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High-Speed Rail Authority

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January 3, 2017

Chair, Joint Legislative Budget Committee
1020 N Street, Room 553
Sacramento, CA 95814

Dear Chairperson:

The California High-Speed Rail Authority (Authority) is pleased to submit to you the enclosed Central Valley Segment Funding Plan, San Francisco to San Jose Peninsula Corridor Funding Plan, and corresponding Independent Consultant Reports required pursuant to Section 2704.08(d) of the Streets and Highways Code.

In 2012, the Legislature passed Senate Bill 1029 that appropriated over $7.9 billion in federal funds and Proposition 1A bond funds to begin construction of the California high-speed rail system. That legislation directs $5.8 billion to the Central Valley, $600 million to the Caltrain Peninsula Corridor Electrification Project, and $500 million to Southern California projects. In 2014, the Legislature passed Senate Bill 862 that continuously appropriated 25 percent of specified Cap and Trade auction proceeds to Phase I (San Francisco to Anaheim) of the high-speed rail project.

Project work is advancing in each of the three regions specified in SB 1029. The Authority has been moving forward with construction in the Central Valley primarily using these federal funds, and currently has three active construction contracts covering 119 miles of civil works. Caltrain has selected both a construction contractor and railcar manufacturer for the Peninsula Corridor Electrification Project. With a recent federal Transportation Investment Generating Economic Recovery (TIGER) grant, the Los Angeles Metropolitan Transportation Authority will likely be ready soon for a Proposition 1A Funding Plan for the Rosecrans/Marquardt grade separation project.

In order to expend Proposition 1A bond funds, the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century requires the Legislature to appropriate Proposition 1A funds (as it did in 2012), and for the Authority to prepare and submit a Funding Plan to the Director of Finance and the Chair of the Joint Legislative Budget Committee. The enclosed Funding Plans, approved by the Authority Board effective January 1, 2017, are consistent with the Authority's 2016 Business Plan and the Legislature's appropriation and direction in SB 1029.

If you have any questions, please contact Barbara Rooney, Deputy Director of Legislation, at Barbara.Rooney@hsr.ca.gov, or (916) 330-5636.

Sincerely,

Jeff Morales

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Chief Executive Officer

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CALIFORNIA
High-Speed Rail Authority

Central Valley Segment Funding Plan

Final – January 1, 2017

www.hsr.ca.gov

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Glossary of Key Defined Terms

California High Speed Rail Program Phase 1 ("Phase 1")	The corridor of the high-speed rail system from Los Angeles and Anaheim to San Francisco including the blended system between San Francisco and San Jose.
California High Speed Rail Program Silicon Valley to Central Valley Line ("Valley to Valley Line")	As defined in the 2016 Business Plan, the section of the California High-Speed Rail System that runs from San Jose Diridon Station to just north of Bakersfield.
Funding Plan	The plan prepared by the Authority herewith to meet the requirements of S&H section 2704.08, subdivision (d), specifically part (1) for the Usable Segment that is the subject of this Funding Plan.
FRA Agreements	Authority grant agreements with the federal government numbered FR-HSR-0009-10-01-06 (ARRA Agreement, Amendment 6) and FR-HSR-0118-12-01-00 (FY 10 Agreement).
Proposition 1A (Prop 1A) or the Bond Act	The "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century" (the Bond Act), approved by voters in November 2008. The Bond Act authorizes $9.95 billion in GO bonds to pay for the capital costs of the high-speed rail system and improvements to regional services which will connect to the system. The Bond Act is codified in Streets and Highways Code (S&H) section 2704 et seq.
SB 1029	SB 1029, passed by the California State Legislature and signed by Governor Brown in July 2012, appropriates Federal and State funding for the Central Valley Segment. The appropriation includes the $2.6 billion in Prop 1A funds that are the subject of this Funding Plan.

