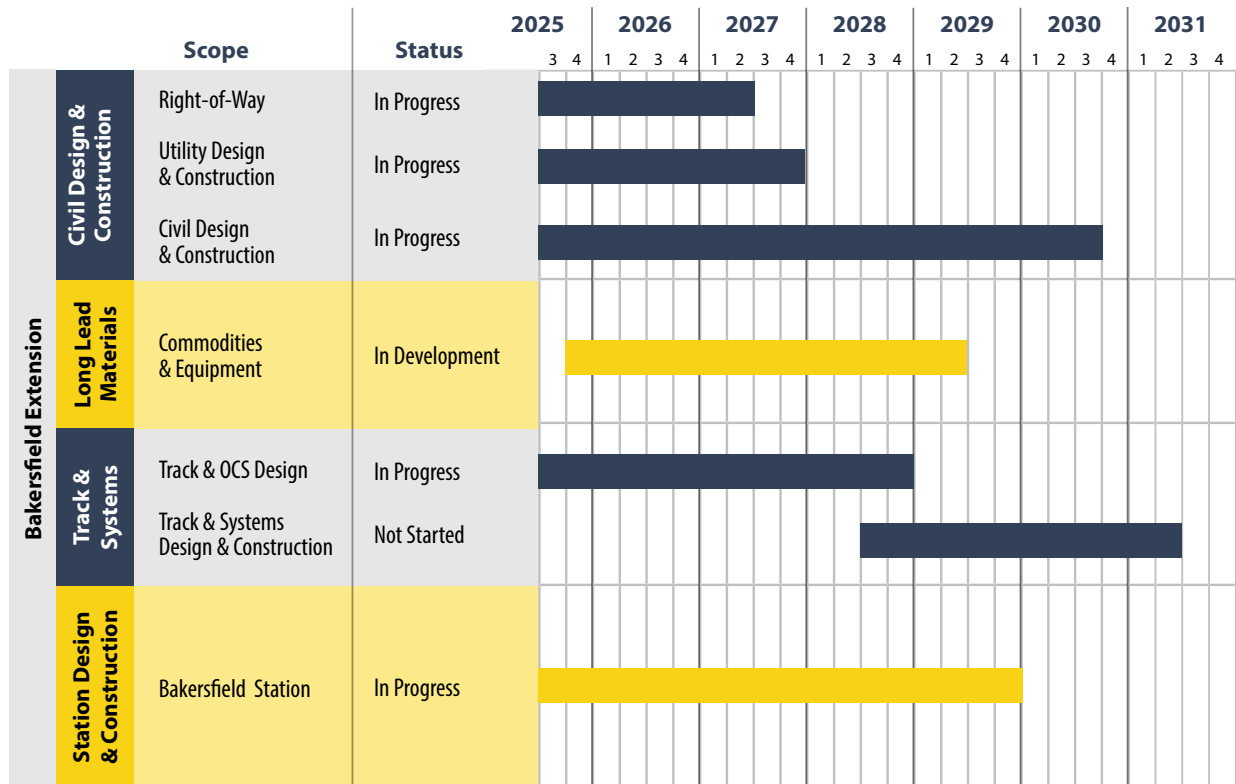
The program baseline schedule was strategically enhanced through an integrated approach that combines collaborative planning sessions, risk management workshops, and in-depth analysis of progress metrics, challenges encountered, and lessons learned. This comprehensive reassessment yielded an optimized schedule with a more efficient design and construction sequence, improved third-party coordination, proactive management of early work elements such as right-of-way acquisition and utility relocation, and a more resilient procurement and delivery strategy.

This optimized schedule for the 119-mile CVS and the Merced – Bakersfield extensions, as shown in **Exhibit B.0**, not only streamlines project delivery but also significantly reduces exposure to delays and cost escalations. The refinements allow for better integration across multiple project interfaces and enhance the Authority's ability to meet delivery milestones with greater confidence.

Key initiatives driving this schedule optimization include:

- **Design Optimization and Value Engineering:** Targeted design enhancements and value engineering efforts are geared to simplify construction methodologies, improve constructability, and shorten installation durations. These refinements may also mitigate potential field execution risks and align design deliverables more effectively with construction sequencing.
- **Accelerated Right-of-Way Acquisition and Utility Relocation:** By prioritizing the acquisition of critical right-of-way parcels and advancing the resolution of utility conflicts, the project will mitigate key risks to the critical path. This approach ensures early works are completed ahead of major construction activities, avoiding bottlenecks and costly rework.
- **Strengthened Risk Management Framework:** A robust, data-driven risk management process will be implemented to proactively address project uncertainties. Mitigation strategies will be put in place to manage long lead material procurement, enhance third-party collaboration (including local jurisdictions and regulatory bodies), and optimize packaging and timing of procurement activities to better align with market conditions and construction readiness.

Exhibit B.O: 119-Mile Central Valley Segment and Merced and Bakersfield Extension Timeline for Major Scope Items



Parallel Procurement Advancement

To ensure project momentum is uninterrupted and flexibility is maximized, the Authority continues to advance multiple procurements concurrently. Each procurement is structured to facilitate seamless integration, or transition into a Preliminary Development Agreement (PDA) with the private sector (PDAs) are used to introduce a private entity into a public-private partnership project, allowing them to develop a project proposal and establish a collaborative framework with the public entity) or other delivery methodologies if selected. Key ongoing procurement activities include:

- **Track and Systems:** Procurement processes for track and systems infrastructure are actively advancing and are structured to enable efficient transfer or integration into PDA arrangements, including the supply of long-lead materials such as ballast, rail, ties, overhead catenary wire, and traction power substations.
- **High-Speed Trainsets:** The ongoing trainsets procurement, with an estimated execution date of December 1, 2025, includes a recently released addendum clarifying scope and schedule adjustments that support potential PDA integration, ensuring alignment with developer-driven solutions and innovative technical requirements.
- **Equipment Purchase:** Proactive procurement initiatives are underway to secure essential equipment, thereby reducing the risk of delays. This includes pre-purchasing critical equipment that may be provided to future developers, ensuring availability and cost savings.
- **Material Procurement:** The Authority is actively engaging with material suppliers to guarantee timely availability of essential

construction and operational materials. Direct procurement initiatives aim to streamline supply chains and reduce cost escalation due to market fluctuations.

This parallel procurement strategy enables the Authority to swiftly pivot between delivery methodologies, safeguarding project timelines and ensuring seamless progression toward delivering the high-speed rail system.

Operational Agreements

As the Authority continues construction on the 171-mile Merced – Bakersfield early operating segment, it is imperative to reevaluate the operational agreement framework to address the impact of decreased ridership projections and increased capital expenditures. Discussions with CalSTA and San Joaquin Regional Rail Commission (SJRR) will focus on developing updated operational agreements and responsibilities in accordance with state high-speed rail policy. The Authority and its partners have identified the following agreements that must be established prior to operation:

- Capital Cost Funding Agreements,
- Operating Costs Agreement,
- Alignment of Track and Systems, Rolling Stock, Power Supply and Station Maintenance Agreements,
- Railroad Asset Access and Use Agreement(s),
- Maintenance Contract Strategy – New Merced Assets,
- Interagency with Legal Framework Agreement,
- Service Agreements,
- Delegated In-House or Subcontract Service Provider Agreements,

- Infrastructure Lease Model and Specifications,
- Rolling Stock Lease Model and Specifications,
- Power Supply Lease Model and Specifications,
- Station Lease Model and Specifications, and
- Final Agreements.

The Authority intends to make more information available in a future Business Plan.

Status of Funding

Prior to the Administration's May 2025 Revision announcement and federal actions, the Authority was projecting total funds from all sources through 2030 at \$28.16 billion. **Table B.3** provides a detailed line by line display of each funding source and value. The Authority previously identified a funding gap for the Merced – Bakersfield EOS, highlighted in the **2023 PUR** and the **California High-Speed Rail Office of Inspector General's Review of the 2023 PUR**.

In May, the Newsom Administration released a proposal to begin the discussions with legislative leaders on an extension to the Cap-and-Trade program and rename it to the Cap-and-Invest program. While the Administration and the Legislature work out the details on continuing this transformative program, this report provides funding estimates if the program is extended to 2045 with at least \$1.0 billion annually for this project. This new infusion of funding would provide the high-speed rail project with a

stable and predictable funding stream, which would enable the Authority to plan with greater certainty and deliver the project more efficiently. A guaranteed minimum funding level would also improve the project's ability to attract private capital and leverage additional funds up front, which would accelerate project delivery, lower long-term costs, and increase flexibility through alternative delivery methods.

This proposed minimum funding level, and 15-year extension would cover the costs to build the **Merced – Bakersfield** segment, effectively closing that funding gap.

However, a "Pay-Go" approach at a minimum of \$1.0 billion a year would not allow the Authority to complete the section by the planned construction schedule resulting in inflationary cost increases and potential new funding gap. Authority would need a mechanism to match timing of funding with capital expenditures and will work with the Administration and Legislature will need to examine what options exist to address any cash timing issues.

In June 2025, under the Trump Administration, the Federal Railroad Administration (FRA) completed a federal grant compliance review and, on July 16, 2025, issued a decision to terminate the cooperative agreements for the Federal State Partnership and FY10 grants, even though no fraud, waste, or abuse was identified. On July 17, 2025, the Authority filed a lawsuit in federal court challenging FRA's decision to terminate the grant funding, asserting that the termination violates the Administrative Procedure Act because

it was arbitrary and capricious, and the asserted reasons were pretextual, reflecting the Trump Administration's hostility to California and the high-speed rail program. Since then, the Authority and the FRA have reached agreement that the obligated and contingent funds under both cooperative agreements will not be transferred to another grantee, except through a new Notice of Funding Opportunity, while litigation is pending.

While Administration and Capital Outlay Support funding and expenditures have been included in various other reports, the Authority is reflecting those totals in **Table B.3** to provide a more holistic view of all commitments against realized and forecasted Authority funding. In any future scenario, the Authority will need to identify a solution to funding administrative costs once the current statutory funding allocation is exhausted.

The Authority recognizes the importance of actively managing potential limitations to cashflow and is actively exploring innovative financing mechanisms to optimize the use of future Cap-and-Invest program funds for near-term expenditures. These efforts aim to maximize the impact of future Cap-and-Invest program revenues to ensure the program can maintain construction momentum and adhere to the Merced – Bakersfield segment construction timeline. With above strategies available to the Authority, the timing of cash outlays with expenditures can be managed.

Table B.3: Summary of Total Baseline Funding Available and Total Funds Expended (\$ in billions)

Funding Source	Total Funding A	Total Expended*** B	Total Remaining C = A - B
Federal Funds			
ARRA Construction	2.09	2.08	0.01
ARRA Planning	0.47	0.47	0.00
FY 10 + Brownfields + RAISE FY 21	0.95	0.00	0.95
New IIJA Federal Grants (Fed-State + RAISE FY 22 & FY 23 + CRISI + Corridor ID)	3.32	0.03	3.30
New RCE FY 23-24	0.09	-	0.09
State Funds			
Proposition 1A Project Development	0.61	0.61	0.00
Proposition 1A Central Valley Segment Construction	6.62	6.19	0.43
Proposition 1A Bookends	1.10	0.62	0.48
Proposition 1A Capital Outlay Support	0.22	0.22	0.00
Proposition 1A Administration	0.45	0.23	0.22
Cap-and-Trade Received through May 2025	7.91	3.91	4.00
Subtotal	23.83	14.36	9.47
Future Cap-and-Invest (\$1.0B/yr, through 2030)	5.50	-	5.50
Subtotal through 2030*	29.33	14.36	14.97
Reserved for Capital Outlay Support	-0.72	-0.32	-0.40
Reserved for Administration	-0.45	-0.23	-0.22
Available Total Capital Funding Through 2030	28.16	13.81	14.35
Potential Future Cap-and-Invest (\$1.0B/yr, 2031 to 2045) **	15.00	-	15.00
Available Total Through 2045	43.16	13.81	29.35

Notes: Totals may not sum due to independent rounding

* The above "Subtotal through 2030" reflects funding amounts available for capital expenditure, including previously appropriated funds, actual auction proceeds through May 2025, and an estimate of the Authority's share of future Cap and Invest auction proceeds at \$1.0 billion per year through December 2030.

** The above "Future Cap-and-Invest" funding assumes \$1.0 billion per year from August 2025 to December 2030.

*** "Total Expended" shown above is through May 2025 (based on the Capital Outlay Budget and Expenditures Report July 2025).

MERCED – BAKERSFIELD AND OTHER PROGRAM COMMITMENTS: DETAILED FUNDING PLAN

With the changes since Business Plan 2024, the Authority has developed a detailed funding plan

by providing scope categories, 2024 Business Plan funding status, changes since 2024 and the plan for funding the scope going forward. The results are prepared in table below, **Table B.4.**

Table B.4: Merced – Bakersfield Funding Plan

Scope	2024 Business Plan	Change	Detailed Funding Plan
Phase 1 Environmental Clearance, Bookends, and Program Wide Support	Funded	None	Funded with Prop 1A and Cap-and-Invest Existing Funds
119 m Mile Central Valley Segment	Funded	FY10 Grant Funding – Contested	Prevail on FY10 Grant Funding Dispute Alternative: Backfill with Cap-and-Invest Existing Funds
Merced Extension Scope Under FSP Grant	Funded	FSP Grant Funding – Contested	Prevail on FSP Grant Funding Dispute Alternative: Proposed funding from Cap-and-Invest Funds
Bakersfield Extension Scope Under FSP Grant	Funded	FSP Grant Funding – Contested	Prevail on FSP Grant Funding Dispute Alternative: Proposed funding from Cap-and-Invest Funds
Fresno Station Scope Under FSP Grant	Funded	FSP Grant Funding – Contested	Prevail on FSP Grant Funding Dispute Alternative: Proposed funding from Cap-and-Invest Funds
Trainsets & Facilities	Funded	FSP Grant Funding – Contested	Prevail on FSP Grant Funding Dispute Alternative: Proposed funding from Cap-and-Invest Funds
Merced Extension Civil Construction	Unfunded	None	Proposed to fund with Cap-and-Invest Funding
Bakersfield Extension Remaining Civil Construction	Unfunded	None	Proposed to fund with Cap-and-Invest Funding
Kings/Tulare Station Construction	Unfunded	None	Proposed to fund with Cap-and-Invest Funding
Merced Station Construction	Unfunded	None	Proposed to fund with Cap-and-Invest Funding
Bakersfield Station Construction	Unfunded	None	Proposed to fund with Cap-and-Invest Funding
Merced Extension Track and Systems	Unfunded	None	Proposed to fund with Cap-and-Invest Funding
Bakersfield Extension Remaining Track and Systems	Unfunded	None	Proposed to fund with Cap-and-Invest Funding

Appendix C: San Francisco – Palmdale Capital Cost, Net Revenue, and Project Schedules

The Authority is pleased to provide capital cost estimates for Gilroy to Palmdale, with a through service estimate to extend to San Francisco with a statewide blended approach, based on the scenarios presented in Chapter 1. Other project segments outside of this report have no additional design milestone advancements to report and the current estimates are the most up to date. However, the Authority will be reviewing project segments for additional efficiencies and update those project segments in a future Business Plan.

In addition, the Authority has identified several action areas to continue to improve the cost estimate of this project, see **Table C.4.** and more information on these efforts will also be provided in a future Business Plan.

