6 PROJECT COSTS AND OPERATIONS

6.1 Introduction

This chapter discusses the estimated costs for building, operating, and maintaining the Los Angeles to Anaheim Project Section (project section) of the California High-Speed Rail (HSR) System, based on a preliminary level of design that was used in preparing this project-level Final Environmental Impact Report (EIR) and Proposed Final Environmental Impact Statement (EIS) (hereafter referred to as the Final EIR/EIS). The Draft EIR/EIS estimates have been updated in the Final EIR/EIS based on the California High-Speed Rail Authority's (Authority) 2026 Revised Business Plan.[1] Information about the approach and additional details in preparing the construction cost estimates are provided in the following Volume 2 documents of the Final EIR/EIS:

- Appendix 6-A, *High-Speed Rail Operating and Maintenance Cost for Use in Environmental Impact Report/Environmental Impact Statement Project-Level Analysis*, revised in the Final EIR/EIS: summarizes the assumptions used to estimate full system HSR operations and maintenance (O&M) costs, and provides more detailed cost information for the project section.
- Appendix 6-B, *2026 Business Plan Technical Supporting Document: Capital Cost Basis of Estimate Report,* revised in the Final EIR/EIS: presents the assumptions, methodologies, and key inputs used in the Operations and Maintenance Cost Model.

The sections below discuss capital and O&M cost estimating methodology, assumptions, and costs.

6.2 Capital Costs

Capital costs represent the total cost associated with the design, management, land acquisition, and construction of the HSR system. The estimated long-term O&M costs include both train operations and infrastructure maintenance. Operations consist of labor costs, electrical power, and other factors required to keep the California HSR System in service, whereas maintenance includes routine servicing of vehicles, maintenance of the tracks, signals, communications, and other systems needed to keep the system safe and reliable.

6.2.1 Standardized Capital Cost Categories

To help evaluate and compare project construction costs, the Authority used seven main standardized capital cost categories, based on the Federal Railroad Administration's Standard Cost Categories. Each standard cost category is briefly described below:

- **10 Guideway and Track Elements:** Includes elevated structures (bridges and viaducts), embankments and open cuts, retaining wall systems, tunnels, culverts and drainage structures, track (ballasted and nonballasted), and special trackwork.
- **20 Stations, Stops, Terminals, Intermodal:** Includes rough grading; excavation; station structures; enclosures; finishes; equipment; mechanical and electrical components, including heating, ventilating, and air conditioning; station power; lighting; public address/customer information systems; station site elements, such as pedestrian/bike access and accommodation; landscaping for parking lots; automobile, bus, and van access ways,

[1] The analysis presented in the Draft EIR/EIS was initiated using the 2023 Project Update Report, which was the most recent source of information available at the time the estimate was prepared. In this Final EIR/EIS, the cost information was updated to be consistent with the 2026 Business Plan, which was approved on June 1, 2026. Refer to Appendix 1-A, Changes in Project Benefits and Impacts, of the Final EIR/EIS for a description of how data from the 2023 Project Update Report and the 2024 Business Plan were used in the analysis, as well as why the analysis was not updated to reflect 2026 Business Plan ridership estimates and why the analysis in the Final EIR/EIS remains valid.

including roads; and safety systems, such as fire detection and prevention, security surveillance, access control, and life safety systems.

- **30 Support Facilities: Yards, Shops, Administration, Buildings:** Includes rolling stock service, inspection, storage, heavy and light maintenance and overhaul facilities and equipment, as well as associated yard tracks and electrification. In addition, maintenance-of-way facilities are included in this cost category.
- **40 Sitework and Special Conditions:** Includes cost of demolition, hazardous materials removals, environmental mitigation, utility relocations, noise mitigation, intrusion protection, grade separations, roadway improvements, and temporary facilities and other indirect costs.
- **50 Systems:** Includes costs of traction power supply system, including supply, paralleling, and switching substations as well as connections to the power utilities and the traction power distribution system in the form of the overhead contact system.
- **60 Right-of-Way, Land, Existing Improvements:** Includes acquisition of real estate and cost of real estate services.
- **80 Professional Services:** Includes all professional, technical, and management services related to the design and construction of infrastructure (Categories 10 through 60) during the preliminary engineering, final design, and construction phases of the project/program (as applicable).

6.2.2 Los Angeles to Anaheim Project Section Build Alternatives

As detailed in the Capital Cost Basis of Estimate Report for the 2026 Business Plan, the Authority used a new “bottom-up” approach to develop a discrete estimate for each geographic segment of the HSR system. The new approach uses detailed quantities from the preliminary engineering drawings and design elements. This approach guarantees that design data contributing to the estimates are methodically reviewed. All material quantities for the project section are estimated using pricing obtained through product research based on the descriptions listed in the scope documents and vendor outreach. The bottom-up approach expands the estimate from the lowest level of work decomposition whereby design elements and their associated quantities (e.g., bridges, structures, embankments) are independently broken out, and quantities, craft labor resources, materials, and equipment are estimated for each design element (refer to Appendix 6-B).