Acronyms and Abbreviations

AB	Assembly Bill
ARB	California Air Resources Board
ARRA	America Recovery and Reinvestment Act
Authority	California High-Speed Rail Authority
BNSF	Burlington Northern Santa Fe
CO	Changer Order
CP	Construction Package
DB	Design Build
DBE	Disadvantaged Business Enterprise
DRB	Disputes Resolution Board
DVBE	Disabled Veteran Business Enterprise
EIR/EIS	Environmental Impact Report/Environmental Impact Statement
FRA	Federal Railroad Administration
GHG	Greenhouse Gases
GGRF	Greenhouse Gas Reduction Fund
GO	General Obligation
NEPA	National Environmental Policy Act
PRIIA	Passenger Rail Investment and Improvement Act of 2008
Prop 1A	Proposition 1A, also known as the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century"
RFP / RFQ	Request for Proposals / Request for Qualifications
ROD	Record of Decision
SB	Senate Bill
S&H Code	Streets and Highways Code
SCC	Standard Cost Category
SJJPA	San Joaquin Joint Powers Authority
STO	State Treasurer's Office
YOE	Year of Expenditure

Introduction

Proposition 1A, the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century" (the Bond Act) was approved by voters in November 2008. The Bond Act authorizes $9.95 billion in general obligation (GO) bonds to pay for the capital costs of the high-speed rail system and improvements to regional services which will connect to the system. The Bond Act is codified in Streets and Highways Code Section (S&H) 2704 et seq. S&H 2704.08, subdivision (d) requires that, prior to committing any proceeds of bonds described in paragraph (1) of subdivision (b) of Section 2704.04 for expenditure for construction and real property and equipment acquisition on each corridor, or usable segment thereof, other than for costs described in subdivision (g), the authority shall have approved and concurrently submitted to the Director of Finance and the Chairperson of the Joint Legislative Budget Committee the following: (1) a detailed funding plan for that corridor or usable segment thereof...(as further described herein); and (2) a report or reports prepared by one or more financial services firms, financial consulting firms, or other consultants, independent of any parties, other than the authority, involved in funding or constructing the high-speed train system, making certain indications.

Purpose of the Funding Plan

The California High-Speed Rail Authority (Authority) has prepared this Streets and Highways (S&H) Code Section 2704.08 subdivision (d) Funding Plan for the Central Valley segment currently under construction, which is the Usable Segment described in **Section A**, in satisfaction of the above-referenced requirement in the S&H Code for the commitment of $2.609 billion of Proposition 1A (Prop 1A) bond proceeds for expenditure for construction activities and real property and equipment acquisition.

In 2012, Prop 1A bond proceeds in the amount of $2.6 billion were appropriated by the Legislature in Senate Bill 1029 (SB 1029). In making its appropriation, the Legislature chose to use Prop 1A funds to match the concurrent appropriation of federal funds to begin construction of the high-speed rail system. This Funding Plan follows the Legislature's direction by using the appropriated funds to pay for the ongoing construction in the Central Valley that SB 1029 authorized.

Consistent with the Legislature's appropriation, the Authority proposes to use these Prop 1A bond proceeds for the segment of the system that covers the length of the existing construction contracts (construction packages (CPs) 1-4). This segment consists of 119 miles of civil works as well as the systems, communications, yards, buildings and stations for the Authority to be able to start testing trains on it once construction is completed.

This segment will serve as the foundational backbone for the statewide high-speed rail system and serve as the test track that will be necessary before service can begin on the Silicon Valley to Central Valley Line (Valley to Valley Line) as described in the 2016 Business Plan. There is currently no other place in this country to test trains at speeds of 200mph and higher so completing this segment is essential to bringing high-speed rail to California. Access to the funding that is the subject of this Funding Plan is critical to maintaining momentum on the ongoing construction in the Central Valley and providing the required matching funds under the terms of the Federal grant agreements.

This Funding Plan covers the use of the Prop 1A funds that were requested under the S&H Code section 2704.8, subdivision (c) Funding Plan that was approved on November 3, 2011 (Resolution HSR#11-23). Since then, the Legislature has appropriated those funds and the Authority has advanced the project through the environmental process, acquired right of way, and relocated utilities, has broken ground, and significant construction is underway.

Overview of the Central Valley Segment

The Central Valley segment that is the subject of this Funding Plan incorporates an alignment from approximately adjacent to the Madera Amtrak Station to Poplar Avenue in Shafter as described in the Final Environmental Impact Reports/Environmental Impact Statements (FEIR/EIS) for the Merced-Fresno and Fresno-Bakersfield sections. The segment includes two stations that are environmentally cleared at Fresno and Kings/Tulare. The segment will be a fully electrified high-speed rail segment suitable and ready for high-speed train operations that, upon completion, could be put into use by one or more passenger rail service providers. The segment will first serve as the nation's first test track for high-speed trains (over 200mph) and the Authority will run high-speed revenue service over the segment once it completes the Valley to Valley Line, as described in the 2016 Business Plan. As required under the Federal grant which the Prop 1A funds are matching, if the development of the Valley to Valley Line is significantly delayed then the existing state Amtrak service could use the segment on an interim basis to provide faster service to their customers, as was described in the Authority's Business Plans. However, this is a back-up option and not the primary goal of completing this segment.