Capital Costs

The 2024 Business Plan estimated the cost for extensions to Gilroy and Palmdale segments without a schedule to complete, bottom-up estimating, 15 percent design, and newly adopted optimized delivery strategies. Utilizing the Merced – Bakersfield advanced designs the potential growth in cost for those project segments would have driven the estimates up significantly more than what has is presented in **Table C.0** through **C3**. The same new management strategies have been adopted for resequencing work, refinement of design criteria, bottom-up estimating, and adoption of innovative engineering methods. By doing so, the Authority was able to offset potential significant cost growth in these project segments.

Table C.0: High-Speed Rail San Francisco – Gilroy – Bakersfield Capital Costs (\$ in millions)

Scope Element	2025 PUR Estimate	Expenditures**
Central Valley Segment	19,198	11,253
Madera to Wye & Bakersfield and Phase 1 Balance	11,487	2,560
Gilroy to Central Valley Wye	22,819	0
Subtotal Gilroy to Bakersfield:	53,504	13,813
San Francisco to Gilroy Blended Approach*	873	0
TOTAL:	54,377	13,813

*San Francisco to Gilroy Blended Approach Scope Element figures include station platforms and associated track and additional trainsets.

“Total Expended” shown above is through May 2025 (Capital Outlay Budget and Expenditures Report July 2025**).

Table C.1: High-Speed Rail San Francisco – Gilroy – Bakersfield (including Merced) Capital Costs
(\$ in millions)

Scope Element	2025 PUR Estimate	Expenditures**
Central Valley Segment	19,198	11,253
Madera to Wye & Bakersfield and Phase 1 Balance	15,119	2,560
Gilroy to Central Valley Wye	22,819	0
Subtotal Gilroy to Bakersfield:	57,135	13,813
San Francisco to Gilroy Blended Approach*	967	0
TOTAL:	58,102	13,813

*San Francisco to Gilroy Blended Approach Scope Element figures include station platforms and associated track and additional trainsets.

** "Total Expended" shown above is through May 2025 (based on the [Capital Outlay Budget and Expenditures Report July 2025](#)).

Table C.2: High-Speed Rail San Francisco – Gilroy – Palmdale Capital Costs (\$ in millions)

Scope Element	2025 PUR Estimate	Expenditures**
Central Valley Segment	19,198	11,253
Madera to Wye & Bakersfield and Phase 1 Balance	13,921	2,560
Gilroy to Central Valley Wye & Bakersfield to Palmdale	52,475	0
Subtotal Gilroy to Palmdale:	85,593	13,813
San Francisco to Gilroy Blended Approach*	1,528	0
TOTAL:	87,122	13,813

*San Francisco to Gilroy Blended Approach Scope Element figures include station platforms and associated track and additional trainsets.

** "Total Expended" shown above is through May 2025 (based on the [Capital Outlay Budget and Expenditures Report July 2025](#)).

Table C.3: High-Speed Rail San Francisco – Gilroy – Palmdale (including Merced) Capital Costs
(\$ in millions)

Scope Element	2025 PUR Estimate	Expenditures**
Merced to Bakersfield and Phase 1 Balance	36,750	13,813
Gilroy to Central Valley Wye	19,398	0
Bakersfield to Palmdale	26,392	0
Program Wide Other	6,684	0
Subtotal Gilroy to Palmdale:	89,225	13,813
San Francisco to Gilroy Blended Approach*	1,622	0
TOTAL:	90,847	13,813

*San Francisco to Gilroy Blended Approach Scope Element figures include station platforms and associated track and additional trainsets.

*** "Total Expended" shown above is through May 2025 (based on the [Capital Outlay Budget and Expenditures Report July 2025](#)).

Cost Savings Plan

While the Authority completed an exhaustive effort to re-evaluate the program, there are several additional potential savings opportunities that need more review to assess the viability of further reducing costs and risk while accelerating the delivery plan. Additional potential cost savings are shown in **Table C.4**.

The key initiatives include strategic early purchasing of right-of-way with a priority for urban areas that are more likely to take time and carry more risk, value engineering to reduce costs as designs are advanced, potential cost sharing on improvements to state and local road improvements, and other opportunities that may present themselves.

Table C.4: Cost Savings Plan for San Francisco – Gilroy – Palmdale Scenario (\$ in millions)

Scope Element	2025 PUR Estimate	Expenditures**
Gilroy to Palmdale		
Merced to Bakersfield and Phase 1 Balance	36,750	13,813
Gilroy to Central Valley Wye & Bakersfield to Palmdale	52,475	0
Subtotal Gilroy to Palmdale:	89,225	13,813
San Francisco to Gilroy Blended Approach*	1,622	0
TOTAL:	90,847	13,813

Savings Plan		
Targeted Cost Savings Plan Minimum	-5,000	
TOTAL:	85,847	13,813

*San Francisco to Gilroy Blended Approach Scope Element figures include station platforms and associated track and additional trainsets.

***"Total Expended" shown above is through May 2025 (based on the [Capital Outlay Budget and Expenditures Report July 2025](#)).

Net Revenue (Profit) Generated

The 40-year net revenue nominal values, derived from high, medium, and low ridership scenarios presented in **Tables C.5 to C.8**, are utilized to determine the net present value (NPV) at 2040, at 8 percent, 11 percent, and 14 percent discount rates of return for each project segment.

Table C.5: San Francisco – Gilroy – Bakersfield Potential Net Revenue Generated (\$ in millions)

	Nominal (YOE)	NPV (8%)	NPV (11%)	NPV (14%)
High	\$60,329	\$14,290	\$10,161	\$7,754
Medium	\$47,454	\$11,235	\$7,987	\$6,094
Low	\$28,825	\$6,729	\$4,763	\$3,621

Table C.6: San Francisco – Gilroy – Bakersfield (including Merced) Potential Net Revenue Generated (\$ in millions)

	Nominal (YOE)	NPV (8%)	NPV (11%)	NPV (14%)
High	\$58,706	\$13,935	\$9,914	\$7,570
Medium	\$45,896	\$10,877	\$7,735	\$5,904
Low	\$27,177	\$6,344	\$4,490	\$3,413

Table C.7: San Francisco – Gilroy – Palmdale Potential Net Revenue Generated (\$ in millions)

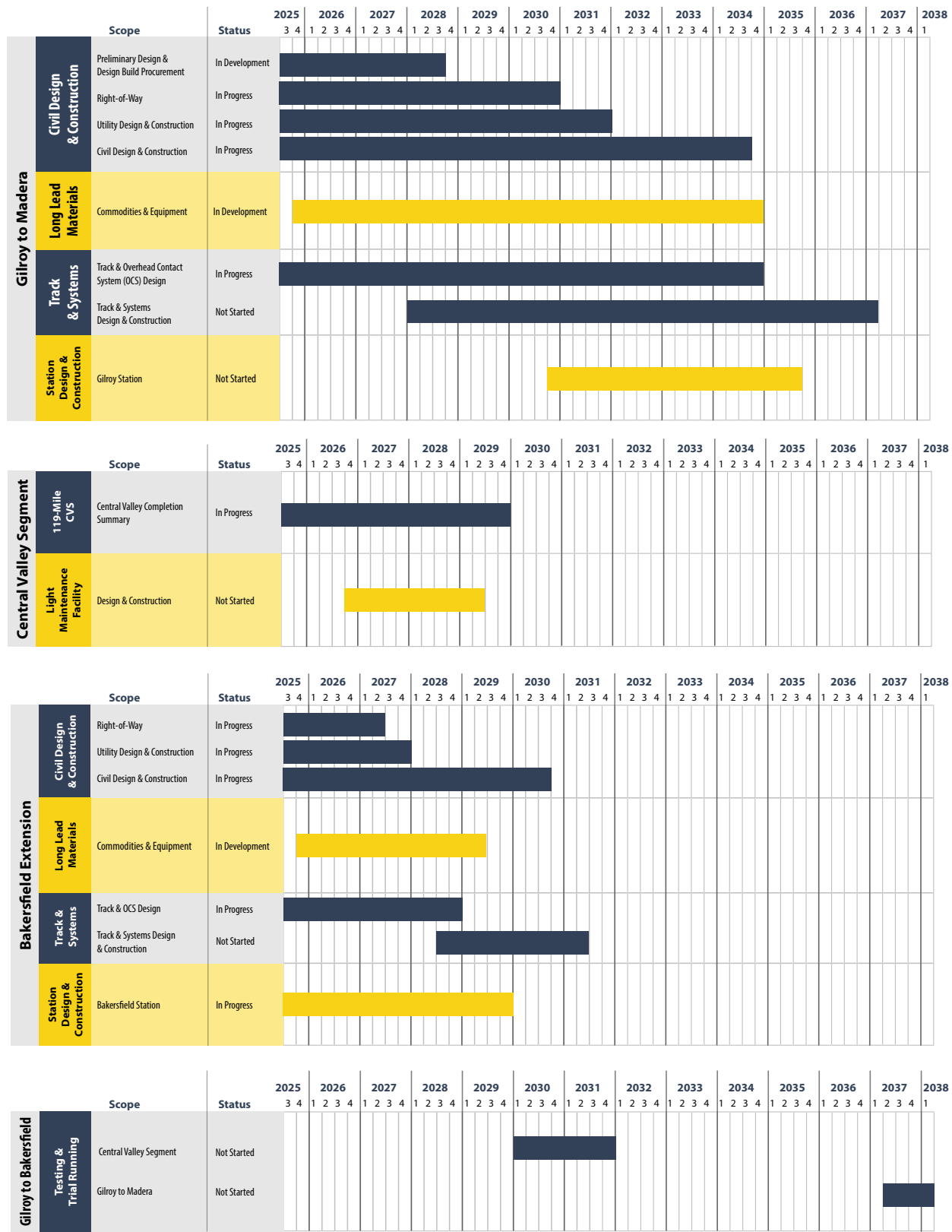
	Nominal (YOE)	NPV (8%)	NPV (11%)	NPV (14%)
High	\$117,318	\$27,845	\$19,812	\$15,127
Medium	\$98,122	\$23,270	\$16,552	\$12,635
Low	\$58,255	\$13,771	\$9,786	\$7,464

Table C.8: San Francisco – Gilroy – Palmdale (including Merced) Potential Net Revenue Generated (\$ in millions)

	Nominal (YOE)	NPV (8%)	NPV (11%)	NPV (14%)
High	\$115,792	\$27,506	\$19,575	\$14,949
Medium	\$96,804	\$22,952	\$16,325	\$12,461
Low	\$56,495	\$13,367	\$9,501	\$7,248

Project Schedules

Exhibits C.0 and C.1 provide an overview of the estimated schedule for design, construction, procurement, track and systems and track testing for Gilroy – Bakersfield and Gilroy – Palmdale segments. Schedules presume sufficient funding, and efficiencies are made available in 2025. Included in each scenario is a summarized timeline of the 119-mile Central Valley Segment (CVS). For a detailed 119-mile CVS timeline, see **Exhibit B.0**.

Exhibit C.0: Gilroy – Bakersfield Timeline for Major Scope Items

*If delivery of Merced extension is added, see Gilroy to Palmdale timeline for detailed Central Valley Wye and Merced extension build out schedule.