The capital costs include the total labor effort and materials to build the project section, including track structure, station facilities, support facilities, communications and signaling, electric traction, utility relocations, and modifications to roadways required to accommodate HSR grade-separated guideways. It should be noted that the capital cost estimate reflects only related infrastructure improvements; planned infrastructure improvements from which the project would benefit that would occur regardless of project implementation are not included in capital cost estimates.

Estimates are prepared in base-year dollars, with the base year defined as June 2025. Unit costs are updated annually or as required. For cost estimates with a base year that is older than the current calendar by one or more years, actual historical construction cost index values are used to calculate the escalation rate to be applied to bring a cost from the period in question to the present.

The methodology for estimating right-of-way costs was developed based on the unique characteristics of each geographic section in the HSR system. For example, the Los Angeles to Anaheim Project Section has minimal property needs compared to other project sections in the state. Right-of-way costs are estimated based on the preliminary design and provided in the Los Angeles to Anaheim Project Section Preliminary Engineering for Project Definition design, included as Volume 3 of the Draft EIR/EIS, with revisions in Volume 3 of the Final EIR/EIS, as well as preliminary right-of-way requirements reports. However, as the design of the project is refined, the right-of-way limits would be reassessed to reflect refined property acquisition needs.

An allowance to account for the cost of environmental mitigation that relates to, for example, hydrology and water resources, wetland impacts, hazardous material, historic/archaeology, safety and security, noise, vibration, and air quality during construction and permanent aesthetic impacts is included in the total capital cost. Environmental mitigation costs are estimated by using the cost of actual commitments the Authority has made in the Central Valley segment as a baseline in determining environmental mitigation costs that may be expected in the other geographic segments. This includes costs to satisfy monitoring during construction and post-construction reclamation and replacements, and monitoring after substantial completion.

Professional services are estimated as a percentage of construction costs, based on standard percentages used for preliminary and final design. At this preliminary stage of design, the capital cost estimates include contingencies to account for changes in material costs and unforeseen circumstances during project design. Contingency estimates were prepared using the Federal Railroad Administration's top-down risk model.

The capital cost estimates for the Shared Passenger Track Alternatives do not include the cost of acquiring HSR vehicles because the vehicles would be part of the statewide system and are not associated with building individual sections. The Authority's procurement process for high-speed trainsets is ongoing.

The cost estimates do not include costs associated with HSR track construction just north of U.S. Highway 101 to First Street because this work is analyzed in the Link Union Station environmental document and is not part of either Shared Passenger Track Alternative A or Shared Passenger Track Alternative B. However, the cost estimate does include costs associated with the Authority's installation of the overhead contact system just north of U.S. Highway 101 to First Street because this work is included in both Shared Passenger Track Alternative A and Shared Passenger Track Alternative B.

Table 6-1 provides the estimate for the Shared Passenger Track Alternatives. The construction cost is estimated to be the same for Shared Passenger Track Alternatives A and B; excluding the cost of early action projects, it is estimated to be approximately $8,780 million.

Table 6-1 Capital Cost of the Shared Passenger Track Alternatives (2025$ in millions)

FRA Standard Cost Categories[1]	Shared Passenger Track Alternatives A and B
10 Guideway and Track Elements	$4,514
20 Stations, Terminals, Intermodal	$251
30 Support Facilities: Yards, Shops	$192
40 Sitework and Special Conditions	$1,081
50 Systems	$1,235
60 Right-of-Way, Land, Existing Improvements[1]	$665
80 Professional Services	$840
Total[2]	**$8,780**
Early Action Project Total Costs	$7,445
Total with Costs by Others[3]	**$16,225**

Source: Authority 2026

[1] The FRA's Standard Cost Categories do not include items specifically excluded such as allowances for agreements or right-of-way costs with the Los Angeles County Metropolitan Transportation Authority, or Orange County Transportation Authority for shared use in the Los Angeles to Anaheim Project Section. These agreements would be required and would have an associated fee.

[2] The Los Angeles to Anaheim Project Section capital costs from the 2026 Business Plan (Table B.4) are not inclusive of the Program-Wide Support that is spread across all high-speed rail segments in Phase 1. Applicable costs from this Program-Wide Support cost line in the 2026 Business Plan were isolated out and applied to the Los Angeles to Anaheim Project Section, as appropriate, to present the total costs in the Final Environmental Impact Report/Environmental Impact Statement. Therefore, the capital costs presented in the Final Environmental Impact Report/Environmental Impact Statement may not perfectly match the costs line from the 2026 Business Plan tables.