The Authority is currently delivering the Central Valley infrastructure through a series of contracts. The first contracts that the Authority let were design-build (DB) contracts for construction of the civil works for the segment. These contract packages include CP 1, CP 2-3, and CP 4. All of these contracts have been fully executed and work is underway with heavy construction ongoing. The Authority is now seeking the remainder of the appropriated funds through this Funding Plan in order to continue to advance these contracts and to be able to procure systems, power and track to complete the full build-out of the test track on the way to completing the Valley to Valley Line.

Organization of the Funding Plan

This Funding Plan is organized consistent with the requirements of S&H Code section 2704.08, subdivision (d).

Section A: Usable Segment - defines the 119-mile Central Valley segment as the Usable Segment.

Section B: Sources of Funds and Anticipated Timing of Receipt - describes the sources of funds to be used for the construction and acquisition activities for the segment.

Section C: Projected Ridership and Operating Revenue - includes a discussion of ridership and revenue forecasts when the Authority plans to run service on the segment after it is connected to the Valley to Valley Line. It also provides an overview of the ridership of the existing San Joaquin service that could run on the infrastructure in case the Valley to Valley Line is significantly delayed.

Section D: Construction Cost - describes the construction and acquisition cost estimates for the segment.

Section E: **Material Changes** - describes the material changes between the Funding Plan prepared pursuant to S&H Code section 2704.08, subdivision (c) on November 3, 2011 and this Funding Plan.

Section F: Terms and Conditions - describes the terms and conditions of the agreements that the Authority has or plans to enter into with regard to the completion of the Central Valley segment.

A. The Usable Segment

Streets and Highways Code section 2704.08, subdivision (d)(1)(A) requires identification of the corridor, or usable segment thereof, and the estimated full cost of constructing the corridor or usable segment thereof. A usable segment is defined in section 2704.01 as a portion of corridor that includes at least two stations.

Overview of the Usable Segment

The Usable Segment that is the subject of this Funding Plan is the part of the high-speed rail system now under construction stretching from approximately adjacent to the Madera Amtrak station to Poplar Avenue in Shafter. As required, this section includes at least two stations in Fresno and at Kings/Tulare. This Funding Plan includes all of the necessary high-speed rail components to be able to test and run high-speed rail trains over the segment. Additionally, the segment could be connected to the existing BNSF line on both ends to run Amtrak service over the corridor, should the completion of the Valley to Valley Line be significantly delayed. Funds are specifically reserved in the Federal grant for this purpose.

Construction Elements

The total expenditure for completion of this segment is estimated to be $7.813 billion in Year of Expenditure dollars (YOE$). This includes all items that will enable the Authority to test and run high-speed trains on the segment. Specifically, the expenditures will include the following:

- Civil Works
- Track
- Railroad Infrastructure
- Signaling
- Overhead catenary system
- Communications systems
- Positive train control
- Heavy Maintenance Facility
- Stations (Fresno and Kings/Tulare)

The purchase of high-speed rail trains is not part of completing the Usable Segment but will be part of the Authority's implementation of the Valley to Valley Line. The trains will utilize this Usable Segment as a test track in order to enable the rolling stock, signaling system, and the electrification system to be tested and commissioned and for all of those systems to be certified. To purchase the trains, the Authority will request an additional appropriation of $865 million in Prop 1A funds or will use $865

million from the continuous appropriation the Legislature provided in SB 862. Those funds (if Prop 1A) will be part of a future Funding Plan that the Authority will submit.

Exhibit A-1 – Central Valley Segment Capital Cost Projections

Capital Costs	2015$	YOE$
Central Valley Segment	7,161	7,552
Heavy Maintenance Facility	234	261
Total Central Valley Segment Capital Cost	**7,395**	**7,813**

Components of the Usable Segment

The Central Valley segment that is under construction has been adopted by the Authority's Board as a Usable Segment upon approval of this Funding Plan. The segment will cover 119 miles of new high-speed rail alignment. As adopted by the Board, the segment will include substructure, bridges, track, systems and communications, yards, buildings and stations constructed to high-speed rail standards and will be suitable and ready for high-speed rail operations. Construction of Central Valley segment civil works has been ongoing since 2013 with over $3 billion of contracts awarded to design-build contractors.