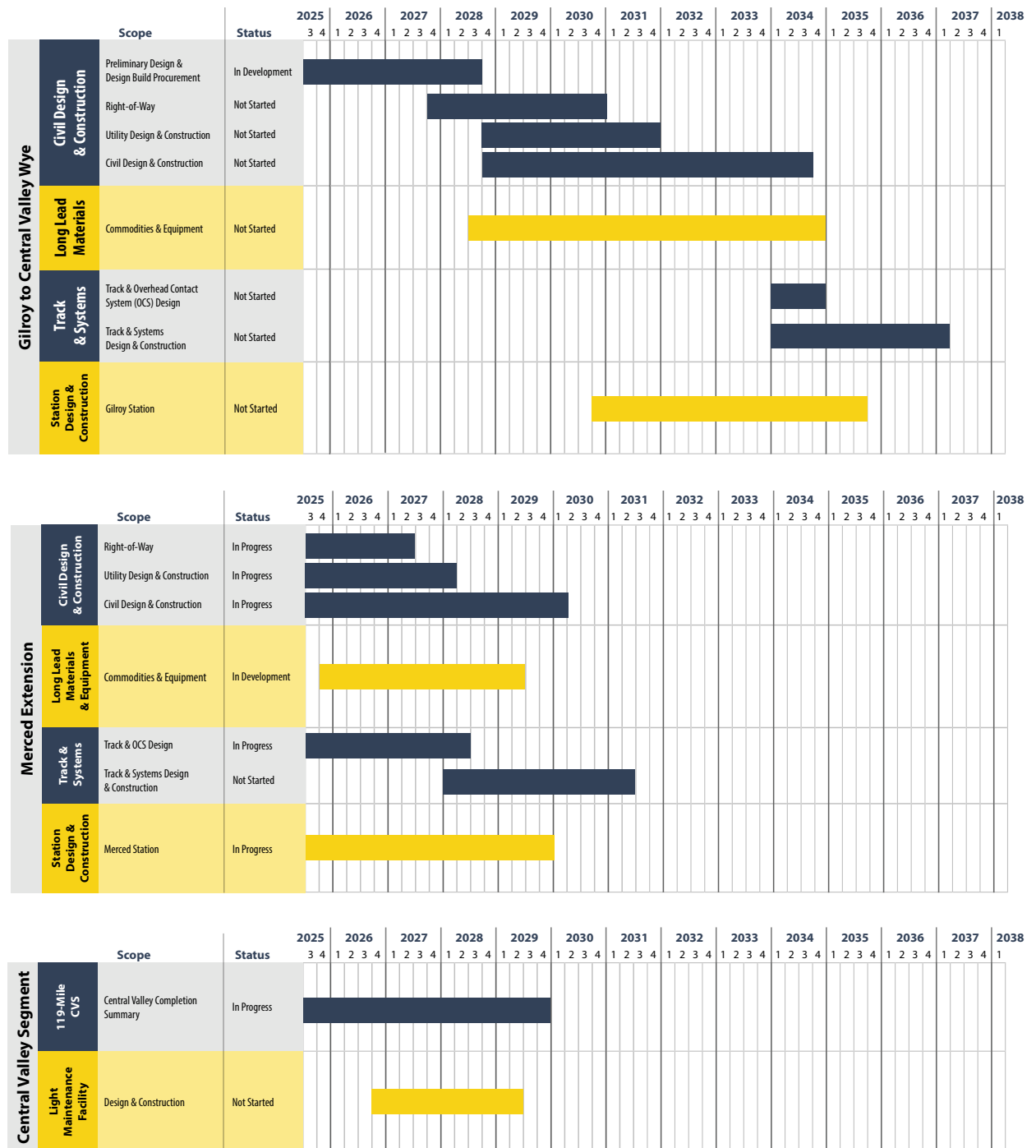
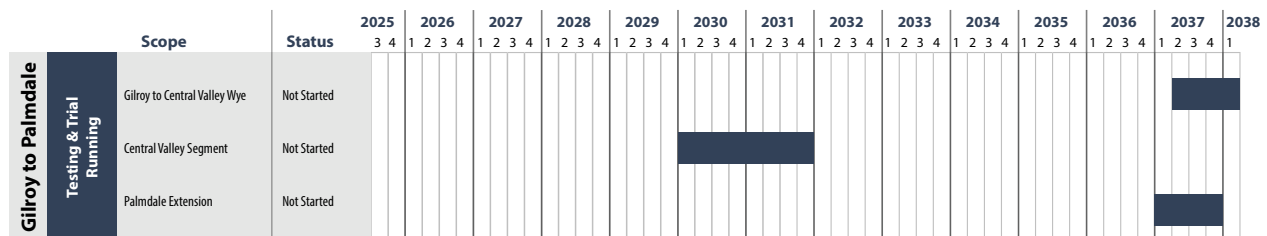
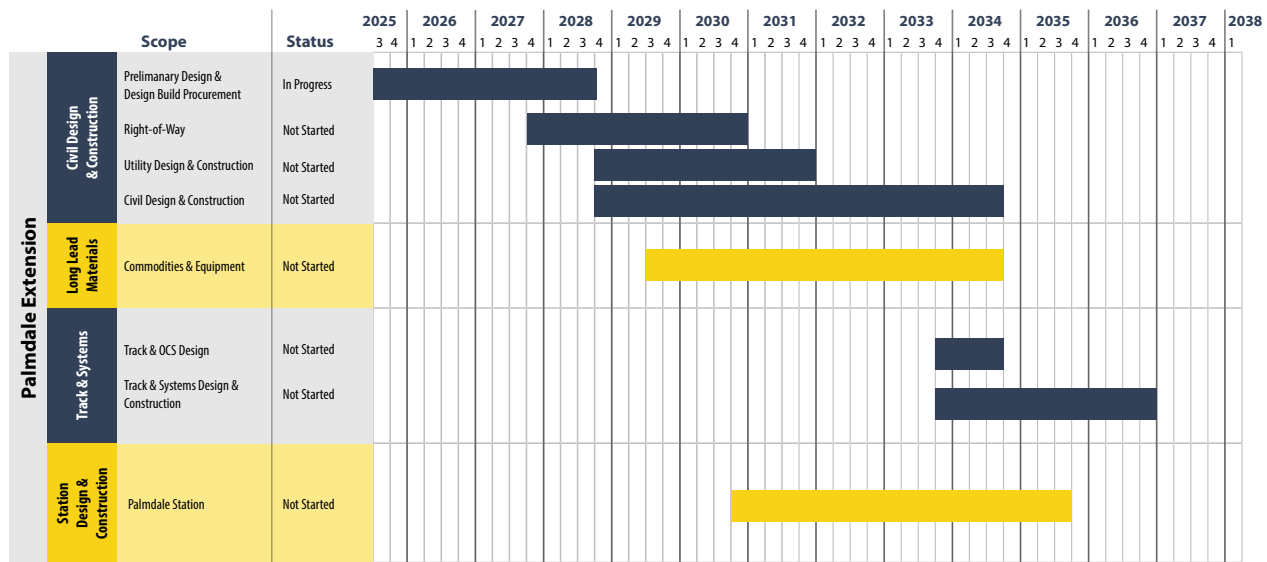
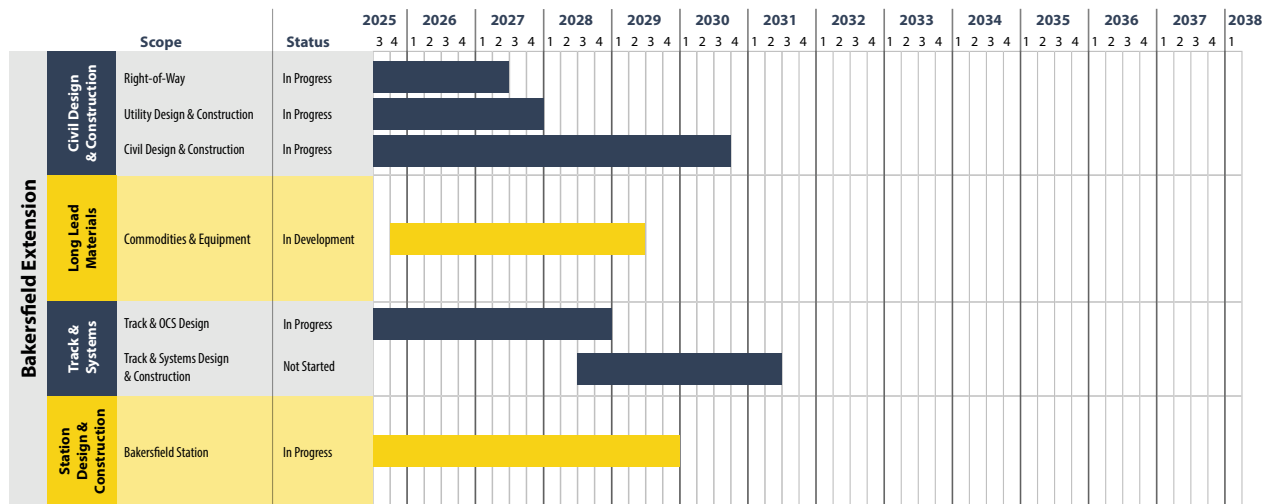
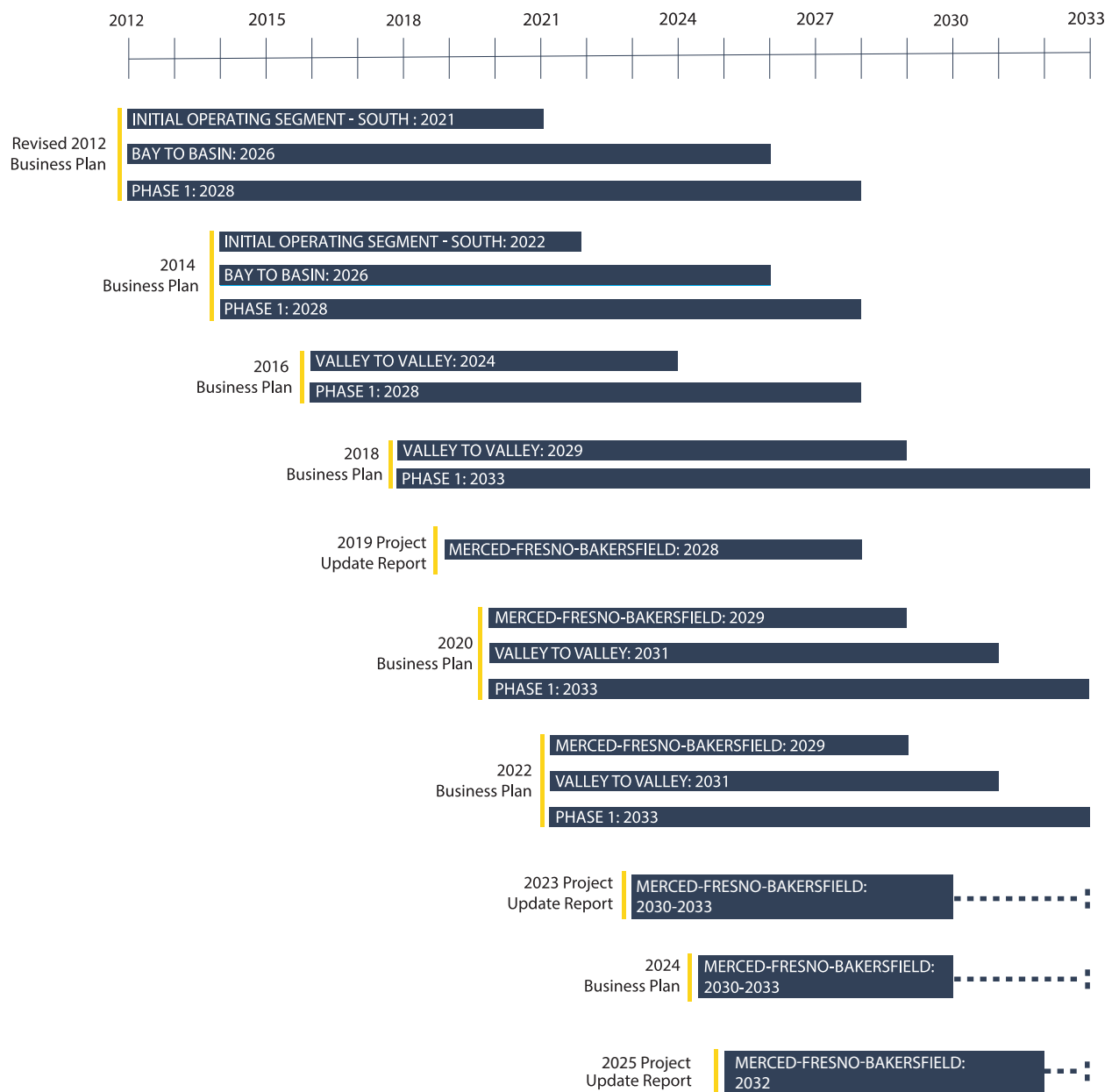
Exhibit C.1: Gilroy – Palmdale Timeline of Major Scope Items

Exhibit C.1: Gilroy – Palmdale Timeline of Major Scope Items

Appendix D: Schedule Comparison

Exhibit D.0 compares the baseline schedules from the Revised 2012 Business Plan to the 2025 supplemental Project Update Report.

Exhibit D.0: Comparison of Baseline Schedules Since 2012



Appendix E: Construction Package Progress for the 119-Mile Central Valley Segment

The Authority has transformed the Central Valley by constructing viaducts, overpasses, and underpasses for the initial 119-mile CVS high-speed rail track. This involved intricate engineering, logistical and legal coordination, and the daily efforts of as many as 1,700 workers, predominantly in Madera, Fresno, Kings, and Tulare counties. As of August 2025 reporting, a total of 55 structures and 70 miles of guideway are finished, alongside the successful completion of 1,572 utility relocations (86 percent) and the delivery of 2,275 parcels (99.3 percent) to design builders. The Authority provides updates of its progress in the Central Valley progress reports on the **[Finance & Audit Committee webpage](#)**.

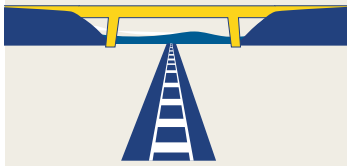
In the Central Valley, three construction packages are underway — one of which is substantially completed. The following maps provide a snapshot of the progress and status of the structures within each construction package along the 119-mile CVS.

