

2018

June 1, 2018

BUSINESS PLAN



CONNECTING

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CALIFORNIA

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TRAVEL



CALIFORNIA High-Speed Rail Authority

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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 mega-regions of the state, contribute to economic development and a cleaner environment, create jobs and preserve agricultural and protected lands. When it is completed, it will run from San Francisco to the Los Angeles basin in under three hours at speeds capable of exceeding 200 miles per hour. The system will eventually extend to Sacramento and San Diego, totaling 800 miles with up to 24 stations. In addition, we are working with regional partners to implement a statewide rail modernization plan that will invest billions of dollars in local and regional rail lines to meet the state's 21st century transportation needs.



LETTER FROM

BOARD CHAIR

June 1, 2018

On May 15, following a 60-day public comment period, the California High-Speed Rail Authority Board of Directors adopted this 2018 Business Plan. The comments we heard from the public helped shape our final plan, and we thank the many individuals and organizations who took the time to share their thinking with us.

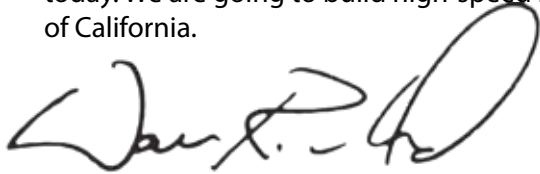
This 2018 Business Plan provides an update to the Legislature and the public on where we are and where we are going. On behalf of the Board, we want to thank our staff and our new Chief Executive Officer, Brian P. Kelly, for preparing a plan that has been widely commended for being candid in its assessment of the challenges we face but, also, in providing a viable, step-by-step approach to delivering this critically needed mobility investment. Mr. Kelly has assembled a strong team as the organization transitions from planning into effective project delivery.

The Board's discussion of the plan provided an opportunity to reflect on what this project means to California, as well as some of the challenges that lie ahead. Simply put, "dirt is flying" in the Central Valley, where we have almost 2,000 people working on more than a dozen construction sites. This initial work and the wider economic benefits it spins off is paying exactly the kind of returns that people want to see from infrastructure investments. And, although that work is underway in the center of the state, we are advancing design on the rest of the system from San Francisco to Los Angeles/Anaheim. Work is also starting on early investment projects that will provide near-term benefits and lay the foundation for future high-speed rail.

In California, those leaders closest to the populace and most aware of the concerns of everyday Californians reside in the mayor's chambers — and the mayors of cities up and down this state have told us that they want this project to be built. Their ardent support reflects their understanding of this project's importance to sustaining economic prosperity and expanding economic opportunity to more people by providing greater connectivity to jobs, affordable housing and educational institutions. The mayors know that, as part of a broader community strategy, this project plays a key role in enhancing quality of life and protecting our environment.

Infrastructure projects take time and persistence. In 1999, the mayor of San José proposed to extend the Bay Area Rapid Transit (BART) system from San Francisco into his city. Twenty years later, the Bay Area is still working on securing full funding to complete the last leg of work on the project. As our business plan lays out very clearly, and as emphasized by the California High-Speed Rail Peer Review Group, there are important funding decisions ahead that need to be made on this program. We will need to work at all levels—federal, state and local—to make these decisions.

This business plan lays out a roadmap for how we will deliver high-speed rail. We are building high-speed rail today. We are going to build high-speed rail tomorrow. And we are going to deliver high-speed rail to the State of California.



Dan Richard

Board Chair

California High-Speed Rail Authority

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LETTER FROM

CHIEF EXECUTIVE OFFICER

June 1, 2018

Ten years ago, when Californians went to the polls to decide whether the state should build a high-speed rail system, they voted, “Yes.” They did so because they recognized that an environmentally clean, fast and efficient high-speed rail system would fundamentally transform how people move around the state, put people to work building the system, spur economic growth and new industries, and help achieve our state’s ambitious environmental objectives.

The California High-Speed Rail Authority remains committed to its mission to deliver this system. I recently became the Chief Executive Officer of the Authority because I share this commitment.

This is the Authority’s 2018 Business Plan. It presents a vision for implementing the nation’s first high-speed rail system. Delivering high-speed rail involves implementing a series of highly complex, integrated megaprojects in the face of challenges that projects around the world of similar magnitude and complexity have faced and successfully addressed. These challenges primarily relate to cost, schedule, funding and project management. This plan provides a candid discussion about the challenges we have already faced and challenges we may face—and it outlines a clear strategy to confront and manage them as we work to deliver this transformative project.

In this plan, we show that our cost estimates have increased and we need greater certainty on funding to fully deliver the initial Silicon Valley to Central Valley Line. As you will read in the pages that follow, today’s challenges require that we conduct business differently than we have in the past. Here is what we have done—and what we are doing—to tackle those issues:

First, we have already taken important steps, including new management and governance structures, to expedite the Authority’s transition from a planning organization to a project delivery organization. This plan outlines additional actions we are now taking to complete that transition. Moreover, we have learned some hard but valuable lessons from our construction contract experience in the Central Valley. We are incorporating those lessons into our future procurements and our construction management practices to ensure that we better identify and mitigate risk, establish appropriate project budgets and contingencies, and effectively manage costs.

Second, this is the first business plan that assigns costs to the risks previously identified in prior plans and reports and presents a revised baseline cost estimate for all project segments. Notably, about 83 percent of the estimated cost increase for the Phase 1 system falls into three distinct categories: contingency increases, inflation, and the revised Central Valley Segment costs released by the Authority in January. This plan presents a full discussion of those costs. In addition, apart from the 119-mile Central Valley Segment that is under construction, most of the system is in the environmental review and preliminary design stage, which is still very early in the project lifecycle process. Because of that, we are applying ranges to our cost estimates based on the status of project development. This is a new approach, but one that is consistent with best practices for megaprojects.

Third, on the funding side, there has been both progress but also some remaining uncertainty for current and future funding dedicated to delivering our initial line between the Silicon Valley and the Central Valley. Last

year, AB 398 was approved by the Legislature and signed into law by Governor Brown extending the Cap-and-Trade Program through 2030. This was another important step by the Legislature toward securing a long-term, stable source of funding for the project. This plan outlines a financing strategy consistent with the one outlined in the 2016 Business Plan as well as an approach to better align the timing of Cap-and-Trade funds so that the project can be delivered in a manner that provides benefits to Californians at the earliest possible time.

Although these challenges and uncertainties compel a different way of doing business, the key objectives and principles that guide our decisions remain the same:

- Initiate high-speed rail service in California as soon as possible.
- Make strategic, concurrent investments that will be linked over time and provide mobility, economic and environmental benefits at the earliest possible time.
- Position ourselves to construct additional segments as funding becomes available.

This 2018 Business Plan reflects considerable challenges to fully deliver the initial Silicon Valley to Central Valley Line. Therefore, to invest available funding consistent with our objectives and principles, our plan proposes to:

1. Meet our commitments to our federal partners by constructing the 119-mile Central Valley Segment and completing the environmental review for all project segments statewide (Merced/San Francisco-Los Angeles/Anaheim) by 2022.
2. Extend the Silicon Valley to Central Valley Line to run from San Francisco to Bakersfield, a line that generates the highest ridership and revenue and that has very strong commercial viability.
3. On our path toward completing the Silicon Valley to Central Valley Line, invest funds to develop 224 miles of high-speed rail ready infrastructure on two lines. One line will be in the Central Valley between Bakersfield, Fresno and Madera. It will also include evaluating construction between Madera and Merced for early service, including understanding the opportunity for connections to the San Joaquins and Altamont Corridor Express services. The other one will be in the Silicon Valley/Bay Area between Gilroy, San José/San Francisco). Doing this will provide early benefits by reducing travel times on existing passenger rail systems, expand clean electrified rail service, and prepare for testing and potential high-speed rail operations in these two corridors by 2026-27.
4. Complete project development work to refine the design, scope and cost for the Pacheco Pass tunnels and the Merced extension that comprise the critical link between the Central Valley and the Silicon Valley. We will also conduct important early works, such as geotechnical analysis, to reduce uncertainty and further “de-risk” the construction of the tunnels. As we do so, we will engage private and public sector expertise to examine and refine design options, optimize operational efficiency, limit costs and evaluate delivery options.
5. Invest remaining Proposition 1A bookend funds as a full partner in vital, high-priority projects in Southern California along the Burbank to Los Angeles to Anaheim corridor that improve freight, local and regional passenger rail service, enhance transit connections, improve safety, and accommodate the introduction of high-speed rail service in Southern California. These include investments in the Rosecrans/Marquardt Grade Separation Project and the Link Union Station project.

6. Leverage state funding committed to the project to pursue additional federal funding or financing and potential private financing to invest in the development of the high-speed rail system statewide.

This implementation strategy will provide early mobility and environmental benefits and build upon the economic dividends that the investments we have already made are yielding for the state and its citizens. Thousands of good-paying jobs have helped put people back to work in the Central Valley. Hundreds of businesses—large and small—are hard at work on the program across the state. And billions of dollars have infused the state's economy, which was recently ranked the 5th largest economy in the world, creating more than \$5 billion in economic output. In the longer term, California will reap even greater dividends from developing a new high-speed rail system connecting the state's economic and population centers, positioning it to stay economically competitive into the 21st century.

In March, we issued our Draft 2018 Business Plan for public review and comment. I appreciate the comments and questions we received from the public, our partners and other stakeholders, which helped us shape and finalize this plan. Some issues are properly addressed in the 2018 Business Plan while others will be addressed through other means. Although some comments were not supportive of the program, many—Bakersfield, Merced, San José, Anaheim and others—express a strong interest to connect their communities and the state with high-speed rail as soon as possible.

Over the next two years, we will continue to build on the progress we have made to advance our organizational and governance structure and enhance our capacity as a project delivery organization. We will continue to advance construction in the Central Valley and the design and environmental reviews of the other project sections. With the help of the Early Train Operator, we will continue to refine our cost estimates and advance our approach to developing two lines of high-speed rail ready infrastructure for early operations. And we will continue to engage with the Legislature, our federal partner, the private sector and others on ways to fully fund and build the Silicon Valley to Central Valley Line for service by 2029. A report on our progress on these and other fronts will be presented in our next comprehensive Project Update Report, which we will submit to the Legislature in March 2019.

I look forward to continuing the march to deliver the most transformative transportation project I have experienced in my nearly quarter of a century working on transportation policy in California—the nation's first true high-speed rail system.



Brian P. Kelly
Chief Executive Officer
California High-Speed Rail Authority

WHY HIGH-SPEED RAIL IN CALIFORNIA

Ten years ago, when Californians went to the polls to decide whether the state should build a high-speed rail system, they voted “Yes.” They did so because they recognized that an environmentally clean, fast and efficient high-speed rail system would fundamentally transform how people move around the state, put people to work building the system, spur economic growth and new industries and help achieve the state’s ambitious environmental objectives.

Sustaining Economic Growth

Connecting the Central Valley to the Bay Area and the Los Angeles economic megaregions through high-speed rail will give businesses around the state new opportunities to choose locations based on labor force availability and to tighten linkages with businesses and field offices. These improved connections will be essential to creating a better jobs-housing balance throughout the state, providing access to new job opportunities, and generating new workforce development possibilities.

The Silicon Valley drives much of the economic growth in California. It is home to leading-edge global companies—Intel, Apple, Google and Facebook, among others. Its industries lead the world in innovation, and no region in America or the world has seen so many startup companies grow so quickly into global enterprises of enormous influence. Similarly, the Los Angeles Basin is the global hub of the media and entertainment industry, as well as a hub for tourism, finance and a growing tech presence in “Silicon Beach.”

However, these regions of the state often struggle to provide adequate affordable housing for their citizens and California’s state and local leaders have put a high priority on policies and strategies to address these issues. Connecting the state’s regions with fast and frequent high-speed rail service is an integral part of the solution to diversify housing options and increase access to housing that is affordable for workers in all regions.

The Authority is committed to connecting the Silicon Valley to the Central Valley—from San Francisco to Bakersfield—as quickly as possible. A trip from San José to Fresno would be reduced to about an hour, from the three hours it currently takes to make the trip by car. This drastic reduction in travel time would give tech and other Bay Area companies an incentive to locate branch offices and back-office functions in the more affordable Central Valley. A new reliable connection between the valleys will enable people to work at high-tech jobs while having access to more affordable housing options in cities such as Gilroy, Merced and Fresno.

Housing prices and the cost of rent vary widely throughout the state. According to a recent article in the *Sacramento Bee*^[1], the median price of rent for a two-bedroom unit in San Francisco is now nearly \$4,200. Comparatively, the rent for a two-bedroom unit in Kings County, which will be connected to the Silicon Valley by high-speed rail, has a median cost of just less than \$900. A shortened commute, made possible by high-speed rail, will open up an affordable housing market for those working in the Bay Area.

Joining the valleys and their unique economies will also drive the development of new vibrant, livable districts around high-speed rail stations and help achieve state and local community goals for economic development, jobs and housing. At the same time, it can spark significant economic growth in the Central Valley and help sustain the economic prosperity of the Silicon Valley.

The Authority is also committed to delivering the full Phase 1 System as expeditiously as possible. Ridership and revenue forecasts show that the initial line—from San Francisco to Bakersfield through the Silicon Valley—will produce revenue that can help fund construction from the Central Valley southward to the Los Angeles Basin.

EXHIBIT 1.0 THE ECONOMIC IMPACT OF HIGH-SPEED RAIL INVESTMENTS (JULY 2006-JUNE 2017)



Infrastructure Investments Create Jobs and Economic Benefits

Investing in high-speed rail delivers multiple near- and long-term benefits, including job creation, small business opportunities and wider economic impacts that are spread throughout California. For more than 10 years, high-speed rail contractors have hired workers throughout the state and paid businesses for goods and services.

What Is a Job-Year?

Job-years represent a combination of total jobs and the length of time of those jobs.

For example, one job supported for two years equals two job-years; five jobs supported for one year equals five job-years.

These firms, in turn, have hired employees and purchased materials necessary to make their products. Workers also spent their earnings throughout the economy on housing, food and other household purchases. High-speed rail investment rippled throughout California’s economy and, over an 11-year period from 2006 to 2017, generated between \$5 billion and \$6 billion in total economic activity in the state.

The largest economic impact from the state’s investment in high-speed rail has been felt in the Central Valley, stimulating an estimated 11,300 job-years of employment and approximately \$2 billion in total economic activity. A substantial majority of this investment occurred in the last three years after construction broke ground in 2015. The

economic activity generated by high-speed rail construction in the Central Valley will continue to grow in the coming years, as construction activities expand further.

Fresno County has been the hub of high-speed rail construction thus far. California’s Employment Development Department estimated that 9,400 jobs were added in Fresno County between July 2016 and June 2017. Over this same period, high-speed rail investment in Fresno County supported 3,100 full-time jobs; the equivalent of more than 30 percent of all jobs added in the county.

It’s not just the Central Valley that benefits from high-speed rail investments. In addition to the engineering and design work on the project, the ripple effect from construction in the Central Valley reached other regions, as more and more businesses provide expertise to variety of construction related activities. Exhibit 1.2 shows the spread of economic benefits, jobs and business opportunities to the state’s largest regions. ^[2]



Faces of High-Speed Rail: Modern Custom Fabrication



Modern Custom Fabrication, Inc. (MCF) celebrated the groundbreaking for its new, 100,700-square-foot modernized facility in late August 2017. MCF's previous location in south Fresno was acquired by the Authority. Thanks to the combined efforts of the Authority, the Fresno County Economic Development Corporation and the City of Fresno, MCF found a suitable location to continue its operations within Fresno. The company, which employs 35 people, will continue to produce large steel storage tanks, and the relocation will give the company the opportunity to expand its operations in the region and continue to make positive contributions to Fresno's economy.

In addition to the economic benefits generated by the investment in California's economy, the continued design and construction of the Silicon Valley to Central Valley Line is expected to create enormous benefits throughout the state. As the Authority contracts with new companies and those firms hire new workers, advancement of the program will further bolster a new high-speed rail industry in California. A forward-looking analysis shows that a completed Silicon Valley to Central Valley Line will support nearly 240,000 job-years of employment and nearly \$50 billion in economic activity over the lifetime of the line's construction.

EXHIBIT 1.1 FUTURE BENEFITS OF THE COMPLETED SILICON VALLEY TO CENTRAL VALLEY LINE



JOB-YEARS OF
EMPLOYMENT

239,000



LABOR
INCOME

\$15.6B



ECONOMIC
OUTPUT

\$48.7B

EXHIBIT 1.2 ECONOMIC BENEFITS BY REGION (JULY 2006-JUNE 2017)
 INCLUDING DIRECT, INDIRECT, AND INDUCED IMPACTS FROM FISCAL YEAR 16/17 AND PROGRAM TOTALS
 (JULY 2006 - JUNE 2017)*



*Totals may not sum due to rounding

Enhancing Mobility

High-speed rail will fundamentally transform how people travel in California. California's transportation system, once the envy of the world and a key driver of economic prosperity, is becoming increasingly gridlocked, and it's a problem that will only worsen.

California's population is projected to grow to 51.1 million by 2060, a 30-percent increase from today's population of 39.4 million.^[3] That's roughly the entire population of Ohio moving to California over the next 40 years, and those new residents will be joining us on our roadways, at our airports and on our rail systems.

California's cities already have some of the most grueling commutes in the nation, and travel between cities is plagued by delays because California's extensive highways and roads rank among the busiest in the nation and are nearing or exceeding capacity.^[4] Airports are crowded and near capacity, and flight delays are common.

Los Angeles commuters lose 102 hours to congestion every year—the most of any commuters in a study of major cities worldwide—according to the INRIX 2017 Global Traffic Scorecard.^[5] Congestion delays on the state's roadways are so bad that three California cities—Los Angeles, San Francisco and San José—rank among the top five most gridlocked cities in the nation.^[6]

It is clear that we need another option to the state's overburdened transportation system.

Those traveling between the major regions of the state will fare no better as our population increases. Interregional travel is forecasted to increase to 544.7 million trips annually by 2040 on all modes of travel, compared to the estimated 361 million annual interregional trips that Californians took in 2010.^[7]



WHAT IS THE SMARTEST WAY TO MOVE AROUND THE STATE?



A New Mobility Option for the Central Valley

The Central Valley, which lacks quick and easy connections to the rest of the state, ranks as one of California's most underserved regions when it comes to transport. For the average traveler, what would seem at first glance to be a straightforward trip from Fresno to San José is either a long, frustrating drive or a multiple-transfer ride on existing passenger rail service that can take from four to five hours to complete:

- Assuming no highway congestion or traffic delays, a trip from Fresno to San José takes just under three hours by car. But a driver has limited route choices, and the routes to San José will undoubtedly be congested, quite possibly adding an hour or more to the drive.
- Using existing passenger rail service requires jumping through several hoops because no direct, non-stop service between the two cities currently exists. A rail passenger in Fresno can choose any one of the five trips per day on the Amtrak San Joaquin line that require a bus transfer in Stockton, and those trips average approximately four hours.

Compare the above travel scenarios to high-speed rail: A trip from Fresno to San José could take approximately one hour on high-speed rail, with no transfer with the proposed system.

With high-speed rail, a trip from as far south as Bakersfield and other key locations in the Central Valley to the San Francisco Bay Area will take two hours or less, and it will be the same every time no matter how congested the roads or how bad the weather.

It's a similar situation for Central Valley travelers who want to go to the Los Angeles area. A Fresno traveler is looking at nearly a four-hour drive (under ideal traffic circumstances) or a five-hour odyssey by passenger rail and bus. The same trip by high-speed rail would take two hours every time, without delays caused by snow or other hazards along the grapevine area.

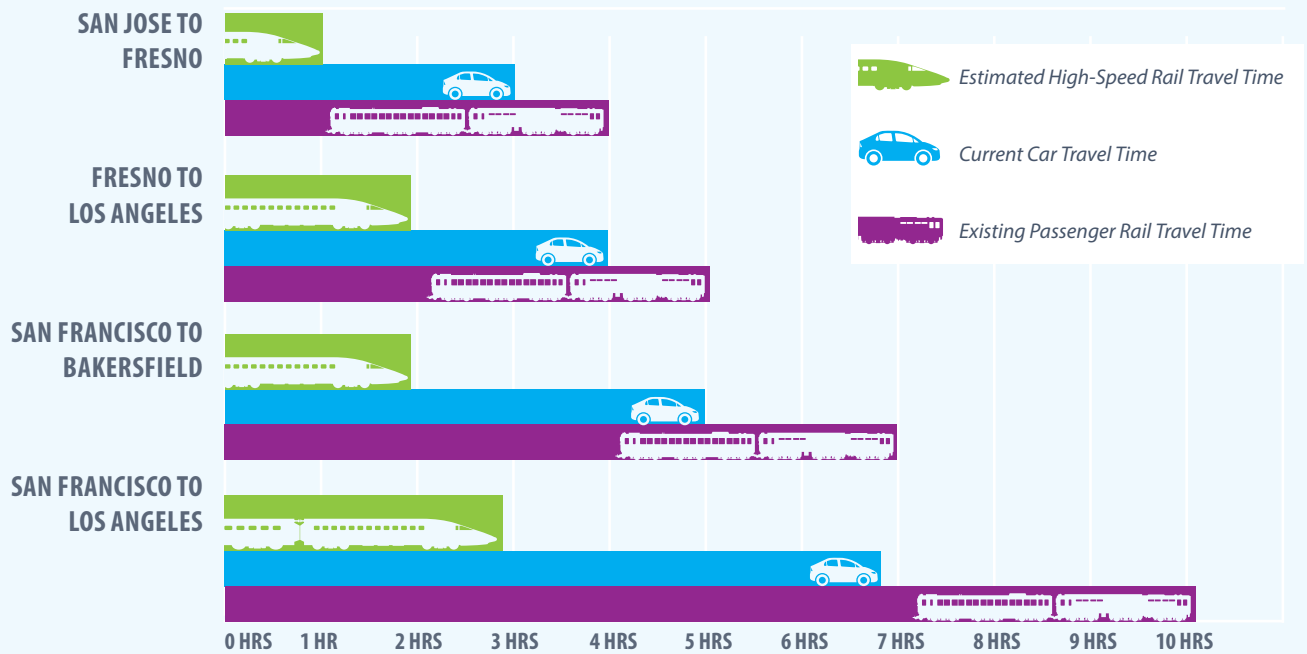
From North to South

Travelers who need to go from Northern California to Southern California, or vice versa, can choose between driving, flying or taking a bus:

- It's a nearly seven-hour drive under good conditions, which eats an entire workday in the best-case scenario. In the worst-case, a driver is looking at up to nine hours in the car.
- Flying may be quicker but no less frustrating. Actual flight time between the two regions is approximately an hour-and-a-half, but an hour-and-a-half flight quickly turns into four or five hours when getting to and from the airport, finding parking and going through security checks are factored into the travel equation.
- Hopping on a bus means a nearly 10-hour ride, not exactly ideal for travelers under time constraints.

It is also possible to take conventional rail between Oakland and Los Angeles. There is one trip daily in each direction, with a scheduled travel time of more than 12 hours southbound and more than 11 hours northbound.

EXHIBIT 1.3 COMPARATIVE TRAVEL TIMES: FUTURE HIGH-SPEED RAIL, CAR, AND EXISTING RAIL



**All travel times are approximate. Trips are measured from central business district, existing passenger rail stations, or planned high-speed rail stations. Approximate car travel times were estimated based on the California Statewide Travel Demand Model. Existing passenger rail travel times were approximated using the Amtrak website, referencing schedules current as of publication. High-speed rail travel times are for non-stop service and were estimated by the Authority using internal modeling, which includes at least 5% padded time. Run times do not take into account integration with other operators' services in blended sections.*

High-Speed Option

With Phase 1 of the high-speed rail system complete, trips to and from the Central Valley will typically take half the time it currently takes to drive. Trips between San Francisco and Los Angeles will take less than three hours, with options to connect to other modes of transport along the way or at the final destination, potentially extending travel times.

Exhibit 1.3 compares travel times between cities by car, existing passenger rail and high-speed rail, showing the tremendous time savings realized by high-speed rail service in California. California can do better than the existing options, and high-speed rail is the answer.

Additionally, shifting more trips from flying or driving to high-speed rail will increase capacity at our busiest and most congested airports, as well as reduce roadway congestion in already overburdened corridors. Many countries that initiated high-speed rail service between two destination cities—such as San Francisco and Los Angeles—saw a considerable mode shift from cars and planes to high-speed rail.

When high-speed rail service was introduced between Madrid and Seville, Spain, the share of trips taken by plane was reduced from 40 percent to 13 percent, and rail trips grew from 16 percent to 51 percent. Additionally, in France, travel habits changed after high-speed rail became an option for travelers between Paris and Lyon, with the share of rail trips growing from 40 percent to 72 percent.

High-Speed Rail Internationally

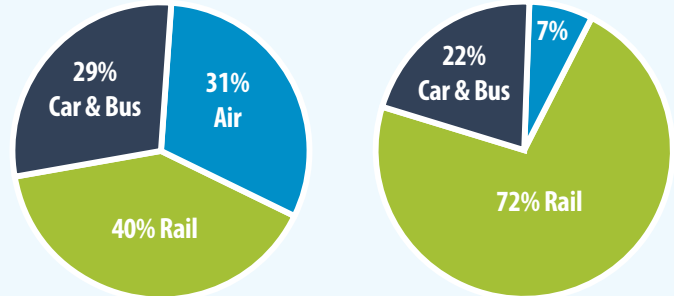
High-speed rail may be new to the United States and California, but countries around the world have been building thousands of miles of high-speed rail for years, and many more countries plan to join them.

Japan inaugurated its first 319-mile Shinkansen line between Tokyo and Osaka in 1964, just over 50 years ago.^[8] China has built the largest high-speed rail network in the world, connecting its urban centers and carrying more than 1.5 billion passengers each year with high-speed rail travel growing at a dramatically higher rate than air.^[9]

In addition, many countries are in the process of building high-speed rail lines. Some countries, such as China, Japan, Turkey, Spain, Germany and the UK, are constructing more miles of track capable of supporting high-speed service. Other countries, such as Saudi Arabia and Morocco, are building completely new high-speed rail systems.

EXHIBIT 1.4 HIGH-SPEED RAIL MODE SHIFT

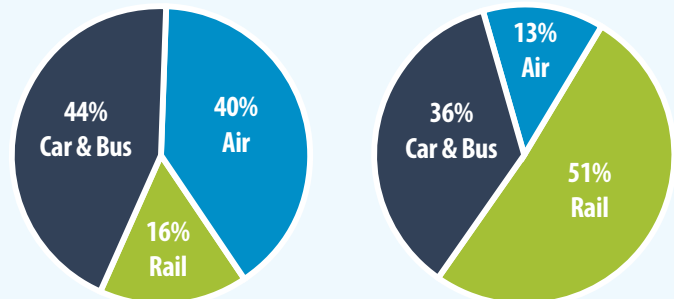
France's Train a Grand Vitesse - (TGV Sud-Est)



Before HSR

After HSR

Alta Velocidad Española - (AVE Madrid-Seville)



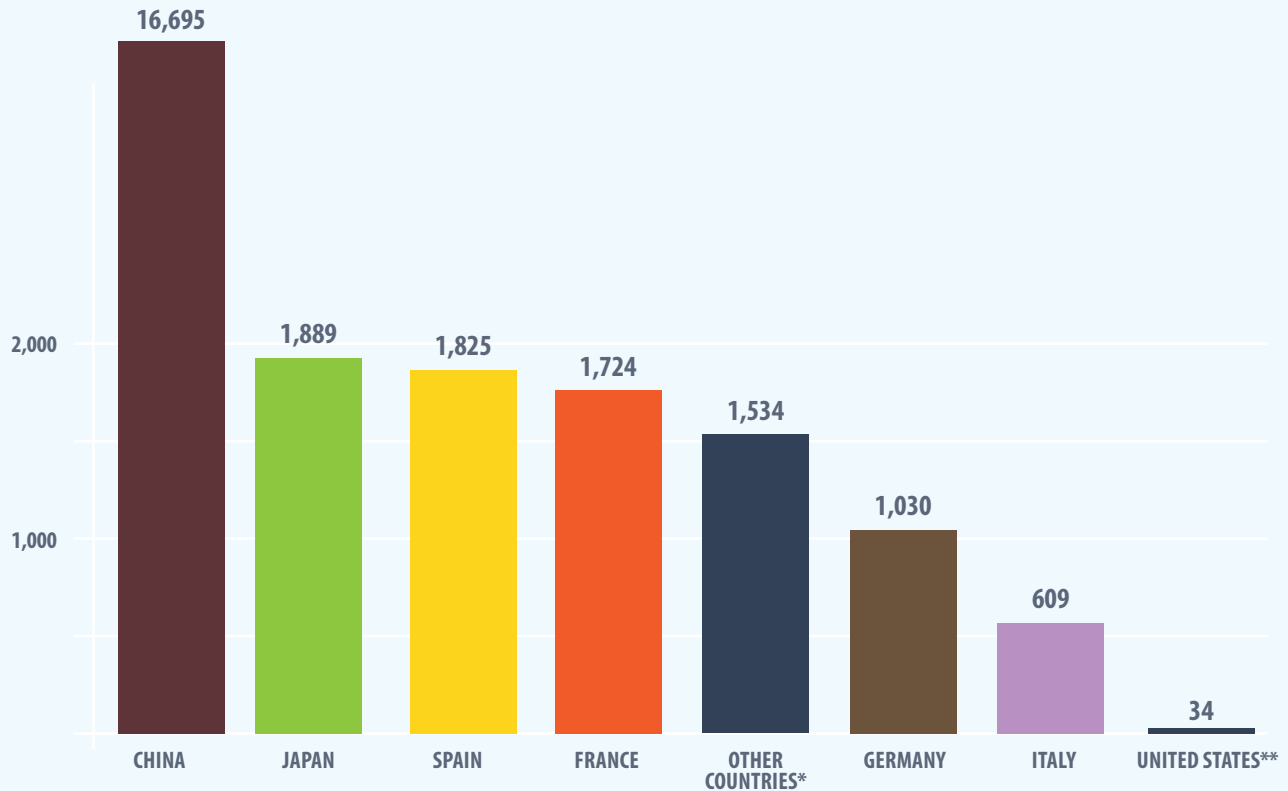
Before HSR

After HSR



Alta Velocidad Española - (AVE Madrid-Seville)

EXHIBIT 1.5 MILES OF HIGH-SPEED RAIL TRACK IN OPERATION, BY COUNTRY* (2018)**



*South Korea, China, Turkey, Austria, Belgium, Poland, Switzerland, the Netherlands, and the United Kingdom

**The Northeastern Corridor, operated by Amtrak, is 457 miles long connecting Boston to Washington, D.C. The Acela Express attains a speed of 150 miles per hour on 33.9 miles of the Northeast Corridor route. The UIC includes 457 miles in their statistics to reflect the total length of the route between Boston and Washington, D.C.

*** UIC, The Worldwide Railway Organisation: High Speed Lines in the World (updated Feb. 15, 2018), https://uic.org/IMG/pdf/20180215_high_speed_lines_in_the_world.pdf

Exhibit 1.5 compares the number of miles of passenger rail systems that travel at 150 miles per hour or faster in China, Japan and other countries to the number of miles of passenger rail systems in the United States that travel at 150 miles per hour or faster.

Investment in intercity passenger rail is historically flat in the United States despite our growing economy and a population that’s becoming increasingly urbanized. This investment trend may be changing as other states and regions, such as Texas, Florida, Nevada and the Northeast Corridor, have recognized the increasing need and demand for a new mobility option and are implementing high-speed rail systems in various stages of planning and development.

California, with 119 miles of high-speed rail in final design and construction, has made the most progress toward making this mobility option a reality in America—a fact that’s not surprising given California’s global position as the fifth-largest economy in the world.

“At a time when science shows us that climate change is happening faster than anticipated, California is responding with a bold plan that rises to meet this global challenge.”