[3] Although the Authority anticipates the funding for early action projects to come in part, and potentially in whole, from other agencies and entities, this cost estimate includes combined spending anticipated by the Authority and others. Costs do not include optional intermediate high-speed rail station facilities at Norwalk/Santa Fe Springs or Fullerton. Totals may not add up because of rounding.
Authority = California High-Speed Rail Authority; FRA = Federal Railroad Administration

6.2.3 Maintenance Facilities

O&M of the HSR system would require the placement of maintenance facilities along the alignment. For systemwide operations, the HSR system would include four types of maintenance facilities: maintenance of infrastructure facilities, maintenance of infrastructure siding facilities, a heavy maintenance facility, and light maintenance facilities (LMF). These four types of maintenance facilities are described in Chapter 2, Alternatives, Section 2.4.9, Maintenance Facilities, of the Draft EIR/EIS. The California HSR System would require one heavy maintenance facility, in the Central Valley. HSR maintenance facilities would not be used for BNSF Railway (BNSF) trains.

The Los Angeles to Anaheim Project Section Shared Passenger Track Alternatives include an alternative with the LMF at 26th Street (Shared Passenger Track Alternative A) and an alternative with the LMF at 15th Street (Shared Passenger Track Alternative B). A description of the alternatives and their locations can be found in Chapter 2, specifically Section 2.6.3.4, Light Maintenance Facility, and Section 2.6.4.4, Light Maintenance Facility. Only one LMF would be included in the project. The 2026 cost estimate includes the cost of one LMF in the project section. The estimated cost would be the same for either LMF site, because they are a similar size and include the same components and facilities.

6.3 Operation and Maintenance Costs

Chapter 2 describes O&M activities for the Shared Passenger Track Alternatives in greater detail. This analysis assumes HSR service during Phase 1 would connect San Francisco with Los Angeles via the Central Valley, with full service beginning in 2040 (refer to Appendix 6-B). The plan is to offer express, limited-stop, and all-stop services, depending on time of day and projected needs. The Phase 1 system would serve at least 12 HSR stations. For the project section, Los Angeles Union Station and Anaheim Regional Transportation Intermodal Center would serve as termini HSR stations. Norwalk/Santa Fe Springs and Fullerton have been identified as locations for an intermediate station option that could be added on further consideration and would also support HSR operations within the project section. By 2040, multiple facilities would be required for overnight storage, inspection, and routine maintenance of over 30 trainsets, each 656 feet long. The heavy maintenance facility serving the entire HSR system would be between Merced and Bakersfield. The heavy maintenance facility would store and maintain a portion of the trainsets. A maintenance of infrastructure facility would be located approximately every 150 miles, and a maintenance of infrastructure siding facility would be needed approximately every 75 miles.

O&M costs account for staff, labor, and materials supplies required to run the HSR system and to perform required maintenance. O&M costs are estimated based on service planning assumptions, station operations, maintenance and storage facilities, and staffing and energy use in accordance with the 2026 Draft Business Plan.

6.3.1 Assumptions

The O&M cost forecasts for the Shared Passenger Track Alternatives are based on assumptions from the *High-Speed Rail Operating and Maintenance Cost for Use in Environmental Impact Report/Environmental Impact Statement Project-Level Analysis*, which is included as Appendix 6-A of the Final EIR/EIS. The Authority developed assumptions based on refinements to the HSR plan over time and aspects specific to the project section. Assumptions used in the 2026 Business Plan analysis include the following:

- The apportionment of systemwide O&M cost estimates to the project section is proportional to the cost per route mile in the project section.

- The Phase 1 system would open in 2040 and cover approximately 500 miles.
- The Phase 1 system would serve 12 stations: San Francisco, Millbrae, San Jose, Gilroy, Merced, Fresno, Kings/Tulare, Bakersfield, Palmdale, Burbank, Los Angeles Union Station, and Anaheim Regional Transportation Intermodal Center.
- The Phase 1 system would include 148 revenue service train runs per day with varying stopping patterns between San Francisco and Anaheim, San Francisco and Fresno, Merced and Madera, Palmdale and Victor Valley, and additional trips in the Central Valley.
- The Phase 1 system assumes two trains per hour per direction during operating hours.
- Phase 1 operations would include connecting bus service between Madera and Merced as well as between Palmdale and Victor Valley to connect with Brightline West (refer to Appendix 6-B).
- Phase 1 HSR operations would include 30 trainsets including spares and 13.54 million total trainset miles.