CP 1 is the first construction contract executed on the Valley to Valley Line portion of Phase 1 of the high-speed rail system. The CP 1 construction area is a 32-mile stretch between Avenue 19 near the city of Madera (approximately adjacent to the existing Madera Amtrak station) and East American Avenue in Fresno County. It includes 20 grade separations, 2 viaducts, 1 tunnel and a major river crossing over the San Joaquin River. Construction is under way at multiple active sites and will expand in the coming months to other areas. The scope and boundaries of CP1 are presented in **Exhibit A-2**. For more information on CP1 please refer to: http://www.hsr.ca.gov/Programs/Construction/about_construction_package_1.html

Exhibit A-2. 1 CP 1 Project Scope and Boundaries

Source: About Construction Package 1
http://www.hsr.ca.gov/Programs/Construction/about_construction_package_1.html

CP 2-3 is the second construction contract executed on the Central Valley segment. The CP 2-3 construction area extends in excess of 65-miles from the terminus of CP 1 at East American Avenue in Fresno County to approximately one mile north of the Tulare-Kern County line. CP 2-3 includes approximately 36 grade separations in the counties of Fresno, Tulare and Kings, including viaducts,

underpasses and overpasses. Work in this section is currently underway with construction progressing. The scope and boundaries of CP2-3 are presented in **Exhibit A-3**. For more information on CP2-3 please refer to:
http://www.hsr.ca.gov/Programs/Construction/about_construction_package_2_3.html

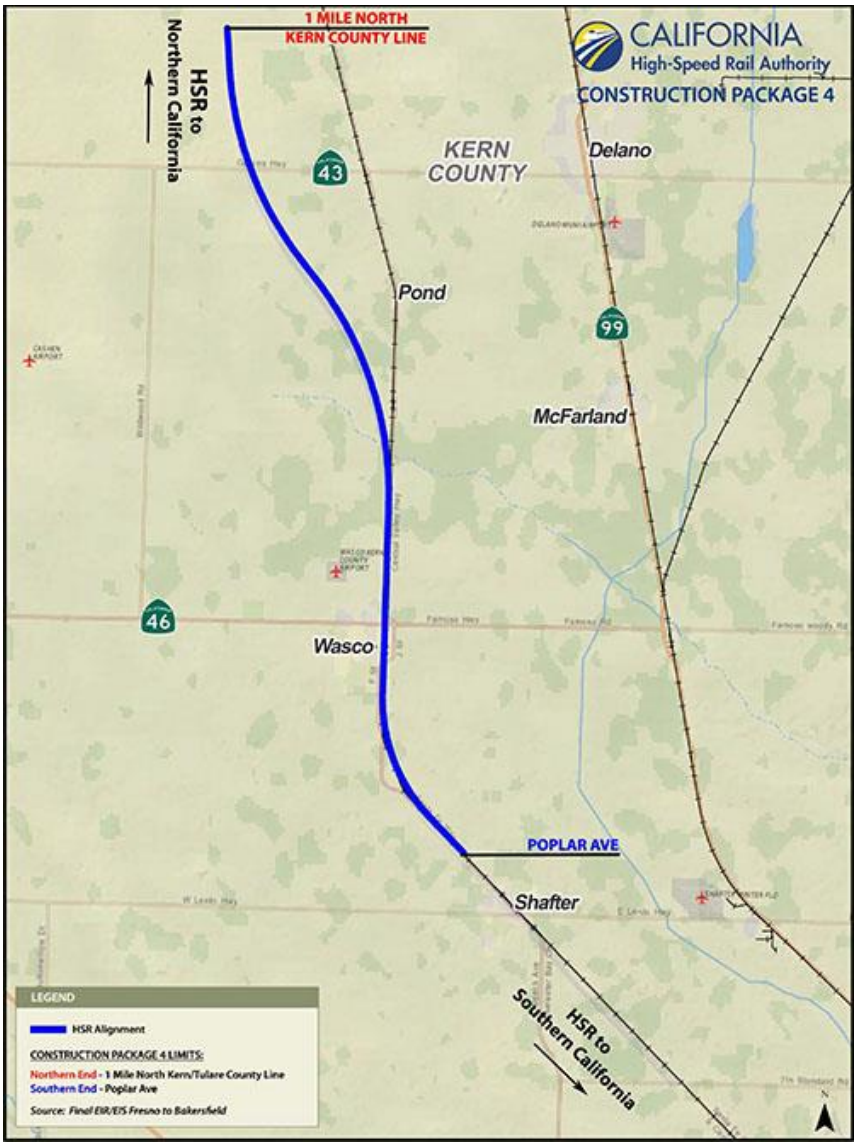
Exhibit A-3. CP 2-3 Project Scope and Boundaries