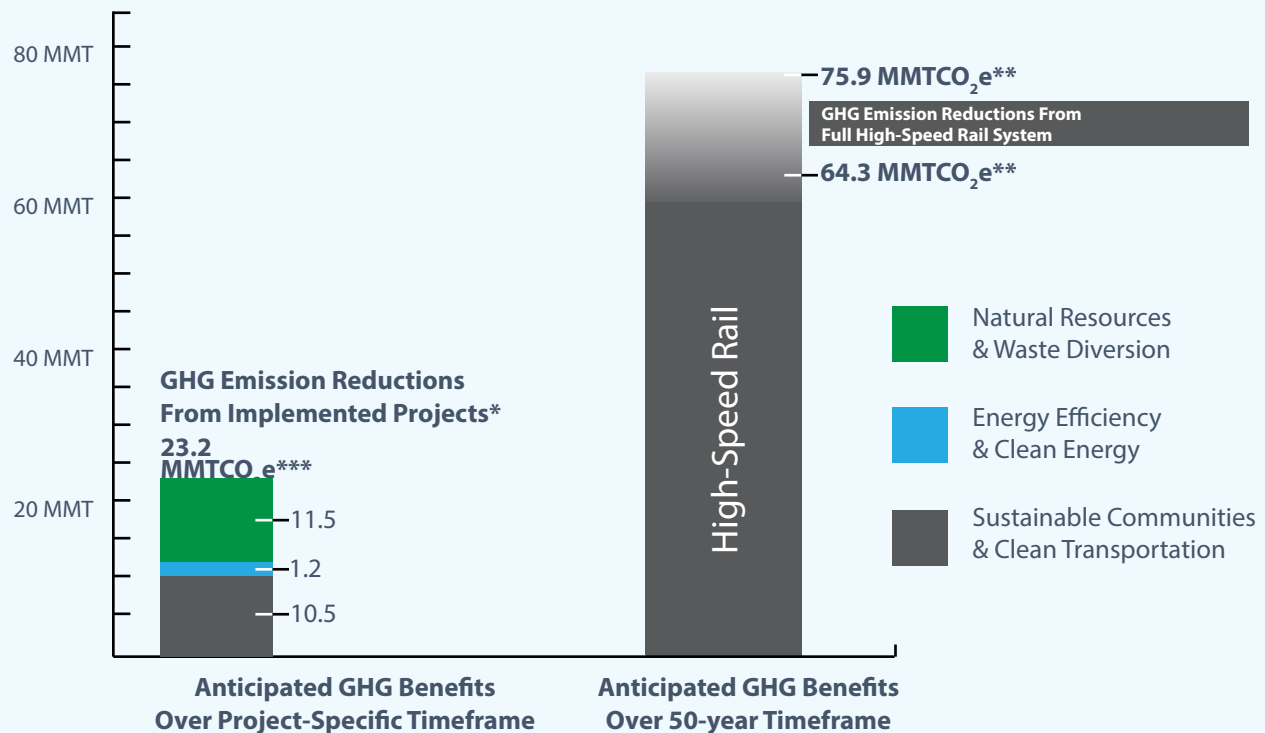
**- Mary Nichols, Chair,
California Air Resources Board**

Advancing Environmental Goals

California’s leaders are globally recognized for setting ambitious policies and regulations for how the state addresses environmental quality and sustainable development. California’s far-reaching policies set a national tone on climate change, developing clean energy, curbing greenhouse gas emissions, protecting endangered species and valuable agricultural lands, and transitioning to a sustainable, low-carbon future.

For example, SB 32 established a greenhouse gas reduction target for California of 40 percent below 1990 levels by 2030—the most aggressive benchmark enacted by any government in North America to reduce carbon emissions by 2030. The state’s ultimate goal is to reduce emissions 80 percent under 1990 levels by 2050. Crucially, the investments made to achieve long-term emission reduction value have also been legally mandated to provide near-term benefits, particularly in disadvantaged communities.

EXHIBIT 1.6 CALIFORNIA CLIMATE INVESTMENTS AND GREENHOUSE GAS EMISSIONS REDUCTIONS



*Estimates for California Climate Investments implemented through 2016 & 2017; does not include benefits from High-Speed Rail Project.

**Based on 2018 Business Plan ridership results

MMTCO₂e=millions of metric tons of carbon dioxide equivalent

*** https://www.arb.ca.gov/cc/capandtrade/auctionproceeds/2018_cci_annual_report.pdf

In addition, Governor Brown’s inaugural address in 2015 set a goal for California to reduce petroleum use in cars and trucks by up to 50 percent by 2030. High-speed rail service is an essential element of the state’s strategy to reduce greenhouse gas emissions while maintaining economic growth through improved mobility options for Californians.

The Authority, recognizing the role high-speed rail plays in meeting the state’s climate mitigation and adaptation objectives, matches that commitment with the goal to create the greenest infrastructure project in the nation, both in its construction and its operations. The Authority intends to use 100-percent renewable energy to power the high-speed rail system once complete. This is a unique commitment made possible by the abundance of renewable energy resources in California—solar, wind, geothermal and bioenergy.

These strategies, among others, will play a major role in California’s cutting-edge efforts to reduce greenhouse gas emissions and address the effects of climate change. High-speed rail is a part of the state’s success in decarbonizing its current economy.

In December 2017, the California Air Resources Board approved a bold plan, entitled “California’s Climate Change Scoping Plan: The Strategy for Achieving California’s 2030 Greenhouse Gas Target,” to accelerate the reduction of greenhouse gas emissions over the coming decade while improving air quality and public health, investing in disadvantaged communities, and supporting jobs and economic growth.

The Authority already requires that its Central Valley contractors use clean equipment, which has resulted in the construction sites being 50 to 60 percent cleaner than typical California construction sites. These and other efforts are yielding positive results for an area of the state which, by many measures, has the worst air quality in the country.^[10]

The critical value of the system will be the millions of trips that will no longer be taken in automobiles. Particularly in the Central Valley, avoided automobile emissions will result in hundreds of thousands of tons of reduced particulate matter, volatile organic compounds and other pollutants that affect human health, improving air quality in disadvantaged communities.

The high-speed rail system is a key part of ensuring that all California residents can have clean air to breathe and opportunities to participate in the cleaner economy. The high-speed rail system will provide a fast, efficient and clean alternative to traveling between the state’s economic centers by car or by short-haul air travel.

Over time, the average annual greenhouse gas emissions savings of the system, 1.5 million metric tons of carbon dioxide equivalent, is projected to be the equivalent of taking 322,000 passenger vehicles off the road, and 169 million gallons of gasoline avoided, every year. In addition, on average every year, more than 3,700 tons of harmful pollutants, such as particulate matter, carbon monoxide and nitrogen oxide, are kept out of the air.

Benefits to Disadvantaged Communities

In many areas of the state, the high-speed rail system will travel near or through disadvantaged communities. High-speed rail stations will serve as catalysts for infill development, which will include affordable housing and other benefits to local communities. The Authority and station cities are working together to develop and implement local land use plans to keep



growth compact and walkable. This planning effort will connect high-speed rail to existing neighborhoods and protect the natural environment.

These stations and high-speed rail facilities will also be designed to be “net-zero” energy, which will not only increase environmental benefits but also reinforce California’s renewable energy economy.

Sustainable infrastructure can make communities safer places to live and can restore multimodal connections previously severed by ill-placed infrastructure projects. The Authority is working with its local municipal partners to fund several grade separation projects at key locations along the high-speed rail alignment.

In the near term, these grade separations will not only greatly improve safety but also increase access to adjacent communities, including many disadvantaged communities. Furthermore, because cars will no longer sit idling at rail crossings, there will be local air quality improvements and reductions in greenhouse gas emissions.

The high-speed rail program provides a unique opportunity to expand sustainable, quality employment throughout California. Focusing job opportunities on those areas hardest hit by the economic downturn helps deliver benefits to communities that need jobs the most.

The Authority’s Community Benefits Agreement (CBA) is a cooperative partnership between the Authority, skilled craft unions and contractors that is based on its Community Benefit Policy, which promotes employment and business opportunities for small and disadvantaged businesses and workers during the construction of the project. Under the CBA, training opportunities are advanced and promoted for all individuals so that workers gain necessary skills to advance their employment opportunities. Through the CBA, the Authority is continually focused on engaging disadvantaged communities and achieving employment targets for individuals who reside in disadvantaged areas and those designated as Disadvantaged Workers, including veterans.



Improving Safety and Security for Passengers and Freight

Safety and security is an important element of the entire high-speed rail system, and the Authority is creating a 21st century transportation system that will implement the most advanced and innovative safety technology available today.

Studies have shown that passenger rail consistently offers people the safest transportation mode available. According to the United States Department of Transportation, there were more than 35,000 deaths on U.S. highways in 2015, as compared to slightly more than 800 deaths related to rail.^[11] Many of those rail-related deaths are due to trespassing on rail property or collisions at grade crossings—which high-speed rail will avoid in almost all instances. In fact, along with air travel, passenger rail continues to be one of the safest modes of transportation today.

California's high-speed rail system will be built according to international safety guidelines and will integrate several key safety mechanisms, such as grade separations, Positive Train Control (PTC), quad gates and intrusion protection barriers. In the Central Valley alone, a total of 50 new, fully grade separated crossings will be built.

Not only will these grade separations prevent the overwhelming majority of major traffic collisions, they will improve operations on existing freight and passenger rail lines, including Union Pacific Railroad, BNSF, the San Joaquin Valley Railroad and the San Joaquin Amtrak service, which also runs on these freight lines.

In Northern and Southern California, the Authority is working with local and regional partners to identify methods to fully grade separate the high-speed rail corridor. Examples of this collaboration include the 25th Avenue grade separation project in San Mateo and the Rosecrans/Marquardt Avenue grade separation project in Santa Fe Springs, being led by Los Angeles Metro. These investments will eliminate collisions, improve safety, allow freer-flowing vehicle traffic and improve air quality by reducing vehicle idling while trains traverse intersections.

The Authority concurs with the recommendation that, as the implementation of the state rail plan expands passenger and freight rail service throughout California, a comprehensive statewide strategy is necessary to address safety and mobility concerns. The strategy would identify grade crossings in need of elimination or improvement in order to reduce congestion, improve safety, or otherwise benefit communities. The Authority will work with other state agencies and regional and local partners to pursue this further.

In addition to grade separations, PTC provides another layer of safety for the high-speed rail system by preventing train-to-train collisions and over-speed derailments. For example, if a train engineer doesn't respond to speed or motion detection warning, the PTC system takes over and prevents the train from running a red signal light or entering a stretch of track at an unsafe speed. The Authority is also adopting an Early Earthquake Detection System that will be designed to detect the initial wave produced by a seismic event and immediately cut power to trains in operation at the time of the earthquake.

With these precautions in place and an organizational philosophy that puts safety and security first, California high-speed rail will be among the safest transportation networks in the world.

Investing in California's Future

California's history of investing in physical infrastructure has been key to making the state an economic powerhouse. With a population of 40 million people and a \$2.5 trillion economy—ranked 6th largest in the world—we are among the world leaders. Our vision for high-speed rail is reinforced by the success of other countries that have demonstrated the value of a high-speed rail system to their growth and success.

High-speed rail is more than just a train. It's about providing the mobility and access that opens economic opportunity. It's about jobs, job training and opportunities for small and disadvantaged businesses to be engaged in planning, building and operating the system. It's about improving safety at grade crossings and improving air quality. It's about reducing congestion on our heavily-traveled roads to free up capacity for moving goods and freight.

It's about providing new options for people to move around the state and relieving the burden from our busy airports. It's about partnering with our regional and local transit operators to provide seamless, connected transit service to move Californians quickly and efficiently.

It's about leading efforts to reduce greenhouse gas emissions and address climate change. It's about enhancing quality of life by providing more livable, pedestrian-friendly communities. It's about transforming California.

"Our economy, the sixth largest in the world, depends on mobility, which only a modern and efficient transportation system provides."

**- Governor Edmund G. Brown, Jr.,
2018 State of the State Address**



EXHIBIT 2.0 PHASED HIGH-SPEED RAIL SYSTEM IMPLEMENTATION



IMPLEMENTATION AND DELIVERY STRATEGY

The California High-Speed Rail Authority remains committed to the Proposition 1A mission to connect California with a new high-speed passenger rail service, capable of connecting San Francisco to Los Angeles in under three hours. This system will be delivered through a phased implementation strategy. In our 2016 Business Plan, we established the following objectives:

- **Initiate high-speed rail into passenger service as soon as possible**
- **Make strategic concurrent investments throughout the high-speed rail corridor that can be linked together over time**
- **Position ourselves to advance additional segments as funding becomes available**

The implementation and delivery strategy summarized in this chapter reflects those objectives and reiterates our intent to develop an initial line connecting the Silicon Valley to the Central Valley as soon as possible.

Delivering the Silicon Valley to Central Valley Line

In this 2018 Business Plan, we now define the Silicon Valley to Central Valley Line as service between San Francisco and Bakersfield. This line has stronger ridership potential and higher commercial value than the shorter line between San José and Poplar Avenue (north of Bakersfield) laid out in the 2016 Business Plan. This is a strategic enhancement that will generate higher revenue which can then be used to help fund expanding the system in Southern California. In its 2016 Business Plan, the Authority adopted the goal of completing a connection between the City of Merced and San José as part of the initial Silicon Valley to Central Valley Line. In this 2018 Business Plan, we reiterate our commitment to this goal. As in 2016, funding for this connection still must be identified.

The revised cost and schedule estimates, discussed in *Chapter 3: Capital Costs and Funding*, require a different approach to building this line. The estimated funding shortfall is approximately equivalent to the cost to construct the tunnels through the Pacheco Pass—the critical link between the Silicon Valley and the Central Valley. Our phasing approach focuses on completing the Central Valley and the San Francisco to Gilroy segments first, working toward beginning interim operations.

Under this incremental approach, the Pacheco Pass tunnels and the extension to Merced, funding permitted, will be the last link of the Silicon Valley to Central Valley Line. This tunnels segment, required to connect San Francisco and Gilroy to the Central Valley, presents challenges in terms of environmental planning, cost, technical complexity, schedule and available funding to complete.

We will continue to advance the environmental review and design to identify a preferred alignment and provide greater certainty on costs. We will also continue and/or initiate early works, including geotechnical evaluation, right-of-way acquisition, third-party agreements, and utility identification and relocation. Completing these early works will enable us to refine our cost estimates and schedule projections and be ready for construction of the tunnels as funding is available.

The Authority will benefit from broad public and private sector expertise as we develop and finalize design options that will maximize operational efficiency and reduce construction costs for the tunnels section. We will also concurrently work with the private sector to explore innovative ways to construct and finance these remaining investments to connect the two ends of the system.

We will work to deliver the Silicon Valley to Central Valley Line incrementally through the following steps:

- 1. Complete Central Valley civil work**—We will complete the construction work that is already well underway in the 119-mile Central Valley Segment (Madera to Poplar Avenue) by 2022, consistent with our federal funding grant agreement commitment.
- 2. Add Central Valley track and systems**—Adding the track and systems will prepare the Central Valley Segment for early, interim use by an operator and for testing of the high-speed trains.
- 3. Expand Central Valley construction**—We will extend south from Poplar Avenue into Bakersfield and analyze the potential to utilize a completed segment in the Central Valley for early operations or interim improved services for Amtrak passengers consistent with the grant agreement with the Federal Railroad Administration. Our analysis will include evaluating the cost and benefits of providing interim service between Bakersfield and Madera. It will also include evaluating construction between Madera and Merced for early service, including understanding the opportunity for having strong connections to San Joaquins and Altamont Corridor Express services. This analysis will inform our Project Update Report, due to the legislature in March 2019.
- 4. Expand electrification of the Caltrain corridor**—We will expand electrification south of San José to Gilroy. The Authority continues to be in discussions with Caltrain, Caltrans, the City of San José, Santa Clara County, Union Pacific Railroad and other partners about right of way and operational options, including how passenger and diesel freight trains could share the corridor. This may potentially allow enhanced electrified service all the way to Gilroy, eliminating the need to use passenger diesel trains in the corridor and potentially allow the line to be used for express high-speed rail operations between San Francisco and Gilroy.
- 5. Make additional capital investments from San José to San Francisco**—We will make limited capital investments in the San José to San Francisco section to improve safety and prepare the segment for initial high-speed rail operations at the soonest possible time. We will also analyze the earliest possible date for high-speed rail trains to be introduced in the corridor.
- 6. Advance Pacheco Pass and Merced project development work**—We will complete project development and other early works—geotechnical analysis, environmental review, design, right-of-way acquisition—to further “de-risk” the construction of the tunnels.
- 7. Engage with partners**—In delivering the tunnels, we will engage the federal government and public and private sector experts to examine tunnel design options that maximize operational efficiency, safety, environmental stewardship and cost containment.



San Joaquin River Viaduct Construction in Fresno

EXHIBIT 2.1 SILICON VALLEY TO CENTRAL VALLEY



Silicon Valley to Central Valley Line: What it Means

Connecting the Silicon Valley to the Central Valley will usher in a new era of transportation and have a transformative effect as it creates new connections and access. The impact of this line will be inestimable in terms of the economic impacts within each region.

The Silicon Valley to Central Valley Line will enable people to connect and work at high-tech jobs in Silicon Valley and San Francisco while having greater access to more affordable housing options in cities such as Gilroy, Merced and Fresno, which are already working on plans to create vibrant, livable districts around high-speed rail stations. These new connections will foster economic revitalization, affordable housing and workforce development goals.

New linkages will be created between higher education institutions in the Central Valley and high-tech and other cutting-edge industries in the Silicon Valley. With more convenient, cost-effective transportation options, some high-tech and other companies might choose to locate corporate functions in the Central Valley—seeing benefits from less-expensive commercial real estate, expanded housing options for employees or generating new job opportunities in this region.

By building the Silicon Valley to Central Valley Line, we can reduce the trip time from Fresno to the Bay Area from about three hours driving today to about an hour on high-speed rail. The opportunity to connect these two regions and their unique economies—to help bring about jobs and housing balance through effective land use and transit oriented development and to provide for fast, efficient connections to Silicon Valley employment centers—could spark significant economic growth by connecting the Central Valley with the Northern California megaregion.

Early Interim Services in the Central Valley and Between San Francisco and Gilroy

The strategy for incrementally delivering the Silicon Valley to Central Valley Line would create approximately 224 miles of high-speed-rail-ready infrastructure on two different lines, one in the Central Valley and one connecting San Francisco to Gilroy. Both lines could be ready for service as early as 2027—and delivering early benefits on the way to completing the full Silicon Valley to Central Valley Line.

While the Authority builds out the Silicon Valley to Central Valley Line, we intend to look for ways to bring benefits to Californians as quickly as possible. To that end, we will work to identify how to put each segment of the system into service once completed. In the Central Valley, this may include using the newly upgraded high-speed rail track for existing San Joaquin service from Sacramento to Bakersfield. At the same time, we may be able to transform the connections from southern Santa Clara County to the rest of Silicon Valley and San Francisco. Early investments between San Francisco and Gilroy will be focused on providing two trains per hour during peak commute times and one train per hour during non-commute hours. The investments would include platforms, track, and station improvements, as well as investments in maintenance facilities. Early improvements such as these will enhance operations, create new connections and improve air quality.

The Authority, working with our Early Train Operator (ETO), will explore options for how best to put infrastructure into service. Early train service decisions will include the type of service and the operator of those services that will ensure full compliance with our Proposition 1A requirements. In the Central Valley, this will include evaluating how to best optimize connectivity to other passenger rail services.

Delivery Assumptions for the Silicon Valley to Central Valley Line

This incremental approach for completing the Silicon Valley to Central Valley Line assumes that funding is available to execute major civil contracts and other procurements within the next two years. This is consistent with our 2016 Business Plan funding approach, which assumed financing of Cap-and-Trade revenues and the creation of an investment grade revenue stream through 2050. As discussed in *Chapter 3: Capital Costs and Funding*, this fundamental assumption remains in this plan because early financing is required to meet the planned construction schedule. More specifically, a megaproject of this magnitude and complexity cannot be delivered on this schedule using only a pay-as-you-go approach.

Bay Area Corridor Benefits

Extending the current work on electrifying the San Francisco to San José segment all the way to Gilroy offers opportunities to improve service options. This would allow Caltrain to offer enhanced electrified service or potentially allow for the introduction of high-speed rail options in the corridor. Creating an express line will provide unprecedented connections between Gilroy and Silicon Valley, allowing southern Santa Clara County residents to see the potential benefits that high-speed services can provide.

Traveling or commuting between Gilroy and San Francisco would be faster, compared to taking as much as two and a half hours to make the trip today. This provides options to avoid the onerous trip on Highway 101 and mitigate the increasing travel demands along this corridor. Ahead of completing the entire Silicon Valley to Central Valley Line, improving this connection between Gilroy and the rest of Silicon Valley can begin to lessen the housing burden faced by Bay Area residents as new housing markets come within reach.

Since 2014, the Legislature has successively committed to the Cap-and-Trade Program, which continues to provide an ongoing source of funding. In July 2017, AB 398 was approved by the California Legislature and signed into law by Governor Brown, extending the horizon of the Cap-and-Trade Program through December 31, 2030. This was another important step toward securing a long-term, stable source of funding for the project. Since AB 398 was passed, quarterly receipts from Cap-and-Trade auctions have been strong—an indication that the market has reacted positively to the legislation.

As noted in *Chapter 3: Capital Costs and Funding*, we will continue to work with the Legislature and Department of Finance to structure the Cap-and-Trade Program to allow financing. We will also pursue opportunities to access further federal funding and/or loan programs to help us complete the Silicon Valley to Central Valley Line

Drawing Upon International Tunneling Expertise

Tunnels will be required through the California Coast Range between Gilroy and Merced, the Tehachapi Mountains between Bakersfield and Palmdale, and the San Gabriel Mountains between Palmdale and Burbank. The alignments currently under consideration involve between 45 to 50 miles of tunnels that range in length from several thousand feet to more than 20 miles, some of which are more than 2,000 feet underground. Tunnels of this magnitude and complexity have been constructed internationally. Five high-speed rail tunnels of the same length and longer have been successfully completed worldwide, and another six are currently in planning and under construction. We are drawing upon international experience and expertise in tunneling to help us design and deliver the tunnels in the California high-speed rail program.

How we enlist international experience today

Our tunnel design and construction approach involves taking advantage of international expertise and lessons learned on other high-speed rail programs worldwide. California's high-speed rail program is supported by a diverse engineering team of geotechnical engineers, structural engineers and tunnel designers with experience designing tunnels on an international level. Our team includes firms with direct experience on similar projects in Austria, England, Italy, Spain, Switzerland and Taiwan. This team is supported by a seismic specialist team that develops design ground motions for the tunnels employing the latest state-of-the-art methods.

Contractor input is also critical for construction packaging, contract delivery and procurement, and risk management. We gather input through the project development phase by seeking advice from construction experts currently working for the Authority and from informal meetings with contractors following the project.

Two advisory panels currently support our work:

- A Technical Advisory Panel that includes internationally recognized technical experts in the areas of tunnel design and construction. This panel provides advice regarding tunneling methods of design and construction and reviews the incorporation of related design criteria into our design criteria manual. It also provides advice on procurement and risk-management strategies.

Current members have international experience in the areas of geotechnical engineering and investigations; rock mechanics; design, analysis and construction support for tunnels; tunnel excavation and lining construction methods; investigation of geotechnical conditions for tunneling; and deep rock tunnels. They also bring experience as technical advisers for other major tunnel projects in North America.

- A Seismic Advisory Board that includes nationally and internationally recognized experts in seismic hazards evaluation and seismic design. This panel provides expert advice regarding seismic design of tunnels and reviews our design criteria. It also reviews and provides advice on special conditions that must be addressed in developing California's high-speed rail system, including high seismicity, near-source seismic response and active fault crossings.

Current members are internationally recognized experts in engineering seismology with extensive experience in the practical application of the latest knowledge of seismology to the development of deterministic and probabilistic seismic criteria for engineering design and analyses.

Enlisting even greater international expertise as we move forward

Within the next year, we intend to convene a blue-ribbon panel of internationally recognized experts in various tunnel disciplines. This panel will advise us on a range of issues and questions, with specific early focus on the Pacheco Pass tunnels. We would also involve the panel in outreach to other experts at major tunneling conferences.

Our target audience will include tunneling contractors, tunnel-boring-machine manufacturers, tunneling engineering firms, geotechnical engineering firms and firms specializing in tunnel construction and risk management.

In seeking this feedback, the Authority will focus on three primary areas:

- Technical specifications and cost
- Delivery models, contract packaging and risk transfer
- Procurement and funding strategies

In summary, although our tunnel sections are among the most challenging elements of the system, they are buildable. We are taking early and ongoing actions to ensure that they are delivered successfully, just as they have been in other parts of the world.



Photo credit: Washington State Department of Transportation

The Central Valley Segment Will Improve the Quality of Life for Central Valley Residents

Extending the Central Valley Segment from Poplar Avenue into Bakersfield creates the potential to utilize a completed segment between Bakersfield and Madera and potentially all the way to Merced. This could create early benefits for people today, either through interim high-speed rail service or improved service for Amtrak passengers. This is an interim service benefit as we continue our march to fully construct the Silicon Valley to Central Valley Line from San Francisco to Bakersfield.

Central Valley communities and stakeholder groups have worked for years to improve rail service and connectivity along this corridor. By connecting an enhanced Amtrak corridor to the first completed segment of the California high-speed rail line to Bakersfield, those efforts will take a giant step forward. Trip times will be reduced dramatically, improving rail's competitiveness along the often-congested State Route 99. These faster trips will make the rail service attractive to Central Valley residents as well as those who will connect to it on Amtrak to or from Sacramento. Improving the rail service in this corridor can provide an economic catalyst for development and connectivity of major universities and health care providers while attracting new and innovative businesses.

Creating Opportunities for Higher Education

By tying together the Central Valley's major universities—including, for example, UC Merced, Fresno State and California State University, Bakersfield—which are home to 325,000 students, these improved rail connections can lay the groundwork for creating an educational corridor spanning the center of the state. This corridor will allow for the free flow of students, faculty and professionals to collaborate, stimulating learning and research options. This will build upon the efforts already underway to install ultra-high-speed internet lines that are to improve the digital information flow along the corridor, providing enhanced connectivity between universities, institutions and businesses.



Livable Communities and Economic Development

Where universities thrive, so does research and development. Working with local cities and communities, the areas around the stations are being planned as livable communities focused on bringing economic development and innovation to Central Valley cities. Businesses will be able to take advantage of the education corridor by tapping into innovation that often begins in academic settings. Plans for station areas are being developed to create vibrant places where employees will be able to work, shop and play.

Improving Access to State-of-the-Art Healthcare

Currently more than 50 hospitals and healthcare centers serve Central Valley residents. Faster trips on high-speed rail can provide opportunities for improved access to specialized care. With an integrated transportation network, complete with door-to-door service built around high-speed rail, patients will be able to travel longer distances in a shorter amount of time to access the care they need. By connecting healthcare providers, high-speed rail helps create the foundation for a synergistic healthcare network of innovation and collaboration. The result will be improved healthcare options, solutions and care systems for Central Valley residents.

Bookend and Other Projects That Deliver Early Benefits

Consistent with making strategic concurrent investments that will be linked together over time, we are continuing to work with regional rail providers to build projects that will provide early benefits and also lay the foundation for future high-speed rail operations. This approach is integral to the strategy for delivering the full Phase 1 System.

For example, over the last two years, the Authority, working with partner agencies, allocated and received authorization from the Department of Finance on nearly \$700 million in Proposition 1A bond funds for improvements in the Northern and Southern California blended sections. As part of these actions, along with \$114 million from the Authority's Cap-and-Trade funds, full funding was completed for the San Francisco to San José Peninsula Corridor Electrification project in Northern California.

Of the \$500 million appropriated for Southern California, \$76 million is helping fund the Rosecrans/Marquardt Grade Separation Project to address the state's highest-priority grade crossing. Both projects are major investments toward building high-speed rail in these areas. More information on these projects can be found in *Chapter 5: Working With Our Valued Partners*.

In addition to the Proposition 1A funding plans, the Authority is leveraging Cap-and-Trade and federal funds to complete other important projects in Northern and Southern California:

- **San Mateo**—In 2016, the Authority partnered with the City of San Mateo to contribute \$84 million to complete a high priority grade separation project to improve safety and traffic operations on the northern blended corridor.
- **Salesforce (Transbay) Transit Center**—Consistent with the 2016 Business Plan, the Authority continues to coordinate with the City of San Francisco and the Transbay Joint Powers Authority (TJPA) to complete a connection between the Caltrain Station at 4th and King and the Salesforce Transit Center. The Transit Center will ultimately serve as the Northern California hub for future high-speed rail service from Los

"The Caltrain Electrification project is in construction and will provide the foundation for future important improvements. We are very excited to work with the California High-Speed Rail Authority to explore expanded electrified rail service all the way to Gilroy. Getting this done would eliminate the need to run diesel trains on our service and would set the stage for high-speed rail to provide efficient, clean, reliable service from Gilroy to San Francisco as part of its Silicon Valley to Central Valley service. Let's get to work!"

- Jim Hartnett, CEO, Caltrain



Rendering of Salesforce (Transbay) Transit Center

Angeles to San Francisco. The Salesforce Transit Center received \$400 million from the Authority's American Recovery and Reinvestment Act (ARRA) grant funds. In 2017, TJPA created a position on the Board of Directors for an Authority delegate to further the cooperation between the two agencies.

- **Los Angeles Union Station**—Also in 2016, the Authority approved up to \$18 million to help fund engineering and technical studies and to environmentally clear a range of investments around the station. This will deliver improvements to accommodate expanded regional and inter-city rail service and high-speed rail trains. In *Chapter 5: Working With Our Valued Partners*, we outline how we would use the remaining bookend funds for Southern California—\$423 million—for the development of a world-class transportation facility that cost effectively meets the service needs of all operators including the Los Angeles County Metropolitan Transportation Authority, Metrolink, LOSSAN, Amtrak, the Authority and other partners.

Over the next two years, we will continue to collaborate on these and other projects and continue to coordinate our work with the California State Transportation Agency as it awards state funding to local and regional rail partners. We will look for opportunities to deliver benefits in shared corridors to ensure the highest value for our future integrated services. This coordinated strategy will address the state's most heavily congested urban passenger rail corridors in Northern and Southern California. The goal is to ensure significant, near-term direct benefits from expanded capacity, service frequency and reliability, with added benefits of improved safety, air quality and goods movement.

Burbank to Anaheim Corridor Improvements

The approximately 45-mile rail corridor connecting Burbank-Los Angeles-Anaheim is of regional and statewide significance and critical to supporting the Southern California economy. It provides vital freight and goods movement to and from the ports of Los Angeles and Long Beach; is a critical link in the passenger rail network serving Amtrak's second busiest line in the country and Metrolink's commuter rail service throughout Southern California; and will become an essential part of the high-speed rail system. It connects significant California tourist, entertainment, cultural and business destinations.

The corridor contains key stations that will provide significant connectivity benefits. Burbank, Los Angeles Union Station, Anaheim and potential stations at Norwalk/Santa Fe Springs or Fullerton will be model intermodal facilities.

Even as we advance the Silicon Valley to Central Valley Line, we remain committed to working with state and regional partners to fulfill commitments made in the 2012 Southern California Memorandum of Understanding to accelerate project improvements in this essential corridor. We have a shared interest in improving mobility and enhancing economic growth in Southern California and recognize the tremendous benefits associated with coordination and collaboration.

Delivering Phase 1

Once the Silicon Valley to Central Valley Line is constructed and demonstrates operational viability, the incremental revenue and positive net cash flow can be monetized. This longer line, which will connect San Francisco to Bakersfield, provides greater monetized proceeds through higher revenue and ridership than the line described in the 2016 Business Plan (see *Chapter 3: Capital Costs and Funding*, for the monetization discussion and forecasts). Although the timing and value will be driven by the interest of the private sector, it is anticipated that funds generated from this approach will be dedicated to extending the system, completing a Phase 1 high-speed rail system providing a one-seat ride from San Francisco/Merced to Los Angeles/Anaheim in Southern California.

Looking Forward to Phase 2

Although Phase 1 is the current priority, it is important to advance Phase 2 planning so connectivity improvements are made in anticipation of future high-speed rail service. We are working closely with local partners to advance planning activities between Los Angeles and San Diego, Merced and Sacramento, and over the Altamont Corridor.

Northern California: Merced to Sacramento and the Altamont Pass

As part of the effort to integrate the high-speed rail system into the state's overall passenger rail network, the Authority continues to work with the Northern California Rail Partners to identify and prioritize near-term regional rail improvements as part of the Northern California Unified Rail Service and for the 2018 California State Rail Plan work.

Our work includes coordinating with affected rail providers and considering transportation service connections to the Bay Area and south to Fresno and Bakersfield. The planning efforts have resulted in the draft Connected Corridor North Study, which has widespread support of agencies and elected officials through the Northern San Joaquin Valley and Sacramento. It summarizes opportunities and constraints for better, faster, more frequent and more coordinated passenger rail service.

With construction of the high-speed rail backbone underway in the Central Valley, we are working to assess other locally planned improvements that increase connectivity and enhance the network in conjunction with the California State Rail Plan's emphasis on network integration. The Authority will continue to work with our partners to maximize service options with the San Joaquin, Altamont and Capitol Corridor passenger rail lines to improve service frequency, reduce travel times and provide connectivity to the future high-speed rail system.



Rendering: Phase 2 Sacramento Station

Southern California: Los Angeles to San Diego (Via the Inland Empire)

In Southern California, similar efforts are underway as the Authority continues close coordination with regional transportation partners. Work being conducted for Phase 2 high-speed rail provides key linkages across Southern California, including closing the existing passenger rail gap between San Diego and the Inland Empire.



The Southern California Inland Corridor Group (ICG), an organizing body consisting of agencies across a four-county area, was established to ensure the high-speed rail program was well coordinated with regional land use and transportation planning. Technical planning work is underway in collaboration with this group to enable key shorter term objectives, including; identifying opportunities for enhanced connections to the Phase 1 System, increased service and reduced trip times between Los Angeles and the Inland Empire, and identifying opportunities to preserve right of way between San Bernardino, Riverside and San Diego, where service is currently planned to terminate at a multimodal station at the San Diego International Airport.