STRUCTURES COMPLETED



21 of 33
64%

GUIDEWAY MILES COMPLETED



11 of 32
34%

UTILITY RELOCATIONS COMPLETED



820 of 992
83%

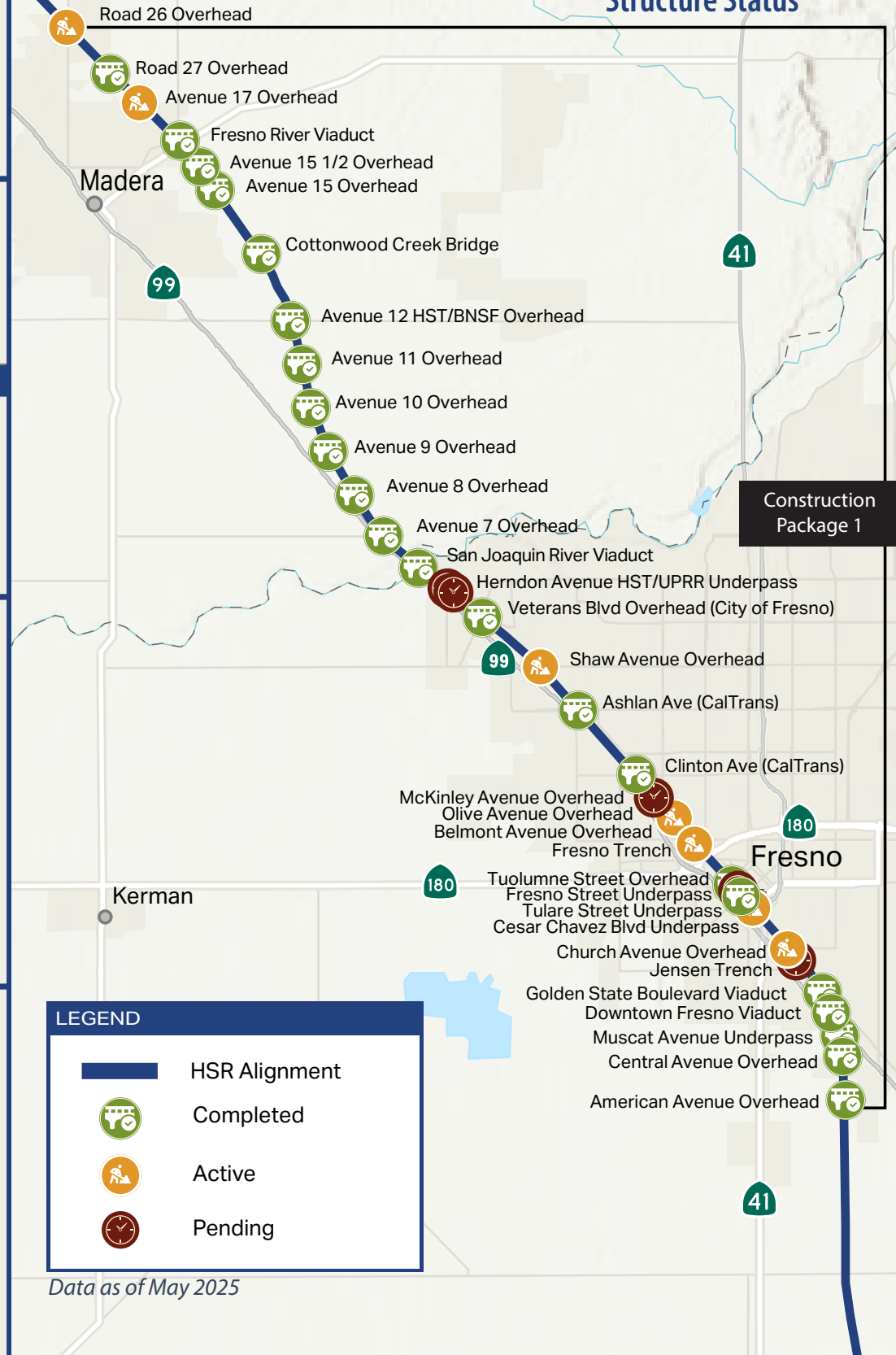
RIGHT OF WAY PARCELS DELIVERED



1,071 of 1,081
99%



CALIFORNIA High-Speed Rail Authority Construction Package 1 Structure Status



STRUCTURES COMPLETED



23 of 48
48%

GUIDEWAY MILES COMPLETED



38 of 65
58%

UTILITY RELOCATIONS COMPLETED

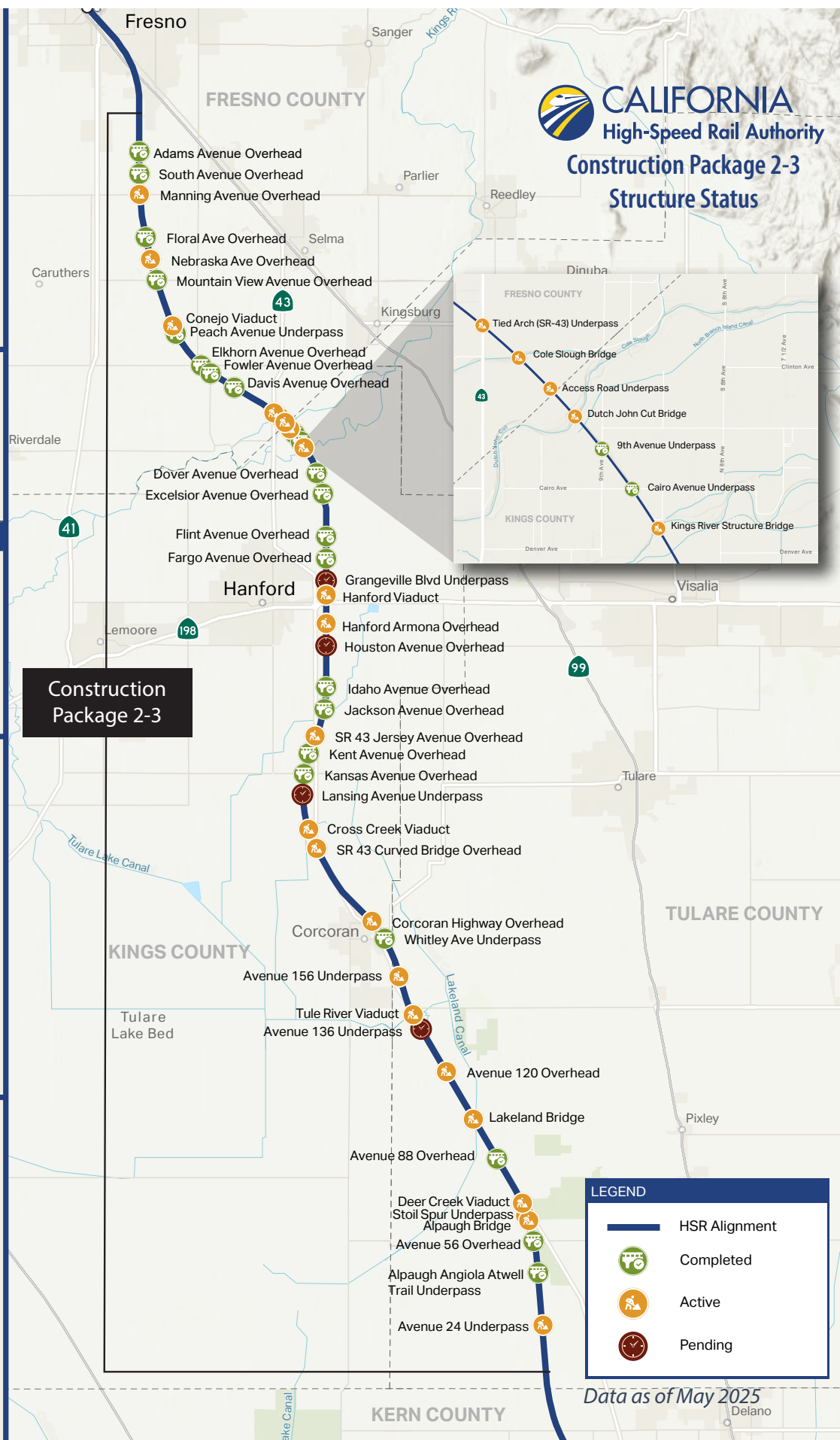


619 of 701
88%

RIGHT OF WAY PARCELS DELIVERED



981 of 987
99%

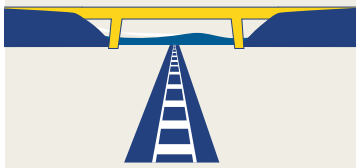


STRUCTURES COMPLETED



11 of 11
100%

GUIDEWAY MILES COMPLETED



21.1 of 21.2
99.5%

UTILITY RELOCATIONS COMPLETED



133 of 133
100%

RIGHT OF WAY PARCELS DELIVERED



223 of 223
100%

LEGEND



HSR Alignment



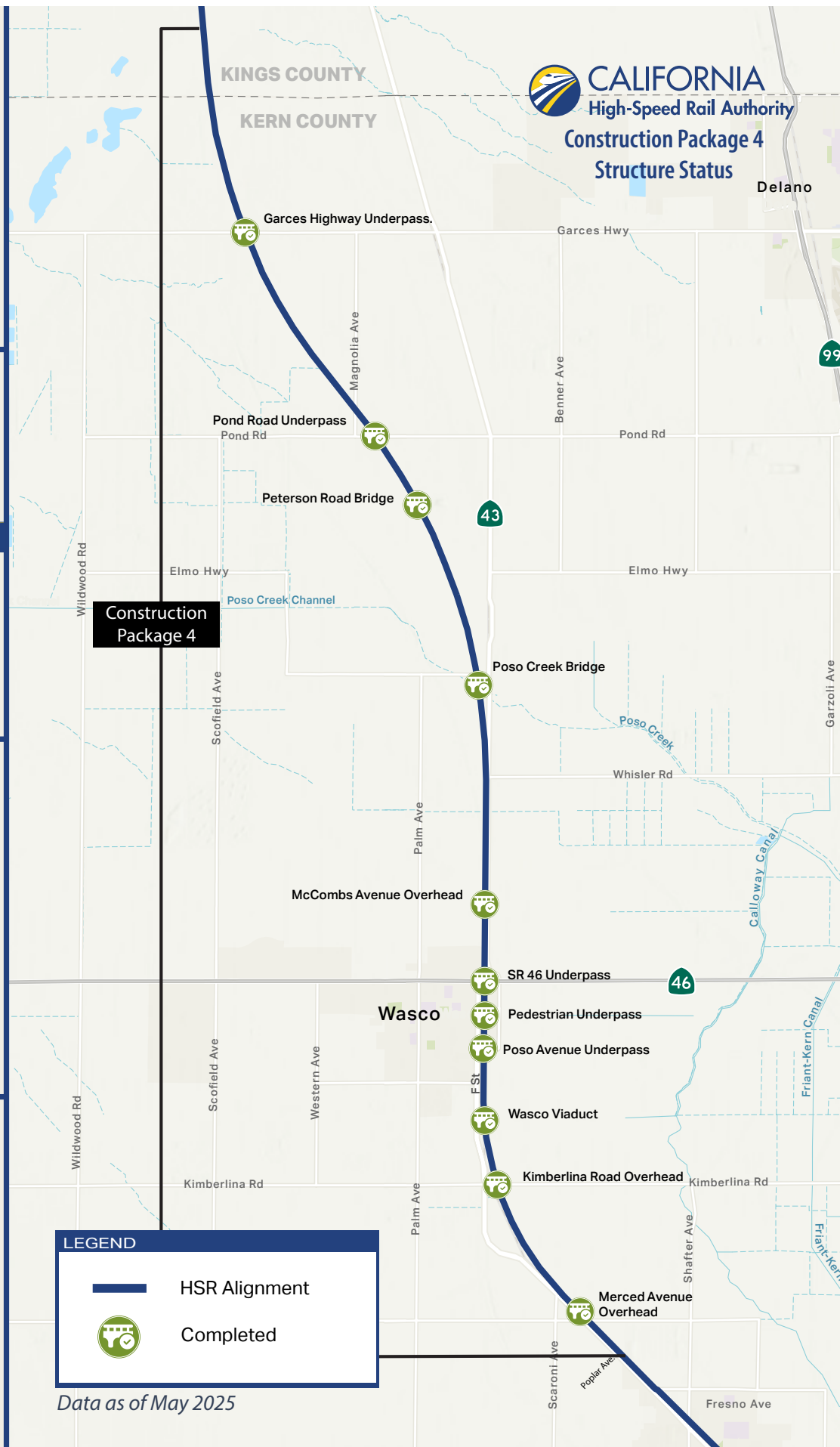
Completed

Data as of May 2025



CALIFORNIA
High-Speed Rail Authority

Construction Package 4 Structure Status



Appendix F: Enterprise Risk Register

The following section provides an update on management of the Authority’s top risks and mitigation efforts.

Management of Risks and Mitigation Strategies

Each year the Authority’s risk management function facilitates an annual enterprise risk assessment (ERA) with the end goal of refreshing its Enterprise Risk Register and mitigation plans.

The Enterprise Risk Register represents the highest risk priorities to achieving the Authority’s stated goals and objectives and is overseen by the Authority’s Enterprise Risk Committee (ERC). The ERC recently established the prioritized risk register (see table below) and continues to monitor progress, and the effectiveness of mitigations and controls assigned to each risk to improve outcomes for Authority goals and objectives. The top risks and their key mitigations and controls are further highlighted below:

2025 Enterprise Risk Register	
1	Funding Uncertainty
2	On Time Right-of-Way Acquisition and Delivery
3	Third Party Relationships
4	Integrated Program Delivery
5	Procurement Strategy Execution and Timeline Adherence
6	Legislative Impact and Policymaker Support
7	Integrated Schedule Adherence
8	Environmental Clearance and Permitting
9	Workforce Planning
10	Infrastructure and Asset Maintenance
11	Stakeholder Alignment
12	Track and Passenger Rail Rights
13	Tariffs and Trade War Impacts

Funding Uncertainty

The Authority is actively monitoring potential risks associated with the lack of stable and long-term funding that has existed since the project’s origination and is pursuing new opportunities to address these risks. If not mitigated properly, future funding gaps could result in project slow-downs, cost increases from project delays, scope reductions, and cash shortfalls impacting the

Authority’s ability to fulfill its mission. In addition, lack of stable funding degrades private sector confidence and discourages private sector investment, which is envisioned as a key resource of funding since the project inception. To address these challenges, the Authority established a series of controls and mitigation plans to identify viable, long-term funding options for key decision-makers’ consideration that would stabilize funding.

MITIGATIONS AND CONTROLS

- Collaborate with the Newsom Administration to secure funding from the Cap-and-Invest program (extended through 2045), which would provide the Authority with a stable source of funding, providing an opportunity for the conversion of future revenues into immediate capital to expedite project delivery.
- Actively engage with state legislators to execute critical updates to Senate Bill 198 that will enable pathways for private sector investment participation.
- Establish and update funding plans with accurate and reliable estimates to achieve the Authority's mission. In addition, provide various long-term funding scenarios to key decision-making stakeholders to deliver the high-speed rail system under the building block approach.
- Active monitoring of projected expenditures and available cash to mitigate any potential short-term funding issues, including prioritizing available federal resources.
- Submit high-quality and timely financial deliverables and reports to key stakeholders. Implement effective stakeholder engagement strategy and education efforts to increase understanding of Authority financial reporting and analyses.
- Develop and update the annual program management plans, and hold monthly, quarterly, and annual meetings to provide status on relevant scopes of work and meet annual reporting requirements for our strategic funding partners.

On Time Right-of-Way Acquisition and Delivery

The Authority is focused on mitigating risks associated with right-of-way to ensure seamless progress in construction and future rail operations. Challenges such as landowner resistance, incomplete designs, and complex negotiations pose risks to timely right-of-way delivery. The following controls and mitigation strategies focus on strengthening planning efforts, aligning utility and design requirements, and securing necessary agreements to minimize delays and cost impacts.

MITIGATIONS AND CONTROLS

- The Authority's right-of-way team works with functional areas to identify, and survey required high-speed rail parcels, and coordinate with the Authority's Engineering program to understand parcel limits. Dedicated project managers subsequently develop a right-of-way acquisition plan that is prioritized in alignment with the program master schedule.
- The Authority is seeking options to increase judicial capacity and streamline proceedings for program-related property acquisition cases, which would provide timely resolutions and cost savings not only for the Authority, but also for property owners awaiting just compensation and local agencies coordinating parallel infrastructure work.
- Right-of-way progress is reported monthly to executive management, where mitigations and decisions are reached to address key right-of-way risks and issues.
- Where warranted, if landowner offers remain unaccepted and parties are unable to reach a mutually acceptable settlement within 45 days, the Authority initiates condemnation to prevent delays to early works and construction in order to meet statewide goals and commitments.

Third-Party Relationships

The Authority is actively enhancing communication and coordination efforts to address evolving third-party requirements, concerns, and changing conditions. A key focus is identifying and establishing third-party agreements and securing necessary third-party approvals to advance design and construction activities. The following controls and mitigation plans outline critical steps taken to reduce risks associated with delays and ensure continued progress.

MITIGATIONS AND CONTROLS

- Third-party strike force meetings are held monthly to record, deliberate, and address critical risks and issues affecting construction progress. Additionally, this team has implemented an issue tracker to systematically document and track the resolution of potential third-party conflicts during construction.
- A focused team of state staff and project and construction management (PCM) staff is organized to manage third-party relationships in each region. This team regularly engages with third parties to share Authority plans and progress to address potential conflicts, capture changed conditions and ultimately negotiate resolutions that are fair and reasonable for all sides.
- The Authority seeks to partner with the state to enhance engagement and enforcement by ensuring third parties actively participate in scheduled meetings with the Authority and adhere to established timelines. This would allow the streamlining of approval and permitting processes to reduce unnecessary delays and create clear expectations for all stakeholders.
- The Authority is also working with the state to expand oversight and accountability measures to proactively address bottlenecks and hold third parties responsible for meeting commitments. The Authority plans to leverage digital project management tools to improve coordination, track progress, and increase transparency and coordination for all parties.

Integrated Program Delivery

The Authority recognizes the importance of efficiently coordinating interfaces and effectively transitioning from the construction phase to the rail operations phase of the project lifecycle. By transitioning through the different build phases with an integrated delivery roadmap, the Authority aims to minimize potential schedule impacts and control costs, ensuring a seamless progression to revenue service.

MITIGATIONS AND CONTROLS

- The Authority has a robust governance committee structure, and other program-level coordination meetings addressing various aspects of integration management (e.g., regular update and monitoring of integrated program schedule, governance and coordination, rail system integration, data and technology integration, etc.) and provide an opportunity to escalate and mitigate emerging integration risks for resolution.
- Comprehensive integration management plans have been drafted and continue to be updated to reflect additional scopes of work to ensure contractors assisting with the design and delivery of the end-to-end high-speed rail system, technologies, and data are properly aligned.

- The Authority established a Program Management Plan and Organizational Management Plan which outline roles, responsibilities, and interfaces for each functional area to facilitate cohesive integration of our teams, schedules, data, designs, construction, and future operations.

Procurement Strategy Execution and Timeline Adherence

The Authority is committed to executing a higher volume of strategic procurements to meet organizational objectives and commitments. Through our new streamlining efforts, the Authority intends to expedite these timelines while managing market dynamics to ensure successful outcomes.

MITIGATIONS AND CONTROLS

- In response to current market conditions, and the uncertainty presented by tariffs, the Authority has taken measures to directly purchase commoditized materials in advance to reduce costs and accelerate the development of a Southern railhead.
- The Authority is exploring the feasibility and impact of developing a library of pre-engineered components and designs. This analysis will assess the degree to which this approach can accelerate track installation, streamline the construction process, reduce costs, and ensure consistent quality.
- The development of a strategic procurement roadmap that defines the sequential order of procurements in alignment with the Authority's master program schedule, and staggers procurement such that the labor market is not limited or constrained.

Legislative Impact and Policymaker Support

The Authority is actively working to retain and strengthen policymaker support by providing detailed information, program updates, project benefits, and future plans that will help achieve important milestones. Through proactive engagement with legislators and policymakers, the Authority seeks to correct mischaracterizations or claims that could impact funding, operations, or public perception. The following controls and mitigation measures outline actions to secure and sustain legislative and policymaker support:

MITIGATIONS AND CONTROLS

- The Authority continues to engage with state officials and their staff by providing regular updates, legislative briefings, information on key milestones, and project tours to build ongoing support for the project.
- The Authority partakes in efforts to strengthen congressional backing and secure additional funding by engaging with members and staff through briefings on project progress, needs, and funding priorities.
- The Authority participates in legislative hearings and responds to project inquiries with transparent information and a thorough analysis of milestones, progress, key challenges, funding, risk assessment, and several other details that provide information to help assess the status of the project.

Integrated Schedule Adherence

The Authority is dedicated to effectively aligning, arbitrating, and reconciling the delivery timelines of various contractors, third-party stakeholders, and other agencies involved in executing the Integrated Program Master Schedule. By fostering strong collaboration and communication among all parties, the Authority aims to optimize execution and minimize the risk of costly delays.