Source: About Construction Package 2-3
http://www.hsr.ca.gov/Programs/Construction/about_construction_package_2_3.html

CP 4 is the third construction contract executed on the Silicon Valley to Central Valley Line. The CP 4 construction area is a 22-mile stretch bounded by a point approximately one mile north of the Tulare/Kern County Line at the terminus of CP 2-3 and Poplar Avenue to the south. CP 4 work will include construction of at-grade, retained fill and aerial sections of the high-speed rail alignment and relocation of four miles of existing BNSF tracks.

The scope and boundaries of CP4 are presented in **Exhibit A-4**. For more information on CP4 please refer to: http://www.hsr.ca.gov/Programs/Construction/about_construction_package_4.html

Exhibit A-4. CP 4 Project Scope and Boundaries



Source: About Construction Package
http://www.hsr.ca.gov/Programs/Construction/about_construction_package_4.html

The remaining elements that will enable the Central Valley Segment to perform as the first high-speed rail test track have yet to begin procurement but will be delivered consistent with the Authority's Business Plan through subsequent procurements once civil works have advanced further. These remaining elements include the following:

- Stations and passenger platforms
- Traction power (including the overhead contact system and all of the necessary substations, switching stations, and paralleling stations) capable of achieving design speeds of 250 mph and operating speeds of 220 mph.
- Communications system including fiber-optic cables and radio communications
- Signaling system and related on-board equipment for the trains
- The operations control center
- Warning system to detect, report, and where appropriate, autonomously mitigate safety events such as earthquakes, broken rails, intrusions by unauthorized persons/objects, high temperatures, high winds, and flooding.
- Supervisory Control and Data Acquisition System
- Closed Circuit Television System
- Direct Line Telephone System
- Passenger information system at each station tied to the operations control center and signaling system to ensure accurate and current information.

Legislative Counsel Conclusion

In June 2012, the Office of Legislative Counsel (a nonpartisan public agency that provides legal services to the Legislature and others) concluded that the Central Valley segment qualified as a 'usable segment' under the Bond Act. The Legislature considered this opinion in making the appropriation in SB 1029 and the Authority is submitting this Funding Plan consistent with the Bond Act and the Legislature's direction. The Legislative Counsel wrote:

"Moreover, while it is clear that eventually the HSR system is to be used by electrified high-speed trains (subd. (a), Sec. 2704.09), there are several provisions of the bond act that contemplate use of newly constructed high-speed rail line segments for passenger train service, as distinguished from high-speed train service. (see para. (3), subd. (f), Sec. 2704.08, referring to "the utility of those corridors or usable segments thereof for passenger train services other than the high-speed train service"; see sub para. (1), para. (2), subd. (e), Sec. 2704.08, referring to "one or more passenger service providers ... using the tracks or stations for passenger train service"; and see subpara. (e), para. (2), subd. (d), Sec. 2704.08, referring to "one or more passenger train providers ... using the tracks or stations for passenger train service"), Thus, with respect to the service that may be expected to operate on a line that is constructed with Proposition 1A HSR funds, the bond act makes a distinction between "high-speed train operation" and "passenger train service," … Based on the foregoing, we think that operation of a conventional passenger train service on the track and structures constructed for high-speed rail is contemplated and

authorized by the bond act as an interim measure until further progress is made on construction of the HSR system that will allow operation of a commercially viable high-speed train service...