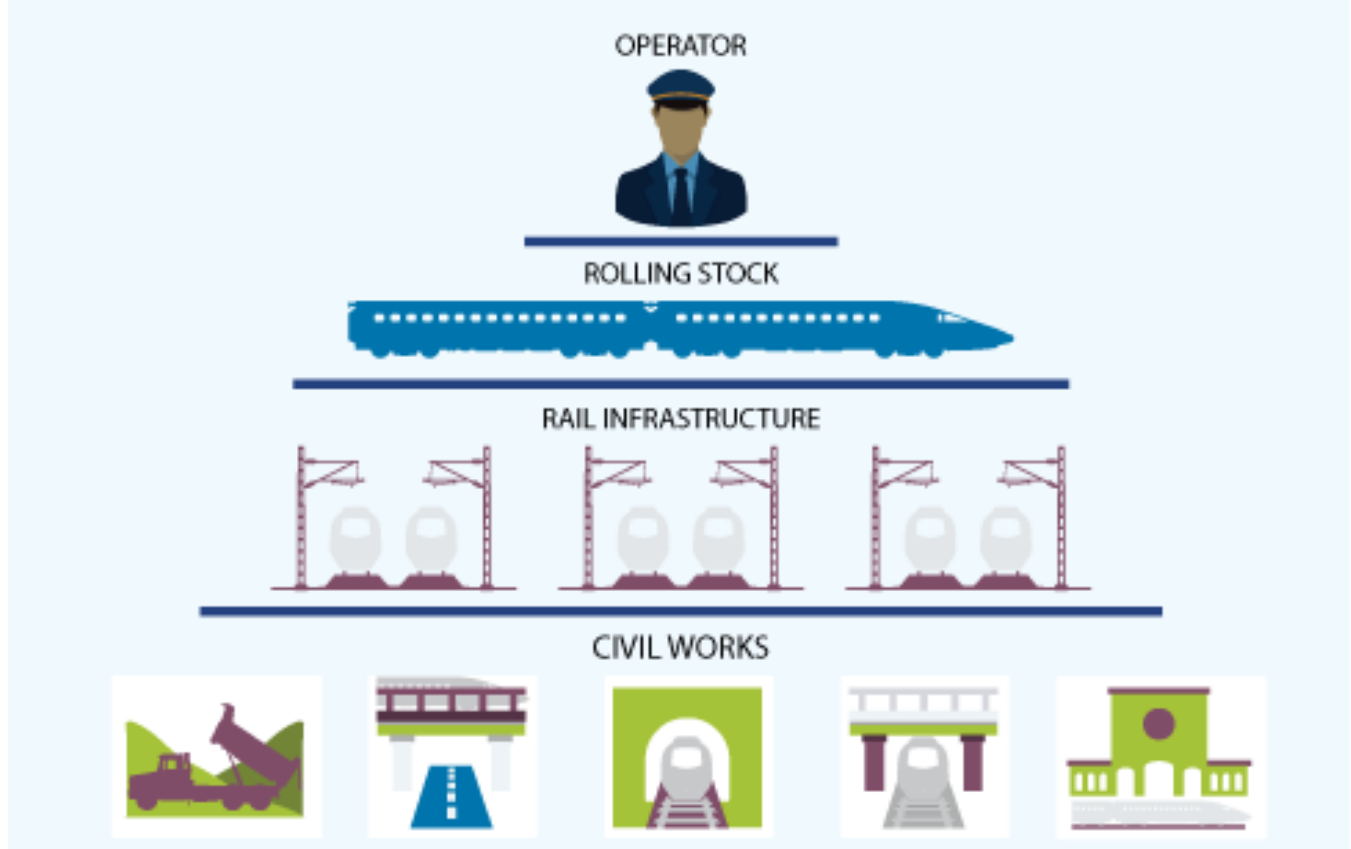
Procurement Planning

Our procurement approach remains unchanged since the 2012 Business Plan. Developing high-speed rail involves designing, constructing and integrating complex component parts into a seamless, safe and commercially successful system. It requires very large, multiyear contracts with payments tied to performance milestones. All delivery methods are being considered and decisions are made case-by-case based on the best overall value.

To date, the Authority has focused on environmental planning and civil-works delivery. Beginning last year, operations planning began with the hiring of the Early Train Operator to help advise and prepare for operational service. With this 2018 Business Plan, the Authority is now preparing for the long lead work associated with procurement of trains, procurement of the track and systems necessary to operate them and planning for tunnel construction through the Pacheco Pass.

Our planning contemplates phasing numerous procurements so that available funding can be applied to critical needs to minimize delays and schedule slippage. We are planning for system delivery in a way that is flexible and allows us to act strategically. Contract sizing will be an important factor. If contract capacity is too large and the number of contracts too few, competition will be reduced to a few very large firms. Conversely, if contract capacity is too small and the number of contracts too many, the number of interfaces becomes cumbersome and challenging, distributing risk among too many entities and potentially leading to increased costs. We will focus on finding the right balance to achieve efficiency while also managing risk.

EXHIBIT 2.2 PROCUREMENT STRATEGY



We will consider incorporating flexibility into procurements to allow individual contractors to deliver certain high-speed rail elements, such as high-speed trains and rail infrastructure, in an integrated manner across the system. This flexibility will allow us to achieve this while balancing phased implementation of service in keeping with our fundamental objectives. One possible approach is to structure procurements so that one contractor is used with segment-specific notices-to-proceed that are executed over time. The Authority will continue to work with our partners and industry leaders on a range of options. More analysis on the timing and approach to our procurement strategy will be conducted as we advance the development of the implementation strategy laid out in this 2018 Business Plan. The public can expect updates on this strategy in our Project Update Report, due to the Legislature in March 2019, and our next Business Plan, due in 2020.

The Role of the Early Train Operator

The Early Train Operator, DB Engineering and Consulting USA, was placed under contract by the Authority in December 2017 and, following a swift mobilization, is now actively engaged in the program's implementation and delivery strategy. The ETO provided comment on the Draft 2018 Business Plan, confirming that the procurement strategy illustrated in Exhibit 2.2 and described in this section is consistent with the long-term objectives of the program.

The ETO is currently assisting the Authority's with the analysis of the early interim services that would operate in the Central Valley and between Gilroy and San Francisco, as described in this Business Plan.

In addition, per the request of the Authority CEO, the ETO is conducting an independent construction cost estimate review to identify any areas where further refinements of the estimate would be appropriate. Information regarding both areas of work will be reported on in the Authority's 2019 Project Update Report, which will be submitted to the Legislature next March.

Along with these high priority activities, the ETO is reviewing our travel demand forecasting model, commenting on draft rail procurement documents and providing input to service planning. Future tasks will include station design, fare policy and integration, marketing and system branding, and operations and maintenance costing. These activities will be programmed in accordance with the program objectives and the schedule for future operations. For more information about DB Engineering and Consulting USA, see Chapter 6, Progress Since the 2016 Business Plan.

High-Speed Rail Trains (Rolling Stock)

The performance of high-speed rail trains is the key element of the passenger experience. The trains must be safe, comfortable and perform consistently across the entire system. Purchasing world-class, high-speed rail trains with a proven safety record is vitally important to our delivery model.

These are long lead procurements. Their timing and structuring relies on additional analyses on a range of related issues, including funding and its timing, operations planning and the readiness of our infrastructure for rolling stock among others. As we advance these analyses along with our overall procurement strategy, we will continue to provide updates to the Board of Directors and to the Legislature.

Our intent is to initiate procurement of the high-speed rail trains that we need as soon as feasible—this may be through a lease or phased purchase, whichever is determined to be the best value. We will aim to reduce capital outlay in the short term, while completing critical design and testing elements. Future high-speed rail train purchases will need to be flexible to accommodate the timing of delivery to meet the system's evolving service plans and growing ridership demand. Over time, we will expect to have the option to purchase additional trains as we continue to build out the full Phase 1 System.

Rail Infrastructure (Track, Systems and Power)

Complex rail infrastructure elements, such as systems, track, traction power and overhead catenary, need to be compatible across the entire system. The Authority requested industry comments on potential procurement approaches for these elements. The feedback indicated that combining these elements into a single procurement could reduce integration and interface risks. Industry commenters observed that pursuing a contracting model that combined construction and long-term maintenance for multiple elements may also be in the Authority's interest.

The rail infrastructure provider will interface with the system operator and will be responsible for integrating the other elements of the high-speed rail system (high-speed rail trains, civil works and facilities) so that the system works seamlessly. The rail infrastructure provider is intended to be a key long-term partner and also to be responsible for maintaining the underlying civil works across the system. The Authority intends to move forward as soon as feasible with initial procurement for rail infrastructure on the Central Valley segment, with future options for ultimate completion of the Silicon Valley to Central Valley Line and full Phase 1 build-out.

Civil Works Construction

We will continue to build from our experience with the initial three design-build construction contracts in the Central Valley that have resulted in valuable design innovations and delivery implementation improvement. We have learned valuable lessons in the procurement and management of these contracts, and these lessons will help us deliver future contracts in a more efficient and cost-effective way.

It is important to note that procurement of future civil contracts will proceed only when all prerequisites are in place. We will not advance until we obtain environmental approvals, complete all necessary third-party agreements and advance right-of-way acquisition for the segment. We anticipate using design-build for the next set of civil works contracts, but we will continue to consider other procurement models that best match the levels of complexity of future contracts.

Moving Forward

We will continually and proactively assess and understand the risks and challenges to delivering the system from a cost and funding perspective. This can be achieved by:

- Managing current construction more aggressively to deliver projects within scope and budget.
- Advancing design on the Silicon Valley to Central Valley Line to reduce cost risk and increase cost certainty.
- Coordinating with our partners to make concurrent investments that can have early benefits while ultimately supporting high-speed rail operations.
- Working with the Department of Finance and others, including the Legislature, to assess the long-term funding approach and finance timing to complete the final tunnels segment.
- Managing our procurement strategy to maintain flexibility to align with funding availability and to maintain momentum to be construction and operations ready.
- Using our partners (Rail Delivery and Early Train Operator) to leverage worldwide best practices.

CAPITAL COSTS AND FUNDING

In 2017, the Board of Directors directed a comprehensive review of the current Central Valley construction contracts and cost estimates for the Silicon Valley to Central Valley Line and the complete Phase 1 System. This work has been completed and is now reflected in this 2018 Business Plan.

Below is a summary of what was completed during this comprehensive cost review:

- A Central Valley Segment estimate-at-completion. This exercise built upon the scope and costs embodied in the Central Valley Segment Funding Plan that was approved by the Board of Directors in January 2017. Our review resulted in a higher estimate-at-completion, now estimated at \$10.6 billion, which was reviewed with the Board of Directors in January 2018.
- An updated Silicon Valley to Central Valley Line estimate includes the revised Central Valley Segment costs and reflects extensions from Poplar Avenue (in Shafter) to Bakersfield and from San José to San Francisco (Caltrain station at 4th and King). This estimate is higher than the one presented in the 2016 Business Plan, now estimated at \$29.5 billion, and it also reflects an extended completion schedule of 2029.
- A Phase 1 System estimate which includes the sections from Bakersfield to Anaheim and from Madera to Merced and completing final improvements between San José to San Francisco (Salesforce Transit Center). The overall estimates for these remaining sections have also increased, now estimated at \$77.3 billion. For purposes of preparing an updated estimate for Phase 1 System, a completion schedule of 2033 was assumed.
- As noted below, the key cost drivers affecting all phases of the project are: (1) the costs identified in the Central Valley Segment and anticipated future costs associated with early contract execution; (2) increased contingencies for future risks; and (3) escalation tied to project schedule adjustments.

Exhibit 3.0 summarizes the cost changes since the 2016 Business Plan. A summary of the Central Valley cost drivers can be found in *Chapter 4: Lessons Learned and Managing Risks*. For those project sections that are not yet under construction—and are still in early design—there are three major factors that account for the higher cost estimates:

Net Design Refinements/Scope Changes—These reflect the combined effects (positive and negative) of design refinements and scope changes that have occurred in the past two years. These result from additional design and engineering information, environmental reviews and public, stakeholder and other third-party input. The extensions to San Francisco and Bakersfield are also now part of the Silicon Valley to Central Valley Line estimate and are shown separately in Exhibit 3.0 Capital Cost Crosswalk.

Contingencies—Through our cost and program delivery review, we increased the overall contingency

for the Silicon Valley to Central Valley Line and Phase 1 System from approximately 16 percent to 26 percent, excluding the Central Valley. Contingency estimates vary by construction requirements for each geographic section, with higher contingencies applied where there is greater construction risk and more complex structures. This contingency level is in keeping with industry standards applied to established organizations. As each project section advances, alignments are finalized and design is refined, cost certainty will increase and contingency levels may change as appropriate. These contingencies will continue to evolve based on the lessons learned and program improvements identified in *Chapter 4, Lessons Learned and Managing Risks*.

Escalation—Incorporating some of the lessons learned in the Central Valley, we re-evaluated the schedules for completing environmental reviews, right-of-way acquisition, major capital procurements, construction and system/vehicle testing for the Silicon Valley to Central Valley Line. Based on that review, the schedule for completing the line was extended to 2029, which increases the year of expenditure (YOE) estimate because of escalation. For purposes of developing a YOE estimate for Phase 1 System, 2033 was assumed. Both schedules are unconstrained by funding.

These cost estimates are presented in more detail further in this chapter. In addition, more details can be found in the 2018 Business Plan Capital Cost Basis of Estimate Report.

EXHIBIT 3.0 CAPITAL COST CROSSWALK										
	2016 CAPITAL COST	CARRYOVER INCREASE	ESCALATION IMPACT	CONTINGENCY INCREASE	NET DESIGN/ SCOPE INCREASE	CENTRAL VALLEY INCREASE	TOTAL	INCREASE SINCE 2016	EXTENSION TO SF, BAKERSFIELD	NEW TOTAL
CV	\$7.8B					\$2.8B	\$10.6B*	\$2.8B	N/A	\$10.6B
V2V	\$20.7B	\$2.8B	\$1.4B	\$1.6B	\$1.1B		\$27.7B	\$7.0B	\$1.9B**	\$29.5B
PH1	\$64.2B	\$7.0B	\$2.1B	\$3.0B	\$1.1B		\$77.3B	\$13.1B	N/A	\$77.3B
Cost Increase Drivers			\$3.5B	\$4.6B	\$2.2B	\$2.8B				

*Updated Central Valley estimate-at-complete
 **Represents minimal capital investment to extend Silicon Valley to Central Valley to San Francisco and Bakersfield; full build-out of these sections are captured in PH1 crosswalk numbers
 Notes: Totals may not sum due to rounding

Consistent with best practices, updates and refinements of cost estimates will continue. Over the next several months, we will be conducting the following exercises as part of our ongoing work to review and update our current capital cost estimates:

1. At the request of the Authority’s CEO, the Early Train Operator is conducting an independent construction cost estimate review to identify any areas where further refinements of the cost estimate would be appropriate
2. We will expand our Monte Carlo risk analysis application to determine whether our range-based approach to the cost estimates (discussed below) should be updated or further adjusted to reflect ongoing development of the program
3. We will continue to address identified risk areas through detailed mitigation strategies

Progress on these activities will be included in the next Project Update Report, which will be submitted to the Legislature in March 2019.

Introducing Cost Ranges

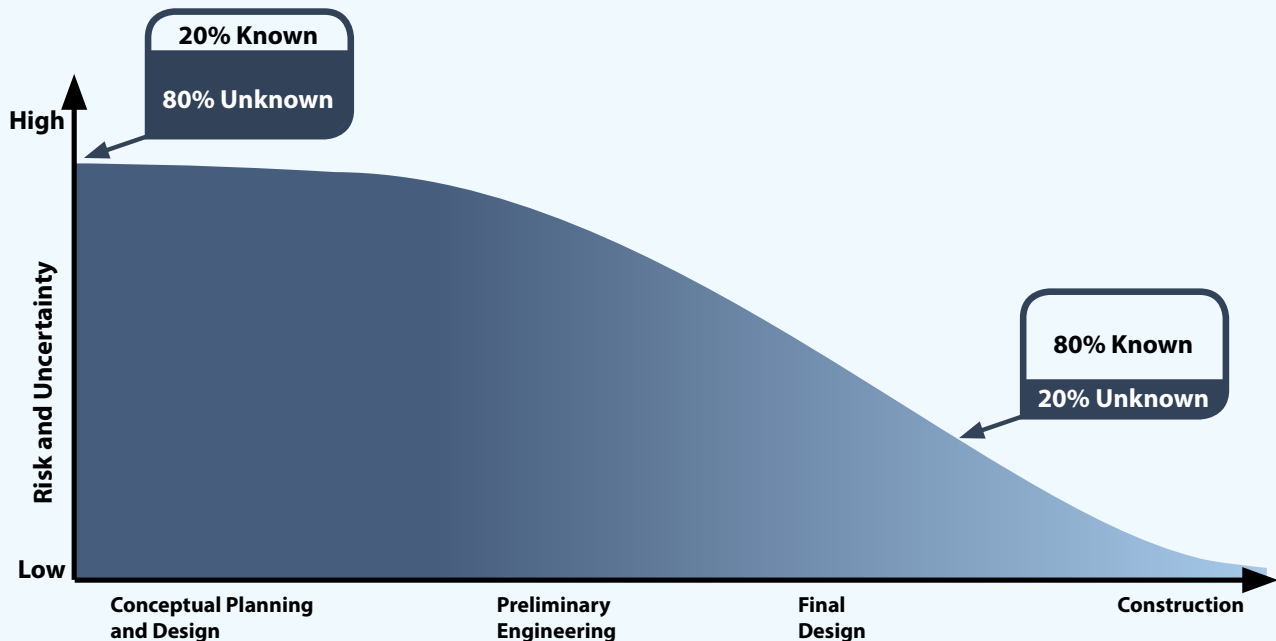
Delivering the program involves the implementation of a series of highly complex, integrated megaprojects. As we move the program forward, there are, and will continue to be, uncertainties around cost, funding and timing. Apart from the 119-mile Central Valley Segment, which is under construction, most of our current cost estimates are based on preliminary environmental reviews, design and alignment assumptions that are still early in the project lifecycle process. Our past practice has been to provide point estimates too early in the process. In this 2018 Business Plan, we end this practice.

Where the project is more advanced—and costs are more certain—we will be more specific. For example, for the Central Valley Segment, where construction is underway, we present the cost in a narrower range based on our recent estimate-at-completion exercise. In addition, under current assumptions, we show that there is sufficient funding to complete that work. Because construction is in progress but not yet complete, the costs are shown in a relatively narrow range.

Where design is less advanced—and costs are less certain—we present our estimates in wider ranges. For example, on the Silicon Valley to Central Valley Line, design is less advanced, environmental reviews are still underway and alignments and scope are not yet final. Many decisions are yet to be made.

Exhibit 3.1 illustrates how risk and uncertainty change over a project’s lifecycle and, with that, costs become more certain and ranges become narrower. The costs for the Central Valley construction underway fall to the right side of this exhibit and reflect a narrower range. It recognizes there are fewer risks and greater certainty on costs. However, costs for much of the remaining system (Silicon Valley to Central Valley Line and Phase 1 System) lie more toward the left side of the graphic reflecting more uncertainty about alignment and scope decisions, risks and costs.

EXHIBIT 3.1 RISK AND UNCERTAINTY TIMELINES



Modified version of Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK Guide) - Fifth Edition, Project Management Institute, Inc.

In summary, we will express costs in ranges until we have the detailed project level information upon which we can develop clearly defined scope, contracts, budgets and procurements. Currently, these ranges are based on industry standards that reflect the current level of design development. Going forward, using the risk analysis, we plan to further develop this approach. This approach will shape our decisions and our strategy for how we plan, manage and implement the system over time. By staying nimble and adjusting to future circumstances, we will continue to advance the program in line with events that we cannot always control.

These cost ranges, which are detailed further in this chapter, are based on assumptions, preliminary design information and on our current assessment of the risks and uncertainty for each project section. A summary of those ranges is presented in Exhibit 3.2 which shows our base estimate and the range around that estimate, given the information we have today.

EXHIBIT 3.2 SUMMARY OF COST ESTIMATES BY PHASE AND BY RANGE (IN BILLIONS)			
	LOW (YOES)	BASE (YOES)	HIGH (YOES)
Central Valley Segment	\$10.1	\$10.6	\$12.2
Silicon Valley to Central Valley Line*	\$25.1	\$29.5	\$36.8
Phase 1 System **	\$63.2	\$77.3	\$98.1

*Silicon Valley to Central Valley - YOES based on completion date of 2029
 **Phase 1 YOES - 2033 was used as basis for projecting YOES

The Silicon Valley to Central Valley Line and Phase 1 System ranges are illustrated in Exhibits 3.10 and 3.14. These graphics show that within that wider range is a narrower band within which we will work to manage costs and risks. As noted in *Chapter 4: Lessons Learned and Managing Risks*, we will apply lessons learned and drive organization change to reduce risks and lower costs as we advance through the project development, environmental approvals, preliminary design, and ultimately procurement and construction of each project section to ensure that the high-speed rail system is delivered in a cost-effective manner.

As previously noted, the CEO has directed a further assessment of the reasonableness of the cost estimates and the ranges being presented in this 2018 Business Plan. This review will include work performed by the Early Train Operator to assess these estimates and the separate risk analysis.

In tandem with reviewing our capital cost estimates, we have reviewed our current committed and assumed funding. As we show in this chapter, the 119-mile Central Valley Segment currently under construction is affordable and within current and committed funding. However, for a variety of reasons discussed further in this chapter, there is still some uncertainty related to Cap-and-Trade funding. Because of that uncertainty, we are also showing Cap-and-Trade funds as a range for completing the Silicon Valley to Central Valley Line.

The following sections are organized as follows:

- A review of our current and committed funding and financing opportunities
- Our updated cost estimate and current funding to complete the Central Valley Segment consistent with our FRA grant agreement and the Central Valley Proposition 1A Funding Plan
- The range of costs and funding scenarios for implementing the Silicon Valley to Central Valley Line from San Francisco to Bakersfield
- An updated cost range for the Phase 1 System and a funding discussion including system monetization

Project Funding

To date, the Authority has secured significant funds from both state and federal sources. These funds are being used to deliver the Central Valley Segment and complete environmental planning and other early work for the entire Phase 1 System, consistent with our federal grant agreements. However, as we describe in this section, the challenges of funding a transportation system of this magnitude are significant and actions still need to be taken to secure a long-term funding and financing strategy that can help us deliver the full Silicon Valley to Central Valley Line.

The Authority is currently operating on a pay-as-you-go funding approach which means that contracts are let as funding is committed. However, the continuation of this approach indefinitely will not support our delivery schedule. This is because the large contracts needed for the Silicon Valley to Central Valley Line—such as track and systems, rolling stock and tunnel construction—are greater than the committed funding that the Authority anticipates having at the time those contracts need to be executed to meet the 2029 completion schedule. To proceed with these contracts the Authority needs to be able to rely on a steady stream of future funds that provide certainty to long term contracting partners.

As such, we describe the steps identified by the market that should provide enough certainty to the Cap-and-Trade program, or a similar long-term source of funding, to allow the Authority to finance future cash flows. Accelerating future funds that are estimated to be received after the scheduled end of construction by using financing is critical to the overall funding package for the Silicon Valley to Central Valley Line and to aligning dollars with the timing of construction expenditures so that operations can begin in 2029.

The Authority is actively exploring financing options with partner agencies. In this chapter, we present a range of possible funding outcomes against a range of construction cost scenarios for the Silicon Valley to Central Valley Line that identify where a fully funded solution exists.

Federal Funding

American Recovery and Reinvestment Act (ARRA) Grant

The expenditure of ARRA grant funds represents a significant milestone in the life of the program. This money has been expended on system planning and Central Valley civil works contract packages in compliance with the federal grant agreement. More than \$2.55 billion has been expended to date on construction in the Central Valley and planning for the wider system. The full expenditure of the grant was achieved before the federally mandated completion date. ARRA funds are currently being matched with appropriated Proposition 1A funds and Cap-and-Trade funds.

FY10 Grant

Once ARRA funds are fully matched with state funds and other requirements of the grant are fulfilled, the Authority will access a further \$929 million of federal FY10 grant funding for construction in the Central Valley. The entire FY10 balance remains available and will be matched with \$360 million of state funds upon expenditure.

EXHIBIT 3.3 HISTORICAL CAP-AND-TRADE AUCTION PROCEEDS



* Final Feb-18 Cap-and-Trade auction proceeds share is subject to foreign exchange and state operations adjustments. Final amount will be posted on March 20, 2018

State Funding

Proposition 1A

In 2008, voters approved Proposition 1A, which provided a total of \$9.95 billion for high-speed rail planning and construction and regional connectivity projects. In 2017, the Authority successfully received permission to access \$3.3 billion in Proposition 1A funds for construction in the Central Valley, Caltrain electrification and the Rosecrans/Marquardt Grade Separation Project in Southern California. These funds provide the required state match to the ARRA federal funds and have allowed construction to proceed. A further \$4.166 billion for construction of the Silicon Valley to Central Valley Line is still available for appropriation by the Legislature.

Approximately \$423 million of bookend funds remains available and, as outlined in *Chapter 5: Working with Our Valued Partners*, the Authority is committed to providing additional funding to the \$18 million in Cap-and-Trade Funds that was provided for the development of the Los Angeles Union Station Project to accommodate expanded local, regional and high-speed rail.

Cap-and-Trade

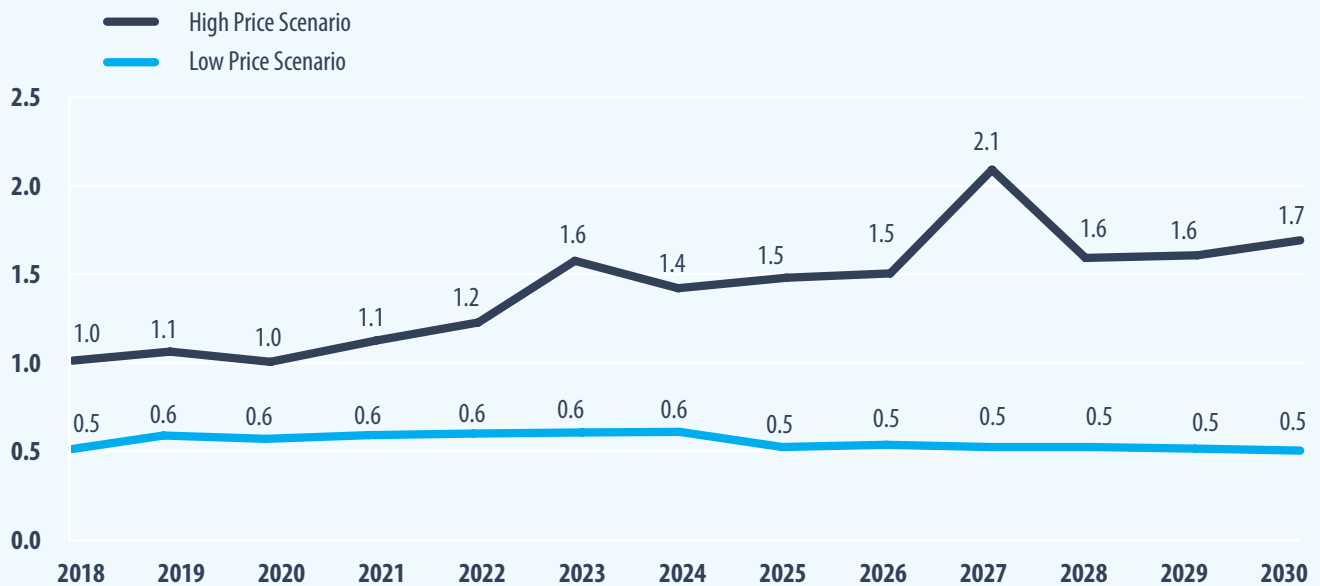
The Authority has received both one-time Cap-and-Trade funding as well as a 25 percent continuous funding appropriation. The one-time funding has provided \$650 million in proceeds to the Authority. The quarterly auctions have delivered variable amounts each quarter since August 2015. In July 2017, AB 398 was approved by the California Legislature and signed into law by Governor Brown. The bill extends the horizon of the Cap-and-Trade Program through December 31, 2030. This was another important step by the Legislature toward securing a long-term stable source of funding for the project. Since the passage of this bill, quarterly receipts from Cap-and-Trade auctions have been strong—an indication that the market has reacted positively to the legislation.

Exhibit 3.3 shows the historical quarterly Cap-and-Trade auction proceeds that have been received by the Authority—\$1.218 billion in total. The variable nature of these proceeds means that it has been difficult to assign a trend to them. However, more recent auctions have yielded more consistent results and, if this turns into a longer-term trend, it will strengthen our ability to fund the system.

“High-speed rail is an integral part of California’s program to modernize our transportation system, making it cleaner, more efficient, and more connected. We are investing proceeds from the carbon cap and trade regulation to upgrade transit in San Francisco and Los Angeles, and these systems will be able to send passengers smoothly to intercity High-Speed Rail. We look forward to a steady revenue stream from sale of carbon allowances as the recently reauthorized cap and trade market continues to reduce emissions statewide.”

**- Mary Nichols, Chair,
California Air Resources Board**

EXHIBIT 3.4 AUTHORITY SHARE OF CAP-AND-TRADE REVENUE BASED ON LAO REVENUE FORECAST 2018-2030 (IN BILLIONS)



Source: Legislative Analyst’s Office (LAO), *Cap-and-Trade Extension: Issues for Legislative Oversight*, December 2017
 Note: Source graph does not have point labels showing annual Cap-and-Trade receipt. Point labels in above graph are visual approximations of source graph.

In December 2017, the Legislative Analyst’s Office (LAO) produced a report entitled “Cap-and-Trade Extension: Issues for Legislative Oversight.” The LAO provides two revenue scenarios in the report, under the following assumptions:

- *Low price scenario*—All allowances sell at the minimum price established by the California Air Resources Board from 2018 to 2030.
- *High price scenario*—Prices are roughly \$20 in 2018 and increase to a price ceiling of about \$85 in 2030 (in 2017 inflation-adjusted dollars).

Under these two LAO scenarios, Authority revenues could range from \$500 million to \$1 billion in 2018 and from \$500 million to about \$1.7 billion in 2030. On a cumulative basis, total proceeds until 2030 could provide a funding source ranging from \$7.1 billion to \$18.4 billion which, at the high end, would be sufficient to cover the delivery of the Silicon Valley to Central Valley Line.

The Authority has assumed that annual receipts will be \$750 million for the purposes of capital planning. This planning assumption has been increased from the 2016 Business Plan assumption of \$500 million because actual auction receipts are trending higher and LAO estimates indicate that \$750 million is reasonable and within the range of potential receipts (see Exhibit 3.4). Actual receipts are likely to differ as they are contingent upon a market-based auction but using a \$750 million assumption would yield \$9.75 billion in proceeds between December 2017 and December 2030.

Funding and Financing Options

Financing Using the Cap-and-Trade Program

In the 2016 Business Plan, we introduced the concept of financing Cap-and-Trade. The concept was envisioned by the Legislature in its passage of SB 862 (Ch. 36, Statutes 2014), which, among other things, appropriated Cap-and-Trade proceeds to the Authority for repayment of any loans made to the Authority to fund the project. In the 2016 Business Plan, the Authority acknowledged that using Cap-and-Trade in only a pay-as-you-go capacity would not provide the funding needed at the time it is needed to deliver the Silicon Valley to Central Valley Line. This is because funds would not be received fast enough to accommodate the projected project delivery schedule. Financing the stream of Cap-and-Trade funds through 2050 can accelerate the funds necessary to meet the 2029 delivery schedule.

The use of financing within the 2016 Business Plan was premised on various structural changes within the Cap-and-Trade program. The same assumptions have been made in this 2018 Business Plan. The financing of a long-term, large pool of revenues will be a complex process and will take time to complete. Because of that, to meet our schedule, legislative action will be required prior to 2021. The Authority will work closely with the Legislature, the Department of Finance and other partner agencies to determine the required steps and specific structure that can yield the most benefit. Industry feedback has indicated that three critical elements are preferred for best financing terms:

- *Non-impairment of appropriations to the Authority*—To provide lenders with the confidence that the revenues flowing to the Authority that will be used for debt repayment will not be restricted, redistributed or otherwise impaired. This kind of language has been included in prior statutory authorizations for revenue financing (e.g., San Francisco Bay Area Toll Bridge Revenue Bonds, State of California Power Supply Revenue Bonds and Tobacco Settlement Asset-Backed Bonds).

- *Extension of the program through 2050*—Extension of the program through 2050 will provide more time and funds to repay the borrowing.
- *Minimum guarantee*—The state would need to provide an additional credit enhancement through a minimum guarantee or a floor (a guaranteed minimum amount to be received by the Authority periodically) to make future Cap-and-Trade receipts certain.

The Authority believes that if the above elements are enacted into new or existing legislation, the Cap-and-Trade revenue stream that is appropriated to the Authority can become “Investment Grade.” With access to an investment grade, long-term, stable source of funding, the Authority will be able to initiate larger, multi-year procurements and deliver the project on the schedule that it has set out in this plan. It may be possible to structure a financing without all of these elements in place; however, that would likely result in higher borrowing costs and lower finance proceeds.