MITIGATIONS AND CONTROLS

- The Authority's Business Oversight Committee is designated powers to review and approve any changes to the Master Program Schedule and oversee mitigation strategies to remediate potential schedule risks raised by project delivery teams.
- The Authority's Program Controls Office also holds monthly schedule coordination meetings with project teams and functional directors to understand potential schedule risks that could impact key program schedule milestones and ultimately aligning management actions to maintain schedule fidelity and commitments.
- Document lessons learned and schedule performance reviews to refine scheduling processes, leading to improved forecast accuracy and decision-making. Subsequently, incentivizing on-time-delivery through contractual terms and conditions.

Environmental Clearance and Permitting

The Authority is committed to effectively managing environmental and permitting requirements to facilitate the smooth progression of its projects. By addressing potential conflicts

with environmental third parties, the Authority aims to minimize costly scope increases and maintain schedule commitments to key stakeholders.

MITIGATIONS AND CONTROLS

- To help reduce delays associated with environmental review, and accelerate the integration of clean energy solutions, the Authority is pursuing exemptions or waivers to elements of the existing California Environmental Quality Act requirements that can better enable clean power interconnection. This would help California reach its climate goals by promoting the use of renewable energy for electrification, but also lower costs and improve project feasibility, encouraging investments in sustainable infrastructure.
- The Authority also seeks to partner with the Legislature to streamline environmental permitting through fair and reasonable legislative alternatives or compromises that support both environmental agency and Authority objectives to constituents. This would enable more timely construction delivery and more prudent use of limited state resources.
- The Authority has a dedicated environmental program guided by procedures and supported with templates and technology that identify, monitor, and manage conflicts and risks to negotiate and achieve environmental clearance / permitting where required for future construction and rail operations.
- The project teams and environmental program work closely with key third parties in weekly external coordination meetings to share project progress and future plans, identify potential conflicts or changing conditions, and resolve issues for projects in advanced design or active construction.

Workforce Planning

Securing and retaining the appropriate staffing is essential for the successful delivery of the high-speed rail project. To meet the demands and requirements of this initiative, the Authority is focused on strategically enhancing its workforce.

MITIGATIONS AND CONTROLS

- The Administration Office conducted supervisory and managerial level needs assessments to help identify gaps in employee skills, knowledge, and abilities that could impact project delivery and limit workforce potential. These efforts will result in a revised workforce and succession plan to aid in successful execution of the CEO's vision, under its revamped organizational structure.
- The Authority also continues to carry out its Form to Function strategic activities (assessments, reorganization, and the submittal of budget change proposals as needed) by appropriately increasing state staff positions and augmenting the workforce with specialized contractors where appropriate.

Infrastructure and Asset Maintenance

The Authority is dedicated to maintaining a clear interim and long-term approach for managing all property and infrastructure assets in its possession. By allocating appropriate funds for this purpose, the Authority aims to uphold the highest standards of safety and security.

MITIGATIONS AND CONTROLS

- The Authority established an Infrastructure Maintenance Office dedicated to asset management and maintenance. Efforts are underway to identify required staffing and key positions to ensure the office is fully resourced and operational.
- The Authority developed several key procedures such as the Strategic Infrastructure Management Plan, Strategic Asset Management Plan, and Asset Management Policy and Operations and Maintenance Policy to drive accountability, define roles and responsibilities, and establish mechanisms for managing HSR-owned assets and infrastructure (by asset class). This accounts for routine maintenance and ad hoc due repairs to vandalism, theft, fire hazards, crime, etc.

Stakeholder Alignment

The Authority is committed to early and consistent engagement with both internal and external stakeholders, including funding partners and local communities. By actively seeking to understand and address stakeholder needs, the Authority aims to enhance project support, advance operations, and create opportunities for future funding.

MITIGATIONS AND CONTROLS

- The Authority adopted technology and tools (e.g., EMS, Borealis, Airtable, etc.) that provide a single source for stakeholder events and information at all levels to provide visibility of stakeholder needs and drive a consistent Authority response.
- Weekly coordination through internal stakeholder engagement meetings are conducted by Strategic Communications, External Affairs, and Regional leads to align on a strategy and approach to meet stakeholder needs and address concerns.

Track and Passenger Rail Rights

The Authority is actively working to obtain shared passenger rail rights and the necessary permissions to construct within existing rail corridors owned by other entities. Securing these rights is essential for the Authority to continue progress toward constructing and operating a high-speed rail system.

MITIGATIONS AND CONTROLS

- For Northern California passenger railways, agreements are established with Caltrain that will lay the foundation for more specific agreements the Authority will need, from an integration standpoint, in order to operate passenger trains. The Authority will continue to have conversations with Union Pacific Railroad to secure key agreements critical for the project to advance beyond Gilroy into San Jose.
- The Southern California team is currently working with the California State Transportation Agency (CalSTA) to identify needs and mutually beneficial agreements with BNSF as well as for local passenger railways such as Metrolink, Orange County Transportation Authority, and the Riverside County Transportation Commission.
- The Authority will work with CalSTA to identify funding opportunities to make corridor improvements and secure passenger rail rights along the high-speed rail alignment in the north and south.

Tariffs and Trade War Impacts

The Authority is aware of the potential impacts of US tariffs on imported goods, which may influence its procurement strategy, program schedule, and baseline budget, particularly concerning the total cost of ownership for construction, rail, and trainset materials. An example of this can be seen in a recent decision by the U.S. Administration to increase tariffs on copper products by 50 percent.⁴ Unpredictable decisions like this could result in increased uncertainties and could impact program costs. Given the frequent tariff fluctuations, ongoing uncertainty, and other economic factors, including the possibility of an economic downturn, the Authority continues to take proactive measures to maintain project momentum by monitoring price fluctuations and supply chains to assess any impacts to cost, schedule, and contingency levels.

MITIGATIONS AND CONTROLS

- The Authority actively monitors price fluctuations, tariff changes and monitors supply chains for materials including steel, aluminum, and concrete to better inform program decisions.
- The Authority continues to monitor new trade agreements and shifts in trade policy to understand potential impacts they could have on the program and ultimately adjust accordingly.

Appendix G: Financing Method and Assumptions

Lack of stable, long-term funding is a persistent challenge for the high-speed rail program. Even the dedicated funding from the Greenhouse Gas Reduction Fund (GGRF) has not been sufficient in stability or longevity to support long-term financing of the high-speed rail program.

Since the 2016 Business Plan, the Authority regularly outlined specific financial terms necessary for GGRF financing, including:

- A priority lien over all GGRF revenues,
- A stable and substantial funding commitment to the program with a set floor on GGRF revenues,
- A continuous appropriation through the new GGRF sunset date, without the need for separate appropriations in future budget years, and
- Non-impairment language under the new bill guaranteeing the state will not change the law in a manner that would impair any contracts entered into by the Authority secured by the GGRF revenues.

The rating agencies and investors also will require a legal opinion of the State Attorney General that the state has full authority to issue the revenue bonds (most likely this would rely on the special funds doctrine for an exception to the Constitutional Debt Limit in Article XVI, Section 1).

The contemplated GGRF revenue bonds differ somewhat from other state revenue bond precedents that have relied on the special fund doctrine, because in these cases the revenues being pledged are generated directly from the enterprises, programs or projects being financed.

Assumptions

1. A longer-term commitment provides a more stable and predictable funding source with 25 percent of GGRF revenues, and at least \$1.0 billion annually (“off the top”) through 2045.
2. The proposed GGRF structure implies the initial debt service coverage within GGRF is at least 4.0x (i.e., debt service is at or below 25 percent of GGRF revenues, based on a 25 percent share or \$1.0 billion minimum dedicated to the high-speed rail program).
3. An accreting debt service reserve account, which over the term accretes to an amount covering 6 months of debt service, is included to satisfy any remaining investor concerns on the potential tapering of GGRF revenues expected through 2045 based on CARB projections.
4. If the above conditions are met the Authority believes any financing of GGRF revenues would be possible without recourse to another state backstop.
5. For modelling purposes, it is assumed state bond issuances would be tax-exempt (i.e., interest earned by investors would be exempt from federal and state income taxes).
6. Assumed retention of federal grant funding under scenarios outside the Merced-Bakersfield alignment is contingent not just on reinstatement of the grant agreements currently subject to litigation, but also FRA’s agreement to amend those agreements to align with new routes and timelines.

Appendix H: Comparison of International High-Speed Rail Systems

The nation's first truly high-speed rail system in California experienced cost increases since its inception. However, these increases, just as those for similar projects in Japan, Europe, and China, reflect the realities of large-scale infrastructure investments. Considering the project's numerous economic and environmental benefits, California's high-speed rail project remains transformative with positive long-term outcomes that will reshape the state's future. **Table H.0** provides an overview of how California's high-speed rail project compares to international counterparts on cost per mile, total years for planning and building, route length, miles of tunneling, and environmental/geographic constraints.

High-Speed Rail System Attributes

The following are key attributes of international high-speed rail programs.

ROUTE LENGTH

High-speed rail systems vary widely in scale. China's Beijing to Shanghai high-speed rail line is the longest at more than 800 miles, and serves as a backbone of the country's extensive rail network. In contrast, projects like the UK's HS2 (Phase 1) and Japan's Chūō Shinkansen are shorter (140 and 180 miles respectively), designed primarily to alleviate congestion between specific urban centers rather than span entire regions.

Phase 1 of California high-speed rail project will be about 500 miles long and runs between the

San Francisco Bay Area and the Los Angeles Basin. Despite its moderate length, it is one of the most ambitious in terms of engineering and regulatory complexity.

VIADUCT LENGTH

Viaducts are expensive but often necessary in densely populated or agriculturally productive regions. The Beijing-to-Shanghai high-speed rail has the highest viaduct proportion (~62 percent), driven by the need to preserve farmland and reduce land acquisition costs.

Taiwan's high-speed rail uses viaducts for nearly half its route to accommodate the island's narrow, populated corridor and to avoid seismic fault zones.

By contrast, France's TGV Sud-Est has relatively minimal bridge infrastructure due to favorable geography, enabling lower costs and faster construction timelines.

TUNNEL LENGTH

Japan's Chūō Shinkansen Maglev leads the pack with tunnels comprising nearly 90 percent of its route, a reflection of Japan's mountainous interior, the maglev technology, and commitment to a direct alignment. This design enables high speeds but drives up costs significantly.

In Spain's Madrid to Barcelona AVE, about 18 percent of the route is in tunnels due to mountain ranges, while California's includes around 10 percent, primarily through the Tehachapi and San Gabriel Mountains. Projects in France have less extensive tunneling, owing to flatter terrain.

PLANNING AND CONSTRUCTION TIME

Projects in democratic nations often experience longer planning periods due to environmental reviews, public consultation, and legal challenges. California's high-speed rail and UK's HS2 are the longer examples of this: Both spent more than a decade in planning stages before construction began. Legal, environmental, and political hurdles have added years to their schedules.

In contrast, China's HSR projects benefit from centralized authority and streamlined approval processes, allowing them to move from concept to completion in less than a decade.

European countries and Japan also have long planning cycles, but construction is generally predictable due to strong national commitment for HSR, technological precision, and consensus-building practices.

Table H.0: Comparative Timelines

Project	Planning Start	Construction Start	Initial Operation	Total Years (Planned + Build)
California HSR	2008	2015 (CV segment)	Est. 2030 to 33	22+ years
HS2 (UK)	2009	2020	Est. 2033 (Phase 1)	24+ years
Chuo Shinkansen (Japan)	2007	2014	Est. 2027	20 years
Taiwan HSR	1990	1999	2007	17 years
Beijing – Shanghai HSR (CN)	2004	2008	2011	7 years
Madrid – Barcelona AVE (ES)	1992	1996	2008	16 years

ENVIRONMENTAL AND GEOGRAPHIC CONSTRAINTS

Environmental and geographic factors strongly influence design choices:

- California high-speed rail must contend with seismic faults, wetlands, farmland preservation, and strict environmental laws (CEQA and NEPA), making each segment a complex engineering and regulatory challenge.
- HS2 in the UK faces opposition over its impact on ancient woodlands and rural landscapes and must tunnel under cities like London and Birmingham.
- Japan must navigate both geography (Japanese Alps) and ecology, with deep tunnels and high seismic resilience requirements.
- China, while not without environmental impacts, has greater national control over mitigation and land use, enabling aggressive infrastructure development.

Key Takeaways

- China leads in viaduct construction due to population density and land usage efficiency.
- Japan's maglev is tunnel-heavy due to the technology and mountainous geography.
- California's high-speed rail system, though shorter, is very complex due to challenging geographies, complex regulatory structures, environmental laws and engineering requirements.
- HS2 faces significant ecological and political hurdles despite its relatively short initial segment as it passes through dense urban areas of Birmingham and London requiring expensive infrastructure and tunneling.
- France and Spain benefited from fewer constraints in earlier phases due to more sparsely populated geographical areas and strong national commitment.

Independent Benchmarking Study

In 2015, an independent **International Benchmarking Study (IBS)** of major global high-speed rail programs, as shown in **Table H.1**, was undertaken on behalf of the UK government, as a comparator analysis for then proposed HS2 Phase 2.

This comprehensive study considered 32 international high speed rail comparator schemes, 11 international workshops/site visits, and held 110 interviews with subject matter experts from 12 countries, including desktop reviews of over 50 economic research and transport published benchmark papers. Of these 32 comparator schemes, the IBS reviewed over \$442 billion (2025 prices) of high-speed rail projects across 5,133 miles of railroads, including 1,629 bridges/viaducts, 135 tunnels, and 69 stations in 12 countries.

The study concluded that the average high-speed rail lines can be delivered under certain circumstances at an average capital cost \$46 million per mile (2025 prices) on data from 20 European comparator projects and over 2,113 miles of rail lines. However, this increased significantly where the route required a high proportion of tunnelling and viaducts to \$133 million (2025 prices).

High-speed rail in Europe and other parts of the world can appear less expensive than similar projects in the United States due to a combination of factors, including greater experience, standardization, and project complexity. European rail networks, for example, often have more extensive international connections and a greater focus on integrating rail with other modes of transportation.

Table H.1: Independent Benchmark Study Comparison

Project	Route Length	Tunnel Length	Planning Time	Environmental / Geographic Constraints
California High-Speed Rail	~500 miles (Phase 1)	50 miles (~10%)	15+ years	Wetland, farmland seismic zones, CEQA and NEPA
Taiwan	~214 miles	31 miles (14%)	10+ years	Typhoons, earthquakes, narrow corridor
Japan Chūō Shinanseri (Maglev)	~178 miles (Tokyo-Nagoya)	160 miles (90%)	10+ years	Mountainous terrain, long tunnels under Japanese Alps, environmental opposition
France TGV Sud-Est	~264 miles	9 miles (3%)	8 years	Mild terrain, fewer constraints
China Beijing – Shanghai HSR (CN)	~819 miles	50 miles (~6%)	4 years	High land acquisition pressure, river crossings, flood plains
UK HS2 (Phase 1)	140 miles	30 miles (~22%)	12 to 15+ years / ongoing since 2020	Ancient woodlands, urban tunnelling, political opposition
Spain Madrid–Barcelona AVE	385 miles	32 miles (~8%)	10 years	Mountain ranges, archaeological sites

European projects, for example, often emphasize standardization in design, construction, and operational practices. This reduces the need for custom solutions and allows for economies of scale, lowering costs. In contrast, the United States often relies heavily on contractors, subcontractors, and consultants, which can lead to increased costs and delays.

European projects often involve more complex infrastructure, including more stations closer together, running through city centers, and sharing space with other traffic. U.S. rail projects tend to be routed along existing freight lines or highway corridors, which may not be the most efficient or cost-effective solution for high-speed rail.