It is our understanding that the initial 130-mile segment, as proposed to be constructed by the authority, would include two stations, Fresno and Kings/Tulare, and that it would be designed to be used on an interim basis by the Amtrak San Joaquin conventional passenger train service until additional segments of the HSR system are constructed and the operation of a commercially viable high-speed train service can be implemented. Accordingly, it is our opinion that the initial 130-mile segment would qualify as a "usable segment" under the bond act."[1]

[1] Legislative Counsel Bureau's Opinion, June 8, 2012. Note that the opinion analyzed use of the Central Valley segment infrastructure without electrification or advanced signaling systems by an interim Amtrak San Joaquin diesel service. While this Funding Plan has evolved that concept to actually build full high-speed rail infrastructure, the concept and viability of an interim operation of passenger service on the infrastructure before commercial high-speed rail operations (as analyzed by the Legislative Counsel) still applies.

B. Sources of Funds and Anticipated Time of Receipt

Streets and Highways Code section 2704.08, subdivision (d)(1)(B) requires identification of the sources of all funds to be used and anticipated time of receipt thereof based on offered commitments by private parties, and authorizations, allocations, or other assurances received from governmental agencies.

This section describes the sources of funds, summarizes key conditions to receipt of funds, including timing constraints and matching funds requirements, and presents the anticipated time of receipt of such funds.

Prop 1A bond funds in the amount of $2.6 billion were appropriated by the Legislature in SB 1029. In making its appropriation, the Legislature also provided guidance for how it (and the people of California) want the system to be developed in compliance with the requirements set out in Prop 1A. The Authority's plans follow the Legislature's direction in delivering the system and using the funds that were appropriated. The Authority has been using the Federal funds that were appropriated for the ongoing construction in the Central Valley. This Funding Plan is being submitted to begin using the appropriated Prop 1A funds to match those Federal funds.

Overview of Sources of Funds

The Authority has identified the following funding sources, totaling $7.813 billion, to fund construction of the Central Valley test track, the Usable Segment that is the subject of this Funding Plan. The segment is funded from three sources:

(1) Prop 1A bond appropriations totaling $2.609 billion;

(2) Matching Federal grants totaling $2.970 billion; and

(3) State Cap-and-Trade Proceeds totaling $2.234 billion.

Both Prop 1A bond funds and matching Federal grant funds were appropriated in the fiscal year 2012-13 Budget Act (see Senate Bill 1029, enacted in July 2012). The State Cap-and-Trade Proceeds were appropriated in 2014 through a one-time appropriation in SB 852 and a continuous appropriation in Senate Bill 862, as described in detail, below. The total amount of funds to be used to complete the segment is $7.813 billion.

Exhibit B-1. Funding Sources to Complete the Central Valley Segment[2]

Funding Sources	Funding Amounts ($ millions)
State General Obligation Bond Funds - Proposition 1A	$2,609
State funds - Cap-and-Trade	$2,234
State Funds Subtotal	**$4,844**
American Recovery and Reinvestment Act of 2009 (ARRA)	$2,041
High-Speed Intercity Passenger Rail Program for Fiscal Year 2010 (FY 10)	$929
Federal Funds Subtotal	**$2,970**
All Funding Sources Total	**$7,813**

Sources: SB 1029, SB 862, ARRA and FY 10 Agreements and September 2016 Funding Contribution Plan (subject to FRA approval)

All the physical elements contemplated in this Funding Plan related to electric high-speed trains running, including for testing, on the Central Valley segment (e.g., electrification equipment, etc.) are not necessary for San Joaquin service to operate. Without those elements, the total cost of the Central Valley segment would be $6.69 billion and would be covered by the $2.609 billion in Prop 1A funds, the $2.97 billion in federal funds, and $1.11 billion in Cap-and-Trade proceeds.

Beyond the funding sources listed above, the Authority's Grant Agreements with the Federal government contain provisions for an Interim Use Reserve. The Interim Use Reserve is designed to cover costs that would be incurred to allow interim service to run on the corridor. These elements could include track connections and associated communications and signaling, interim stations, operations control, and maintenance, if necessary. The funds allocated to this Interim Use Reserve are 100 percent Federal funds. These funds ensure that the usable segment will be put into use by passenger train service, as required in Prop 1A.