To support Phase 1 HSR service outlined above, total O&M costs include additional assumptions related to maintenance and train operations. The system would include one operations control center and three terminal control facilities to manage dispatching. A heavy maintenance facility would be in the Central Valley, with two LMFs dispersed across the rest of the system, including one in Northern California along the Peninsula Corridor at Brisbane, and one in the project section in Southern California at either 26th Street in Vernon or 15th Street in Los Angeles. O&M support activities would also be provided at four maintenance of infrastructure facilities.

6.3.2 Operating Speeds

The HSR system would operate at high speeds (up to 220 miles per hour) along fully grade-separated, dedicated track, and at lower speeds in some areas with blended operations. Operating speeds in the project section would not exceed 90 miles per hour because of blended operations. Along certain curves throughout the project alignment, the maximum speed may be lower, and as low as 45 miles per hour. Between Los Angeles Union Station and Redondo Junction, the maximum speed at certain curves would be 60 miles per hour, between Redondo Junction and Fullerton Junction the maximum speed at certain curves would be 80 miles per hour, and between Fullerton Junction and Anaheim Regional Transportation Intermodal Center the maximum speed would be 90 miles per hour.

6.3.3 Development of Operational and Maintenance Costs

An important goal of the Authority's business plans is to achieve a balance between O&M costs and projected farebox revenue as proof of the requirements mandated by Proposition 1A, the Safe, Reliable High-Speed Passenger Train Bond Act, adopted by California voters in November 2008. The Authority has continued to refine its O&M cost model to reflect a more accurate cost basis for the program's current level of design. As part of the 2026 Business Plan, the Authority has refined its evaluation of operating scenarios for the statewide HSR system, with a particular focus on the Central Valley and Phase 1 corridors. This effort builds on prior analyses and reflects updated assumptions regarding system phasing, regional connectivity, and operational feasibility.

O&M cost estimates include operational activities needed to serve and carry the forecast train service for Phase 1 in 2040 for the medium and high ridership scenarios as described in the 2026 Business Plan, the maintenance costs necessary to keep the system in a state of good repair, and the administrative costs. A variety of factors drive the cost forecasts including, but not limited to, service planning assumptions, station operations, maintenance facility operations, staffing, and energy use.

The O&M cost model assumes station staffing and operating costs are based on station size. San Francisco and Los Angeles represent the largest stations and, as a result, have the highest staffing level. For more details on staffing assumptions, please refer to Appendix 6-A. The energy

costs were also updated; these energy costs are a key driver of train operations and station operating costs based on usage.

The 2026 O&M cost model includes the following categories of O&M costs:

1. Train operations
2. Bus operations
3. Security
4. Dispatching
5. Maintenance of equipment
6. Maintenance of infrastructure
7. Station and train cleaning
8. Commercial
9. General and administrative activities
10. Insurance
11. Unallocated contingencies
12. Margin
13. Capacity mark-up

The upgrades made to the 2026 O&M model have improved the detail and flexibility of the model to allow for more precise estimating and easier validation of source material.

Table 6-2 outlines the medium ridership forecast O&M costs by cost category estimated for Phase 1 of the California HSR System for the year 2040.

Table 6-2 Annual Operational and Maintenance Costs for Phase 1 (2025$ in millions)

Operations and Maintenance Activity	2040 Medium Ridership Forecast
Train operations	$177
Bus operations	$0
Security	$26
Dispatching	$13
Maintenance of equipment	$106
Maintenance of infrastructure	$105
Station and train cleaning	$23
Commercial	$25
General and administrative	$241
Insurance	$84
Unallocated contingency	$34
Margin	$84
Capacity mark-up	$45
Total	**$971**

Source: Appendix 6-A of the Final Environmental Impact Report/Environmental Impact Statement
Totals may not add up because of rounding.

The total O&M costs in 2025 dollars as apportioned to the project section are listed in Table 6-3 and are based on the Phase 1 HSR system, total cost per route mile for the medium-cost scenario. The costs associated with O&M are apportioned on the basis of trainset miles operating in the project section, taken from a systemwide total. O&M costs by geographic segment are estimated by multiplying the cost per route-mile by the approximate route miles in geographic

section. The cost model used for Appendix 6-A of the Final EIR/EIS does not attempt to optimize operations to reduce costs but provides an achievable operating scenario that could be further improved on by a private operator and could be subject to change by the operator using more current assumptions.

Accordingly, the project section is expected to cost $55 million annually under the 2040 medium ridership forecast (Appendix 6-A).

Table 6-3 Annual Operations and Maintenance Costs, Apportioned to the Los Angeles to Anaheim Project Section ($2025 in millions)

Cost Category	Approx. Route Miles	2040 Scenario 3: Medium[1]
Los Angeles–Anaheim	31	$55

Source: Appendix 6-A of the Final Environmental Impact Report/Environmental Impact Statement
[1] The 2040 medium cost is based on a rate of $1.78 million per ride.