The U.S. regulatory environment makes constructing a new high-speed rail system a challenging effort. Use of existing rail lines in

the United States is difficult because most are owned by private freight railroads and freight trains dominate track usage. Freight railroads resist increasing passenger operations on these tracks because they could increase costs and create delays. The United States has a stronger car culture with lower gas taxes and fewer road tolls compared to many other countries, which also limits demand for high-speed rail.

BUREAUCRACY VS. SPEED

China and Taiwan demonstrated efficient timelines due to centralized planning and streamlined land acquisition. Democratic nations such as the United States, UK, and Japan faced delays due to legal processes, public consultation, and stringent environmental reviews.

ENVIRONMENTAL AND SOCIAL FACTORS

California and HS2 were shaped as much by environmental regulation as by engineering. Protection of farmland, forests, and habitats added layers of complexity. Conversely, China implemented mitigation but under far fewer constraints, allowing for massive viaduct spans.

VALUE FOR MONEY

Evaluating high-speed rail projects depends on how one defines value: economic return, cost-efficiency, ridership, speed, or environmental benefit. **Table H.2** compares several projects based on cost per mile, ridership success, construction efficiency, and long-term return.

Table H.2: Comparator Rating of Internal High-Speed Rail Systems

Project	Average Cost per Mile (2025 Prices)	Build Time	Ridership & ROI	Value Rank
Beijing – Shanghai HSR	~\$61M	4 years	Very High / Profitable	★★★★★
Spain Madrid – Barcelona AVE	~\$75M	8 years	High / Subsidized but efficient	★★★★★
Taiwan HSR	~\$134M	8 years	High / Eventually profitable	★★★★
HS1 (UK)	~\$202M	9 years	High / Public benefit	★★★★
California HSR	~\$212M	Ongoing	High / In Progress	★★★
Japan Chūō Shinkansen	~\$562M+	Ongoing	Unproven / Still in development	★★
UK HS2 (Phase 1)	~\$613M+	Ongoing	High / In progress, controversy, low ROI so far	★

Key Takeaways

- China’s high-speed rail benefits from state control, low land acquisition cost, and high population density.
- Taiwan’s model struggled financially early on (private debt) but recovered and now operates efficiently.
- California high-speed rail has had time, and cost increases due to its environmental, local needs, and legislative complexity.
- HS2 has seen cost increases, scope changes, and timeline slippage, severely reducing its value for money so far.
- Japan’s maglev is a technological leap but extremely costly per mile due to both technology and tunnelling — its return on investment will only be demonstrated after long-term operation.

Conclusion

High-speed rail projects, while superficially similar in purpose, differ significantly in complexity based on geography, political systems, engineering requirements and environmental regulation.

Countries like China and Spain have achieved rapid progress through centralized planning or favorable geography, while projects in California, Japan, and the UK have taken much longer due to a combination of terrain, democratic processes, and public scrutiny.

Projects heavy on viaducts and tunnels — such as those in California, Japan, and Taiwan — tend to be more expensive and slower to build, but they are often necessary to meet environmental standards and maintain speed in difficult terrain.

Ultimately, while the engineering solutions may be universal, the political, geographic, and societal contexts define each high-speed rail system's unique path from vision to reality.

California high-speed rail, when benchmarked to other international high-speed rail projects, has similarities with countries such as UK which face demanding and protracted planning and environmental processes, and also with those with complex infrastructure across challenging geographical terrain such as Japan and Taiwan. These challenges drive higher average costs in comparison to the countries that have more streamlined planning environmental approvals and less demanding terrain.

Appendix I: Design Criteria Manual

As part of CEO Ian Choudri's evaluation of the program, the Authority conducted a comprehensive review of its Design Criteria Manual (DCM), which serves as the basis of design for the high-speed rail program, ensuring the integrity of the system. When the DCM was developed 15 years ago, the Authority leveraged a collection of sources including guidance from the International Union of Railways (UIC) while also considering common U.S. practices and the guidance of the Manual for Railway Engineering of the American Railway Engineering and Maintenance of Way Association (AREMA) manual.

As part of the effort to optimize project schedule and improve capital efficiency, a conceptual study was conducted to refine the vertical alignment of the rail corridor. The primary objective was to reduce the length of major cost and schedule drivers — namely tunnels, bridges, and associated earthworks — which together account for more than 50 percent of the project's capital costs. Through an iterative evaluation of multiple vertical profile alternatives, the Authority sought a balance between constructability, operational performance, and regulatory compliance. Emphasis was placed on reducing tunnel lengths due to their high cost per linear foot and longer construction times. These refinements led to significant reductions in tunnel requirements while maintaining performance standards, improving long-term maintainability, reducing environmental disruption, and enhancing the overall constructability of the alignment.

The simplified alignment reduces the number of critical path elements, shortens construction durations, and supports phased delivery strategies, allowing more parallel workstreams and earlier procurement. Reducing exposure to high-risk, time-intensive elements such as deep tunnels and long-span bridges enhances schedule reliability and lowers the likelihood of delays. In addition, the refined profile improves coordination with third parties — including utility relocation, right-of-way acquisition, and environmental clearance — by enabling better integration with external timelines and reducing potential rework, thereby further increasing schedule certainty.

The March 2025 PUR highlighted various areas where cost-saving opportunities were identified. The Authority since took additional steps to review, vet, approve and implement revisions to specific project sections. These DCM revisions were incorporated at a conceptual level into the new cost baseline for the Central Valley segment and for future extensions to Gilroy and Palmdale.

Key areas where alignment with the DCM revisions can reduce costs are discussed in the following sections.

Operating and Design Speed

Previously, the DCM design speed was set to 250 mph, despite the actual maximum operating speed of 220 mph. By resetting the design speed to 220 mph, the Authority can refine track geometry, allowing for tighter curves and more flexible routing. This adjustment may reduce land grading and the length of viaducts and tunnels, ultimately creating opportunities to reduce infrastructure costs, minimize environmental impacts, and lower future operating expenses, particularly energy consumption.

Track Alignment – Vertical Profile (Tunnels / Viaducts)

The vertical profile of a track, which refers to its slope or incline, directly impacts the required length and quantity of costly structures such as bridges and viaducts. The previous DCM limited the maximum gradient to 2.5 percent, with a conservative baseline of 1.25 percent. This restrictive gradient limit was influenced by freight rail design standards, which require longer braking distances and have heavier loads as compared to passenger-focused high-speed rail systems. Given their different operational requirements, high-speed rail trains have more powerful acceleration and braking capabilities and can efficiently operate on steeper gradients.

The revised DCM allows for a maximum gradient of 4 percent, with a baseline of 3.5 percent, consistent with international standards. This change reduces the need for extensive viaducts and tunnels, leading to substantial cost savings. Modern high-speed rail trainsets are also specifically designed to handle steeper gradients efficiently without significantly increasing energy consumption.

In the Pacheco Pass corridor, increasing the maximum allowable gradient could enable a reduction in tunnel length from 15.1 miles to 7.1 miles. In the Tehachapis, raising the maximum allowable gradient could eliminate four tunnels and shorten five others, reducing the total length of tunneling from 10.8 miles to 5.8 miles. These modifications offer considerable construction cost savings while preserving operational efficiency.

A more detailed overview of the factors to be considered for these cost-saving refinements, including environmental and regulatory constraints, would be included in the technical reports accompanying a future Business Plan.

Guideway / Vertical Clearance

The previous DCM required the vertical clearance between the top of the rail and any new structure above the trackway to be 27 feet. In the Authority's trainsets procurement, the allowable dimensions of the trainsets based on their dynamic envelope is just over 16 feet. This adjustment may result in cost savings based on the reduced size of the infrastructure and the reduction of earthworks quantities.

Reducing the maximum speed also allows for the re-design of the guideway width. This would result in a reduced cross-section and length of platforms and viaducts, and it would lower guideway-related earthwork quantities and costs.

Bridge Structures (Seismic)

California is highly vulnerable to seismic events, requiring infrastructure such as bridges to be designed for earthquake resilience and safety. The previous DCM relied heavily on the California Department of Transportation (Caltrans) Bridge Design Manuals, which were primarily developed for roadway applications.

The revised DCM applies optimal rail-specific design principles for both structural integrity and operational continuity in an active seismic environment. Furthermore, the updated DCM reduces the limitations on the use of seismic isolation devices and allows the use of rail expansion joints, which have well documented successful use on international projects and on Construction Packages 1 through 4. The changes would allow greater flexibility in bridge design, improved seismic resilience, enhanced operational reliability, and potential cost savings.

Earthworks

The DCM revisions include the option for allowing the use of additional types of soils, enabling the re-use of local materials, for earthworks. This allows for greater flexibility in the potential re-use of excavated tunnel material, thereby promoting a lower carbon footprint by reducing the volume of materials transported to and from the site.

Appendix J: Ancillary Revenues and Asset Commercialization

The Authority is exploring innovative ways to generate revenue from the high-speed rail program through ancillary revenue opportunities and asset commercialization along the Gilroy – Palmdale section to attract private capital investment. These strategies are a first step in identifying which opportunities are best suited for the California high-speed rail system.

The full vision repositions the rail corridor as a multifaceted utility, capable of carrying electricity and people while supporting the state's artificial intelligence industry and clean energy goals. Potential revenue streams include selling excess power from the authority's planned solar farms and battery storage sites, leasing right-of-way to utility companies for broadband, oil and gas, water, or electric transmission lines, developing real estate around train stations, and allowing freight services to use the tracks during off-peak hours

This preliminary analysis has identified 14 potential revenue sources that can be implemented before and after the commencement of train operations. By leveraging the Authority's assets and infrastructure, these ancillary revenues can provide additional financial capacity to support the project's delivery and long-term sustainability. This approach transforms ancillary revenues from a supplementary consideration into a strategic financial tool for addressing project funding constraints.

Concept of Asset Commercialization and Ancillary Revenues

Asset commercialization represents the overarching strategy, involving systematically identifying, developing, and leveraging existing infrastructure assets to generate additional revenue. This approach transforms traditional infrastructure from a cost center to a multifaceted revenue-generating platform. For transportation networks, this can include strategies such as real estate development, telecommunications infrastructure leasing, advertising, retail partnerships, and innovative service offerings.

Ancillary revenues represent the mechanism by which the Authority can realize asset commercialization, as it reflects the additional income streams generated from supporting or complementary services beyond the Authority's core business operations of generating revenue from train ticket sales. This concept extends to monetizing assets, rights-of-way, and associated infrastructure through strategic commercial opportunities that create value beyond primary transportation services.

The primary objectives of ancillary revenue and asset commercialization include:

- Diversifying revenue sources,
- Offsetting operational and capital expenses,
- Maximizing the economic potential of existing infrastructure,
- Creating additional value for stakeholders, and
- Reducing financial dependency on traditional funding mechanisms.

Ancillary Revenue Opportunities

Comparative analyses across global train systems reveals significant potential for ancillary revenues beyond traditional farebox income. Based on FY 2014 data from the United States, Japan, Taiwan, and European countries, ancillary revenues ranged from 3 percent to 30 percent of net revenues.⁵

Using a combination of previous analyses, comprehensive research and peer group studies, the Authority has created its own robust list of ancillary revenue sources that can be pursued and secured prior to system operations, offering a proactive approach to enhancing the project's financial potential.

Other categories such as energy, data centers, bike rentals, shared rail services, and other transit-oriented developments are still being analyzed, and an update will be provided in a future Business Plan.

ADVERTISING – BILLBOARD

Billboard advertising presents a significant revenue opportunity for transportation infrastructure, leveraging high-visibility locations and consistent traffic patterns. The revenue model can include long-term leases with local and national advertisers, with rates varying based on location, traffic volume, and demographic reach. Digital billboards offer additional flexibility, allowing for multiple advertisers to rotate content and potentially increasing revenue per location. The effectiveness of billboard advertising depends on factors such as proximity to major routes, visibility, audience demographics, and local market conditions. Strategic placement near transportation hubs, along major highways, or

in high-traffic urban corridors can maximize advertising potential and create a steady revenue stream.

In prime locations such as Los Angeles, digital billboards can generate significant revenue, with top-performing locations delivering up to \$50,000 per month.⁶ However, these premium rates reflect optimal conditions including high-traffic locations, dense urban populations, and strong advertising market demand. Therefore, the Authority has applied discounts to establish high and low revenue estimates respectively, accounting for varying market conditions along the corridor.

ADVERTISING – TRAINS AND STATIONS

Advertising on and within high-speed rail trains and throughout stations offers a dynamic revenue opportunity through multiple placement options. The revenue model includes interior and exterior train car wraps, digital displays, poster spaces, and sponsored messaging. Rates can vary based on type, route popularity, and audience demographics.

Historical research from Los Angeles metro transit indicates bus and train “wrapping” can generate significant revenue of up to \$20,000 per month.⁷ Given historical timing of this data, it is expected that wrapping revenue would be closer to between \$25,000 to \$30,000 per month. These premium rates reflect optimal conditions including high-traffic locations, dense urban populations, and strong advertising market demand. Therefore, the Authority has applied discounting to establish high, and low revenue estimates respectively, accounting for varying market conditions along the corridor.

BAGGAGE FEES AND OTHER ASSOCIATED TRAVEL FEES

Baggage fees have been successfully implemented across the transportation industry, particularly by airlines and increasingly by rail systems in the United States, such as Amtrak and Brightline. The revenue model centers on charging passengers for luggage transportation, with fees typically structured based on weight, size, and number of bags.

To establish relevant data for baggage fee structures, we analyzed leading transportation providers across both air and rail sectors. Our precedent group includes major U.S. airlines such as United Airlines and American Airlines, representing established baggage fee models in domestic travel. We also analyzed Brightline, the only private higher-speed rail service in the United States. This selection provides insights into both traditional and emerging approaches to baggage fee implementation in the transportation sector.

- American Airlines: \$40 for the first checked bag⁸
- United Airlines: \$35 for the first checked bag⁹
- Brightline Florida: \$30 for the first checked bag

While these comparisons show checked baggage fees ranging from \$30 to \$40, more conservative pricing has been adopted, given factors such as regional market dynamics, anticipated demand levels, demographic considerations, and competitive positioning within the transportation landscape.

EXCESS LAND (FEE SIMPLE)

- This revenue model focuses on outright land sales, for land deemed as excess/surplus and no longer required by the Authority. Revenue generation depends on factors like location, zoning regulations, and market demand. Proximity to transportation in addition to urban/suburban corridors often present unique opportunities for maximizing the value of excess land assets.
- To establish realistic projections for the sale of excess land, the Authority has drawn on market evidence for surplus land sales within the transportation sector, coupled with insights from comparable real estate market conditions in California.
- The transactions reflect a range of \$1.51 to \$8.13 per square foot (PSF). However, a majority of right-of-way land available to the Authority reflects less commercially attractive land parcels. It has, therefore, been assumed that up to 10 percent of the total right of way could be realized for sale.

PARKING FEES

- Parking facilities represent a robust ancillary revenue source, particularly in urban and high-traffic areas. The revenue model can include tiered pricing structures with hourly, daily, and monthly rates. Additional revenue streams can be developed through reserved parking, monthly subscriptions, and partnerships with local businesses or event venues. The success of a parking revenue strategy depends on factors such as local parking demand, proximity to key destinations, competitive pricing, convenience, and additional amenities offered. Urban areas with limited parking options, transportation hubs, and locations near major attractions present particularly lucrative opportunities for parking revenue generation.