As part of implementing the Valley to Valley Line, the Authority plans to submit an additional Funding Plan to request $865 million in Prop 1A funds, or to use $865 million from the continuous appropriation the Legislature provided in SB 862, for the purchase of high-speed trains. The trains are a long-lead time item so procurement will start as described in the 2016 Business Plan. Those funds, if Prop 1A, will be matched using the Federal and Cap-and-Trade funds that are part of this Funding Plan but that go

[2] Does not include already-expended project development costs (e.g. environmental clearance).

beyond (so are not needed to match) the $2.6 billion in Prop 1A funds included here as described in **Exhibit B-1** above.

The following sections describe the sources of funds in more detail and the anticipated time of receipt of those funds based on expected commitments, authorizations, agreements, allocations, or other means.

Bond Proceeds

The California High-Speed Rail Program will use proceeds from the sale of State GO bonds authorized under the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century" that voters approved in 2008. This section outlines the process by which GO bond proceeds can be accessed by the Authority.

The Bond Act authorizes the State to issue $9.95 billion of GO bonds, $9 billion of which will be used to develop the high-speed rail system. Prop 1A bond proceeds currently fund the environmental, planning, engineering, and administrative operations of the Authority and also will contribute to the construction of the high-speed rail system and real property and equipment acquisition. As discussed above, SB 1029, passed by the California Legislature and signed by Governor Brown in July 2012, appropriated Federal and State funding including the $2.6 billion of Proposition 1A bond funds that are the subject of this Funding Plan for construction in the Central Valley.

The remaining $950 million authorized under Prop 1A is allocated for capital improvements to commuter and intercity rail lines. This portion of Prop 1A bond proceeds may be used for connectivity, preliminary engineering, right-of-way acquisition, and the construction of tracks, structures, power systems, and stations. Additionally, rolling stock and related equipment, as well as other capital-related facilities and equipment, may be purchased with these bond funds for those systems. SB 1029 also appropriated the rest of these funds for statewide rail modernization and they have been put into use by local project sponsors.

In addition, Prop 1A stipulates that bond proceeds may not be used for more than 50 percent of the total cost of construction of each corridor or usable segment of the system.

On an ongoing basis, the Authority works with the Department of Finance to develop cash flow projections for the Authority's funding needs. The Authority completes a biannual bond survey that is submitted to the Department of Finance to identify its needs for bond proceeds for the next five fiscal years.

The Department of Finance includes the Authority's information as part of its cash flow projections for all state GO bonds, which are submitted to the State Treasurer's Office (STO). The Proposition 1A bonds are sold as part of a combined issuance of State GO bonds for a variety of voter-approved purposes.

Anticipated Timing - Bond Funds

Prop 1A Bond funds will be used for pay-go funding of construction contracts. The Authority's cash flow needs are projected on a quarterly basis which allow it to plan for forthcoming expenditures. The

Authority will work with Department of Finance and the STO to coordinate bond sales in order to provide adequate and timely funding for active projects. This follows the process that the State uses to sell GO bonds for infrastructure projects.

Cap-and-Trade Proceeds

The Legislature appropriated 25% of the annual auction proceeds of the Cap-and-Trade Program for the high-speed rail program, which are deposited in the Greenhouse Gas Reduction Fund (GGRF). Due to the nature of the Program, the annual auction proceeds are variable and may impact the Authority's funding stream but for planning purposes we use an average annual amount to account for that variation.

In June 2005, Governor Schwarzenegger issued an executive order to set a greenhouse gas (GHG) reduction target of 80% below 1990 levels by 2050. In 2006, Governor Schwarzenegger signed into law the California Global Warming Solutions Act of 2006 (Assembly Bill (AB) 32) which committed California to reducing its GHG emissions to 1990 levels by 2020.

The California Air Resources Board (ARB) was charged with developing a market-based strategy to reach these goals. To plan strategies for reducing emissions, ARB develops a Scoping Plan, which is updated on a five-year basis. In the Scoping Plan, ARB developed the Cap-and-Trade Program as the centerpiece of its GHG reduction strategy and created a market for GHG emissions that covers roughly 85% of the GHG emissions in the State. In addition, ARB identified several complimentary measures that will reduce GHG emissions from California's major economic sectors that are not directly covered under the Cap-and-Trade Program.