Financing Scenarios

Because the specific details of the financing still need to be determined, the Authority has analyzed different scenarios to understand what the potential range of proceeds could be.

The timing of access to funding is very important to delivering the Silicon Valley to Central Valley Line. There is significant capital expenditure from 2021 through 2024, which means that higher amounts of funding are necessary during that timeframe. If financing proceeds are received later, it will affect the delivery schedule. We have used high-level assumptions that funds could be accessed between 2021 and 2023 and then repaid from 2024 through 2050. That means that the conditions for financing will need to be established in advance of that.

We analyzed a base case scenario of \$750 million per year and a sensitivity of \$500 million per year. Two interest rates were used—4 percent and 6 percent—as well as a range of assumptions about how much debt service coverage would need to be applied to annual debt payments. This financing could take a number of forms and might include state revenue or lease revenue bonds, federal loan programs, or public-private partnerships.

These scenarios yield a range of \$3.9 to \$11.1 billion in Cap-and-Trade-financed proceeds using the assumptions set out above. The actual funds available for this project will be contingent upon the actual changes enacted through legislation and then structured through the capital markets. The above assumptions include some changes from those used in 2016, so results between the two plans are not directly comparable.

Exhibit 3.5 is a summary of the Authority’s current funding appropriations, expenditures and net funds position (includes both cash, appropriations and legislative allocations). Assumed financing has been included.

As this exhibit shows, based on the projected low funding of \$20.518 billion, the federal share represents 12 percent of the total funding. The comparatively high state share positions the Authority to competitively pursue and secure additional future federal funds. Using the ranges set out in Exhibit 3.5, the Authority will have access to between \$20.5 billion and \$28.2 billion in funds through 2029. These funds can be used to complete planning and construction of the Silicon Valley to Central Valley Line. If financing is not accessible, Cap-and-Trade proceeds through 2030 range between \$19.1 billion and \$22.4 billion. This illustrates how important the financing component is to achieve the project schedule. It also illustrates that achieving the optimal financing structure is critical, as this can significantly impact total proceeds. The Pay-as-you-Go scenario is illustrated in Exhibit 3.5A below and starts with the Subtotal from Exhibit 3.5.

EXHIBIT 3.5 SUMMARY OF CURRENT AND FUTURE FUNDING WITH FINANCING AS OF DECEMBER 2017 (IN MILLIONS)			
FUNDING SOURCE	TOTAL AVAILABLE (\$M)	TOTAL EXPENDED (\$M)	TOTAL REMAINING (\$M)
FEDERAL FUNDS			
ARRA Construction	\$2,074	\$2,074	-
ARRA Planning	\$479	\$479	-
FY10	\$929	-	\$929
STATE FUNDS			
Proposition 1A Planning	\$675	\$383	\$292
Proposition 1A Central Valley Segment Construction	\$2,609	\$543	\$2,066
Future Proposition 1A for Silicon Valley to Central Valley Line Construction	\$4,166	-	\$4,166
Cap-and-Trade received through 12/17	1,686	\$583	\$1,103
Subtotal	\$12,618	\$4,062	\$8,556
Future Cap-and-Trade ^{1,2}	\$4,000 - 4,500		\$4,000 - 4,500
Financing Proceeds from Cap-and-Trade 2024-2050 ²	\$3,900 - 11,100	-	\$3,900 - 11,100
TOTAL	\$20,518 - 28,218	\$4,062	\$16,456 - 24,156
<i>1: Free cash flow after debt service.</i> <i>2: Assumes a low of \$500 million to a high \$750 million per year</i> <i>Note: In addition to Proposition 1A funds above, \$1.1 billion of bookend funds are available.</i>			

EXHIBIT 3.5A CURRENT AND FUTURE FUNDING WITHOUT FINANCING AS OF DECEMBER 2017 (IN MILLIONS)			
FUNDING SOURCE	TOTAL AVAILABLE	TOTAL EXPENDED	TOTAL REMAINING
Subtotal from Exhibit 3.5	\$12,618	\$4,062	\$8,556
Future Cap-and-Trade ^{1,2}	\$6,500 - 9,750	-	\$6,500 - 9,750
TOTAL	\$19,118 - 22,368	\$4,062	\$15,056 - 18,306
<i>1. Cap-and-Trade funds through 12.31.2030.</i> <i>2. Assumes \$500 million or \$750 million per year</i>			

Cost and Funding by Phase

This section discusses the cost and funding for each major phase based on the implementation strategy outlined in *Chapter 2: Implementation and Delivery Strategy*.

Central Valley Segment

In January 2017, the Authority Board of Directors adopted the Central Valley Segment Funding Plan, which estimated the cost of this segment at \$7.8 billion in YOE dollars. The Funding Plan estimate included the three design-build construction contracts, track and systems, interim passenger stations at Madera and Shafter/Wasco and a permanent station at Fresno, as well as a heavy maintenance facility scaled to support initial operations. More specifically, it included the costs of ensuring that the Central Valley Segment would have independent utility, consistent with the FRA grant agreement. The estimate did not include trainsets.

More recently, the Authority conducted an estimate at completion for the segment, which now shows it costing \$10.6 billion (YOE\$), see Exhibit 3.6.

EXHIBIT 3.6 CENTRAL VALLEY SEGMENT CAPITAL COST ESTIMATES		
(IN MILLIONS)		
STANDARD COST CATEGORY (SCC)	2017\$	YOE\$**
10 – Track structures and track	\$2,502	\$2,584
20 – Stations, terminals, intermodal	\$153	\$174
30 – Support facilities: yards, shops, administrative buildings	\$155	\$176
40 – Sitework, right-of-way, land, existing improvements	\$4,810	\$4,825
50 – Communications and signaling	\$345	\$394
60 – Electric traction	\$704	\$803
70 – Vehicles	—	\$-
80 – Professional services (applies to categories 10–60)	\$1,003	\$1,075
90 – Unallocated contingency	\$586	\$600
100 – Finance charges	—	—
TOTAL*	\$10,257	\$10,632

**Figures may not sum due to rounding.*
***YOE figures in this table derived using escalation factor.*

Exhibit 3.7 demonstrates that the Authority can meet its obligations for delivering the Central Valley Segment with existing identified funds given current funding assumptions. Cap-and-Trade funds will be used to bridge the cost increases.

EXHIBIT 3.7 CENTRAL VALLEY SEGMENT FUNDING SOURCES	
(IN MILLIONS)	
SOURCES	TOTAL
ARRA – Construction	\$2,074
ARRA – Allocation of Planning Funds	\$112
Proposition 1A – Construction	\$2,609
Proposition 1A – Allocation of Planning Funds	\$157
FY10	\$929
Cap-and-Trade	\$4,751
Total Funding	\$10,632
Total Construction / Planning	\$10,632

Note: ARRA and Proposition 1A figures include a proportionate allocation of total planning funds.

Silicon Valley to Central Valley Line

Exhibit 3.8 provides the updated capital cost estimates for the Silicon Valley to Central Valley Line in current 2017 and year of expenditure (YOE) dollars broken down by the FRA Standard Cost Categories. This line is now defined as San Francisco to Bakersfield. The estimate includes the higher investment (\$1.9 billion) associated with building the section from Poplar Avenue to Bakersfield plus an initial minimal capital investment to extend passenger service from San José to the Caltrain station at 4th and King in San Francisco. The estimate is inclusive of the Central Valley Segment (\$10.6 billion).

EXHIBIT 3.8 SILICON VALLEY TO CENTRAL VALLEY COST ESTIMATES		
(IN MILLIONS)		
STANDARD COST CATEGORY (SCC)	2017\$	YOE\$**
10 – Track structures and track	\$10,903	\$12,168
20 – Stations, terminals, intermodal	\$625	\$713
30 – Support facilities: yards, shops, administrative buildings	\$487	\$555
40 – Sitework, right-of-way, land, existing improvements	\$7,578	\$7,982
50 – Communications and signaling	\$788	\$899
60 – Electric traction	\$1,465	\$1,671
70 – Vehicles	\$998	\$1,139
80 – Professional services (applies to categories 10–60)	\$2,792	\$3,116
90 – Unallocated contingency	\$1,196	\$1,297
100 – Finance charges	—	—
TOTAL*	\$26,831	\$29,539

*Note: Does not include costs to be utilized for Phase 1 Project Development, or Bookends.
 *Figures may not sum due to rounding.
 **YOE figures in this table derived using escalation factor.*

The estimates include all assets and components required to construct the line and start revenue service, including trainsets, maintenance facilities, stations and all necessary rail systems. The year of expenditure estimate assumes that the full Silicon Valley to Central Valley Line is delivered by 2029.

Consistent with our 2016 Business Plan, the Authority places a high priority on completing the connection to Merced as part of the Silicon Valley to Central Valley Line. Although the cost of the Merced extension is not included in this estimate, our goal is to identify funding for its completion.

Exhibit 3.9 shows a summary of the YOE cost estimate in ranges by project section. The ranges vary based on the current cost estimating risk and uncertainty associated with each project section, given the preliminary level of design and scope. Additional information can be found in the 2018 Business Plan Technical Supporting Document titled "Capital Cost Basis of Estimate Report."

EXHIBIT 3.9 SILICON VALLEY TO CENTRAL VALLEY COST ESTIMATE BY PROJECT SECTION AND RANGE (IN MILLIONS)			
	LOW (YOES)	BASE (YOES)	HIGH (YOES)
San José to Gilroy	\$2,252	\$3,217	\$4,826
Gilroy to Carlucci Road	\$8,199	\$10,249	\$13,323
Carlucci Road to Madera	\$2,033	\$2,392	\$2,870
Central Valley Segment	\$10,100	\$10,632	\$12,227
San Francisco* and Bakersfield Extensions (initial investment)**	\$1,529	\$1,911	\$2,342
Rolling Stock (16 Trainsets)	\$1,025	\$1,139	\$1,253
TOTAL	\$25,138	\$29,539	\$36,840

*Note: Costs exclude Phase 1 project development and bookend costs.
 *SF to SJ investment includes: temporary platform at the Caltrain station at 4th and King Street and a light maintenance facility.
 **Poplar to Bakersfield: Extension to Bakersfield and initial investment at Bakersfield station.*

Silicon Valley to Central Valley Funding

The Authority is working to establish a full funding package for the delivery of the Silicon Valley to Central Valley Line. The building blocks of the funding package will continue to be the federal grants, Proposition 1A funds (including funds not yet appropriated), and Cap-and-Trade funds. Consistent with the 2016 Business Plan, we assume that the receipts available to the Authority from the Cap-and-Trade Program through 2050 can be financed, which will front-end funding and align it with the projected capital cost expenditure curve.

Exhibit 3.11 shows the estimated forecasted capital expenditures relative to the potential range of available funding. This shows that there are ranges of cost outcomes that are funded and ranges which require further funding to be identified. Although the high and the low funding and construction scenarios are not correlated, they do emphasize the need for the Authority to secure its funding sources, which it is currently doing to drive more certainty as the program advances. Using the baseline construction costs of \$29.6 billion would present a funding gap which would likely result in only partial funding of the Pacheco Pass tunnels section of the Silicon Valley to Central Valley Line.

EXHIBIT 3.10 CURRENT CAPITAL COST ESTIMATE RANGE: SILICON VALLEY TO CENTRAL VALLEY LINE

\$36.8 Billion (YOE)

\$29.5 Billion (YOE)

\$25.1 Billion (YOE)

As project work advances, cost accuracy will increase

As outlined in *Chapter 2: Implementation and Delivery Strategy*, we are currently evaluating how these funds can be most effectively employed to overlay an incremental delivery approach. Specifically, our current plan is to implement the line incrementally by targeting the delivery of two independent operational lines—one in the Central Valley and one from San Francisco to Gilroy—providing early passenger service in those two corridors by either our partner agencies or the Authority. This then isolates the tunnel through the Pacheco Pass as the unfunded asset on which to focus future federal, state and/or private funding.

EXHIBIT 3.11 SILICON VALLEY TO CENTRAL VALLEY FUNDING SOURCES VS. COST RANGE (IN MILLIONS)

SOURCES	LOW	HIGH
ARRA ¹ – construction	\$2,074	
ARRA – planning	\$236	
FY10	\$929	
Proposition 1A ¹ – current construction	\$2,609	
Proposition 1A ¹ – future construction	\$4,166	
Proposition 1A - planning ¹	\$333	
Cap-and-Trade ²	\$4,758	\$5,421
Cap-and-Trade Financing ³	\$3,900	\$11,100
Range of Total Sources:	\$19,006	\$26,869
Range of Capital Costs:	\$25,138 - \$36,840	

1: The ARRA and Proposition 1A figures include a proportionate allocation of total planning funds

2: Free cash flow after debt service.

3: Cap-and-Trade receipts from 2024-2050 are financed

Other Funding Opportunities

The Authority is exploring innovative ways to partner with the private sector and accelerate involvement in the Silicon Valley to Central Valley Line. As presented in Chapter 2: Implementation and Delivery Strategy, the Pacheco Pass tunnels present the highest uncertainty for the segment in terms of cost and schedule. By partnering with the private sector, there may be ways to further refine cost and schedule certainty to the delivery of the tunnels and other components of the system.

The federal government built the nation's interstate highway system through grants to the states covering 90 percent of the costs of building the system. Historically, the federal government has provided grants averaging 50 percent and higher to partners in the cost of building regional passenger rail systems, such as Bay Area Rapid Transit, where the initial system investments were made with local and state funds and subsequent extensions have been supported by federal dollars. To date, we have received \$3.5 billion in federal funds to support the development of California high-speed rail. The state has identified \$9.95 billion in Proposition 1A funding as well as Cap-and-Trade appropriations totaling \$1.7 billion through December 2017. With this in mind, it is not unreasonable to expect that over the course of the development of the program, there will be opportunities for significant additional federal financial assistance in the form of infrastructure funding or federal financing.

One expression of support for ongoing major transportation infrastructure projects is the infrastructure plan proposed by the current administration. Now under consideration in Congress, the plan includes several elements that would make a variety of funding and financing tools for high-speed rail available. This includes infrastructure investment incentives and expanded federal credit programs, such as Railroad Rehabilitation and Improvement Financing (RRIF) and Transportation Infrastructure Finance and Innovation Act (TIFIA) loans. These programs could provide the program with a low cost of debt and more flexible repayment terms.

Should an infrastructure program that includes these and other potentially favorable funding and financing tools be passed into law, it would provide an opportunity to seek and secure additional federal financial support that could coincide with the Silicon Valley to Central Valley Line and/or extensions to complete the Phase 1 System. We believe that the program, using a mix of matching funds from state sources, could deliver the benefits and funding leverage that the federal government is seeking to achieve.

Phase 1 System

Exhibit 3.12 provides the updated capital cost estimates for the Phase 1 System in current 2017 and year of expenditure (YOE) dollars broken down by the FRA Standard Cost Categories. Exhibit 3.13 shows these estimates by project section. These estimates include everything required to complete the full Phase 1 System and initiate revenue service, including procuring trainsets and all necessary rail systems, and constructing all maintenance facilities and stations. For purposes of preparing this updated estimate for Phase 1 System, a completion schedule of 2033 was assumed.

EXHIBIT 3.12 PHASE 1 SYSTEM COST ESTIMATES (IN MILLIONS)		
STANDARD COST CATEGORY (SCC)	2017\$	YOE\$**
10 – Track structures and track	\$29,694	\$34,343
20 – Stations, terminals, intermodal	\$1,966	\$2,196
30 – Support facilities: yards, shops, administrative buildings	\$940	\$1,090
40 – Sitework, right-of-way, land, existing improvements	\$16,099	\$18,039
50 – Communications and signaling	\$1,494	\$1,732
60 – Electric traction	\$3,712	\$4,195
70 – Vehicles	\$4,493	\$5,263
80 – Professional services (applies to categories 10–60)	\$6,517	\$7,512
90 – Unallocated contingency	\$2,575	\$2,924
100 – Finance charges	—	—
TOTAL*	\$67,490	\$77,295

*Note: YOE\$ assumes completion by 2033
Figures may not sum due to rounding.

EXHIBIT 3.13 PHASE 1 SYSTEM COST ESTIMATE BY PROJECT SECTION AND RANGE (IN MILLIONS)			
SEGMENT	LOW (YOE\$)	BASE (YOE\$)	HIGH (YOE\$)
Silicon Valley to Central Valley	\$25,138	\$29,539	\$36,840
San Francisco to San José (balance/full investment)*	\$1,659	\$2,074	\$2,696
Merced to Wye	\$2,028	\$2,386	\$2,863
Bakersfield to Palmdale**	\$13,076	\$16,345	\$19,614
Palmdale to Burbank	\$13,159	\$17,546	\$25,442
Burbank to Los Angeles	\$1,256	\$1,478	\$1,699
Los Angeles to Anaheim	\$3,049	\$ 3,587	\$4,125
Heavy Maintenance Facility (Balance)	\$173	\$216	\$281
Rolling Stock (Balance)	\$3,712	\$4,124	\$4,536
TOTAL*	\$63,250	\$77,295	\$ 98,097

*Note: YOE\$ assumes completion by 2033
*SF to SJ balance includes: Additional investment to complete full service to Transbay
**Bakersfield to Palmdale: Completes full investment in Bakersfield Station.*

The ranges represent the current level of cost estimating risk associated with each project section. Exhibit 3.14 illustrates that the ranges will narrow with time. Additional information can be found in the 2018 Business Plan Technical Supporting Document titled “Capital Cost Basis of Estimate Report.”

EXHIBIT 3.14 CURRENT CAPITAL COST ESTIMATE RANGE: PHASE 1

\$98.1 Billion (YOE)

\$77.3 Billion (YOE)

\$63.2 Billion (YOE)

As project work advances, cost accuracy will increase

Expanding the System and Completing the Phase 1 System

Over time, as the system is projected to generate significant revenues and positive cash flow, the value as a commercial enterprise will be significant for California. In turn, this will create the opportunity for private investment to support expansion of the system. However, this will likely come after some years of demonstrated system viability and maturity.

There are three key sources of funding to help complete the Phase 1 System:

1. The positive cash flow generated from selling tickets and operating the first parts of the system which could be leveraged for financing;
2. Potential private investment through the monetization of future discounted net cash flows; and
3. Additional public funds, including state and federal funds, which can help match project-generated funding.

Consistent with previous Business Plans, we have analyzed the value of future net cash flows generated by the system. These cash flows run from the start of operations to an end date of 2060. The cash flows are discounted at a range of values to illustrate the potential weighted average cost of capital that private investors may apply. Consistent with previous plans, we have discounted the net operating cash flow after capital replacement of both the Silicon Valley to Central Valley Line and Phase 1 System operations at three illustrative discount rates: 8 percent, 11 percent and 14 percent.

The values above would be captured (monetized) by financing and private sector investment secured by the system’s future net operating cash flows. The amount of additional capital to be raised would be determined based on the private sector’s valuation of the future cash flows from the incremental phases of the system.

The financing transactions for each phase of system expansion could be structured as a combination of private debt financing, federally subsidized loans or other financing tools and private equity.

Achieving Full Funding

The challenges of funding a transportation system of this complexity and magnitude are not new to this program or to other large-scale transportation infrastructure programs across the country or around the world. One of the biggest challenges we face is securing full funding for delivering the system. That is why we are taking a “building block” approach to funding and delivering the program.

Since the inception of planning for the program, it has been assumed that the system would be funded with federal, state and local funds – and with private investment. This was the underlying assumption when the Legislature and the voters approved \$9 billion in state bond funds with the passage Proposition 1A in 2008, which was approximately 20 percent of the estimated system cost at that time. It is worth noting that there were no other established funding sources for the program in place at the time.

However, the Legislature and the voters determined that it was appropriate to move forward, stating that, ***“It is the intent of the Legislature by enacting this chapter and of the people of California by approving the bond measure pursuant to this chapter to initiate the construction of a high-speed train system.”***

Proposition 1A also directed that the Authority ***“...pursue and obtain other private and public funds, including but not limited to, federal funds, funds from revenue bonds, and local funds...”***

Over the last 10 years, we have secured approximately one-third of the funds needed to complete the current estimated cost of the system:

- One year after the passage of Proposition 1A, in 2009, we received \$2.5 billion in funds made available through the American Recovery and Reinvestment Act of 2009 (ARRA)
- One year later, in 2010, \$929 million in additional federal funding was authorized through a Fiscal Year (FY10) Transportation, Housing and Urban Development grant
- In 2014, the Legislature appropriated 25 percent of the annual proceeds from the Cap-and-Trade Program to support the development and construction of the system, providing an ongoing revenue stream
- In 2017, the Legislature extended the Cap-and-Trade Program through 2030

In addition, a fundamental premise of this program is that we are creating a commercially viable high-speed rail transportation system that will generate significant revenues and support private investment. Over time, the value of the system as a commercial enterprise will be significant for the State of California, creating the opportunity for private investment to support expansion of the system.

To date, the state has made a large investment toward funding the system. Given the past and current federal emphasis on project sponsors bringing a significant funding match, this should position the state to be competitive in the pursuit of future federal funds.

Going forward, we will work with the Legislature, our federal partner and the private sector to secure the funding and financing to deliver the full system.

**EXHIBIT 3.15 DISCOUNTED CASH FLOWS FOR MEDIUM CASE FORECASTS:
SILICON VALLEY TO CENTRAL VALLEY AND PHASE 1 (IN BILLIONS)**

DISCOUNT RATE	8%	11%	14%
San Francisco to Bakersfield	\$13.7	\$10.2	\$7.9
Increment to Complete Phase 1	\$15.7	\$11.2	\$8.3
Cash Flows from Completing Phase 1	\$29.4	\$21.4	\$16.2

Figures may not sum due to rounding.

**EXHIBIT 3.16 DISCOUNTED CASH FLOWS FOR LOW CASE FORECASTS:
SILICON VALLEY TO CENTRAL VALLEY AND PHASE 1 (IN BILLIONS)**

DISCOUNT RATE	8%	11%	14%
San Francisco to Bakersfield	\$9.7	\$7.3	\$5.7
Increment to Complete Phase 1	\$12.5	\$8.9	\$6.6
Cash Flows from Completing Phase 1	\$22.2	\$16.1	\$12.2

Figures may not sum due to rounding.

The discount rate applied by the private sector in valuing future net operating cash flow is based, in large part, on the level of risk transferred to a private sector partner. For example, it is more likely that the private sector would apply a higher discount rate to any net revenue from a section just placed into service. Conversely, a lower discount rate (and therefore higher valuation) would be used for proven cash flows from existing operational sections.

Once the initial Silicon Valley to Central Valley Line is built out and ridership and revenue is demonstrated, positive cash flows are projected based on the revenue, operations and maintenance and lifecycle forecasts and estimates discussed in *Chapter 7: Ridership/Revenue, Operations and Maintenance and Lifecycle Capital Cost Estimates*.

Although we have provided ranges for both ridership forecasts and discount rates, based on the mid-point discount rate of 11 percent applied to the cash flows from the medium revenue and cost forecasts, we estimate \$10.2 billion could be available in 2032 after ridership revenue and net operating cash flow have been demonstrated for the Silicon Valley to Central Valley Line.

After completion of the Phase 1 System and its first operating concession period, the state will have a fully developed and operable asset that it can continue to monetize over successive 20-30 year periods to generate funds for reinvestment, expansion (e.g., for Phase 2 extensions) or other purposes. Further value is also likely to be generated as the high-speed rail system connects with statewide planned transportation networks, which will increase network integration, enhance the user experience and generate higher ridership. Additionally, planned connectivity to intra-state transportation networks will further enhance the value of the system.

At the regional and local levels, the high-speed rail system will also generate value. The Authority could also seek funding linked to the local value that the railway is generating, focusing on station area value capture and the appreciating real estate values that the system will help create. The full value of the asset will be realized by using innovative methods of value capture, such as secondary use of the system right of way to provide optical fiber communication connectivity. Ancillary revenues and transit-oriented development will provide further sources of funding that can contribute to system expansion or other costs.

LESSONS LEARNED AND MANAGING RISKS

The Authority's sole focus is delivering a functional, certified and commercially viable high-speed rail system under a stringent oversight of stewardship. In doing so, the Authority must build upon its experience and incorporate lessons learned during its ongoing project development, right-of-way acquisition and early construction efforts.

The associated revised cost estimates and schedule impacts require a different way of doing business. We are incorporating the concept of being "learned" into revised strategies, organizational approaches to program delivery, and improved business processes, while recognizing the necessity for ongoing strategic planning and risk mitigation.

The current cost estimate for the Central Valley segment, \$10.6 billion, reflects the realization of risks identified in the 2016 Business Plan and the 2017 Project Update Report. These risks have now been quantified and are included in this revised estimate.

These risks were primarily generated from issuing construction contracts early in the project development process that was primarily focused on project development and planning. There were many unknowns remaining and setting fast-track schedules to meet the American Recovery and Reinvestment Act (ARRA) spending deadline increased risk by requiring multiple concurrent activities.

Despite these risks, there have been many benefits derived from this decision. Construction was essential to addressing economic challenges in the Central Valley, an area struggling with high unemployment and poverty. The Authority has estimated that the initial investment of ARRA funds has resulted in total economic activity of up to \$5.9 billion in the Central Valley construction area. In addition, contracts were also executed in a very competitive market.

This chapter first outlines key lessons of the Central Valley cost drivers and identifies how the Authority is moving forward to incorporate key observations into current Central Valley execution plans and future work. The second part of the chapter outlines the leadership strategy to deliver within the identified base estimate outlined in *Chapter 3: Capital Costs and Funding*.

Lessons Learned in the Central Valley

The Authority is addressing three lessons into its execution plans:

- First, the Authority's decision to award design-build contracts before acquiring right of way and completing agreements with utilities, local governments and railroads meant there were many unknowns.
- Second, the state and federal expenditure deadlines influenced the Authority's implementation of initial project construction and required undertaking several delivery functions concurrently. Concurrent activities created additional cost and schedule risks because actions were taken with incomplete information or undefined requirements.

- Third, as a lean project development and planning organization, the Authority had to quickly establish the requisite organizational capabilities and business processes required to deliver a program of megaprojects.

The following summarizes the key lessons and implications for future work in these three areas.

Early Start of Construction

The early start of construction in the Central Valley resulted in unforeseen or underestimated costs that have now been included in costs to complete these projects. Key lessons are summarized in Exhibit 4.0.

EXHIBIT 4.0 KEY LESSONS FROM EARLY START OF CONSTRUCTION	
COST DRIVER	MOVING FORWARD
At the outset, the Authority lacked the resources to meet the land-acquisition schedule of a magnitude that was greater than had ever been experienced in the state.	The Authority has reorganized its acquisition process and is in the process of updating staffing and aggressive management and mitigation strategies.
Freight railroad-related costs exceeded budgets due to unanticipated requirements, such as an increase in intrusion barriers, identified during negotiations.	With some key railroad agreements complete, future requirements are being identified and will be known prior to contract award. This lesson is also applicable to other passenger railroad partners in future segments.
Requirements of some agreements with local governments and irrigation districts were not available prior to contract award, creating additional costs and delays.	Focused effort is underway to complete these agreements in the Central Valley. Earlier completion of third-party requirements in the future will reduce construction contract unknowns.
Construction Package 1 originally excluded relocation of PG&E and AT&T utilities under the assumption that the utility companies would self-perform this scope. When this assumption changed, the work was added to the Construction Package 1 contract.	The Authority's internally prepared estimates of third-party utility relocation costs, without thorough vetting with respective utility companies, will not be repeated. Staff is monitoring scope changes resulting from design coordination. These risks are currently included in cost forecasts.

Fast-track Schedules With Concurrent Activities

Moving fast to meet the ARRA deadline with concurrent final design, right-of-way acquisition, environmental clearances for changed design and early construction work created extra costs and risks that are now included in the Central Valley cost estimate. Exhibit 4.1 recaps the lessons from this factor.

EXHIBIT 4.1 KEY LESSONS FROM CONCURRENT ACTIVITIES	
COST DRIVER	MOVING FORWARD
The number of parcels needed for construction was 50 percent higher than the budget due to changes in design.	The Authority will complete more right-of-way acquisition before awarding contracts and review design changes for right-of-way requirements.
Delays in completing right-of-way acquisition caused construction schedule delays which have increased costs or risks.	The Authority has worked with the contractors to identify parcels needed to begin construction of critical structures.
The design-build environmental compliance contract language created an economic incentive for the contractor to argue, avoid and/or minimally comply with environmental conditions set forth by regulatory agencies. This issue increased costs related to oversight and mitigation for the Authority.	Contractor performance requirements for environmental permitting and compliance need to be clearer. Better organizational definition is needed to improve environmental and contract compliance oversight.

Organizational Readiness

When the organization began construction, it did not have a clear transition from the strategic planning stage to the construction phase. Exhibit 4.2 summarizes several lessons associated with this process, which the Authority continues to refine.

EXHIBIT 4.2 KEY LESSONS FROM ORGANIZATIONAL READINESS	
COST DRIVER	MOVING FORWARD
Limited delivery capacity was available at the time design-build contracts were awarded.	The program is adding construction management expertise and expanding project controls expertise in the field and at the program level. These additions help to provide the necessary detailed and timely reporting of scope, schedule and cost risks. Comprehensive training was initiated for all contract managers.
Reporting processes and procedures had been defined but limited staff and tools were available to complete them.	Over the next several months, the Authority will expand its reporting tools to provide project managers with real-time performance information and to support the more structured and formalized change control process.
Contract management performance monitoring and regular reporting process were evolving.	New contract management and oversight procedures have been developed to improve contract performance monitoring and reporting; invoicing and payments; contract risk management; contract change management; and contract claim and dispute management.
Design refinements led to unintended challenges that resulted in increased overall costs and/or schedule.	Whole-life cost impact of Alternative Technical Concepts need to be considered and contractors held responsible for the cost implications of those changes.

Ongoing Program Risks and Management Strategies

The program risks identified below have been identified in previous business plans. Although some risk factors have been mitigated over the last few years, many of these risks will likely remain for years to come. Responses to these risks may be revisited in the future as new lessons are learned; decisions made or new opportunities are identified.

Financing and Funding

The State of California and the federal government have identified significant amounts of funding to implement this program. This has resulted in the ability to execute the contracts necessary to begin construction and, as has been noted, to fully fund Central Valley construction. The Authority successfully managed the risk associated with the expiration of ARRA funding over the last two years. However, a major finding of this 2018 Business Plan is that the current “pay as you go” funding approach has been taken as far as it can. Additional tools are necessary to provide financing options to fund a program of this magnitude. Several strategies have been identified over the last few years on how to address this risk. These are more fully described in *Chapter 3: Capital Costs and Funding*.

Litigation

A program of this nature will experience many different legal risks. These include potential litigation and adjudicatory administrative processes related to project funding, environmental clearances, property acquisition and contract disputes. Previous litigation has already affected the Central Valley Segment construction costs and schedules. It is likely that similar litigation on new project sections or new litigation may arise in the future. As the program advances, the Authority will work closely with affected stakeholders to address issues before they become formal lawsuits. In addition, the agency will continue its practice of using alternative dispute resolution processes where possible, such as mediation or arbitration.

Stakeholder Support

At the state level, a decline in public support could translate into problems with fiscal processes and regulatory functions. Locally, interest groups could attempt to prevent or delay the system's advancement through slowing local agreements and permitting processes or inhibiting local collaboration. This could result in delays to completion of environmental documents and delays to moving forward with future construction contracts. The Authority recently created a new leadership position focused on stakeholder outreach recognizing this critical programmatic challenge. This position, working collaboratively with the regional directors from the north, central valley and south regions, will provide a centralized focus on addressing stakeholder interests and concerns related to potential project effects.

Engineering and Environmental

There are still many unknowns associated with the engineering and environmental challenges with tunnels in mountainous terrains. The Authority is currently working on identifying technical issues and concerns in these areas. They are actively reaching out to and working with experts to assess opportunities and challenges. More is yet to be learned over the next two years as the preliminary engineering and environmental reviews progress. During this time, a preliminary hazard analysis on tunneling, ventilation and geotechnical risks will be completed, and staff will continue to explore technical issues associated with construction in through these areas.

Ridership and Revenue

Ridership revenues need to be sufficient to cover the operations and maintenance costs of the system to comply with Proposition 1A requirements. The program's expansion depends on ridership revenues to support access to private capital as the program matures. Inaccurate ridership forecasts could create consequences for the program, including decreasing the level of private sector investment, increasing the public funding required and damaging stakeholder support.

The Authority is ensuring that the travel demand model incorporates the latest socioeconomic projections and travel network forecasts. Independent peer review groups reviewed and endorsed the current model structure and fundamentals as recently as August 2017. More about the model can be found in the Travel Demand Model Documentation technical report. In addition, the Early Train Operator will bring industry expertise to current ridership and revenue strategies to help the Authority make future decisions on how to maximize ridership and revenue.

Operations and Maintenance and Capital Replacement Costs

Differences between actual costs and forecasts could result in limiting resources available to continue system expansion. The Authority will enhance its understanding of these areas through interactions with Network Rail (the operator and maintainer of both the high-speed and conventional rail network infrastructure in the United Kingdom), the Early Train Operator and the International Union of Railways to incorporate best practices. Current assumptions and efforts are also documented in the Operations and Maintenance Cost technical document.