- While parking rates at high-traffic transportation hubs vary widely based on location and demand, research indicated the following full-day rates:¹⁰
- Kern Community College / Weill Institute, Bakersfield: \$5 per day
- Garage #4 (Congo Alley), Fresno: \$9 per day
- Spiral Garage #7, Fresno: \$9 per day
- Convention Center Garage, Fresno: \$9 per day
- UC Merced Parking, Merced: \$10 per day

Additionally, research conducted on other train systems indicated the following full-day rates:

- Union Station: \$16 per day
- Amtrak: \$8 per day
- Brightline: \$20 per day

Daily parking fees of \$5 per day been adopted for modeling to account for the nature of regional market parking, with lower demand in subject areas. The Authority has assumed the number of parking spaces based on a 2024 study completed by Foster & Partners and ARUP,¹¹ and an 80 percent occupancy rate has been assumed across all scenarios.

RETAIL – STATION LEVEL

Station-level retail offers a rental income opportunity through strategically located commercial spaces within transportation hubs. The revenue potential is driven by leasing to various retailers such as convenience stores, cafes, newsstands, and others, with rental rates determined by factors like station location, foot traffic, and market demand.

Retail rates at high-traffic transportation hubs vary widely based on location, demand, and the type of retail services offered. Research indicated

the following average rent rates PSF at various transportation hubs:¹²

- Madera: \$17.77 PSF
- Kings/Tulare: \$14.46 PSF
- Bakersfield: \$18.22 PSF
- Fresno: \$15.46 PSF
- Merced: \$20.54 PSF
- Gilroy: \$27.28 PSF
- Palmdale: \$17.02 PSF

In light of this data, it has been assumed that retail spaces at transportation hubs can achieve rental rates of \$17.50 PSF per year, on average. This assumption considers a blend of urban and suburban locations and varying levels of demand and retail service quality. The analysis assumed the total amount of retail space of 31,630 square feet based on a 2024 study completed by Foster & Partners and ARUP,¹³ and a 90 percent occupancy rate has been assumed across all scenarios.

SPONSORSHIP – STATION NAMING

Station naming rights provide a significant branding and revenue opportunity. The revenue model involves long-term agreements with corporate sponsors, offering exclusive naming rights likely under an annual lease arrangement. Brand alignment and reputational risk will be key considerations for the Authority.

Sponsorship naming for train stations can yield a wide range of annual revenues. Many publicly owned arenas, stadiums, fields, and tracks have been renamed through sponsorships by banking, telecommunications, and other private firms. Precedent transactions include Wawa Station Philadelphia, where Wawa Inc. paid \$5.4 million to Southeastern Pennsylvania Transportation

Authority to secure the station's naming rights for 10 years,¹⁴ reflecting \$540,000 annually; additionally, Miami Dade sold the naming rights to University of Miami's Health System for \$2.9 million more than 20 years,¹⁵ reflecting \$145,000 annually.

It is assumed that revenue could be non-existent, if commercial and reputational considerations deter such partnerships. Midpoint projections, aligning to the lower end of available data set, suggest an annual revenue of \$1.02 million. These figures highlight the significant financial potential while also considering the careful balance required in forming such strategic partnerships.

SPONSORSHIP – SYSTEM NAMING

System-wide naming rights further build upon the sponsorship opportunity, with potentially substantial revenue implications. This approach involves a holistic branding partnership that covers the entire California high-speed rail system. Revenue can be generated through long-term, high-value agreements that provide extensive brand visibility and marketing opportunities. However, there are significant brand and reputational risk implications for the Authority to consider.

Sponsorship naming for train systems can yield a wide range of annual revenues depending on several factors, including market demand, the prominence of the station locations and system, duration of the sponsorship agreement, and commercial and reputational considerations. Notable examples of system sponsorships include the San Diego Metro Transit deal to name the Blue Line as "The University of California San Diego Blue Line," reflecting \$30 million over 30 years, or \$1.0 million annually.¹⁶ On the higher end of examples, Salesforce paid \$110 million over 25

years for the naming rights to the new Transbay Transit Center in San Francisco, implying a rate of approximately \$4.4 million per year.¹⁷ Midpoint projections suggest annual revenue around \$1.0 million, highlighting significant financial potential tempered by careful consideration of strategic partnerships.

FIBER-OPTICS

The commercialization of the owned right of way along the corridor through fiber-optics has the potential to unlock significant value to the Authority.

Monetizing the right-of-way for fiber-optic installations along the high-speed rail alignment presents significant revenue opportunities. For example, the Pennsylvania Turnpike Commission secured a deal worth \$450 million over 25 years covering 550 miles, equating to \$32,727 per right-of-way mile per year. The Georgia Department of Transportation entered a \$703 million agreement covering 1,300 miles over 25 years, generating \$21,631 per right-of-way mile per year.¹⁸ Additionally, the North Carolina Department of Transportation achieved a \$1.015 billion deal covering 660 miles over 25 years, yielding \$61,515 per right-of-way mile per year.¹⁴ The Authority has aligned the low and high scenarios to the precedent transactions. These figures are gross, therefore not accounting for any expenses or revenue share mechanism, highlighting the substantial revenue potential from similar fiber-optic partnerships in California.

TELECOMMUNICATION TOWERS

Cellular tower leasing offers a consistent revenue stream. The revenue model includes long-term leases to telecommunications providers for tower placement and equipment installation. Rates can

be structured as fixed annual payments or include revenue-sharing mechanisms.

Research from San Mateo County indicates that cell tower revenues generally range from \$15,000 to \$25,000, annually.¹⁹ Based on these findings, the Authority adopted revenue estimates for telecommunication towers, reflecting conservative assumptions aligned with market precedents. The Authority also assumed a maximum of one cell tower per station to optimize revenue generation. This strategic approach highlights the potential for substantial ancillary revenue from telecommunications tower leases at each high-speed rail station.

GROUND LEASES

Long-term ground leasing of existing land assets to utility companies, telecommunications providers, renewable energy developers, and commercial/residential developers can produce revenue through rental income and help to achieve broader development goals for the Authority. The effectiveness of ground leasing depends on factors such as property location, infrastructure accessibility, local market conditions, and the specific needs of potential lessees. Land parcels located in proximity to transportation often present unique opportunities for ground lease development.

Ground leases offer substantial revenue opportunities by leveraging available land around high-speed rail stations. Research for ground leases of vacant development sites indicated rental rates of \$0.72 to \$4.32 PSF.

The Authority adopted revenue estimates for ground lease rates, with each station having an average of 50,000 square feet available for leasing. Occupancy is assumed to be 80 percent across

all scenarios. These market insights illustrate the potential revenue generation from ground leases, considering the blend of urban and suburban locations and varying levels of demand and development opportunity

ELECTRIC VEHICLE CHARGING

Electric vehicle (EV) charging stations present a revenue opportunity, especially when located in areas where travelers leave their cars parked for extended periods during the day, with the potential for increased utilization of the charging equipment compared to other market examples (curbside, shopping centers, etc.). The revenue model can include pay-per-use fees for the charging service itself, with rates potentially varying by charging speed. The overall success depends on factors like the number of EV drivers in the area (California has the highest number of registered EVs per capita in the United States²⁰), availability of other public charging, pricing strategy, and the convenience/amenities offered compared to alternatives. However, the ability to capture EV charging demand from people already parked at the station creates an advantageous use case. Additionally, EV charging aligns with many state objectives and initiatives to promote clean transportation and reduce greenhouse gas emissions.

Annual revenue per charger can be calculated as follows when based on high-traffic areas where utilization rates for Level 2 chargers typically range from 20 to 40 percent, and each session delivers 46 kWh: Charging sessions per day (2.5) × days per year (365) × kWh per session (46) × rate per kWh, equating to \$8,395 per charger annually at a \$0.20 rate. With 15 chargers at each station, this translates to substantial revenue opportunities. These estimates underscore the potential financial

benefits of strategically deploying EV charging infrastructure across California high-speed rail stations.

FOOD AND BEVERAGE

The provision of food and beverage services onboard offers a valuable revenue stream for the Authority. The model may include partnerships with reputable catering companies or food service brands to deliver high-quality dining experiences for passengers during their journey. Revenue generation could be through direct sales, concession agreements, or profit-sharing arrangements.

Onboard food and beverage (F&B) services offer a substantial revenue opportunity, leveraging the captive market of train passengers. Competitor analysis indicates an average cost of \$10 per F&B item, with low and high estimates at \$7.50 and \$12.50, respectively.²¹ An assumed annual ridership of 4.96 million passengers and 45 percent of these passengers are assumed to purchase F&B items. This underscores the strategic value of enhancing passenger experience while generating additional revenue for the high-speed rail program.

EXPRESS CARGO

The integration of express cargo services into the California high speed rail system presents a significant revenue opportunity by leveraging the speed and efficiency of the rail network for freight delivery. The revenue model may include partnerships with courier companies to transport express cargo via dedicated train cars attached to the regularly scheduled passage cars. Pricing strategies can be based on volume, weight, and delivery speed. Successful implementation depends on factors such as cargo handling infrastructure, market demand for high-speed

freight services, and streamlined operations to ensure timely and reliable deliveries.

The Authority conducted research to assess the express cargo market potential between Palmdale and Gilroy. The findings revealed that more than 1.2 million tons of express cargo, derived from selected commodities, are transported annually within this region. The Authority performed comparative research of the United Parcel Service (UPS), a leading express cargo carrier, which indicated UPS generated average revenues of \$3,340 per ton in 2024, which equates to approximately \$1.67 per pound. Based on these insights and considering the Authority's competitive positioning, it was conservatively assumed that the Authority could achieve revenue of \$1,500 per ton, or \$0.75 per pound, for its express cargo services in this market. This revenue assumption takes into account a revenue-sharing arrangement with FedEx and UPS, who would be responsible for the first and last mile delivery to customers' doors.

Based on preliminary information provided by the Authority and market research:

One train car (retrofitted to carry express cargo) is expected to handle 899 express items per car,

- The average package weight is 15 pounds, and
- The revenue is \$0.75 per pound.

Therefore, revenue per item is forecast at \$11.25 for the medium scenario, \$8.44 for the low scenario (75 percent), and \$14.06 for the high scenario (125 percent). Each train is assumed to have one train car dedicated to cargo, with an assumed 15 trains operating daily for 300 days a year. This translates to substantial revenue potential, considering the

expected demand for quick and reliable cargo transport. These estimates highlight the significant financial benefits of incorporating express cargo services into high-speed rail operations.

TRACK ACCESS CHARGES

Track access charges involve generating revenue by allowing third-party operators, including freight and passenger services, to use the rail infrastructure. The revenue model can include a mix of fixed fees and variable charges based on track usage, tonnage, and distance traveled. Critical to this approach are well-defined access agreements, robust scheduling coordination, and maintenance of track quality to prevent service disruptions. Effective track access charge policies can optimize asset utilization, enhance service offerings, and ensure fair access to the rail network while preserving the safety and efficiency of operations.

Pre-operations revenues represent ancillary income streams that can be developed and activated before the train system becomes fully operational. These opportunities are particularly valuable as they enable early asset monetization, demonstrate project viability to stakeholders, offset initial infrastructure development costs, and provide financial flexibility during project development. Post-operations revenues are those that can only be activated after the train system becomes fully functional. These sources are dependent on passenger volumes, operational infrastructure, and direct interaction with transportation services.

The categorization allows for a strategic approach to asset commercialization, prioritizing revenue sources that can be activated early while preparing for additional revenue streams post-operations.

Revenue Timing: Pre-Operations and Post-Operations

The revenue sources described in the preceding sections have been categorized based on their potential activation timeline relative to the train system's operational commencement. This categorization is critical to understanding the opportunities for early asset commercialization and revenue generation.

Table J.0: Summary of Revenue Sources and O&M Estimates

Summary of Revenue Sources	Revenue Timing	O&M %	Modeling Assumptions	Source
Advertising - Billboard	Pre-operations / Operations	30.0%	Assumes a revenue share model, with 70% of the revenue realized coming to the Authority, 30% paid to operator.	Prior Analysis - LA metro advertising
Advertising - Rolling Stock and Station Level	Operations	30.0%	Assumes a revenue share model, with 70% of the revenue realized coming to the Authority, 30% paid to operator.	Prior Analysis - LA metro advertising
Baggage Fees and Other Associated Travel Fees	Operations	10.0%	- Minimal operating costs to cover revenue collection and security (10%) - Assumed passenger to handle own baggage - Baggage enforcement to be covered by ticketing enforcement personnel.	Assumption based on operating model
Parking Fees	Pre-operations / Operations	10.0%	Our research on parking management fees (% of revenue) - consideration of SolTrans budget and surrounding California municipalities.	Prior Analysis – SolTrans
Retail - Station Level	Operations	5.7%	- Assumed triple-net lease - Based on Bakersfield: - Operating Expenses \$5.50 PSF per year, - Operating Expense Recoveries \$4.50 PSF per year Therefore, landlord is up for \$1.00 PSF per year Which translates to 5.7% based on assumption of rent of \$17.5 PSF	CoStar data for Bakersfield retail market, 2025
Sponsorship - Station Naming	Operations	30.0%	Assumes a revenue share model, with 70% of the revenue realized coming to the Authority, 30% paid to operator. Our research (including Arizona DOT and Ohio DOT) suggests a range of 10%-50% for system sponsorship revenue share arrangements.	Prior Analysis – UDOT
Sponsorship - System Naming	Operations	30.0%	Assumes a revenue share model, with 70% of the revenue realized coming to the Authority, 30% paid to operator. Our research (including Arizona DOT and Ohio DOT) - suggests a range of 10%-50% for system sponsorship revenue share arrangements.	Prior Analysis – UDOT
Fiber Optics	Operations	56.0%	- Assumes total revenue sharing arrangement developer partner - Capital costs are the responsibility of the developer - Data is based on recent confidential broadband transactions (2020 to 2025).	Prior Analysis
Telecommunication Towers	Pre-operations / Operations	5.0%	- Landowner leases land to cell tower companies who incurs O&M costs - Authority not responsible for O&M. - Adopted typical commercial lease commission ranges from 4% to 6 of lease value (see sources in item 11).	<u>Understand cell tower leasing basics — Cell Site Appraiser</u>

Summary of Revenue Sources	Revenue Timing	O&M %	Modeling Assumptions	Source
Ground Leases	Pre-operations / Operations	5.0%	Typical commercial lease commission ranges from 4% to 6% of lease value.	<u>What is the Standard Commission for a Commercial Lease</u>
EV Charging	Pre-operations / Operations	83.0%	Research reflects 83% O&M cost. - Based on \$265,000 to \$285,000 in annual revenue; \$220,000 to \$250,000 for electricity, demand charge rates, fixed operational expenditures, R&D, and SGA Note: EV Charging is likely not profitable if Capex depreciation is taken into account.	<u>Can public EV fast-charging stations be profitable in the United States? McKinsey</u>
On-board revenues – Food and Beverage (F&B)	Operations	235.3%	Research indicates Amtrak F&B is not profitable and is subsidized by ticket revenue. Assumes operating cost of 235.3% - calculated based on FY2004 data: - Total Food & Beverage Cost \$189,122,342; and - Total Food & Beverage Revenue \$80,380,733	<u>Economics of Food Beverage Service(2004)</u>
Express Cargo	Operations	5%	- Administrative overhead for handling orders / shipments and payments with express cargo clients - \$1M per annum (all alignments). - Per station handling / loading costs of \$250k per annum based on a small number of FTEs. Smaller stations would incur a smaller cost of say \$100k per annum for luggage/cargo handling. - In regard to vehicle costs, the Authority has assumed no incremental cost - a standard passenger car would be converted (once) into a mail van configuration for luggage/cargo.	CHSRA Market Study for California

Net Income Analysis

For the net cashflow analysis of operating scenarios in the 2025 Project Update Report presented in **Chapter 1**, the Authority estimated the operating and maintenance costs for each identified ancillary revenue source.