Future Risks and New Technology

The Authority has now initiated a more in-depth discussion on future risks related to operation. New information now being developed relates to the design of track and systems for ultimate operations. An issue recently identified relates to connections to the power grid for high-speed rail electrification. The cost of these interconnections was previously included in traction power costs and assumed a nominal cost for each interconnection site. Technical feasibility studies by PG&E now indicate that there are capacity variations along the corridor that need to be upgraded for high-speed rail operations. Work is underway with PG&E to define the scope and costs of these improvements to the network including new transmission line construction necessary for a reliable power supply along the 345 miles within the PG&E service territory. Similar efforts will be necessary in Southern California which is served by SoCal Edison and other providers.

The Early Train Operator will begin to help expand and assess additional risks moving forward.

Moving Forward

The risk and complexity associated with delivering this program of megaprojects requires the Authority to change the way it manages, makes project-level decisions and plans for future construction. The Authority must more clearly identify how it transitions from planning to construction and, ultimately, into operations. However, in doing so, the Authority must incorporate strategic planning into its daily business acumen to guide prudent construction and operations under the oversight of stewardship.

The Authority's management team understands this challenge and is reviewing the organization's structure, strengthening oversight functions and initiating new business processes to support improved decision-making and risk management. The discussion below outlines additional ways that the Authority is enhancing decision-making and driving the organization toward project delivery.

Executive Leadership

An experienced executive management team of highly qualified professionals has been charged with transforming the Authority into a robust delivery organization:

- In January 2018, a new Chief Executive Officer (CEO) was appointed by the Authority's Board of Directors with the experience and expertise to provide leadership for the program's delivery and commercialization phase.
- Also in January 2018, a Chief Operating Officer (COO) was appointed to oversee the construction and engineering elements of the high-speed rail program to ensure that they are delivered to quality standards, budget and schedule throughout the program's duration.
- A new Chief Deputy Director was also appointed in January 2018 to bring a focus on transparency, contract oversight, accountability and performance. This position will advise the CEO on programmatic and administrative issues and will oversee the Authority's internal and personnel operations.

- A new Chief Program Officer joined the program in mid-2017 bringing domain expertise in major rail program delivery, including international high-speed rail.
- In addition, the Authority recently created a new leadership position focused on stakeholder outreach and is filling other key vacancies to fill leadership gaps, including directors of real property and risk analysis.

Strong Governance and External Oversight

The program benefits from several extant oversight mechanisms. First among these, the Board of Directors oversees the planning, construction and operation of the high-speed rail system and sets policy directives for the Authority. In 2017, all vacant positions on the Board of Directors were filled with the appointment of Nancy Miller, who brings a legal background in special districts and joint powers authorities, and Ernest Camacho, who brings expertise in construction management. In addition, Board program oversight was augmented with addition of two ex-officio Board members representing the Legislature—Senator Jim Beall and Assemblyman Dr. Joaquin Arambula—bringing legislative perspectives from Silicon Valley and Central Valley.

The Board’s Finance and Audit Committee refined the Authority’s reporting requirements for financial accountability and transparency to include more detailed reports on environmental documentation, right of way, third-party agreements and construction contracts. These reports provide a track record of spending and key issue identification for the Board, the Legislature and the public. Key legislative staff (transportation policy, budget, leadership and the Legislative Analyst’s Office) are directed to these reports each month, along with monthly Board meeting materials.

The California High-Speed Rail Peer Review Group, established by the Legislature, provides independent updates on the feasibility and reasonableness of Authority plans, assumptions, analyses and estimates to the Legislature. The Authority is encouraging filling the Peer Review Group’s open positions, which would augment the Authority’s access to valuable expertise.

Both houses of the California Legislature regularly hold oversight hearings of the high-speed rail program, including hearings to review the Draft 2018 Business Plan. The Authority meets regularly with members of the Legislature to provide updates and to address both statewide and region-specific questions or concerns. To further assist the Legislature in its oversight role, the Authority provides frequent updates and information, including:

- Monthly construction updates, including videos
- Quarterly small business newsletters
- An annual sustainability report
- Economic impact information
- Other key program updates and milestones

Key legislative staff are provided bimonthly briefings to discuss areas of interest, items covered at the Authority Board of Directors’ meetings and to answer questions. Ad hoc legislative staff briefings are also provided as significant issues/or milestones occur. In the regions, district staff in state and federal legislative offices are briefed as part of any community engagement or outreach activity to ensure that staff is fully informed of the Authority’s plans and actions.

Organizational Evolution

The Authority is evolving its business processes and organization to define itself as a project delivery organization and is incorporating the lessons learned in the Central Valley summarized above. We recognize the necessity to plan for future successes, be locally agile for contract delivery, create a “field oriented” headquarters and implement practical solutions to address current challenges. Many of these attributes are a part of the formulation and alignment to a Lean/Six-Sigma method focused on quality delivery and process improvement. These improvements should all be aligned around the 2018 Business Plan goals of:

- Initiating high-speed rail service as soon as possible;
- Making strategic, concurrent investments that will be linked over time and provide mobility, economic and environmental benefits at the earliest possible time; and
- Positioning ourselves to construct additional segments as funding becomes available.

Two fundamental core values will be influential and inspirational leadership and effective and efficient management. Our foundational concept of operations defines four quintessential operational delivery pillars, with a concentrated focus on delivery and stewardship, as displayed in Exhibit 4.3.

EXHIBIT 4.3 CONCEPT OF OPERATIONS

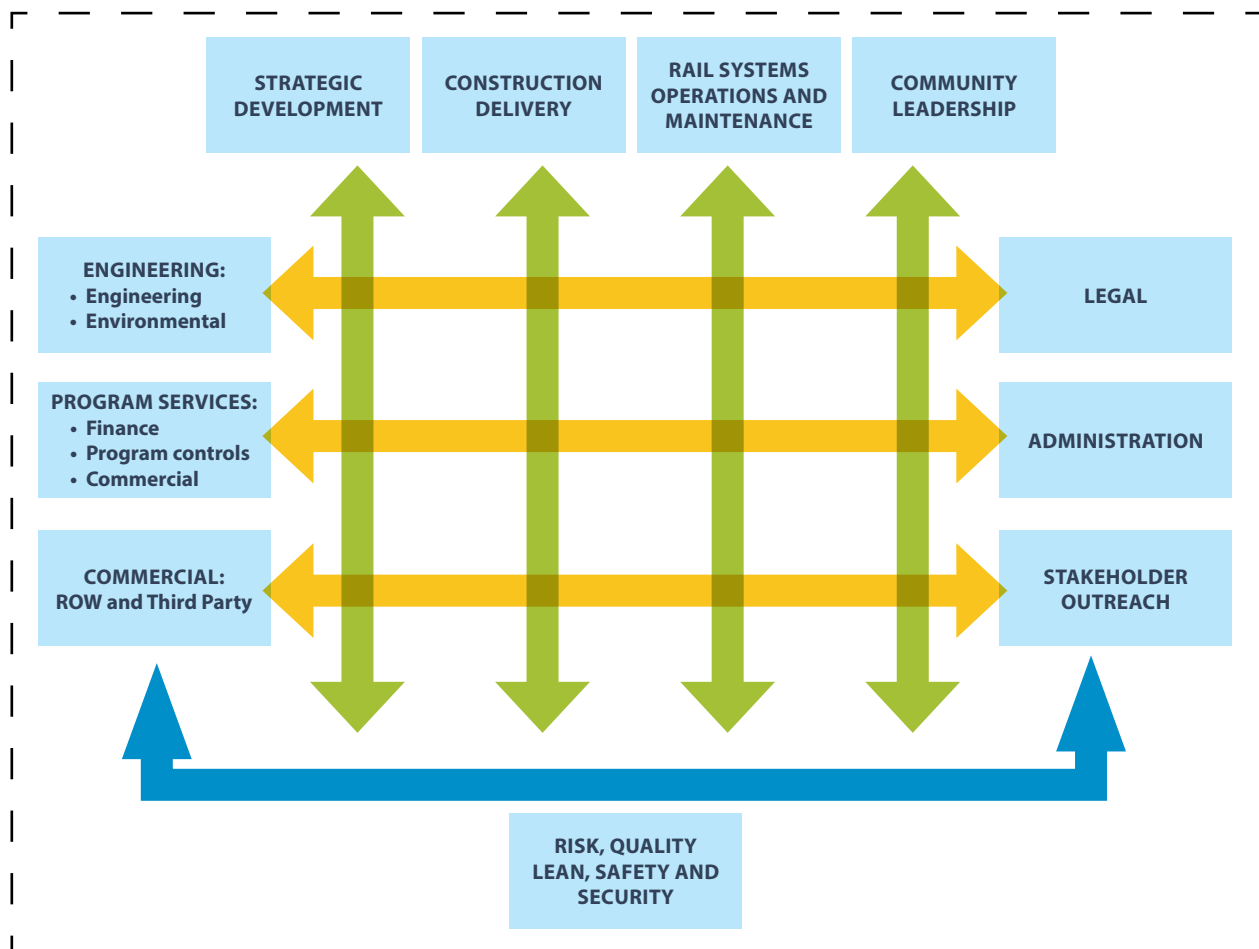


Exhibit 4.3 identifies the four Operational Pillars of delivery—Strategic Development, Construction Delivery, Rail Systems Operations and Maintenance, and Community Leadership. These pillars are supported by functional areas within the organization. The goal of this organizational structure is to break down silos and drive the organization across the phases of delivery. All of this is built upon a foundation of safety and security, risk assessment and quality regime. Each pillar and function is defined around clearly identified responsibilities and objectives, as summarized in Exhibit 4.4 below.

EXHIBIT 4.4 KEY LESSONS FROM ORGANIZATION READINESS		
PILLAR	KEY RESPONSIBILITIES	OBJECTIVES
Strategic Development	Develop project scope, budget, risk, schedule and acquisitions to include completion of environmental reviews and completion of certified real estate in advance of contract procurement.	Advance project planning through organizational collaboration, furthering scope and budget definition while mitigating risk and minimizing unknowns.
Construction Delivery	Execute infrastructure projects on-time, budget, providing a quality product that is safe and secure; holding our contractors accountable; and ensuring transparent project metrics.	Ensure usable and certifiable high-speed rail infrastructure.
Rail Systems Operations and Maintenance	Establish future-focused high-speed rail criteria for infrastructure construction to support rail operations and maintenance.	Validate and certify infrastructure construction for safety, security and quality to ensure a 220-mph, functional, operable and safe rail system.
Community Leadership	Develop the program through effective engagements with local communities by developing and nourishing long-term relationships with residents, stakeholders and policymakers.	Foster and encourage community engagement throughout the organization in all aspect of construction and operations.

These pillars are supported by various Authority staff, consultants and contractors. Recently, the Authority augmented these resources to address numerous factors related to operations, such as high-speed rail trains and systems procurement, operating costs, maintenance costs, and ridership and revenue. At the end of 2017, the Authority contracted with DB Engineering & Consulting USA, a subsidiary of Deutsche Bahn AG, as the Early Train Operator (ETO).

As the Early Train Operator, DB Engineering & Consulting USA will assist the Authority in developing the system—including the procurement of high-speed rail trains, track and systems, and stations—and will eventually become the party responsible for the initial operations and management of the Silicon Valley to Central Valley Line. In addition to helping with operational design and implementation, the Early Train Operator will bring industry expertise to current ridership and revenue strategies to help the Authority make future decisions on how to maximize ridership and revenue.

For the Authority to achieve its objectives, headquarters and field resources must be clearly aligned to these four operational delivery pillars. There must also be direct and efficient processes and clear roles, responsibilities and accountability. The goal is to establish enterprise roles and responsibilities, create value-added processes and identify centers of expertise that directly support field delivery. This will require distribution of direct headquarters-held expertise and resources, including engineering, legal, administration, real estate and environmental, toward project implementation.

The evolution of staff resources to this organizational approach will instill a proactive project-management approach that emphasizes stewardship, creates organizational agility, collaboration and a collective focus oriented toward achievement, transparency and accountability to delivering the nation's first high-speed rail system. This is achieved through deliberate planning to:

- Develop a long-range program strategy and goals;
- Formulate project scope, budget, schedule and risk register;
- Narrow unknowns by methodically and perpetually addressing areas of challenge;
- Execute a deliberate plan's schedule and budget;
- Eliminate risk, and actively manage and mitigate risks that remain;
- Ensure on-time, on-budget and on-quality/safety accountability; and
- Fulfill our community and other agency agreements.

This organizational approach, proactive project management and strategic planning will build upon risk management and mitigation strategies. The Authority's objective and deliberate decision-making concentrates on total cost benefit, guaranteeing transparency and stewardship. But, more importantly, this approach defines clear program objectives and goals, and resolves and eliminates program unknowns as project elements are advanced. It allows risk to be assigned and quantified using Monte Carlo evaluations. Program contingency can then be established specifically to a risk-mitigation plan, and defined in specific risk-mitigation incremental elements.

It also creates an organizational ethic of aggressive risk minimization initiated in strategic planning and comprehensibly carried through construction and rail operations, allowing for the continual refinement of the program cost-to-complete. This approach revolves around creating financial opportunity in mitigating and retiring individual risk. In doing so, lessons learned from leadership and strategic decision-making, organizational input and streamlined processes are directly applied to risk refinement and mitigation. This programmatic approach to refined risk management directly leads to narrowing the cost range and reducing contingencies.

Strengthened Programmatic Decision-making

In 2017, management formed two program committees to provide internal decision-making rigor, accountability and transparency for major decisions. Proposed changes are subject to a comprehensive review through a highly-structured process requiring consideration of the full effects of a proposed change. This includes any increases to level of effort, or increased costs in one area versus savings in another, potential effects on schedule and understanding all potential tradeoffs before a decision is made.

The program committees, which include broad representation across the agency, forward recommendations to the CEO and/or the Board for final resolution and decisions. This has generated better inter-departmental interaction, greater understanding of the effects of various decisions and earlier identification of issues that need to be resolved.

Program Committees

Program Delivery Committee (PDC), chaired by the COO, has the primary responsibility for the delivery of the program and is accountable for overall capital program scope, schedule, and adherence to budget. The committee reviews and acts upon items involving changes in scope, schedule, budget, and/or priorities that require BOC, CEO or Board approval.

Business Oversight Committee (BOC), chaired by the CFO, was created to streamline financial, commercial and fiscal review processes. The committee assesses and reviews requests and/or proposed commitments relating to public funds in accordance with Business Plan objectives, approved annual budgets, program priorities, and funding availability with a focus on the future enterprise value of an operational business.

The Authority has established new approaches to risk management to proactively identify and address new risks, including the development of a comprehensive cost estimate incorporating a cost to complete assessment for the Central Valley segment that assigns dollars to risks. These improved management tools are supported by a commitment for easily accessible and digestible dashboards and quarterly reporting.

WORKING

WITH OUR VALUED PARTNERS

Any project of this magnitude requires collaborative efforts, and the Authority is working with strategic federal, state and local partners to make high-speed rail a reality. Proposition 1A conceived of high-speed rail as a vital component of an integrated, electrified statewide rail network requiring public as well as private sector involvement. From funding to construction to station area planning, strong partnerships continue to be an integral part of building high-speed rail.

Federal Railroad Administration

The Authority and the FRA have entered into several grant agreements, which invest federal dollars to advance high-speed rail in California. The Authority works closely with the FRA in relation to safety and other development standards, environmental clearances, key statutory and regulatory provisions, required systems testing, funding programs, federal financing programs and other support. In the coming



U.S. Department of Transportation
Federal Railroad Administration

years, the Authority will work with the FRA in its important oversight role to establish the first national standards for high-speed rail operations and safety. The Authority remains committed to

meeting the construction and performance criteria articulated in the grant agreements with the FRA and has made significant progress on several key elements of the grant agreements.

Importantly, the Authority worked closely with the FRA to ensure that grant obligations were being met and that American Recovery and Reinvestment Act (ARRA) funds were successfully managed to meet the September 30, 2017, expenditure deadline. This \$2.5 billion in grant funding allowed construction to commence and generated significant economic benefits that were felt throughout California and the nation.

The Authority has also made a great deal of progress with the FRA on Phase 1 environmental clearances over the last two years. First, in November 2017, the Authority and the FRA jointly announced updated schedules for environmental clearance to better align our joint planning efforts and provide additional time for the public and stakeholders to participate in the environmental review process. Although these schedules are subject to further refinement, we continue to be committed to achieving environmental clearance as quickly as possible, while working closely with communities and local partners through this important public process. This will provide clarity to local communities, stakeholders and regional partners as to the route and station locations and will position the program to be shovel ready to facilitate improvements as funding becomes available.

Additionally, the Authority and the FRA have been working collaboratively throughout the past year toward California's assumption of federal environmental responsibilities under the National Environmental Policy Act (NEPA) and other federal environmental laws. Through NEPA Assignment, the Authority will manage both NEPA and California Environmental Quality Act document preparation for Phase 1 and Phase 2 of the high-speed rail program. The Authority will work to find efficiencies where possible to complete the process faster without diminishing the rigor of the environmental analysis or the opportunities for the public to meaningfully engage with the program.

The Authority and the FRA have made significant progress on the high-speed rail program over the years, and that progress has not only strengthened our partnership, but improved the relationship between the two agencies. We look forward to continuing this progress and finding more efficiencies and mutual benefits that can be attained over the coming years.

Freight Railroads

A well-defined and collaborative relationship between the Authority and the freight railroads in California is critical to the successful implementation of the high-speed rail program. There are two major freight railroads with operations within California: Union Pacific Railroad (UPRR) and the BNSF Railway Company (BNSF). The UPRR and the BNSF separately own, operate, maintain and dispatch a significant network of freight rail routes that also host both intercity and commuter passenger rail service. Both the UPRR and BNSF operate on their own right-of-way and under agreement on rights of way owned by public entities.

It is important to emphasize that both UPRR and BNSF play vital roles in the national and statewide economy by maintaining and expanding their ability to move freight by rail, to serve the state's ports and other shippers, and to help relieve the state's crowded highway network. Over the last several years, the Authority has reached fundamental agreements with UPRR and BNSF that are necessary for construction.

The Authority continues to be in discussions with UPRR, Caltrain, Caltrans, the City of San José, Santa Clara County and other partners about right of way and operational options between Santa Clara and Gilroy.

Northern and Southern California

In Northern and Southern California, where high-speed trains will be either blended with existing services and/or share rail corridors, the Authority continues to work with our freight partners to address issues including railroad signaling, operational planning, safety and security assessments, and other coordination needed for high-speed rail implementation.

Two corridors, in particular, are of great mutual interest between the Authority and the freight railroads: San José to Gilroy and Burbank to Los Angeles to Anaheim. In each of these corridors, high-speed rail will largely be traveling in the same corridor as freight rail and other passenger rail services, creating opportunities for investments that can benefit all corridor users. The state is currently working closely with the freight railroads to find opportunities to make mutually beneficial investments.

Shared Corridor Modeling between Los Angeles and Fullerton

The Authority, in partnership with BNSF and regional rail providers, has developed a shared corridor concept between Los Angeles and Fullerton, allowing development of a high-capacity railroad with full grade separation and improvements in the corridor to limit impacts on surrounding communities and businesses. This concept not only benefits passenger rail service, but also provides improved conditions for freight movement for our BNSF partner.

Central Valley

In the Central Valley, where major construction activities are underway and where high-speed trains will be traveling in excess of 200 miles per hour adjacent to freight corridors, ongoing cooperation and partnerships between the Authority and the freight operators are paramount.

The Authority has finalized and signed a series of important agreements with UPRR in the Central Valley. These agreements address the primary issues associated with high-speed rail adjacency, including construction, maintenance, operating indemnification and property transactions. The Authority and BNSF have also executed several agreements necessary for the coordination of Central Valley construction.

Specific Construction Package 1 agreements have been executed and are being used as templates for similar agreements for Construction Packages 2-3 and 4. Those will be executed in the near future when project designs are at a higher level for BNSF to understand and plan for its facility relocations, including tracks, as part of the scope of these construction package contracts. All of these agreements inform the design and construction of modifications to BNSF facilities and right-of-way and operational requirements.

Because high-speed trains will be traveling through the Central Valley at speeds of up to 220 miles per hour, the system requires full grade separation. The Authority is converting 30 existing at-grade street/rail crossings in the Central Valley to grade-separated interchanges. Another 20 roadways will be rebuilt as grade separations where they cross high-speed rail lines and existing freight lines, for a total of 50 new, fully grade-separated crossings in the Central Valley (10 existing crossings on roadways with low traffic counts will be permanently closed).

Not only will these grade separations prevent the overwhelming majority of major traffic collisions, they will improve operations on existing freight and passenger rail lines, including UPRR, BNSF, the San Joaquin Valley Railroad and the San Joaquin Amtrak service, which also runs on these freight lines.

The Authority has also negotiated and executed agreements with two short-line railroads—the San Joaquin Valley Railroad and West Isle Line. These agreements provide for reimbursement design review, flagging support and mitigations to direct impacts of ongoing construction.

State, Regional and Local Partners

A fundamental objective of the high-speed rail program is to make strategic investments throughout California that will deliver early benefits to local and regional future and existing rail systems, which will, in turn, lay the foundation for high-speed rail service. The Authority is currently working with state, regional and local partners to advance significant concurrent investments to existing regional rail systems that will serve as the building blocks for high-speed rail.



Avenue 12 Grade Separation in Madera will eliminate a grade crossing at the freight tracks and allow traffic to pass over future high-speed rail tracks.

Bookend and Connectivity Investments

When California voters approved Proposition 1A in 2008, they did more than authorize the state to issue \$9.95 billion of general obligation bonds to fund the high-speed rail program. The voters also committed to investing a portion of these funds toward improving existing passenger rail lines that serve the state's major population centers. These investments would expand capacity, improve safety and enable transit riders to connect to the high-speed rail system. By approving Proposition 1A, the voters created a partnership between the state, the Legislature and regional partners to implement a statewide rail modernization plan that will invest billions of dollars in local and regional rail lines to meet the state's 21st century transportation needs.

In 2012, with the passage of SB 1029, the California Legislature and Governor Brown laid a foundation for high-speed rail and an integrated statewide rail modernization program. SB 1029 appropriated almost \$2 billion in Proposition 1A funds that will leverage approximately \$5 billion in additional funds for regionally important transit, commuter rail and intercity passenger rail projects, designated as bookend and connectivity projects.

These funds are already being utilized on projects that will strengthen and improve existing rail networks to provide early benefits to travelers and enhance the value of the statewide high-speed rail system by providing efficient connections and access, as well as laying the groundwork for future high-speed rail service. As projects are completed, they will generate near-term benefits, such as increased capacity, frequency, reliability and safety for regional and interregional rail services, as well as air quality improvements and economic benefits.

"The High-Speed Rail Authority played an important role in supporting the Fleet of the Future. The Authority provided BART with \$140 million in funding because of the connectivity expected between our two systems once high-speed rail begins serving San José and San Francisco. The entire Bay Area will benefit from our collaboration with the High-Speed Rail Authority."

**- Grace Crunican,
BART General Manager**

The Legislature's appropriation of funding from the Greenhouse Gas Reduction Fund to the high-speed rail program, and bipartisan extension of the Cap-and-Trade Program in 2017, has also added additional opportunity and benefits to the Authority's state and local partnerships.

Over the last few years, we have worked closely with our state, regional and local partners to identify opportunities and invest in projects that will make strategic improvements to the state's passenger rail network. These investments not only prepare these systems for future connections or shared use with the high-speed rail system; the investments also provide immediate mobility, environmental, economic and community benefits for the passengers that utilize these systems.

Bookend Projects

Bookend projects will lay the foundation for future high-speed rail operations. Investments totaling \$1.2 billion have been made in these projects, which will support blended and shared operations at the bookends of the Phase 1 System:

- Northern California along the San Francisco to San José corridor; and
- Southern California along the Burbank to Los Angeles to Anaheim corridor.

The bookend partnerships are memorialized in two Memoranda of Understanding (MOU) with regional agency partners in Northern and Southern California.

Northern California

The bookend investment in Northern California supports the implementation of electrified service that will increase capacity and improve service along the Caltrain corridor between San Francisco and San José. The Authority is working in partnership with the Peninsula Corridor Joint Powers Board and regional stakeholders to ensure that Caltrain is well positioned to keep pace with increasing ridership demands, while also preparing its line for high-speed service. The San Francisco Bay Area will see the benefits of improved service, reliability, efficiency and air quality through the long-awaited electrification of the Caltrain corridor.

Peninsula Corridor Electrification Project

The Authority is committed to advancing the Caltrain Electrification Project that will improve service between Tamien Station in San José and the Caltrain station at 4th and King in San Francisco, while allowing high-speed rail to use the corridor in the future as part of a blended operations with Caltrain. In 2016, the Authority agreed to a supplement to the original \$600 million Memorandum of Understanding with Northern California agencies to increase the Authority's funding contribution to a total of \$713 million.

The Caltrain Electrification Project, scheduled to be implemented by 2022, will electrify and upgrade Caltrain's commuter rail service, which will result in improved performance, operating efficiency, capacity, safety and reliability of the service between San Francisco and San José. In addition, an important safety component of the modernization program is Caltrain's Advanced Signal System, which consists of installing Positive Train Control technology along the Caltrain corridor. These improvements will allow high-speed rail to utilize this corridor for service from San José to San Francisco as part of a Caltrain/Authority blended system operation.



We are working with our partners on the potential to extend the electrification of this vital transportation corridor to Gilroy. Our investment would allow electric commuter rail trains and high-speed rail trains to share this regionally significant, high travel demand corridor. The Authority would make this funding commitment as part of a comprehensive plan and appropriate institutional agreements. The objective of the plan and agreements would be to ensure that commuter rail and high-speed rail service schedules are harmonized so that efficiencies are achieved and that there is a market-driven service plan which is responsive to emerging and evolving market forces.

Southern California

The bookend investments in Southern California go to regional rail projects that will improve local networks and lay the foundation for high-speed rail service in Southern California. Projects will be selected by regional and local transportation agencies associated with the 2012 Southern California MOU and in conjunction with the Authority. The Authority's \$500 million Proposition 1A investment will be matched by additional investments to make the total investment in these projects \$1 billion.

Rosecrans/Marquardt Grade Separation Project

In early 2017, the Rosecrans/Marquardt Grade Separation project was identified as the first project to be funded through the Southern California MOU at approximately \$76 million. The Rosecrans/Marquardt grade separation is in Santa Fe Springs on the BNSF mainline tracks at the intersection of Rosecrans and Marquardt Avenues. These tracks are part of the Los Angeles–San Diego–San Luis Obispo Rail Corridor (LOSSAN Corridor), the second busiest intercity passenger rail corridor in the country.



Rendering: Rosecrans/Marquardt Grade Separation Project in Southern California

This intersection, traversed by more than 112 freight and passenger trains and more than 45,000 vehicles every day, has been rated by the California Public Utilities Commission as the most hazardous grade crossing in California. This project will provide significant near-term mobility, safety, environmental and economic benefits to the region by making necessary improvements for high-speed rail service. Project benefits also include increasing passenger rail capacity to the Inland Empire by 60 percent.

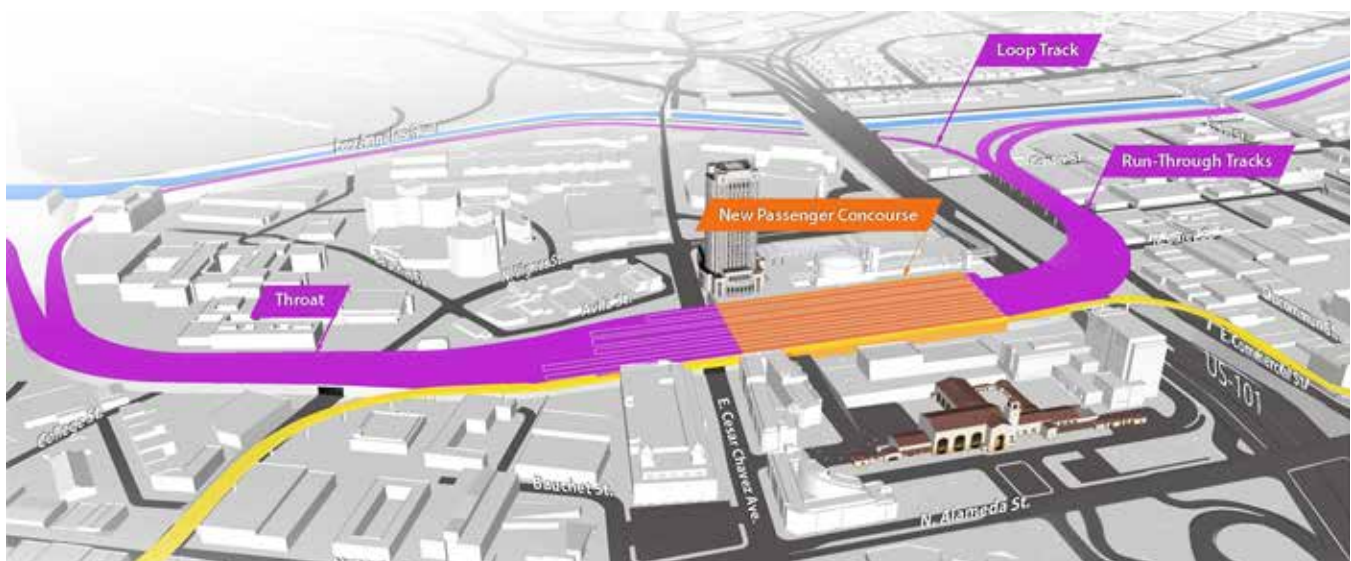
Los Angeles Union Station and Link US

The Authority is partnering with the Los Angeles County Metropolitan Transportation Authority (Metro) on mobility improvements to the Los Angeles Union Station (LAUS) for the Link Union Station (Link US) project in downtown Los Angeles. Link US is the highest priority early investment project in Southern California, as per the 2012 Southern California MOU.

The Link US project in downtown Los Angeles is a transformative early investment project in the Los Angeles Urban Mobility Corridor that the Authority is implementing in cooperation with its partner agencies. Link US will extend up to 10 rail tracks at LAUS to the south of the station over the US Highway 101, including platforms and tracks to be used by future high-speed rail service. The project will allow train service at LAUS to “run through” the station, rather than head in and back out through a single entrance. Link US will significantly increase rail service capacity at LAUS, shorten train idling times from 20 to 30 minutes to under 10 minutes, reduce greenhouse gas emissions and prepare LAUS for high-speed rail. Link US will also upgrade the LAUS passenger concourse into a world-class passenger facility, with new waiting areas and retail amenities.

“I appreciate and welcome the California High-Speed Rail Authority as a partner with LA Metro to deliver the Link Union Station project. With this partnership in place, the historic LA Union Station will be the epicenter for passengers traveling on local, regional and high-speed rail in Southern California.”

**- Phillip A. Washington, CEO,
LA Metro**



Rendering: Link Union Station Project at LA Union Station in Southern California

The Authority executed a contract with Metro in May 2016 to fund a share of Link US project development costs. Since then, Metro has made significant progress on Link US environmental and preliminary engineering work in coordination with the Authority. A conceptual plan was developed for improvements to platforms, tracks and other infrastructure so LAUS can meet the demands of projected increases in regional rail and local transit services, and to fully accommodate high-speed rail. In 2017, the Authority's Board of Directors approved up to \$18 million to help fund engineering and technical studies and to environmentally clear a range of investments to help modernize and integrate high-speed rail at LAUS.

The successful integration of high-speed rail at LAUS is essential, given that it is one of the major regional gateways and transfer points in Southern California with connections to Metro bus and rail service, Metrolink and Amtrak passenger rail service, other connecting local transit services, and multimodal travel options.

The Authority plans to build on the successes to date and will continue to work with our regional partners to direct the remaining \$423 million Southern California MOU funds to the Link US Project. By doing so, the Authority becomes a full partner in this high priority project, which positions high-speed rail as a key transportation option at LAUS. This important regional project will open up connections to bus service, Metrolink, LOSSAN, Amtrak passenger rail service, other connecting local transit services and multimodal travel options that will meet the service needs of existing and future operations.

Connectivity Projects

SB 1029 appropriated \$950 million to regionally significant connectivity projects throughout California that will provide direct connectivity to high-speed rail lines and facilities. As of August 2017, the California Transportation Commission, which oversees these investments, had allocated \$826 million to 18 projects. Currently, 15 projects have received allocation for the construction phase and nearly 75 percent of the Proposition 1A dollars for these projects have been expended.

EXHIBIT 5.0: HIGH-SPEED RAIL CONNECTIVITY PROJECTS

CONNECTIVITY PROJECT	PROPOSITION 1A INVESTMENT
Caltrain, Advanced Signal System and Positive Train Control	\$105.4 Million
Capitol Corridor (and ACE) Travel Time Reduction Project	\$10.2 Million
Capitol Corridor, Sacramento to Roseville 3rd Main Track Project	\$52 Million
Los Angeles County Metropolitan Transportation Authority, Regional Connector Transit Project	\$114.9 Million
Los Angeles to Fullerton Triple Track Project, Positive Train Control	\$2.9 Million
Metrolink, High-Speed Rail Readiness Program	\$88.7 Million
Metrolink, Positive Train Control	\$35 Million
North County Transit District, Positive Train Control	\$17.8 Million
Pacific Surfliner, Positive Train Control, San Onofre to San Diego	\$24 Million
Pacific Surfliner, Positive Train Control, Moorpark to San Onofre	\$46.5 Million
Sacramento Intermodal Facility, Improvements Project	\$26.2 Million
San Diego Metropolitan Transit System, Blue Line Light Rail Improvements	\$57.9 Million
San Francisco Bay Area Rapid Transit, Millbrae Station Track Improvement and Rail Car Purchase	\$140 Million
San Francisco Bay Area Rapid Transit, Maintenance Shop and Yard Improvements	\$78.6 Million
San Francisco Municipal Transportation Agency Central Subway Project	\$61.3 Million
San Joaquin Corridor Merced to Le Grand Double Track Project	\$40.7 Million
San Joaquin Corridor Positive Train Control	\$9.8 Million
San Joaquin Regional Rail Commission, Stockton Passenger Track Extension	\$5.7 Million

Regional and Local Partners

Northern California

San Mateo—San Mateo Grade Separation Project

The Authority, in partnership with the City of San Mateo and the Peninsula Corridor Joint Powers Board, is making a life-saving investment by contributing up to \$84 million to the 25th Avenue Grade Separation Project in San Mateo. This grade separation will significantly reduce collisions and congestion at a series of dangerous intersections.

Central Valley

City of Fresno—Workforce Training and Investing in the Mandela Training Center

The Authority recognizes the need for a skilled workforce to deliver the nation's first high-speed rail program and is committed to providing opportunities for area residents to get involved on the project. In the Central Valley, we have strong partnerships with local unions, contractors and groups, such as the Fresno Workforce Investment Board (WIB), through our Community Benefits Agreement. The WIB has also partnered with the Building Trades Pre-Apprenticeship Training Program to offer a seven-week pre-apprenticeship training program for area residents where they can receive training in a variety of trades before entering apprenticeship programs—and some of those graduates are working on the high-speed rail program today. Even with these great partnerships, we are always on the lookout for new training opportunities.

The Authority intends to enter into an agreement with the Fresno Economic Development Corporation to support and fund a Mandela Training Center in Fresno. The Mandela Pre-Apprenticeship Program is a nationally recognized, independent 501(c)3 nonprofit organization that has received acclaim for excellence in training, and it has a long history of successful operation and placement of students in the construction trades. The Authority has committed a one-time contribution of \$900,000, and once the program is operational, it will be self-sustaining moving forward.

Southern California

Los Angeles Urban Mobility Corridor

The Los Angeles Urban Mobility Corridor connecting Burbank, Los Angeles and Anaheim is of regional and statewide significance and is critical to supporting the economy of Southern California. The corridor is a vital freight and goods movement corridor that facilitates cargo movements to and from the ports of Los Angeles and Long Beach, the nation's two busiest ports based on container traffic. Also, it is part of the nation's second busiest Amtrak line, is served extensively by Metrolink commuter rail service and will be an essential link in the future high-speed rail system. The 2018 California State Rail Plan identified the Los Angeles Urban Mobility Corridor as a critical piece of the statewide rail network and specified service goals and improvements for the corridor through the year 2040.

The Authority and our partner agencies have a shared interest in improving mobility and enhancing economic growth in Southern California and recognize the tremendous benefits associated with coordination and collaboration. By first studying a corridor's operational characteristics, it is possible to develop project sequencing schemes that deliver a whole that is greater than the sum of the parts. This strategic planning is underway now across a wide area of the Southern California network. Here, the Authority, BNSF, Metrolink, LOSSAN and other partner agencies are working together to develop a unified plan to meet future corridor demand and deliver significant regional mobility improvements.

Progress on Network Integration

Developing high-speed rail as part of an integrated transportation network is more than just a smart business approach. California has recognized that high-speed rail investments must go hand-in-hand with investments in traditional intercity rail, commuter rail and local rail and transit systems. The Authority has been working in concert with the California State Transportation Agency to identify strategic, concurrent investments through the state's passenger rail network that can link these projects to the high-speed rail system. This linkage ensures early benefits to users initially, followed by a more efficient implementation of high-speed rail expansion and, ultimately, greater connectivity throughout the state.

This is evident in the way in which recent funding allocations are prioritized and directed. With the passage of Proposition 1A, funds were directed toward building high-speed rail and to key connectivity projects, which will strengthen and enhance local and transit services. The same can be said for the Cap-and-Trade program, which directed revenues to the high-speed rail program and large amounts to local and regional rail and transit programs.

Although it does not provide any money to high-speed rail, SB 1 (2017) directs significant additional funds to local and regional rail and transit programs, some of which share corridors or connect to high-speed rail. These types of investments build on one another by creating improved mobility options that will lead to increased ridership on regional and local transit and high-speed rail, and vice versa.

Rail Modernization and the State Rail Plan

California is making unprecedented investments in its rail and transit networks, as a result of new funding made available under SB 1 of 2017 and the continuous appropriation of Cap-and-Trade auction proceeds to intercity rail and transit.

The Authority continues to determine ways to connect to and further bolster transformative projects associated with high-speed rail's implementation as part of a modernized state rail network. This interaction is contemplated in the 2018 State Rail Plan, expected to be released in final form by the end of March 2018.

The State Rail Plan lays out a vision for statewide, integrated rail and transit service, allowing for rail to connect all urban, suburban and rural communities with frequent, reliable service by 2040. It focuses on the benefits of being able to reliably connect between systems with well-planned transfers, and to purchase and plan travel with one easy transaction, including travel that will include the high-speed rail system. Many investments are contemplated to be in place in the first 10 years (by no later than 2027), allowing for high-speed rail to connect to improved rail, express bus and transit services at all stations.



Examples most relevant to the Silicon Valley to Central Valley high-speed rail service include:

- Enhanced service between San José and San Francisco, including more frequent local and express service with longer trains and investments in level boarding (when compared to the initial outcomes of electrification in the corridor that will be achieved earlier).
- Faster service connecting the East Bay to San José, including both the completion of the BART corridor to downtown San José and Santa Clara, and improvements to intercity and regional rail services.
- Initial rail service connecting Salinas to Gilroy and the Bay Area.
- Frequent rail services connecting Sacramento and the northern Central Valley to both Merced and Madera, allowing high-quality transfers to high-speed rail service.
- Improved express bus service connecting the Central Coast and Visalia/Porterville with the Kings/Tulare station.
- Improved express bus service between Bakersfield and Santa Clarita, connecting to more frequent rail services between Santa Clarita and Los Angeles, Orange County and San Diego, as well as the rest of the Metrolink system.

Additionally, Phase I of the high-speed rail system will offer tremendous opportunity for connecting to additional transformative transportation projects across the state, specifically in Los Angeles and Southern California.

Examples of short-term project investments detailed in the State Rail Plan that will interact with Phase I include:

- The Los Angeles Urban Mobility Corridor: High-speed rail is already investing in this corridor through investments in the Rosecrans/Marquardt Avenue Grade Separation Project and proposed investments in LAUS. Phase I will bring greater corridor capacity and electrification between Burbank and Anaheim. In addition, the LA Urban Mobility Corridor also includes significant Metrolink frequency improvements that will run through LAUS and high-frequency regional and intercity services that use run-through tracks at LAUS to significantly shrink journey times throughout the region. All day local and express trains will allow frequent service to the Inland Empire, Orange County, San Diego County, the San Fernando Valley, Ventura County and Santa Barbara County, connected to high-speed rail trains that allow for statewide travel.
- LOSSAN South: Half-hourly all-day local service and hourly all-day express service, with greater frequency in peak periods, will connect with high-speed rail services at Anaheim to enable easy access to southern Orange County and San Diego County, while benefiting local rail users as well.
- LOSSAN North: Improvements to rail frequency and travel times on services to Ventura and Santa Barbara Counties, allowing for better connections to high-speed rail services at Hollywood Burbank Airport.

- Las Vegas High-Speed Rail: The State Rail Plan supports investments connecting privately operated high-speed rail service to Las Vegas and planned service in the High Desert Corridor with the California high-speed rail system at Palmdale.
- Central Valley: High-speed rail will connect at Madera and Merced to frequent local and express services serving Modesto, Stockton, Sacramento, the Tri-Valley and many stations in between. Express bus service will link many of the high-speed rail stations to many other destinations, including national parks.

The effort to develop the 2018 State Rail Plan included collaboration across many regional operators and planning agencies and included the Authority. As implementation is pursued, the Authority is committed to being an ongoing partner to ensure the best outcomes for the transportation network.

The funding for these improvements will come from a variety of state, federal and local funding sources. The Transit and Intercity Rail Capital Program (TIRCP) is a significant funding source for many of these investments. TIRCP, created by SB 862 and modified by SB 9, provides grants from the Greenhouse Gas Reductions Fund and from SB 1.

These are used to fund capital improvements that seek to modernize California’s intercity, commuter and urban rail systems to reduce emissions of greenhouse gases by reducing congestion and vehicle miles traveled throughout California.^[12] In addition to TIRCP goals of expanded rail ridership and improved safety is the integration of transit services with the planned high-speed rail system.

Transformative projects that were identified through the 2015 and 2016 TIRCP awards included:

- The City of Fresno’s Metropolitan Rapid Transit and Rail Connectivity Project;
- The Capitol Corridor’s increased rail service to Roseville and Travel Time Savings project benefitting service to San José;
- The Peninsula Corridor Joint Powers Board’s Peninsula Corridor Electrification Project;
- The expansion of Metrolink service on the Antelope Valley Line through the acquisition of Tier IV expansion locomotives; and the
- LOSSAN Rail Corridor Agency’s track improvements and leasing of new rail cars for faster and more frequent rail service throughout Southern California.

By planning and partnering with these agencies and projects, the Authority can further identify ways that investments may yield near-term benefits that enhance current rail and transit services and provide significant improvements and access to future high-speed rail service.

Station Cities and Planning Partnerships

The Authority has worked with local governments over the last several years to prepare for future high-speed rail stations. The Authority, in partnership with the FRA, dedicated funding to support station cities in completing station area plans that are consistent with and supportive of local and regional planning efforts required by SB 375 and the Authority’s Station Area Development Policies. To date, the Authority has executed planning agreements with the cities of Gilroy, Merced, Fresno, San José, Bakersfield, Palmdale and Burbank, and with the Tulare County Association of Governments and the Santa Clara Valley Transportation Authority.

These agreements allow the Authority to work closely with station jurisdictions and other service providers to promote city-regeneration opportunities and enable more sustainable, district-scale development. These efforts also include working with regional and local transit providers to enhance multi-modal connectivity to high-speed rail stations and surrounding transportation improvements. Ultimately, the work will facilitate adoption of amendments to general plans and zoning codes and will help develop financing and phasing plans to support the station area plans, as well as options to attract private investors.

The vision for station planning is to create community hubs and help transform cities. The goals being advanced through this program include:

- Fostering sustainable development and operations;
- Reducing greenhouse gas emissions;
- Helping maximize system performance; and
- Creating economic engines for local communities.

Transit and Land Use Committee

In 2016, the Authority's Board of Directors started the Transit and Land Use Committee, which is focused on the connections between land use decisions and public transportation investments; specifically, the state's investment in the high-speed rail system that is connecting its major population centers. Over the last two years, the Committee has discussed a set of statewide interests in strengthening markets, promoting affordable housing and revitalizing California's communities. The Authority is committed to continued collaboration with its state, regional and city partners to spend its dollars in a way that maximizes community investments and to identify mechanisms that will accelerate station development when coupled with the Authority's investments.

In planning for and pursuing station area development, the Authority recognizes that joining forces on mutually beneficial objectives will yield more results than if each entity that engages in station area development pursues its objectives separately. Several ideas to achieve these ends emerged through conversations



San José Diridon Station Integrated Concept Plan

Connecting high-speed rail to the Diridon Station in San José (the 10th largest city in the nation) will provide connections to Bay Area Rapid Transit, Altamont Corridor Express, Caltrain, Santa Clara Valley Transportation Authority light rail and buses, and Amtrak's Coast Starlight service and Capitol Corridor service. Already the South Bay's most important transit hub, millions of square feet of new development near the station will grow the number of jobs in greater downtown San José by more than 50 percent and transform the station area into a major employment destination.

Recognizing this once-in-a-generation opportunity, the Authority entered into a station area planning agreement with the City of San José and transportation partners to develop new intermodal transportation opportunities in the region and encourage transit-oriented development and smart-growth policies around the station area. This multi-agency partnership is designed to develop an intercity transportation facility that facilitates seamless travel and social and economic transactions.

The Authority is committed to being a partner with the City of San Jose, VTA, Caltrain and other partners to develop a vision for the future of Diridon Station and the surrounding area as a world-class integrated transportation hub and thriving neighborhood that goes beyond just the introduction of high-speed rail in the corridor. To that end, we are working with our partners through a joint decision-making framework that is respectful of local and state planning processes and environmental timelines.

with station cities and agency partners. These include, but are not limited to, establishing a rail station area development corporation for each station with responsibility for development and land use in the immediate station area; streamlining development approvals and entitlement processes for station areas; planning for each station to be a transportation hub that supports sustainable modes of travel and has the flexibility to adapt to changes in travel modes and patterns over time; and the creation of a new financing and downtown revitalization tool for station districts to help fund new development and infrastructure needs.

The Authority is further interested in pursuing federal programs, such as Opportunity Zones (initiated with the Tax Cuts and Jobs Act of 2017) in eligible station areas, as well as U.S. DOT Build America Bureau programs for financing infrastructure associated with stations and ancillary operations. We are also interested in pursuing institutional financing opportunities, public-private partnerships and joint ventures.

Partnerships Help Advance Toward the Future

Creating High-Speed Rail Station Economic Development Tools

High-speed rail will enable economic transformation throughout California by linking the state's population centers. Research as well as U.S. and international experience demonstrate that economic activity is drawn to vibrant, diverse, livable and well-connected places. Amazon's recent search for a new headquarters and Google's recent acquisition of significant land holdings around San Jose's Diridon Station demonstrate this preference for high-quality, connected live/work environments. Yet, many future high-speed rail station communities suffer from decades of disinvestment and weak market conditions.

To realize high-speed rail's potential for economic transformation and additional benefits to existing residents and businesses within station communities and regions, high-speed rail station areas must be inviting, dynamic, authentic, attractive and diverse places in their own right. Accelerating delivery of these local economic benefits will require additional financing tools, structured partnerships and expanded authorities to plan and implement coordinated, phased development in station areas. The Authority will continue working with local communities and other partners on advancing creative financing and governance tools and resources to create new resources to advance station area development. This includes tools and resources to support great high-speed rail stations, mixed-income housing, commercial development, urban greening, efficient transportation connectivity that promotes active and shared transportation modes and other place-making infrastructure and development.

Clearly, the high-speed rail program has depended on strong partnerships with many public and private sector entities, and will continue to do so. It is only through these partnerships that the type of truly transformative system Californians voted for can be implemented. We will continue to foster these partnerships and look for ways to create more mutual benefits as the program advances.

PROGRESS

SINCE THE 2016 BUSINESS PLAN

California high-speed rail is one of the largest, most complex and, in many ways, most far-reaching public infrastructure projects in the nation. As the backbone of an integrated and modern statewide rail network, high-speed rail will fundamentally transform how people move around the state.

As with any megaproject, it faces a myriad of challenges and opportunities that must be effectively managed to successfully deliver it. Although we have faced many challenges over the last two years, we have also made progress on many fronts—advancing construction, transforming the organization, strengthening our partnerships and putting people to work to help us deliver the system.

- **Construction is advancing on over 119 miles in the Central Valley** with more than a dozen active construction sites and three major structures already complete.
- **Billions of dollars have been infused into the state’s economy**—stimulating \$5 billion to almost \$6 billion in economic activity.
- **Hundreds of businesses and thousands of people are helping us plan, design and build the system**—this includes small businesses, disadvantaged businesses and disabled veteran businesses. Thousands of people are hard at work in good-paying jobs—including Disadvantaged Workers^[13] and disabled veterans—with more than 1,699 craft laborers dispatched to work on our Central Valley construction projects.
- **Environmental, engineering and community involvement is advancing on every mile of the Phase 1 System**—we are working toward the goal of moving through the environmental review process expeditiously, while maintaining environmental protections and providing meaningful opportunities for the public to participate.
- **New leadership and organizational improvements have been put in place**—this will allow us to continue to evolve the project delivery organization to better manage the program.
- **Putting state dollars to work**—we have put funding from the Cap-and-Trade program and Proposition 1A to use in the Central Valley.

Advancing Construction in the Central Valley

Currently, 119 miles are under construction from Madera to north of Bakersfield. Given the scale of the Phase 1 System—stretching more than 500 miles from San Francisco/Merced to Los Angeles/Anaheim—it represents a massive investment in the state’s future transportation infrastructure, with workers building major bridges, viaducts and grade separations all along the corridor in the Central Valley.

CP 1 AVENUE 12



CP 1 SAN JOAQUIN RIVER VIADUCT



CONSTRUCTION PACKAGE 1
TUTOR PERINI/ZACHRY/PARSONS



CP 1 AVENUE 12



CP 1 SAN JOAQUIN RIVER VIADUCT



CP 1 ROAD 27



CP 1 MUSCAT AVENUE



CP 2-3 KANSAS AVENUE



CP 4 PRECONSTRUCTION GEOTECH



CONSTRUCTION PACKAGE 2-3

DRAGADOS FLATIRON JOINT VENTURE

65 MILES

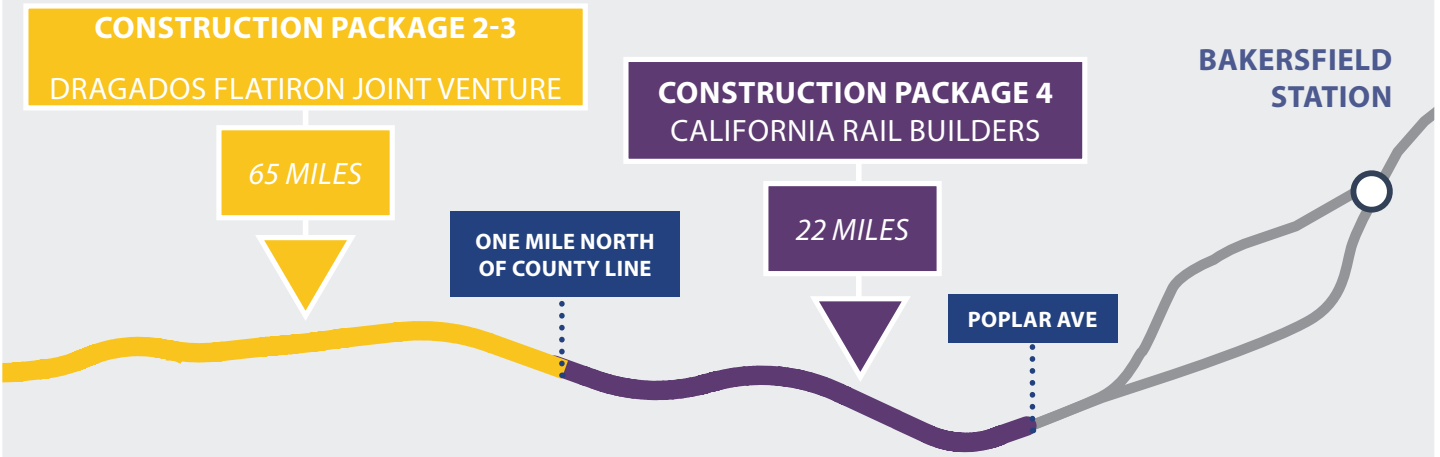
ONE MILE NORTH OF COUNTY LINE

CONSTRUCTION PACKAGE 4
CALIFORNIA RAIL BUILDERS

22 MILES

POPLAR AVE

BAKERSFIELD STATION



CP 2-3 ROAD RESURFACING



CP 4 PRECONSTRUCTION GEOTECH



CP 1 CEDAR VIADUCT



In the Central Valley alone, the Authority needs to acquire upwards of 1,800 parcels, which is a massive undertaking. To put this into perspective, in any given year, the California Department of Transportation (Caltrans) acquires between 700 and 900 parcels for all transportation projects under contract statewide.

Over the last two years:

- Three Construction Packages have advanced on final design, and an overall investment of \$3.08 billion through January 31, 2018, has been made on construction related activities in the Central Valley;
- Bridges, viaducts and grade separations are becoming clearly visible at multiple locations;
- Three major structures have been completed—the Cottonwood Creek guideway structure, the Fresno River Bridge and the new Tuolumne Street Bridge, which opened to traffic in August 2017; and
- Work is advancing, under Caltrans’ oversight, on the realignment of State Route 99 in Fresno to make room for high-speed rail.

Contributing to Economic Recovery by Fully Investing Federal ARRA Funds

In 2009, the United States was at the height of a major economic recession. California’s unemployment rate spiked to 12.4 percent in 2010, and the Central Valley’s unemployment rate stood at nearly 17 percent.

To address this unprecedented national economic crisis, the president and Congress enacted the American Recovery and Reinvestment Act of 2009 (ARRA) to provide economic stimulus to save and create jobs through infrastructure investment. California received \$2.55 billion in ARRA funds for high-speed rail, which was combined with state and other federal funds to advance and build the system.

Initially, these funds were invested primarily in advancing environmental reviews, design and outreach. Although the Authority endeavored to quickly transition to construction, the enormous amount of pre-construction activities, such as environmental clearance, right-of-way acquisition and third-party agreements, meant that progress on the physical infrastructure was slower than hoped. By the end of 2015, only 265 construction craft laborers had worked on the project. However, over the last two years, the pace picked up: By the end of 2017, 1,648 construction labor workers had been sent to work at various construction sites along the alignment.

Faces of High-Speed Rail:

Claudia Chavez

Pre-apprenticeship programs and high-speed rail are allowing workers like third-year electrical apprentice Claudia Chavez find a career that suits them. “I’ve always like construction. I tried working in an office, but it just wasn’t for me,” Chavez says. The mother of two daughters says working on the high-speed rail project not only helps her provide for her family but also allows her to set an example for her little girls. “I want them to know they can do anything they want to. This is what I like to do. Even though it’s a men’s world, I still come out here and do an awesome job.”



The federal ARRA funds came with a requirement that they be fully spent by September 30, 2017, and the Authority achieved that statutory deadline. Because of this investment, thousands of good-paying jobs were created that helped put people back to work. The impact of the Authority’s total investment between July 2016 and June 2017 was equivalent to more than 13 percent of the 33,700 jobs that the Central Valley economy added over the same period overall.

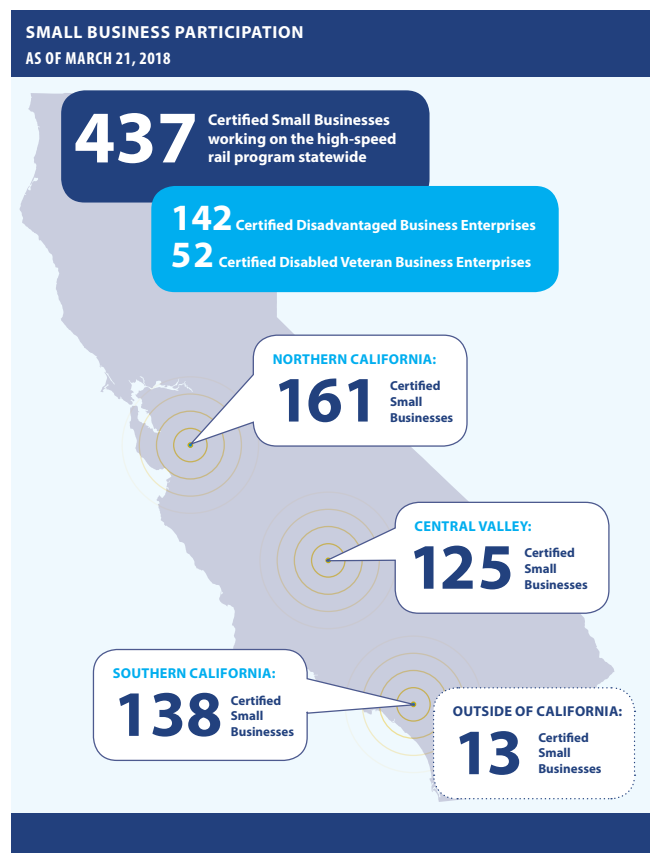
Some of these workers are on the job because they seized the chance to apply for apprenticeships, such as a Pre-Apprenticeship Training Program established by the Fresno Workforce Investment Board, or took advantage of other workforce-development programs, such as Helmets to Hardhats.

Small Businesses Play Big Role

The Authority is fully committed to small businesses playing a major role in building high-speed rail and has demonstrated this commitment by meeting its aggressive 30 percent goal for small business participation—and the specific goals of 10 percent for Disadvantaged Business Enterprises (DBE) and 3 percent for Disabled Veteran Business Enterprises (DVBE).

The numbers show consistently increasing participation since the 2016 Business Plan:

- **In March 2016**—266 Certified Small Businesses statewide were working on the program.
- **Fast forward to December 2017**—427 Certified Small Businesses statewide were working on the high-speed rail project, including 139 Certified DBEs and 51 Certified DVBEs.





Faces of High-Speed Rail: DAVE Trucking and Sweeping

Sean Reed, owner and operator of DAVE Trucking and Sweeping, has been involved with the high-speed rail project since October 2016. Reed, who has spent most of his career in the construction industry, has Native American heritage and is a military veteran who was injured while on active duty. With that background, he knew there were business opportunities for Disabled Veteran Business Enterprises and Disadvantaged Business Enterprises. So, he started DAVE Trucking and Sweeping three years ago (DAVE stands for Disabled American Veteran Enterprises). Reed immediately began bidding on work for Caltrans and other large construction projects around the Central Valley, including the high-speed rail project. Reed said his company has grown by as much as 150 percent in the past year. He currently has 21 full- or part-time employees, and thanks to high-speed rail, he's leased five more trucks and hired drivers to operate them.

Expediting Environmental Reviews for Future Construction

The 2016 Business Plan established a very important goal—to environmentally clear the Phase 1 System between San Francisco/Merced and Los Angeles/Anaheim to make it shovel ready as quickly as possible. Our grant agreement with the Federal Railroad Administration (FRA) requires full environmental completion on all segments by 2022. Over the last two years, the Authority achieved major milestones in advancing environmental clearances on two Central Valley extensions:

Fresno to Bakersfield Project Section

Locally Generated Alternative. In May 2014, the Board of Directors certified a Final Environmental Impact Report/Environmental Impact Statement (EIR/EIS) for the Fresno to Bakersfield project section. The document identified a preferred alignment from the Fresno Station to the Bakersfield Station located at Truxtun Avenue. In June 2014, the City of Bakersfield filed a lawsuit challenging the approval under the California Environmental Quality Act (CEQA). As a result, the Authority and the City of Bakersfield continued meeting in an effort to resolve the issues addressed by the litigation. In December 2014, the Authority and the City of Bakersfield announced that they would study an alternative alignment, known as the Locally Generated Alternative, that includes a high-speed rail station at F Street, and that the City agreed to dismiss its CEQA lawsuit.

The Authority has continued outreach and collaboration with local communities and stakeholders to inform and involve the people of these communities through the next steps of the process in delivering high-speed rail. In May 2016, the Authority Board of Directors concurred with the staff's recommendation to identify the Locally Generated Alternative and the F Street Station as the preferred alternative in the Fresno to Bakersfield Project Section Supplemental EIR/EIS. The Authority and the FRA released the Fresno to Bakersfield Project Section Draft Supplemental EIR/EIS in November 2017 for public review and comment. The Draft Supplemental EIR/EIS provides a detailed analysis comparing the new alignment to the preferred alternative identified in the 2014 Final EIR/EIS. Final environmental clearance is anticipated in 2018.

Merced to Fresno Project Section

Central Valley Wye. The Authority Board of Directors certified the Final Environmental Impact Report/ Environmental Impact Statement (EIR/EIS) for the Merced to Fresno project section in May 2012. The FRA issued the Record of Decision in September 2012. At that time, the Board of Directors determined that the Central Valley Wye alternatives should be further developed and evaluated in a subsequent environmental analysis. The Authority considered input from stakeholders and regulatory agencies, which it used to narrow 14 separate alternatives down to four that are being evaluated as part of the Merced to Fresno Project Section Supplemental EIR/EIS. In May 2017, the Board of Directors identified State Route 152 North and Road 11 as the preferred alternative for the Central Valley Wye. Although it's not the final route decision, the preferred alternative represents the alternative that provides the best option for meeting the project purpose while minimizing impacts to the environment and communities. The Central Valley Wye serves as the junction between the Central Valley and trains heading west to the Bay Area, north to Merced and south to Fresno. Final environmental clearance is anticipated in spring 2019.

In addition, in 2017, the Authority aligned with recent federal environmental streamlining legislation and now identifies preferred alternatives in advance of issuing draft environmental documents for public review. This facilitates public review and comment on what the Authority has identified as the most likely alternative. Final decisions on routes and station locations are not made until after public comment on the Draft EIR/EIS and resource agencies complete the environmental process through the Final EIR/EIS.

Progress on Other Project Sections

Over the last two years, the Authority and the FRA continued to work closely together and strengthen their partnership. Through that effort, the remaining Phase 1 environmental schedules have been brought into alignment and a new schedule was developed in late 2017, pursuant to our FRA grant agreement. Exhibit 6.0 summarizes the projected completion dates.

The Authority is committed to making the environment and surrounding communities top priorities through planning and construction and will build a high-speed program with the fewest impacts and greatest benefits. This means engaging in a transparent process that documents our findings and develops a full range of alignment alternatives that will allow us to arrive at the best possible outcome for communities and natural resources. Working with the surrounding communities and stakeholders is a vital part of the process that, in some cases, could add time to the environmental process. Local communities are key partners in the advancement and identification of the best alignments.

The Authority remains committed to completing environmental reviews as expeditiously as possible to provide clarity to local communities, stakeholders and regional partners on projected alignments and station locations. Work continues on the following Phase 1 project sections:

- **The San Francisco to San José Project Section** will connect the cities of San Francisco, Millbrae (home of the San Francisco Airport) and San José on an electrified corridor utilizing a blended system which will support modernized Caltrain commuter rail service and high-speed rail service on shared, electrified track.
- **The San José to Merced Project Section** will link the Silicon Valley and the Central Valley, traveling between stations located in San José and Gilroy to the Central Valley Wye, where the line connects to go west to the Bay Area, north to Merced and south to Fresno.
- **The Bakersfield to Palmdale Project Section** connects the Central Valley to the Antelope Valley, closing the existing passenger rail gap over the Tehachapi Mountains with proposed stations in Bakersfield and at the Palmdale Transportation Center.

- **The Palmdale to Burbank Project Section** connects the Antelope Valley to the San Fernando Valley, bringing high-speed rail service to the urban Los Angeles area from the Palmdale Transportation Center to the Hollywood Burbank Airport.
- **The Burbank to Los Angeles Project Section** connects two key multi-modal transportation hubs, Burbank (airport area) and Los Angeles Union Station, in a shared corridor.
- **The Los Angeles to Anaheim Project Section** will connect Los Angeles Union Station to the Anaheim Regional Transportation Intermodal Center in a shared corridor with the existing Los Angeles-San Diego-San Luis Obispo rail corridor. Additional stops are being considered at Fullerton and Norwalk areas.

EXHIBIT 6.0 PROJECTED ENVIRONMENTAL SCHEDULES

PROJECT SECTION	PROJECTED RECORD OF DECISION
San Francisco to San José	2020*
San José to Merced	2019*
Merced to Fresno ▶ Central Valley Wye	Completed 2019*
Fresno to Bakersfield ▶ Locally Generated Alternative	Completed 2018*
Bakersfield to Palmdale	2019*
Palmdale to Burbank	2020*
Burbank to Los Angeles	2019*
Los Angeles to Anaheim	2019*
Los Angeles to San Diego (Phase 2)	TBD
Merced to Sacramento (Phase 2)	TBD

*Projected dates are subject to change

Streamlining Environmental Reviews

Early in 2017, Governor Brown submitted a list of 10 high-priority infrastructure projects, which included high-speed rail, which would benefit from an expedited federal environmental review and permitting process. Subsequently, in May, in response to President Trump’s Executive Order 13766, “Expediting Environmental Reviews and Approvals for High Priority Infrastructure Projects,” Governor Brown submitted a formal letter requesting responsibility for compliance with federal National Environmental Policy Act (NEPA) for the high-speed rail program. In November, a draft application was released for public review and comment. A final application and draft Memorandum of Understanding (MOU) was submitted to the FRA. The FRA announced on May 2, 2018, a final 30-day public review and comment on the final application. We anticipate timely action on this application by the federal government.

The NEPA Assignment Program allows states to assume responsibilities for federal environmental law approvals on behalf of the federal government. The program is designed to streamline environmental reviews, find efficiencies where possible and complete the process faster, without diminishing the rigor of the environmental analysis or the opportunities for the public to meaningfully engage with the program. This would allow the Authority to manage both NEPA and CEQA document preparation and would eliminate a separate federal review and approval.