The Authority conducted high-level research into typical costs relating to operations and maintenance (O&M) for each revenue source identified. This assessment is preliminary and assumes the initial capital expenditures required to establish each revenue source is included in the Capex estimate presented in the report (e.g. baggage fees, parking fees, retail, onboard, food and beverages, and express cargo).

Net Income is included in the cash flow analysis and calculated as:

Net Income = Revenue – O&M expenses.

Table J.1 provides annual ancillary revenue net income estimates for each operating scenario, presented in low and high ranges, based on different market conditions and implementation factors. These findings highlight the potential financial contribution of ancillary revenues to the project's long-term economic sustainability and the Authority's objectives of delivering a financially viable transportation solution.

Table J.1: Ancillary Revenue Net Income (\$ in millions)

Buildout Scenario	Annual Net Income Results (\$ in millions)	
	Low Estimate	High Estimate
Merced – Bakersfield	\$15.99	\$34.02
San Francisco – Gilroy – Bakersfield	\$88.74	\$196.03
San Francisco – Gilroy – Bakersfield (including Merced)	\$91.90	\$202.00
San Francisco – Gilroy – Palmdale	\$110.40	\$253.70
San Francisco – Gilroy – Palmdale (including Merced)	\$113.60	\$259.70

Appendix K: Benefit Cost Analysis – Scenario Comparisons

This appendix summarizes a benefit-cost analysis (BCA) of the five scenarios for development of the high-speed rail system. The analysis follows the benefit-cost methodology outlined by the U.S. Department of Transportation (USDOT) in the Benefit-Cost Analysis Guidance for Discretionary Grant Programs released in November 2024. Our analysis accounts for 30 years of benefits after operations begin.

The five scenarios and BCA results are:

- **San Francisco – Gilroy – Palmdale (with Merced):** The societal benefits are estimated to be \$83.2 billion in discounted 2023 dollars over the lifetime of the system. The total capital costs are calculated to be \$57.3 billion in discounted 2023 dollars. The difference in the discounted benefits and costs equals a net present value of \$25.9 billion in discounted 2023 dollars, resulting in a benefit-cost ratio (BCR) of 1.45.
- **San Francisco – Gilroy – Palmdale:** The societal benefits are estimated to be \$81.4 billion in discounted 2023 dollars over the lifetime of the system. The total capital costs are calculated to be \$55.1 billion in discounted 2023 dollars. The difference in the discounted benefits and costs equals a net present value of \$26.3 billion in discounted 2023 dollars, resulting in a BCR of 1.48.
- **San Francisco – Gilroy – Bakersfield (with Merced):** The societal benefits are estimated to be \$54.7 billion in discounted 2023 dollars over the lifetime of the system. The total capital costs are calculated to be \$36 billion in discounted 2023 dollars. The difference in the discounted benefits and costs equals a net present value of \$18.7 billion in discounted 2023 dollars, resulting in a BCR of 1.52.
- **San Francisco – Gilroy – Bakersfield:** The societal benefits are estimated to be \$54.6 billion in discounted 2023 dollars over the lifetime of the system. The total capital costs are calculated to be \$35.5 billion in discounted 2023 dollars. The difference in the discounted benefits and costs equals a net present value of \$19.1 billion in discounted 2023 dollars, resulting in a BCR of 1.54.
- **Merced – Bakersfield:** The societal benefits are estimated to be \$21.7 billion in discounted 2023 dollars over the lifetime of the system. The total capital costs are calculated to be \$28.8 billion in discounted 2023 dollars. Discounted costs exceed discounted benefits for this scenario, resulting in a BCR of 0.75.

Table K.0: Costs and Benefits Detailed Summary, Monetary Values in 2023 dollars (\$ in millions)

Benefit Cost Analysis (Discount Rate 3.1%)	San Francisco – Gilroy – Palmdale (with Merced)	San Francisco – Gilroy – Palmdale	San Francisco – Gilroy – Bakersfield (with Merced)	San Francisco – Gilroy – Bakersfield	Merced – Bakersfield
Total Benefits	\$83,188	\$81,410	\$54,713	\$54,594	\$21,691
User Benefits	\$21,144	\$20,880	\$13,579	\$13,577	\$3,782
Travel and Transfer Times	\$12,120	\$11,947	\$7,443	\$7,443	\$2,597
Reliability	\$3,911	\$3,859	\$2,508	\$2,508	\$390
Stations and Train Amenities Benefits	\$3,605	\$3,593	\$2,907	\$2,907	\$416
Induced Ridership Benefits	\$1,508	\$1,481	\$720	\$719	\$380
Safety & Environmental Benefits	\$18,844	\$18,586	\$11,502	\$11,502	\$3,921
Vehicle O&M (including fuel)	\$9,569	\$9,433	\$5,876	\$5,876	\$2,065
Safety (highway traffic reduction)	\$5,016	\$4,945	\$3,080	\$3,080	\$1,082
Emissions Reductions	\$3,146	\$3,111	\$1,863	\$1,863	\$534
Airport Delay Savings	\$0	\$0	\$0	\$0	\$0
Congestion	\$1,092	\$1,076	\$670	\$670	\$236
Pavement and Noise	\$21	\$21	\$13	\$13	\$5
Wages Wider Economic Benefits	\$28,654	\$27,973	\$20,410	\$20,410	\$2,934
At-Grade Rail Crossing Removals	\$7,307	\$6,932	\$4,023	\$4,023	\$5,132
Emergency Vehicle Benefits	\$5,512	\$5,219	\$2,998	\$2,998	\$3,962
Waiting Time and Emissions Savings	\$1,073	\$1,018	\$567	\$567	\$747
Reliability	\$522	\$495	\$276	\$276	\$364
Safety from Removals	\$201	\$199	\$183	\$183	\$60
Firms' Wider Economic Benefits	\$2,828	\$2,828	\$2,828	\$2,828	\$63
Residual Value	\$12,576	\$12,077	\$7,685	\$7,568	\$7,359
Freight Rail Efficiency Gains	\$97	\$97	\$97	\$97	\$128
Transport Network Resiliency	Qualitative	Qualitative	Qualitative	Qualitative	Qualitative
O&M and R&R	-\$8,262	-\$7,962	-\$5,412	-\$5,412	-\$1,628
O&M	-\$7,130	-\$6,868	-\$4,651	-\$4,651	-\$1,337
R&R	-\$1,133	-\$1,094	-\$761	-\$761	-\$292
Total Costs	\$57,274	\$55,106	\$36,046	\$35,538	\$28,848
Net Present Value (NPV)	\$25,913	\$26,304	\$18,667	\$19,056	-\$7,157
Benefit Cost Ratio (BCR)	1.45	1.48	1.52	1.54	0.75
Payback Period (Years)	28	28	27	27	37
Internal Rate of Return	4.6%	4.7%	4.8%	4.9%	1.9%

The high-speed rail scenarios improve intercity passenger rail service by enhancing on-time performance, safety, reliability, and trip times, while adding capacity in congested areas. They promote better integration with other transport modes, build new connections within the Central Valley, and attract more users to sustainable travel. These upgrades also improve safety at highway-rail crossings, reduce congestion, and boost economic growth and access to opportunities, particularly for disadvantaged communities. The high-speed rail scenarios presented in the 2025 PUR demonstrate a wide variety of benefits to society, with some of the most important benefits include:

- **Improved travel times, accessibility, and equitable access to opportunities for disadvantaged areas:** The scenarios will save travel time and improve reliability for millions of travelers. The scenarios have positive economic impacts along the San Francisco – Palmdale corridor both in areas near historic districts stations, and in other opportunity zones in the Central Valley. Additionally, the travel time savings and accessibility gains as a result of the project are lifting barriers to opportunity by giving greater access to jobs.
- **Increased accessibility has been shown to increase labor market efficiency and productivity:** In addition to traveler or user benefits, these scenarios have broader economic effects from increased connectivity among firms and workers. Agglomeration — often called wider economic benefits (WEBs) — results from improved accessibility within and between labor markets, leading to better job matching, enhanced learning, and greater labor specialization. These factors boost productivity, yielding higher profits and wages for firms

and employees who benefit from improved access. The analysis estimates impacts on wages and firm profits, with wage gains reflecting employee benefits and increased commercial property values indicating capitalized profit growth.

- **Improved service performance of other Amtrak routes in California and beyond and address the state of good repair of several existing Amtrak stations:** Amtrak routes within California — like the Capitol Corridor, San Joaquins, and Pacific Surfliner — will directly benefit from high-speed rail through improved amenities and faster connections. Additionally, the Coast Starlight long-distance route will gain upgraded stations and more seamless transfers, enhancing travel experiences for both local and inter-state passengers.
- **Safety benefits and elimination of multiple existing Amtrak, BNSF Railway, and Union Pacific Railroad at-grade crossings:** The benefits of grade separations alone include improved safety; travel time savings for residents, commercial trucks, and emergency services; reduced noise (no train horns), decrease in traffic congestion; reduction in emissions from idling vehicles; improved train operations reliability (both for freight and passengers rail operation), and property value uplift. These grade-separation projects will also help provide more equity in access to jobs in historically disadvantaged communities as major at-grade crossings have or will be separated from Madera to north of Bakersfield. This will result in major improvements to both urban and rural areas in the Central Valley, including fewer cities and neighborhoods historically separated by the rail lines. In Northern California, the scenarios construction

will upgrade existing at-grade crossings to quad gates.²² Quad gates have been shown to reduce collisions at at-grade crossings by 98 percent.²³ These will deliver safety and environmental benefits even prior to the arrival of high-speed rail. These benefits will be felt across the country along all the long-distance Amtrak routes connecting in the San Francisco Bay Area for cross-country travel.

- **Address climate change and sustainability:** High-speed rail will reduce greenhouse gas and criteria air pollutant emissions by transferring trips from road and air to zero-emissions high-speed rail, promoting energy efficiency, increasing transport network resiliency, and recycling and redeveloping existing aging infrastructure.
- **Improve multimodal efficiency:** High-speed rail will promote multimodal integration for both passengers (rail to public transit and active modes) and freight (truck to rail) transport modes. It protects and enhances the freight-carrying capacity of existing freight rail providers and reduces conflicts between freight and passenger trains, increasing reliability and reducing delays. This results in freight rail benefits including cost savings to rail maintenance, existing rail freight operations, as well as emissions, accident, congestion, and pavement damage reductions from truck-to-rail diversion.
- **Add resiliency to California's transportation network:** The risk of climate-related events makes California's transportation network more vulnerable to frequent weather-related disruptions than most other places within the U.S. Unplanned disruptions are not typically accounted for in traditional ridership models

— neither the likelihood of disruptions nor the resultant impact of nonrecurrent congestion are considered. The scenarios add redundancy to California's transportation network, and will reduce the impact of disruptions, climate-related or otherwise, compared to a scenario where the project does not exist. Specifically, this redundancy helps mitigate potential travel delays.

- **Provide economic growth:** High-speed connections will improve access to opportunity zones and to local families and communities with families.
- **Investments in vital infrastructure assets:** High-speed rail connections will provide opportunities for California families to achieve economic security through rail industry employment and better access to job opportunities in larger economic centers. The scenarios provide large positive economic and employment impacts in areas near stations, historic districts and other opportunity zones including opportunities to disadvantaged areas. These are not quantified as part of the BCA.
- **Serving Historically Unconnected and Under-Connected Communities:** Central Valley and economic centers in the Bay Area and in Los Angeles will be accessible to underserved communities beyond the core economic centers. The scenarios also incorporate small businesses as part of project completion and include community engagement outreach.

Appendix L: Correspondence



Gavin Newsom
Governor

Toks Omishakin
Secretary

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August 18, 2025

Mr. Ian Choudri
Chief Executive Officer
California High Speed Rail Authority
770 L Street, Suite 620
Sacramento, CA 95814

Dear Mr. Choudri:

I have reviewed and approve the California High-Speed Rail Authority's Supplemental 2025 Project Update Report for submission to the California State Legislature, as required under Section 185033.5 of the Public Utilities Code. As indicated in the Project Update Report that was submitted to the Legislature on March 1, 2025, the Supplemental Report includes updates on cost estimates, ridership, and revenue projections.

As you and I have discussed, California's high-speed rail project will revolutionize how people travel around the state—it is a transformative investment that will expand mobility, create jobs, and drive economic growth while advancing the state's climate, equity, safety and prosperity goals. From my tours of the project, I can confirm that the Merced to Bakersfield segment is under active construction, and progress is visible every day.

I fully support a commitment to drive efficiency and accountability within the project. A comprehensive review of cost-saving measures, procurement strategies and project delivery improvements reflect the urgency and responsibility required to complete this critical infrastructure.

I appreciate the Authority's commitment to providing a supplemental report with updated financial projections. This approach ensures transparency and accountability while keeping California's first-in-the-nation high-speed rail system moving forward.

This project is about more than just building a train—it's about creating a modern, sustainable transportation network that will serve generations of Californians. With strong state and federal support, we will deliver high-speed rail, reduce emissions, connect communities and position California as a global leader in 21st-century mobility.

Thank you for your continued efforts on this critical project.

Sincerely,

A handwritten signature in black ink that reads "Toks Omishakin". The script is fluid and cursive, with the first letters of the first and last names being capitalized and prominent.

Toks Omishakin
Secretary
California State Transportation Agency

Endnotes

- 1 Source: Wall Street Journal, July 30, 2025: "Trump Just Crashed the Copper Market"
- 2 Source: Electric trains are quieter, more reliable than diesel. New study finds they're healthier, too.
UC Berkeley News
- 3 The proposed GGRF extension establishes a 20-year period from 2025 to 2045, extending the current program by 15 years beyond its scheduled end in 2030.
- 4 Source: Wall Street Journal, July 30, 2025: "Trump Just Crashed the Copper Market"
- 5 Source: KPMG Ancillary Revenue Report, December 2017
- 6 Source: Los Angeles Billboards | Premium Advertising Across LA
- 7 Source: Buses and trains wrapped in ads pay off big for Metro Transit | MPR News
- 8 Source: Checked bag policy — Travel information — American Airlines
- 9 Source: Basic Economy | United Airlines
- 10 Source: Authority Analysis and Research (2025).
- 11 Source: Central Valley Stations - Board Presentation
- 12 Source: KPMG Analysis (2025).
- 13 Source: Central Valley Stations - Board Presentation
- 14 Source: Wawa Signs Deal for Regional Rail Station Naming Rights | Convenience Store News
- 15 Source: UHealth buys naming rights to a Metrorail stop - Miami Today
- 16 Source: UC San Diego to Pay MTS \$30 Million for Naming Rights on Trolley Line — NBC 7 San Diego
- 17 Source: Salesforce Secures Rights to Transbay Transit Center and Park — SocketSite™
- 18 Source: KPMG Analysis (2025).
- 19 Source: sanmateo.courts.ca.gov/system/files/anf_cell_towers.pdf
- 20 Source: Alternative Fuels Data Center: Maps and Data - Electric Vehicle Registrations by State
- 21 Source: Onboard Snacks & Drinks | Brightline
- 22 Quad gates are designed to block all lanes of traffic on both sides of the track, and to provide a closure delay on the exit side to allow vehicles that may get stuck between the gates to get off the tracks.
- 23 Source: UC Berkeley Safe Transportation Education and Research Center as shown in hsr.ca.gov/about/safety/quad-gates/



A crew works on the Tied Arch Bridge structure at State Route 43 in Fresno County.

2025 SUPPLEMENTAL PROJECT UPDATE REPORT



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