Additionally, the state application includes assuming FRA responsibility for related projects, including the ACEforward Project on the Altamont Corridor Express system, and projects that will directly connect to stations on the high-speed rail system, such as the Link Union Station (Link US) and West Santa Ana Branch Transit Corridor projects in Southern California.

Once assigned, the Authority will assume NEPA responsibilities. The FRA will remain integrally involved in the program in significant ways and still retains its responsibilities for compliance with other federal laws and regulations independent of the environmental review process.

Creating an International Partnership

The Authority reached an important milestone in November 2017 by awarding a contract to DB Engineering & Consulting USA to act as the Early Train Operator.

The 2016 Business Plan called for the engagement of an early train operator to be involved in:



- The pre-operations phase, where the operator will advise the Authority on the planning, design and construction of the system; and
- The early operations phase, where the operator provides the actual operation of passenger service and works to build the market once the system is built.

These two roles are being combined so that there is continuity between the advice offered by an Early Train Operator during the project development phase and the actual operations that the operator will perform once the system goes into service. The idea to combine these two phases came from discussions with the rail industry and through an unsolicited proposal that the Authority received consistent with its unsolicited proposals policy.

The intent is that this team will be a long-term partner into the ridership ramp-up and operations phases. Strategically partnering with a private sector operator will help ensure that the system is designed to enhance its ultimate commercial value and profitability. The Early Train Operator will help the Authority reduce any early-year losses as the system is ramping up and optimize system performance while maximizing revenue generation with the goal of creating enterprise value in a financially non-subsidized high-speed rail train system.

DB Engineering & Consulting USA will provide input on procurements for trains, track and systems; maintenance facilities; station design and passenger operations; revenue collection; market brand; and financial planning and modeling, including ridership and revenue estimation.

State Funding for High-Speed Rail

Since the initial planning for high-speed rail in California, it has been assumed that the program would be funded with federal funds, state funds and private sector investment, each at approximately one-third. This was the underlying assumption when the California Legislature and the voters approved Proposition 1A in 2008, which included the following language directing the Authority to "...pursue and obtain other private and public funds, including but not limited to, federal funds, funds from revenue bonds, and local funds..." to augment the high-speed rail bond funds. In the last two years, the Authority has made significant advancements to access and expend state funds to build high-speed rail.

Cap-and-Trade Extension

Last year, AB 398 was approved by the Legislature and signed into law by Governor Brown. AB 398 strengthened and extended the horizon of the Cap-and-Trade Program by 10 years through December 31, 2030. This represents another important step by the state in providing funding for and supporting the project. Since AB 398 was passed, quarterly Cap-and-Trade auctions have been strong—an indication that the market has reacted positively to the legislation and that the proceeds will be a more reliable source of funding to advance the high-speed rail program. To date, \$1.7 billion in Cap-and-Trade proceeds has been appropriated for high-speed rail.

Accessing Proposition 1A Funds

More than \$3 billion has been expended to date on construction in the Central Valley and planning for the wider system. Through a provision in the Authority's grant agreement with the FRA, the Authority had been primarily expending federal ARRA funds to advance the program. The full expenditure of all the federal ARRA funds in 2017 was a significant milestone, and, over the last year, additional steps were taken to access state funds to continue work and begin to meet the grant's match requirements.

At its December 2016 meeting, the Board of Directors approved two funding plans—the San Francisco to San José Peninsula Corridor Segment Funding Plan and the Central Valley Segment Funding Plan—both of which will help fund the advancement of the Silicon Valley to Central Valley Line for passenger service. These funding plans are necessary steps under Proposition 1A before bond proceeds can be used for construction in the Central Valley and for development and construction related to the Peninsula Corridor Electrification Project.

The Central Valley Segment Funding Plan allows access to the \$2.61 billion in Proposition 1A funds that were appropriated in SB 1029, the Budget Act of 2012, for the 119-mile segment in the Central Valley that is currently under construction. The Authority has now accessed \$1.346 billion of Proposition 1A construction bonds and is putting them directly to work in the Central Valley.

The San Francisco to San José Peninsula Corridor Funding Plan allows access to the \$600 million in Proposition 1A bond funds appropriated in SB 1029 for Caltrain's Peninsula Corridor Electrification Project, which represents 30 percent of the total funding for the \$1.98 billion project.

Additionally, at its June 2017 meeting, the Board of Directors approved the Rosecrans/Marquardt Grade Separation Project Funding Plan, which allocates \$76.67 million of Proposition 1A bond proceeds toward the total \$155.3 million project cost. The corridor, one of the busiest rail corridors in the country, is traversed by more than 112 freight and passenger trains and more than 45,000 vehicles in a 24-hour period, with projections of significant growth in train volumes even before high-speed trains begin operating in the corridor. Because of that, the California Public Utilities Commission has rated this intersection as the most hazardous grade crossing in the state.

Continuing Progress in the Years to Come

While challenges remain, great progress has been made on several fronts since the adoption of the 2016 Business Plan. This 2018 Business Plan outlines a path forward toward advancing this transformative project while working closely with our partners, local communities, stakeholders and policymakers at the local, state and federal levels.

RIDERSHIP/REVENUE

OPERATIONS AND MAINTENANCE AND LIFECYCLE COST ESTIMATES

This chapter provides our most recent ridership and revenue forecasts as well as operations and maintenance (O&M) and lifecycle cost estimates based on the latest modeling and analysis. A breakeven analysis, evaluating potential revenue and operations and maintenance cost scenarios, is also presented.

The forecasts included reflect an implementation scenario defined as:

- **Silicon Valley to Central Valley Line:** Service that assumes a one-seat ride from Bakersfield to San Francisco opening in 2029.
- **Phase 1 System:** Service that assumes connections from San Francisco and Merced to Los Angeles and Anaheim opening in 2033. An out-year forecast in 2040 is also provided.

Extending the Silicon Valley to Central Valley Line to San Francisco and Bakersfield allows high-speed rail to reach major urban centers at both ends of the line, which yields increased ridership and revenue forecasts compared to the Silicon Valley to Central Valley Line as defined in the 2016 Business Plan. Moreover, since no additional maintenance facilities are required with the extensions and operating plans remain generally consistent with the 2016 Business Plan, there is only a marginal increase in operations and maintenance costs.

The additional cash flow coverage that the revenue provides over operations and maintenance costs in this longer Silicon Valley to Central Valley Line makes the probability of cash flow breakeven much higher in year one of operations and beyond. Annual forecasts can be found in the tables presented at the end of this chapter.

All dates and numbers presented in this 2018 Business Plan are the best estimates available at the time of publishing, but are subject to change based on both internal and external factors and as the program progresses. Detailed methodologies and assumptions for all forecasts are included in the supporting technical documents and will continue to evolve as estimates, models and input assumptions change.

Forecast Updates and Assumptions

All forecasts and estimates presented in the 2018 Business Plan rely on the same models used in the 2016 Business Plan. However, key model inputs for all forecasting have been updated to reflect the latest available data, such as population forecasts and auto operating costs. Since the 2016 Business Plan, the ridership, farebox revenue and operations and maintenance models have gone through additional internal and external reviews. Below is a brief discussion of the reviews as well as an overview of the updated forecasts and model inputs since the 2016 Business Plan.

Based on comments received from the California High-Speed Rail Peer Review Group and others on the Draft 2018 Business Plan and Technical Supporting Documents, additional analysis was conducted related to system service travel times. The results of this updated analysis are summarized in the Key Takeaways below and are reflected in the supporting technical documents.

External Reviews of Ridership, Revenue and Operations & Maintenance Forecasts

The current ridership and farebox revenue forecasting model, Business Plan Model—Version 3 (BPM-V3), builds on work from the last 15+ years and has undergone extensive technical reviews over time. As with all travel demand modeling, uncertainties exist in some model inputs and assumptions. The 2018 Business Plan includes a comprehensive risk analysis to address these uncertainties.

Since 2010, the travel demand model has undergone technical and conceptual reviews by the following external entities:

- Ridership Technical Advisory Panel (RTAP), which consists of a group of international experts in travel demand forecasting and has worked with Authority staff and consultants to ensure model dynamics are technically and conceptually sound;
- Peer Review Group (PRG), whose duties include "...to prepare its independent judgment as to the feasibility and reasonableness of the Authority's plans, appropriateness of assumptions, analyses and estimates";
- United States Government Accountability Office (GAO); and
- International Union of Railways (UIC).

In addition, in December 2016, the Authority commissioned Project Finance Advisory, Ltd. (PFAL) to provide an independent review of both the BPM-V3 model methodology and the 2016 Business Plan ridership and farebox revenue forecasts. This assessment verified that the models being used met industry best practices and confirmed that outputs of these models were reasonable.

The report states: "We consider the [BPM-V3] forecasting model to be of good quality and can provide it with a clean bill of health in terms of design and functionality."^[14]

The Authority's operations and maintenance cost model was first developed for the 2014 Business Plan with the U.S. Department of Transportation Inspector General's "High-Speed Intercity Passenger Rail Best Practices: Operating Costs Estimation" serving as a guiding document. As part of the model development process, operations and maintenance cost estimates underwent benchmark analyses and significant external reviews from the PRG, the GAO, the California Legislative Analyst's Office (LAO) and the UIC.

Each of these reviews involved in-depth explanations and assessments of the workings, assumptions, and inputs to the operations and maintenance cost model. The reviewers found the model adequate for its purposes and reviewer feedback was incorporated in the model. Prior to the 2016 Business Plan, the operations and maintenance cost model underwent an internal technical review and updates were made to certain operations and maintenance cost model assumptions to reflect current international best practices.

In early 2017, PFAL conducted a separate review of the operations and maintenance cost forecasts and concluded that: "Taken together, the results of the top-down and bottom-up reviews undertaken by the PFAL/FCP team provided reassurance that the O&M costs presented by the Authority across the entire suite of documents were based on a logical, coherent and clearly explained process of derivation from specification of level of operations through to ramp up over time to Steady State."^[15]

2018 Business Plan Ridership and Revenue Forecasts

The ridership and farebox revenue forecasting model has been updated since 2016 to include the latest available input data related to:

- Socioeconomic forecasts
- Transit network plans
- Auto travel time
- Auto operating costs
- Parking costs
- Operations planning, which reflects updated trip times, station assumptions, service frequency and service patterns

Finally, the ridership and farebox revenue forecasts include an enhanced risk analysis that addresses some of the PFAL feedback from its review of the 2016 Business Plan forecasts. The 2018 Business Plan risk analysis considers new, additional risk variables and was conducted separately for the Silicon Valley to Central Valley Line opening year (2029), the Phase 1 opening year (2033) and Phase 1 horizon year (2040).

This enhanced risk analysis builds upon the risk analysis conducted in 2016 by including the following risk variables to address feedback from PFAL external review:

- Reliability of high-speed rail—capturing uncertainty around on-time reliability
- Travel time in autonomous vehicles—measuring the disutility of time spent in an automobile and considers how travel choices might change with autonomous vehicles
- Visitor travel—including out-of-state trips from tourism, business, and other travel
- Induced travel—including trips that would not have otherwise been made without the increased connections created by the high-speed rail system
- An enhanced penalty applied to long-distance high-speed rail trips that require long access/egress travel time

Ridership and farebox revenue forecasts incorporate the same ramp-up methodology used in the 2016 Business Plan, which assumes 40 percent ramp-up in year one, 55 percent ramp-up in year two, 70 percent ramp-up in year three, 85 percent ramp-up in year four and 100 percent ramp-up in year five. Separate ramp-up calculations are applied to each phase based on its assumed opening date.

For more information on Ridership and Revenue Forecasting, please refer to the Ridership and Revenue Forecasting: Technical Supporting Document.

What is ramp-up?

- Ramp-up refers to the period of time during early operations in which ridership and revenue builds up as the system matures, travelers become acquainted with the new rail service and trip behavior adjusts to reflect the introduction of a new travel mode.

How much will it cost to ride high-speed rail?

- We will establish fare guidelines and policies but, ultimately, the operator will set the ticket prices. For purposes of producing forecasts of ridership and revenue, we have assumed the average cost for a trip from San Francisco to Los Angeles to be \$93 (in today's dollars).
- However, like the airlines, the operator will set fares based on yield management techniques such as, when buying a ticket, last-minute purchases for premium services (e.g., first-class) will be more expensive than a ticket that is booked early and is non-refundable.

Operations and Maintenance Cost Forecasts

Adjustments have been made to the 2018 Business Plan operations and maintenance cost model assumptions based on the latest available data, an internal review and feedback from PFAL's review in 2017. The key assumption updates include:

- Consolidation of dispatching functions
- Adding an additional ongoing training day for employees
- Energy costs
- Insurance costs
- Maintenance facility staffing requirements
- Round trips assumed per crew shift

As in 2016, we conducted a Monte Carlo simulation to understand the risks and uncertainties associated with the forecasts and derived a forecast range with associated probabilities of occurrence. The high and low operations and maintenance cost forecasts presented in the tables at the end of this chapter reflect the results of these Monte Carlo simulations.

For more information on Operations and Maintenance Cost Forecasting, please refer to the Operations and Maintenance Cost Model Documentation: Technical Supporting Document.

Lifecycle Cost Forecasts

Lifecycle costs forecast the capital rehabilitation and replacement costs for the infrastructure and assets of the future high-speed rail system. Differences in lifecycle costs between the 2016 Business Plan and this 2018 Business Plan reflect changes in capital cost estimates and adjustments to some asset lifespan assumptions, such as rolling stock, based on an internal review and the latest available data.

A Monte Carlo analysis was developed to evaluate a potential range of lifecycle cost forecasts and is shown in the exhibits below. The Monte Carlo methodology employed in 2016 also applies to the 2018 Business Plan analysis.

For more information on Lifecycle Cost Forecasts, please refer to the 50-Year Lifecycle Capital Cost Model Documentation: Technical Supporting Document.

Ancillary Revenue Projections

The Authority continues to evaluate and pursue ancillary revenues that will provide financial support for system expansion, capital funding, and ongoing operations and maintenance. In prior business plans, the Authority has carried planning assumptions indicating ancillary revenues could range from 1 to 4 percent of farebox revenues. Since the 2016 Business Plan, the Authority has undertaken more extensive benchmarking and market analysis of potential ancillary revenue sources from the system's real property, rights of way and ridership, which provides a basis of support for ancillary revenues at 4 percent of farebox revenues in this 2018 Business Plan. Ancillary revenue contributions could include sources such as advertising, baggage fees, parking, retail concessions, sponsorships and telecommunications.

Using Monte Carlo Simulations

Monte Carlo simulations are an analytic technique used by many decision-makers, both public and private. The goal of a Monte Carlo simulation is to quantify the chances that risks that might impact future costs, revenues or other aspects of a program will occur and, if they did occur, what their impact would be. This allows decision-makers to make informed choices and/or develop strategies and plans to prevent, manage or mitigate potential future risks.

Monte Carlo analysis involves running thousands of simulations where each of the risks may occur with a given probability; the simulation develops an overall probability distribution of potential cost or schedule outcomes. This distribution can be used to describe how likely it is that any given outcome might happen and what the chances are for the results to be above or below a given threshold. This allows decision-makers to thoroughly understand the level of confidence associated with a specific forecast.

These methods are used for a variety of purposes. For example, the banking and finance sector uses Monte Carlo simulations to help make investment decisions in an uncertain environment where risks have been identified and estimated. The decision reflects how much risk the financial institution is willing to take and how costly the risk would be based on the probability that this risk could occur.

Key Takeaways of the 2018 Business Plan Forecasts

Based on the 2018 Business Plan assumptions, inputs and changes detailed above, the updated forecasts demonstrate that:

- Silicon Valley to Central Valley Line ridership and farebox revenue forecasts** are both approximately 9 percent higher than the San Francisco to Bakersfield forecasts in the 2016 Business Plan. This increase is driven by updates to the model inputs as well as moving the opening date to 2029. Farebox revenue increases by approximately two-thirds compared to the forecast for the Silicon Valley to Central Valley Line as defined in the 2016 Business Plan (San José to North of Bakersfield).
- Phase 1 2040 ridership and farebox revenue results** in this 2018 Business Plan decrease by approximately 7 percent total compared to the 2016 Business Plan forecasts; these changes are driven by the updated inputs to the model.
- Operations and maintenance costs** in all scenarios are minimally impacted by the changes made since the 2016 Business Plan. Some line item costs, such as training costs, increase; others, such as dispatching costs, decrease. There is an overall impact on Phase 1 operations and maintenance costs of less than 5 percent from these assumption changes.
- Lifecycle costs** increase overall in the 2018 Business Plan, primarily driven by capital cost increases. Lifecycle costs fluctuate significantly by year based on the years that certain high-cost assets require rehabilitation and replacement.
- The risk analyses demonstrate that even in a pessimistic scenario**, total revenue (farebox, bus, ancillary) is expected to cover operations and maintenance costs.

Silicon Valley to Central Valley Line: Results

All forecasts are presented in base year 2017 dollars and year-of-expenditure dollars. Additionally, low, medium and high scenarios are presented in the forecast tables.

EXHIBIT 7.1 RIDERSHIP: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1
(IN MILLIONS OF RIDERS)

	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Ridership	7.6	10.7	13.8	16.9	30.8	35.3	39.9	51.6	54.3	57.0	60.0	63.0
Medium Ridership	5.7	8.0	10.3	12.7	23.6	27.1	30.7	40.0	42.0	44.1	46.4	48.8
Low Ridership	4.3	6.0	7.8	9.6	17.8	20.5	23.3	30.3	31.9	33.5	35.2	37.0

The following Farebox Revenue results are shown in millions of 2017 dollars.

EXHIBIT 7.2 FAREBOX REVENUE: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1												
(IN MILLIONS OF 2017\$)												
	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Revenue	\$473	\$660	\$852	\$1,049	\$1,941	\$2,235	\$2,537	\$3,323	\$3,407	\$3,493	\$3,581	\$3,671
Medium Revenue	\$334	\$465	\$601	\$740	\$1,380	\$1,592	\$1,809	\$2,374	\$2,434	\$2,495	\$2,558	\$2,623
Low Revenue	\$270	\$376	\$486	\$598	\$1,148	\$1,332	\$1,521	\$2,010	\$2,061	\$2,113	\$2,166	\$2,221

The following Farebox Revenue results are shown in millions of year-of-expenditure dollars.

EXHIBIT 7.3 FAREBOX REVENUE: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1												
(IN MILLIONS OF YOES\$)												
	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Revenue	\$674	\$969	\$1,288	\$1,635	\$3,116	\$3,694	\$4,319	\$6,558	\$7,794	\$9,264	\$11,010	\$13,086
Medium Revenue	\$476	\$683	\$909	\$1,153	\$2,215	\$2,631	\$3,080	\$4,685	\$5,568	\$6,618	\$7,865	\$9,348
Low Revenue	\$385	\$552	\$735	\$932	\$1,843	\$2,202	\$2,590	\$3,967	\$4,715	\$5,604	\$6,660	\$7,916

Operations and Maintenance Costs

The following Operations and Maintenance costs are shown in millions of 2017 dollars.

EXHIBIT 7.4 O & M COSTS: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1												
(IN MILLIONS OF 2017\$)												
	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Cost Estimate	\$279	\$309	\$335	\$363	\$871	\$904	\$947	\$1,036	\$1,045	\$1,041	\$1,044	\$1,051
Medium Cost Estimate	\$255	\$282	\$306	\$332	\$796	\$826	\$865	\$947	\$955	\$951	\$955	\$960
Low Cost Estimate	\$244	\$270	\$293	\$318	\$763	\$792	\$830	\$907	\$915	\$912	\$915	\$920

The following Operations and Maintenance costs are shown in millions of year-of-expenditure dollars.

EXHIBIT 7.5 O & M COSTS: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1												
(IN MILLIONS OF YOE\$)												
	2029	2030	2031	2032	2033	2034	2035	2040	2045	2050	2055	2060
	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	VALLEY TO VALLEY	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1	PHASE 1
High Cost Estimate	\$398	\$454	\$507	\$566	\$1,397	\$1,494	\$1,612	\$2,045	\$2,391	\$2,761	\$3,212	\$3,745
Medium Cost Estimate	\$363	\$415	\$463	\$517	\$1,277	\$1,365	\$1,473	\$1,869	\$2,185	\$2,523	\$2,935	\$3,423
Low Cost Estimate	\$348	\$397	\$444	\$495	\$1,224	\$1,309	\$1,412	\$1,791	\$2,094	\$2,418	\$2,813	\$3,281

Lifecycle Costs

The following Lifecycle Costs are shown in millions of 2017 dollars.

EXHIBIT 7.6 LIFECYCLE COSTS: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1									
(IN MILLIONS OF 2017\$)									
	2029	2030	2035	2040	2045	2050	2055	2060	
High Lifecycle Cost	-	-	-	\$4	\$370	\$430	\$42	\$535	
Medium Lifecycle Cost	-	-	-	\$4	\$339	\$394	\$38	\$492	
Low Lifecycle Cost	-	-	-	\$3	\$308	\$358	\$35	\$446	

The following Lifecycle Costs are in millions of year-of-expenditure dollars.

EXHIBIT 7.7 LIFECYCLE COSTS: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1								
(IN MILLIONS OF YOE\$)								
	2029	2030	2035	2040	2045	2050	2055	2060
High Lifecycle Cost	-	-	-	\$7	\$798	\$1,075	\$121	\$1,800
Medium Lifecycle Cost	-	-	-	\$7	\$732	\$987	\$111	\$1,653
Low Lifecycle Cost	-	-	-	\$6	\$664	\$895	\$101	\$1,499

EXHIBIT 7.8 LIFECYCLE COSTS: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1
CUMULATIVE THROUGH 2060 (IN MILLIONS)

	2017\$	YOES
High Lifecycle Cost	\$6,849	\$17,927
Medium Lifecycle Cost	\$6,288	\$16,460
Low Lifecycle Cost	\$5,704	\$14,930

Total Cash Flow

The following Cash Flow Analysis is shown in millions of year-of-expenditure dollars.

EXHIBIT 7.9 SUMMARY OF NET CASH FLOW FROM FIRST 5 YEARS OF OPERATIONS: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1, HIGH SCENARIO (IN MILLIONS OF YOES)*

	2029	2030	2031	2032	2033
Total Revenue (including Farebox, Ancillary and Bus)	\$715	\$1,028	\$1,367	\$1,735	\$3,241
Less: O&M	\$(398)	\$(454)	\$(507)	\$(566)	\$(1,397)
Net Cash Flow from Operations	\$318	\$574	\$860	\$1,168	\$1,844

*Bus revenue in Total Cash Flow tables for the high and low scenarios is estimated by calculating the increase/decrease from medium farebox revenue to high/low farebox revenue and applying that factor to medium bus revenue each year. Numbers may not add due to rounding.

The following Cash Flow Analysis is shown in millions of year-of-expenditure dollars.

EXHIBIT 7.10 SUMMARY OF NET CASH FLOW FROM FIRST 5 YEARS OF OPERATIONS: SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1, MEDIUM SCENARIO (IN MILLIONS OF YOES)

	2029	2030	2031	2032	2033
Total Revenue (including Farebox, Ancillary and Bus)	\$505	\$725	\$965	\$1,224	\$2,304
Less: O&M	\$(363)	\$(415)	\$(463)	\$(517)	\$(1,277)
Net Cash Flow from Operations	\$141	\$311	\$501	\$706	\$1,027

The following Cash Flow Analysis is shown in millions of year-of-expenditure dollars.

**EXHIBIT 7.11 SUMMARY OF NET CASH FLOW FROM FIRST 5 YEARS OF OPERATIONS:
SILICON VALLEY TO CENTRAL VALLEY LINE THROUGH PHASE 1, LOW SCENARIO (IN MILLIONS OF YOE\$)**

	2029	2030	2031	2032	2033
Total Revenue (including Farebox, Ancillary and Bus)	\$408	\$586	\$780	\$989	\$1,917
Less: O&M	\$(348)	\$(397)	\$(444)	\$(495)	\$(1,224)
Net Cash Flow from Operations	\$60	\$189	\$336	\$494	\$693

Breakeven Analysis

Breakeven forecasts measure the likelihood that farebox revenue is equal to or greater than operations and maintenance costs in a given operating year. The analysis works as though there are two large bags full of marbles, one with thousands of marbles each representing a potential operations and maintenance cost, with more of the marbles having values around the median cost estimate than around the extreme (high or low) values. The second bag of marbles contains potential revenue outcomes, again with more marbles with values around the median than the high or low outliers.

The breakeven Monte Carlo analysis simply “picks” one marble at random from the revenue bag and one marble at random from the cost bag, subtracts the number written on the cost marble from the one written on the revenue marble and records the value. The analysis then puts the marbles back into their respective bags and repeats the process thousands more times, which builds a distribution of potential results and generates a degree of confidence (or confidence interval, expressed as a percentage) as to the likelihood of project breakeven.

The combination of increased farebox revenue and minimal impact on operations and maintenance costs during Silicon Valley to Central Valley operations means that the system has an even higher likelihood of breaking even in the early years of operations compared to the Silicon Valley to Central Valley Line as defined in the 2016 Business Plan.

There is a 79 percent probability that the Silicon Valley to Central Valley Line farebox revenue covers its operations and maintenance costs in 2029; the breakeven probability rises to 96 percent by the opening year of Phase 1 and rises to >99 percent by 2040. The breakeven analysis considers only farebox revenue; the probability of breaking even increases further when considering bus and ancillary revenue.

EXHIBIT 7.12 BREAKEVEN ANALYSIS: OPENING YEAR SILICON VALLEY TO CENTRAL VALLEY (2029)
(IN MILLIONS OF \$2017)

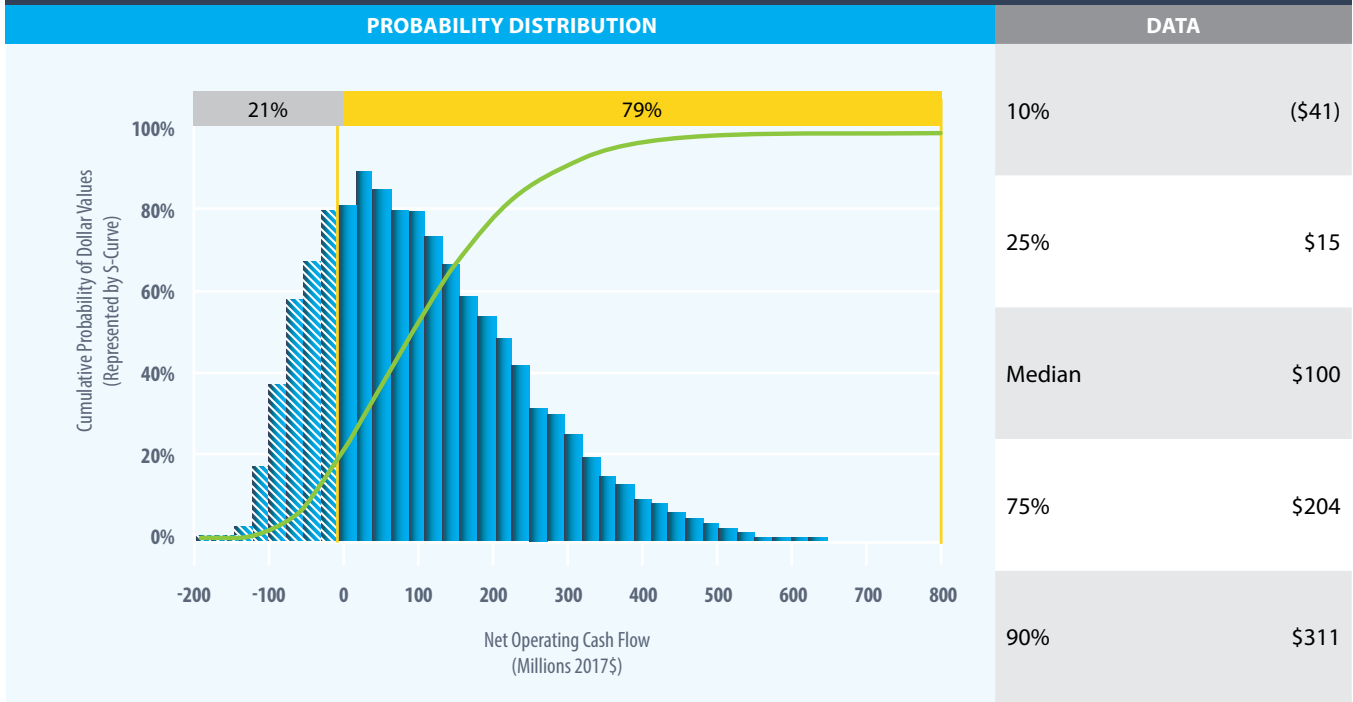


EXHIBIT 7.13 BREAKEVEN ANALYSIS: OPENING YEAR PHASE 1 (2033)
(IN MILLIONS OF \$2017)

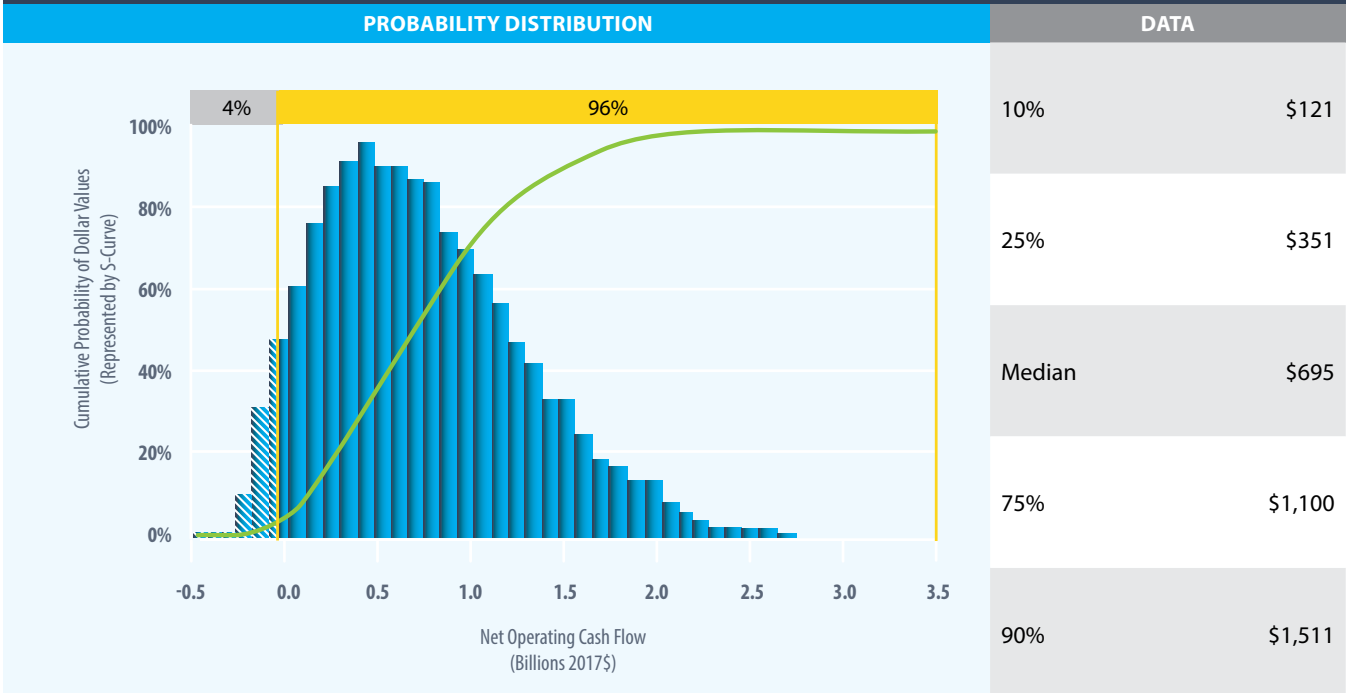
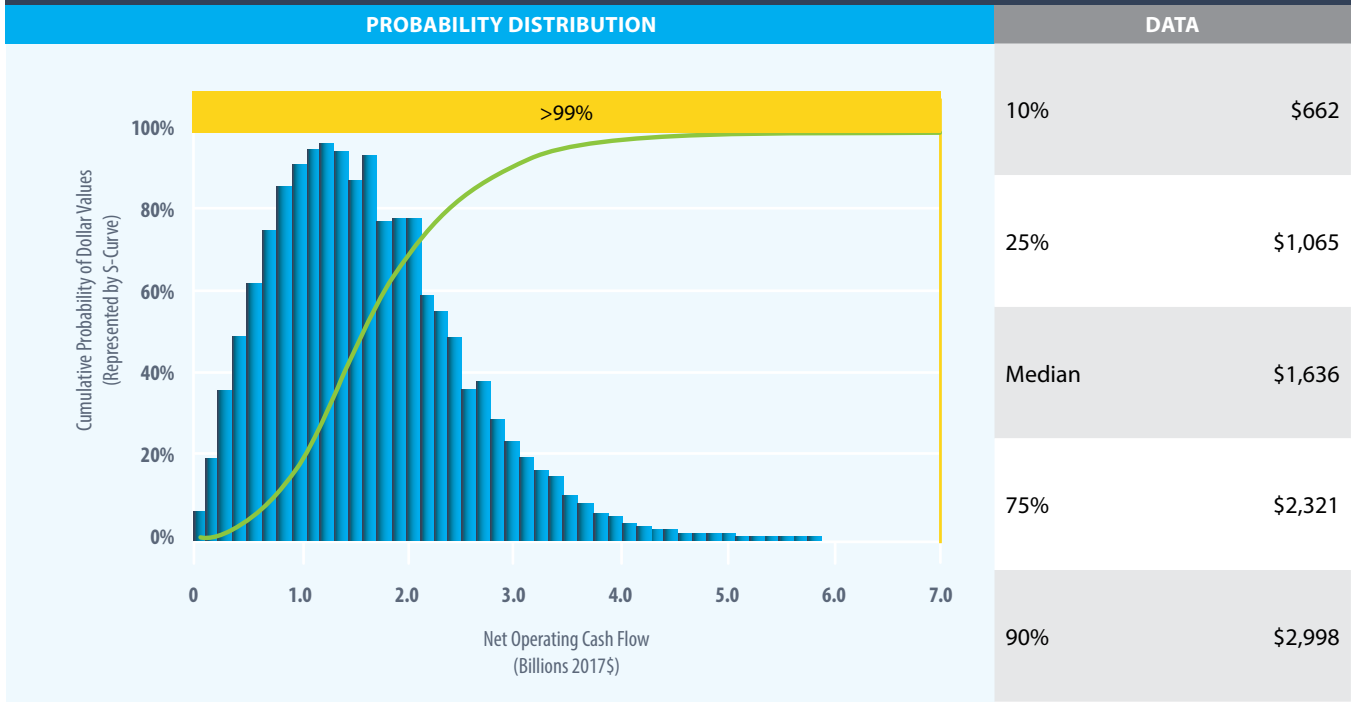


EXHIBIT 7.14 BREAKEVEN ANALYSIS: HORIZON YEAR PHASE 1 (2040)
 (IN MILLIONS OF \$2017)



APPENDICES

A. ACRONYMS AND ABBREVIATIONS

ARRA	American Recovery and Reinvestment Act
ARTIC	Anaheim Regional Transportation Intermodal Center
BART	Bay Area Rapid Transit
BNSF	BNSF Railway
BPM-V3	Business Plan Model—Version 3
CalSTA	California State Transportation Agency
Caltrans	California Department of Transportation
CBA	Community Benefits Agreement
CEQA	California Environmental Quality Act
CP 1	Construction Package 1
CP 2-3	Construction Packages 2-3
CP 4	Construction Package 4
DBE	Disadvantaged Business Enterprise
DVBE	Disabled Veteran Business Enterprise
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ETO	Early Train Operator
FRA	Federal Railroad Administration
GGRF	Greenhouse Gas Reduction Fund (a.k.a. Cap-and-Trade proceeds)
GHG	Greenhouse Gas
LAO	Legislative Analyst’s Office
Link US	Link Union Station Project
LOSSAN Corridor	Los Angeles–San Diego–San Luis Obispo Rail Corridor
Metro	Los Angeles County Metropolitan Transportation Authority
MOU	Memorandum of Understanding
NEPA	National Environmental Policy Act
PFAL	Project Finance Advisory, Ltd.
PRG	Peer Review Group
PTC	Positive Train Control
SCC	Standard Cost Category
TIRCP	Transit and Intercity Rail Capital Program
UIC	International Union of Railways
UPRR	Union Pacific Railroad
VMT	Vehicle Miles Traveled
YOE	Year of Expenditure

B. STATUTORY REQUIREMENTS FOR A BUSINESS PLAN

This 2018 Business Plan summarizes the progress we have made over the last two years, updates information and forecasts that were presented in our 2016 Business Plan and identifies key milestones and decisions we anticipate making over the next few years.

The Authority's governing statutes are established in the California Public Utilities Code sections 185000-185038; Section 185033, as amended by Assembly Bill (AB) 528 (Lowenthal, Chapter 237, Statutes of 2013), lays out the requirements for the Business Plan and they are as follows:

185033. ¹ (a) The authority shall prepare, publish, adopt, and submit to the Legislature, not later than May 1, 2014, and every two years thereafter, a business plan. At least 60 days prior to the publication of the plan, the authority shall publish a draft business plan for public review and comment. The draft plan shall also be submitted to the Senate Committee on Transportation and Housing, the Assembly Committee on Transportation, the Senate Committee on Budget and Fiscal Review, and the Assembly Committee on Budget.

(b) (1) The business plan shall include, but need not be limited to, all of the following elements:

(A) A description of the type of service the authority is developing and the proposed chronology for the construction of the statewide high-speed rail system, and the estimated capital costs for each segment or combination of segments.

(B) A forecast of the expected patronage, service levels, and operating and maintenance costs for the Phase 1 corridor as identified in paragraph (2) of subdivision (b) of Section 2704.04 of the Streets and Highways Code and by each segment or combination of segments for which a project level environmental analysis is being prepared for Phase 1. The forecast shall assume a high, medium, and low level of patronage and a realistic operating planning scenario for each level of service.

(C) Alternative financial scenarios for different levels of service, based on the patronage forecast in subparagraph (B), and the operating break-even points for each alternative. Each scenario shall assume the terms of subparagraph (J) of paragraph (2) of subdivision (c) of Section 2704.08 of the Streets and Highways Code.

(D) The expected schedule for completing environmental review, and initiating and completing construction for each segment or combination of segments of Phase 1.

(E) An estimate and description of the total anticipated federal, state, local, and other funds the authority intends to access to fund the construction and operation of the system, and the level of confidence for obtaining each type of funding.

(F) Any written agreements with public or private entities to fund components of the high-speed rail system, including stations and terminals, and any impediments to the completion of the system.

(G) Alternative public-private development strategies for the implementation of Phase 1.

(H) A discussion of all reasonably foreseeable risks the project may encounter, including, but not limited to, risks associated with the project's finances, patronage, right-of-way acquisition, environmental clearances, construction, equipment, and technology, and other risks associated with the project's development. The plan shall describe the authority's strategies, processes, or other actions it intends to utilize to manage those risks.

¹ Source: Public Utilities Code Section 185033
http://leginfo.ca.gov/faces/codes_displaySection.xhtml?lawCode=PUC§ionNum=185033




(2) To the extent feasible, the business plan should draw upon information and material developed according to other requirements, including, but not limited to, the preappropriation review process and the preexpenditure review process in the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century pursuant to Section 2704.08 of the Streets and Highways Code. The authority shall hold at least one public hearing on the business plan and shall adopt the plan at a regularly scheduled meeting. When adopting the plan, the authority shall take into consideration comments from the public hearing and written comments that it receives in that regard, and any hearings that the Legislature may hold prior to adoption of the plan.

All of these requirements are addressed in this 2018 Business Plan. The Appendix includes a listing of the plan sections and/or supporting technical memos that correspond to each of these requirements. These documents can be found at the following URL:






http://hsr.ca.gov/About/Business_Plans/2018_Business_Plan.html

C. MEETING BUSINESS PLAN STATUTORY REQUIREMENTS

The requirements for the 2018 Business Plan are included in the beginning of the document and the exhibit below shows which sections of the document address each of the requirements:

PUBLIC UTILITIES CODE SECTION 185033 REQUIREMENTS		
▶ The Authority shall prepare, publish, adopt, and submit to the Legislature, not later than May 1, 2018, and every two years thereafter, a business plan.	▶ This is the 2018 Business Plan. It was adopted on May 15, 2018, and was submitted to the Legislature by June 1, 2018.	
▶ At least 60 days prior to the publication of the plan, the Authority shall publish a draft business plan for public review and comment.	▶ The Draft 2018 Business Plan was released on March 9, 2018.	
▶ The draft plan shall also be submitted to the Senate Committee on Transportation and Housing, the Assembly Committee on Transportation, the Senate Committee on Budget and Fiscal Review, and the Assembly Committee on Budget.	▶ The Draft 2018 Business Plan was submitted on March 9, 2018.	

The business plan shall include, but need not be limited to, all of the following elements:

▶ A description of the type of service the Authority is developing.	Chapter 1 Why High-Speed Rail in California	
▶ The proposed chronology for the construction of the statewide high-speed rail system.	Chapter 2 Implementation and Delivery Strategy	
▶ The estimated capital costs for each segment or combination of segments.	Chapter 3 Capital Cost and Funding	
▶ A forecast of the expected patronage, service levels, and operating and maintenance costs for the Phase 1 corridor as identified in paragraph (2) of subdivision (b) of Section 2704.04 of the Streets and Highways Code and by each segment or combination of segments for which a project level environmental analysis is being prepared for Phase 1. The forecast shall assume a high, medium, and low level of patronage and a realistic operating planning scenario for each level of service.	Chapter 7 Ridership/Revenue, Operations/Maintenance and Lifecycle Cost Estimates	
▶ Alternative financial scenarios for different levels of service, based on the patronage forecast in subparagraph (above), and the operating break-even points for each alternative. Each scenario shall assume the terms of subparagraph (J) of paragraph (2) of subdivision (c) of Section 2704.08 of the Streets and Highways Code.	Chapter 7 Ridership/Revenue, Operations/Maintenance and Lifecycle Cost Estimates	

▶ The expected schedule for completing environmental review, and initiating and completing construction for each segment or combination of segments of Phase 1.	Chapter 6 Progress Since the 2016 Business Plan	
▶ An estimate and description of the total anticipated federal, state, local, and other funds the authority intends to access to fund the construction and operation of the system, and the level of confidence for obtaining each type of funding.	Chapter 3 Capital Cost and Funding	
▶ Any written agreements with public or private entities to fund components of the high-speed rail system, including stations and terminals, and any impediments to the completion of the system.	Chapter 5 Working with Our Valued Partners	
▶ Alternative public-private development strategies for the implementation of Phase 1.	Chapter 3 Capital Cost and Funding	
▶ A discussion of all reasonably foreseeable risks the project may encounter, including, but not limited to, risks associated with the project's finances, patronage, right-of-way acquisition, environmental clearances, construction, equipment, and technology, and other risks associated with the project's development. The plan shall describe the authority's strategies, processes, or other actions it intends to utilize to manage those risks.	Chapter 4 Lessons Learned and Managing Risk	
▶ To the extent feasible, the business plan should draw upon information and material developed according to other requirements, including, but not limited to, the preappropriation review process and the preexpenditure review process in the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century pursuant to Section 2704.08 of the Streets and Highways Code	Full Document	
▶ The Authority shall hold at least one public hearing on the business plan and shall adopt the plan at a regularly scheduled meeting.	Public comment will be taken at the regularly scheduled Board of Directors meetings on March 20 and April 17. The Final 2018 Business Plan will be adopted at the May 15 meeting.	
▶ When adopting the plan, the authority shall take into consideration comments from the public hearing and written comments that it receives in that regard, and any hearings that the Legislature may hold prior to adoption of the plan.	To be considered by the Authority in preparing final plan.	

D. HISTORY OF HIGH-SPEED RAIL

California has evaluated the potential for high-speed rail for several decades. The state first pursued the idea of a Southern California high-speed rail corridor working with Japanese partners in 1981 under Governor Edmund Gerald “Jerry” Brown Jr. In the mid-1990s, planning began in earnest as California’s growing population put an increasing strain on its highways, airports and conventional passenger rail lines.

At the federal level, as part of the High-Speed Rail Development Act of 1994 (<https://www.govtrack.us/congress/bills/103/hr4867>), authored by then-U.S. Representative Lynn Schenk, California was identified as one of five corridors nationally for high-speed rail planning. The California Legislature created the Intercity High-Speed Rail Commission in 1993, charging the Commission with determining the feasibility of a system in California. In 1996, the Commission issued a report that concluded that such a project was indeed feasible.

California’s Legislature passed the High-Speed Rail Act in 1996 (http://leginfo.ca.gov/pub/95-96/bill/sen/sb_1401-1450/sb_1420_bill_960924_chaptered.html), a bill that created the High-Speed Rail Authority (Authority) and charged the Authority with preparing a plan and design for constructing a system to connect the state’s major metropolitan areas. In 2002, following the release of the Authority’s first business plan in 2000, Senate Bill 1856 (Costa) was passed and signed by Governor Gray Davis. The legislation authorized a \$9.95 billion bond measure to fund the system, but submitting that measure to the state’s voters was delayed several years.

In the interim, the Authority, together with its federal partner, the Federal Railroad Administration (FRA), issued a Draft Program-Level Environmental Impact Report/Environmental Impact Statement (EIR/EIS) that described the system and its potential impacts on a statewide scale. Through that process, the Authority received and reviewed more than 2,000 public and government agency comments on the draft document, which were used to determine the preferred corridors and stations for the system.

In November 2008, the state’s voters approved Proposition 1A, a bond measure authored by then-Assemblymember Cathleen Galgiani and signed by Governor Arnold Schwarzenegger, making it the nation’s first-ever, voter-approved financing mechanism for high-speed rail.

In 2009, \$8 billion in federal funds were made available to high-speed rail projects nationwide as part of the American Recovery and Reinvestment Act (ARRA), which was passed to help stimulate the economy, create new jobs, and foster development of new rail manufacturing enterprises.

California sought and successfully secured \$3.3 billion in ARRA funds and other funds made available through federal appropriations and grants for planning and environmental work, as well as final design and construction of the first section in the Central Valley, which is underway.

In 2012, the Authority adopted its 2012 Business Plan, which laid out a framework for implementing the California high-speed rail system in concert with other state, regional and local rail investments, as part of a broader statewide rail modernization program. In that same year, the Legislature approved – and Governor Brown signed into law – Senate Bill 1029 (Budget Act of 2012) approving almost \$8 billion in federal and state funds for the construction of the first high-speed rail investment in the Central Valley, to advance design and planning for Phase 1 and Phase 2 of the system and bookend and connectivity projects throughout the state.

In 2014, the Authority adopted its 2014 Business Plan, which built on and updated the 2012 Business Plan, implementing the requirements of Senate Bill 1029. Also in 2014, the Legislature and Governor Brown reaffirmed their commitment to the program by providing an ongoing funding stream through the state’s Greenhouse Gas Reduction Fund.

In 2015, Governor Brown and supporters celebrated the historic groundbreaking of the high-speed rail program at the site of the future station in downtown Fresno, marking the beginning of what will be America's first true high-speed rail system.

The Authority adopted its 2016 Business Plan, which introduced the Silicon Valley to Central Valley Line and built on the 2014 Business Plan, implementing the requirements of Senate Bill 1029.

In July 2017, the Legislature voted to extend the Cap-and-Trade program through 2030, ensuring long-term state funding for the high-speed rail program from the state's Greenhouse Gas Reduction Fund.

In October 2017, the Authority met federal American Recovery and Reinvestment Act requirements by fully investing the more than \$2.55 billion granted to the state to build the nation's first high-speed rail system.

Several years have passed since the official groundbreaking. As of late 2017, 119 miles of construction activities are underway in the Central Valley. In addition, design and environmental planning has advanced on the 500-mile Phase 1 corridor between San Francisco and Los Angeles/Anaheim along with outreach to communities and stakeholders.

E. ENDNOTES

[1] “The Cost of Renting Home with 2 Bedrooms” from the Sacramento Bee: <http://digital.olivesoftware.com/Olive/ODN/sacbee/shared/ShowArticle.aspx?doc=MSB%2F2018%2F02%2F28&entity=Ar00403&sk=EC76CEBB&mode=text>

[2] When summed, the total of the four regions shown in this graphic are not within the range of results shown in Exhibit 1.0. Exhibit 1.0 shows results for the entirety of California; Exhibit 1.2 shows results for the four regions only, not including the many counties in California where economic effects have taken place over this time period. There are many counties that the statewide analysis includes that the regional analysis does not. For more information on the methodologies used to estimate these impacts, please see this report: https://www.buildhsr.com/hsrinvestment/pdf/FY1617_CHSRA_Economic_Impact_Technical_Memorandum_FINAL_01122018_v2.pdf

[3] California Department of Finance, http://www.dof.ca.gov/Forecasting/Demographics/projections/documents/P_PressRelease.pdf

[4] <https://www.fhwa.dot.gov/policyinformation/statistics/2015/hm43.cfm>

[5] <http://inrix.com/scorecard/>

[6] Texas Transportation Institute 2015 Urban Mobility Report, <https://mobility.tamu.edu/ums/>

[7] California Department of Transportation, Draft 2018 California State Rail Plan

[8] <https://www.nippon.com/en/features/h00078/>

[9] <https://www.thetransportpolitic.com/2017/07/01/a-generational-failure-as-the-u-s-fantasizes-the-rest-of-the-world-builds-a-new-transport-system/>

[10] For more information, see California High-Speed Rail 2017 Sustainability Report. http://www.hsr.ca.gov/docs/programs/green_practices/sustainability/Sustainability_Report_2017.pdf

[11] https://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_02_01.html_mfd

[12] <http://www.dot.ca.gov/drmt/sptircp.html>

[13] The Authority has adopted a National Targeted Worker Program that focuses on hiring Disadvantaged Workers. For more information on this Program, please see http://hsr.ca.gov/docs/newsroom/fact%20sheets/CBA_Factsheet_FINAL_0050415.pdf

[14] Draft Memo on Ridership and Revenue for Valley to Valley Line of the California High-Speed Rail System; https://www.hsr.ca.gov/docs/brdmeetings/2016/brdmtg_121316_item2_ATTACHMENT_Ind_Con_Draft_Memo_Ridership_Revenue_for_Valley_to_Valley_Line.pdf

[15] Draft Memo on Ridership and Revenue for Valley to Valley Line of the California High-Speed Rail System; https://www.hsr.ca.gov/docs/brdmeetings/2016/brdmtg_121316_item2_ATTACHMENT_Ind_Con_Draft_Memo_Ridership_Revenue_for_Valley_to_Valley_Line.pdf

F. Peer Review Group Letter

California High-Speed Rail Peer Review Group

Stacey Mortensen

Lou Thompson
Chairman

Martin Wachs

March 30, 2018

The Honorable Toni G. Atkins
Senate President Pro Tern
State Capitol Building
Room 205
Sacramento, CA 95814

The Honorable Anthony Rendon
Speaker of the Assembly
State Capitol Building
Room 219 Sacramento, CA 95814

The Honorable Patricia Bates
Senate Republican Leader
State Capitol Building
Room 305 Sacramento, CA 95814

Dear Honorable Members:

The California High-Speed Rail Authority's draft 2018 Business Plan marks a critical decision point for high-speed rail in California. Although the Authority's work to date is in accord with earlier program and funding actions by the Legislature, the 2018 draft Plan highlights the fact that there is a continuing and growing funding gap that must be addressed in order to complete service between San Francisco and Bakersfield and eventually to Los Angeles and Anaheim in Phase I of the system. This is only in part because costs have gone up since the 2016 Plan and they may well continue to do so. It is also not surprising that the project schedule has slipped and may well slip further, nor is it unexpected that compromises continue to be made with respect to expected system performance. The table below illustrates the general magnitude and direction of change from Business Plan to Business Plan.

Evolution in Capital Costs, System Size and Demand, Revenue and Net Revenue Forecasts								
(Revenue Projections for the Year 2040 re-stated in 2017\$)								
Capital Cost, Demand and Revenues are Medium Level Estimates								
Business Plan	PH 1 Capital Costs (\$ Billions)	Miles	Capital Cost/Mile (\$Millions)	Demand (Millions)	Gross Revenue* (Millions)	Net Revenue** (Millions)	Ratio: Net/Gross (%)	Schedule: SF to LA 3 stops
2012	61	490	124.5	26.4	1,948.5	1,076.3	55.2	na
2014	61.4	490	125.3	34.9	1,766.0	843.3	47.8	3:08
2016	57.9	520	111.3	42.8	2,512.5	1,566.0	62.3	3:10
2018 draft	67.5	520	129.8	42.0	2,561.0	1,610.0	62.9	3:32***
* Farebox revenue plus ancillary revenue								
** Gross Revenue minus O&M Costs and ongoing capital replacement								
*** To be revised in Final 2018 Business Plan								

None of the changes since the 2016 Business Plan are surprises given the history of the project and experience with similar projects worldwide. These patterns result from the enormity and complexity of the project and the inherent uncertainty surrounding it. The changes do not necessarily reflect badly on the competence or honesty of management and many of the changes resulted from issues that were highlighted as risks in earlier plans. They follow the well-established trajectory of most mega-projects that start from a grand *vision* and end up, eventually, forming a more realistic picture of the actual challenges. Public comment is likely to focus on cost escalation, schedule changes, and modifications to system design, but the Peer Review Group would like to highlight questions that are in our opinion more fundamental.

The 2018 Plan poses critical questions because it starkly underlines the need for decisions on the future of the program. Growth in expected costs is of concern even before considering the fact that the most complex and costly parts of the construction (tunneling, for example) have yet to be started, and there is an inadequate and uncertain stream of money to finance the project. There has always been a gap that will have to be filled from unidentified sources, but earlier Plans held out the hope that there would be a set of construction cost estimates, public financial resources, and operating income projections that would elicit enough private investment to build at least a significant operational part of the system without major additional state or federal grants or loan programs. Our earlier comments noted that the expressions of interest from potential private sector investors had made it clear that an added role of the state in guaranteeing the income flow of the Authority would be needed, no matter what other sources were identified.

The Group has comments on the Plan's details attached below, but more importantly we urge the Legislature to respond to the 2018 Plan by focusing instead on the key questions of whether the project should proceed and, if so, what would a revamped project look like and how can it realistically be financed? It will be essential to develop a realistic program of project finance by revenue source and agency (local, state, federal, private) and a realistic discussion of the predictability of funds generation.

The Authority can no longer be expected to deliver a project for which the proposed scope is not matched by adequate and reliable funding. The Legislature will need to consider how adequate and

reliable funding can be provided if the project is to continue. The issue is two-fold: current funding is not sufficient to complete even the San Francisco to Bakersfield section; and the primary source of added funding – Cap and Trade – is too volatile to support monetization by the private sector except at a high risk premium.

The 2018 Plan does not clearly layout the Legislature’s choices or the actions needed to implement the chosen option. This increases the risk that the mismatch between the desired outcome and available funding will continue to grow to the detriment of the project and the state. In broad terms, the choices appear to be:

1. End the project, pay the remaining contractor charges, retain purchased property for state uses where needed and otherwise sell it or return it to its former owners and scrap any work already done. In practice this would not be practical because the work done so far would have no utility and the federal ARRA money would probably have to be repaid.
2. Complete the existing committed work in the Central Valley and provide connections to the existing San Joaquin service so that use could be made of the investment and the ARRA funding would not need to be repaid. Complete all contracted commitments to local authorities on the Peninsula and in the Los Angeles basin including Phase I environmental clearances. After doing so, end the project. This appears to be the minimum feasible program, though it would leave Cap and Trade appropriations unspent.
3. Complete existing work as described above and, using Cap and Trade receipts provided under current policies, add improvements in electrification from San Jose to Gilroy and upgrade Los Angeles Union Station and the Los Angeles to Anaheim lines. Complete planning and engineering for the Pacheco Pass tunnels and all environmental clearances needed. Defer other commitments for future consideration but continue to pursue potential financial options such as state guarantees of the share and level of Cap and Trade flows. This is basically the program status in the draft 2018 Plan. If the Legislature chooses this approach, it may want to commission a review of the program before authorizing further commitments.
4. Reconfirm the state’s commitment to completion of an agreed version of Phase I as contemplated in Proposition 1A and provide the Authority with adequate and reliable sources of financing to complete the project. A workable funding plan should be based on the understanding that the projects schedule and costs are likely to change as the project evolves.

In considering these options (or others the Governor, Authority or Legislature may define), the Legislature will need to reassess the *vision* embodied in Proposition 1A and the reality it is turning into. If the Legislature opts to continue the project beyond the Central Valley segment and the existing commitments to the bookend areas, it may want to request that a study be commissioned to revalidate the role of high-speed rail in the future transport network of California and reaffirm the priority that transportation, and high-speed rail, have in comparison to other spending needs of the state. This would be especially important if, for example, the Legislature considers changing the share of Cap and Trade receipts dedicated to high-speed rail. An essential element of the study would be a full discussion of

the role of high-speed rail within the state's overall rail plan and plans for highways and airports. This should also be based on inputs from the Authority's early operator, who could provide more detail and justification for the projections of services and financial/economic performance of the system for the options being considered.

As stated in previous letters the PRG believes that rail passenger service, including high-speed rail service, is important to the economic growth of the State and can play a central role in the States future transport network. Enhanced passenger rail service – high-speed, conventional and commuter – will be needed in California just as it is useful in other regions of the country and around the world. There is little doubt that better rail service can be achieved if the various providers (not just the Authority) are given appropriate policy guidance and financial support. Unfortunately, the high-speed rail program as it is currently defined and financed will not be able to support the role that high-speed rail could have in the state's future transportation system.

Please let us know if you have any questions, need any further information, or would like to meet with the Group to discuss this letter.

Sincerely,

A handwritten signature in black ink, appearing to read "Louis S. Thompson", with a long horizontal flourish extending to the right.

Louis S. Thompson
Chairman, California High-Speed Rail Peer Review Group

cc: Hon. Jim Beall, Chair, Senate Transportation and Housing Committee
Hon. Anthony Canella, Vice Chair, Senate Transportation and Housing Committee
Hon. Jim Frazier, Chair, Assembly Transportation Committee
Hon. Vince Fong, Vice Chair, Assembly Transportation Committee
Brian Ennis, Secretary, California State Transportation Agency
Mac Taylor, State Legislative Analyst
Ken Alex, Director, Governor's Office of Planning and Research
Dan Richard, Chair, California High-Speed Rail Authority
Brian Kelly, Chief Executive Officer, California High-Speed Rail Authority
Members, California High-Speed Rail Peer Review Group

Detailed Comments

Early Operator

The draft Plan does not incorporate the input of the early operator recently contracted by the Authority. The Authority states that the early operator will be asked to assess the reasonableness of the cost estimates and ranges presented and “[w]hen that assessment is complete, this information will be publicly available.” (page 32 of draft Plan). There are a number of areas where the input and advice of the early operator will be very important, including capital and O&M costs, cash flows and the business model as discussed below. If at all possible, this input should be included in the final 2018 Business Plan. If inclusion in the final Plan is not possible, the Authority should commit to an agreed date when the assessments will be available because the inputs are likely to have a significant impact on the project and this may affect the Legislature’s continuing evaluation of the program.

Business Model

The Authority’s discussion of its proposed business model needs better definition and explanation in the final Plan. This is an area in which the early operator will be able to assist based on experience with rail passenger business models elsewhere in the world. For example, the Authority states “The rail infrastructure provider will interface with the system operator and will be responsible for integrating other elements of the high-speed system (high-speed rail trains, civil works and facilities) so that the system works seamlessly. The rail infrastructure provider is intended to be a key long-term partner and also [to] be responsible for maintaining the underlying civil works of the system.” (page 27 of the draft Plan) The Authority should elaborate on how this would actually be implemented in practice. Would there be a separate contractor or concessionaire who would own and maintain the infrastructure and charge a fee for use while paying the Authority a fee? How would the charges be established and regulated? How would the various service providers interact with the infrastructure provider? There is no single, “right” answer to these questions, and the business model need not be defined in complete detail, but the Authority needs to present a clear and consistent concept of its business model in order not to make decisions now that will foreclose future choices.

Interaction with the Bookend Operators

The Authority has decided to expand the blended operations with Caltrain from San Francisco to Gilroy, and with Metrolink from Burbank to Anaheim, an approach that we consider appropriate both because of limited funding, and because this will have significant immediate benefit to current riders. This approach underlines the need for a clear and fully agreed upon set of operating agreements with the two agencies and with the Union Pacific and BNSF railroads. The existing memoranda of understanding have launched the process, but the Authority should move as quickly as possible to convert the general understandings into specific agreements on ownership, rights of access, costs of access, maintenance responsibility, and dispatching and scheduling decisions, among others. The Authority has already seen how negotiations of final agreements with freight railroads tend to increase estimates of cost and schedule. Any added impacts of these agreements with the commuter operators and the freight railroads should be identified and managed as soon as possible.

Grade Crossings

In prior letters we urged that a broad program of grade crossing elimination be developed. The dangers of the interactions of heavy highway traffic and dense, high-speed, conventional and commuter rail

passenger traffic moving through rail/highway grade crossings cannot be overstated. Now that the Plan envisions operation over grade crossings in the San Jose to Gilroy area and plans for joint operations over the grade crossings in the Burbank to Anaheim territory, the need for a program to eliminate grade crossings is even greater.

This is not a problem that the Authority alone can or should solve. Resolution will be expensive, it will take time, and there may well be a need for prioritizing of funds by crossing exposure and acceptance of interim solutions. Local governments, the state, Caltrain, Metrolink, the freight railroads and federal authorities all have roles to play. A coordinated program over a reasonable period of time to reduce the danger at grade crossings should be developed and implemented. The Legislature may want to request that Caltrans take the lead in forming such a program.

Schedule Trip Time Changes

Although Proposition 1A required that the system be **designed** so that a train could run from San Francisco to Los Angeles in 2 hours 40 minutes or less, continuing changes in plans, all of which have reduced speeds and increased potential trip times, will make it more difficult to meet this requirement. In past Business Plans, the Authority took the position that the “pure run time” as reflected in their train performance calculator results indicated that the 2:40 time could be met for a non-stop train from San Francisco to Los Angeles, but none of the planned schedules included non-stop service. The three-stop **scheduled** trip time from San Francisco to Los Angeles was shown as 2:55 in the 2009 Business Plan (page 66, Table A), 3:08 in the 2014 Business Plan (page 8 of 2014 Service Planning Methodology) and 3:10 in the 2016 Business Plan (page 5 of 2016 Service Planning Methodology). It is now shown at about 3:30 in the draft 2018 Business Plan (page 5 of 2018 draft Service Planning Methodology) though we have been informed that this will be revised in the final Plan. The proposed schedules must be consistent with the actual demand modeling in the plans in order that the revenue and O&M forecasts will match the conditions needed to fulfill the schedule. At the same time, the revised schedules illustrate the risk of reduction in system performance due to added maximum speed limitations in a number of areas.

Overall Variability

A common thread through all our previous letters has been that all of the forecasts of construction cost, O&M costs, revenue and cash flow, and completion schedule should be presented as having a wide range of potential outcomes. The experience gained so far has confirmed this point, as the draft 2018 Plan states. We fully support the Authority’s move to show all projections in terms of ranges and not just point estimates.

For example, on page 18 there is a discussion of international experience with tunneling without furnishing any information on cost experience. If the Authority is learning from international experience, given the enormous contribution of tunneling to the cost uncertainty of the project, it might be especially helpful to include preliminary insights about the ranges of unit costs from these experiences as compared with the Authority’s estimates. The Authority expects to build over 44 miles of tunnels, which is likely the largest single project cost component, so a clearer perspective on the tunneling estimates would help in building confidence the projected costs will fall within the estimates.

More broadly, all future projections should acknowledge that costs, revenues, system performance and completion schedules are still subject to a lot of uncertainty, even after the various contingency allowances are applied. Any funding plans for the system should take into account the possibility that the actual outcomes could be at the unfavorable end of projected ranges.

Urban/Regional Development and Potential for Value Capture by High-Speed Rail

The Draft Business Plan argues (page 1) that high-speed rail will contribute to resolving the state's affordable housing problem and repeats the assertion (pages 11-12), under the heading "Benefits to Disadvantaged Communities." High-speed rail is presented as a catalyst for infill development and for sustainable infrastructure that can make communities safer places to live and the Plan suggests that high-speed rail can benefit lower income communities. The Group considers the relationships between the construction of high-speed rail and land use changes near the stations to be a matter of enormous policy significance and notes that this issue receives inadequate attention in the Draft. Our concern is that the claims, though potentially credible, are not supported by evidence. It is possible, as speculated in the draft Business Plan that people will move to lower-cost housing close to stations while working in Silicon Valley or San Francisco. It could equally be argued that high-speed rail will bring urban sprawl to the central valley and will replace inexpensive housing with luxury market rate development. Because of the significance of the issue of the impact of high-speed rail on regional development, we recommend that better and more detailed studies be undertaken before this issue can be resolved with confidence. Similarly, the plan mentions (page 72) the creation of a Transit and Land Use Committee that is pursuing station area development. References appear to the possibility in the future of value capture financing, to the creation of station area development corporations, and to interest in federal programs such as the federal program of "opportunity zones." We do not argue with the potential importance of these possibilities, but they are not well enough defined or established to give us any confidence in their future role. Much more needs to be done before they can be taken seriously as elements of system planning or finance.

Data are provided on page 5 to demonstrate that Los Angeles has a serious traffic congestion problem (clearly true). The Authority asserts that high-speed rail will contribute to the alleviation of that problem, even though the plan makes no commitment to initiate service in the coming decades in Southern California and provides no analysis to show the contribution that high-speed rail or mass transit will make in future. The Authority should consider removing this discussion from the final Plan. Exhibit 1.3 compares travel times by automobile, conventional rail, and high speed rail. Air travel should be added in the comparison for longer trips like those between San Francisco and Los Angeles.