The Cap-and-Trade Program develops caps for annual emissions and then auctions emissions allowances to businesses covered by the cap. These auctions generate revenues that are then deposited in the GGRF and are used for a variety of programs aimed at reducing emissions. On June 20, 2014, the Governor signed the Budget Act of 2014 (SB 852 and SB 862), which included an appropriation of proceeds from the State's Cap-and-Trade Program to various programs and projects that will reduce greenhouse gas emissions in furtherance and accordance with AB 32. Specifically, SB 852 appropriated $872 million in Cap-and-Trade auction proceeds from the GGRF in Fiscal Year (FY) 2014-15, with $250 million going to the high-speed rail project. SB 862 also directed a $400 million loan repayment to the Authority based on the project's financial needs. These one-time appropriations are further augmented by SB 862, known as the Cap-and-Trade Expenditure Plan (Plan), which established a programmatic structure for the continuous appropriation of annual Cap-and-Trade proceeds from the GGRF including 25% of all proceeds for the high-speed rail program. In making the continuous appropriation, the Legislature determined that these funds could be used to pay for planning and construction costs for the Phase 1 Blended System and/or to repay loans made to the Authority.

On September 8, 2016, Governor Brown signed Senate Bill 32 (SB 32) which required the state to cut emissions at least 40 percent below 1990 levels by 2030 as an interim goal on the way to achieving the original reduction goal set out in the 2005 Executive Order and as part of the State's compliance with

the Paris Agreement to reduce emissions by 2050. ARB will decide on the best strategies for the state to meet this new target.

Anticipated Time of Receipt – Cap-and-Trade

Annual Cap-and-Trade proceeds received during the construction period will be used directly for construction activities on a pay-go basis. This will allow the maximum amount of funding to be contributed directly to project costs during this time. The Authority receives its allocation of receipts on a quarterly basis.

In FY 2015-16, the first year of the continuous appropriation, the Authority received $457 million in Cap-and-Trade proceeds. The cash balance as of November 1, 2016 in the Authority's portion of the GGRF stands at $874 million.[3] The 2016 Business Plan estimates that on average the Authority will receive $500 million of Cap-and-Trade proceeds per year. At that rate, by FY2018-19, the Authority will receive the necessary funds to complete the test track.

Federal Funding

The Passenger Rail Investment and Improvement Act of 2008 (PRIIA) established the framework for the national high-speed rail and intercity passenger rail programs. In February 2009, President Obama signed the American Recovery and Reinvestment Act (ARRA) of 2009. Using PRIIA as a framework, Congress appropriated through ARRA an investment of $8 billion for new high-speed and intercity passenger rail grants. Congress continued to build upon this ARRA funding by making available through annual appropriations in FY 2010 an additional $2.1 billion for high-speed and inter-city rail across the country, bringing the total program funding to $10.1 billion. California's program has received $3.48 billion or 34 percent of these federal funds. Of this amount, approximately $2.97 billion is committed to construction in the Central Valley. These funds are governed by the Authority's grant agreements with the Federal Railroad Administration (FRA), which were recently amended to better match the program's current status.

Anticipated Time of Receipt – Federal Funding

The ARRA and FY 2010 funds have been awarded and appropriated, making them available for project expenditures. The FRA agreed to provide the State with payments consistent with a Funding Contribution Plan described in the ARRA Grant Agreement, where such payment may temporarily exceed the State's contributory matching fund percentage. The State remains responsible for ensuring that the matching contribution at project completion is not less than the contributory matching fund percentage agreed to in the Grant Agreement. The current arrangement anticipates using ARRA funds first then matching with state funds. FY 2010 funds will then be used for project completion.

[3] The Cap-and-Trade balance includes $400 million that is available to the Authority pursuant to Health and Safety Code 39719.1.

C. Projected Ridership and Operating Revenue

Streets and Highways Code section 2704.08, subdivision (d)(1)(C) specifies inclusion of a projected ridership and operating revenue report.

The Authority plans to operate trains on the Valley to Valley Line after completing the testing and commissioning process on the test track. The Authority is not planning to run stand-alone service on the Central Valley Segment.[4]

San Joaquin Service Overview

The Amtrak San Joaquin service runs between the San Joaquin Valley, Sacramento, and the Bay Area. The San Joaquin service runs through the following counties: Sacramento, Contra Costa, Alameda, San Joaquin, Stanislaus, Merced, Madera, Fresno, Kings, Tulare, and Kern; with approximately eight million residents total.

The Amtrak San Joaquin service currently operates seven daily roundtrip trains (with the seventh added in June of 2016), with five running between Oakland and Bakersfield and two between Sacramento and Bakersfield. The San Joaquin service is the fifth busiest intercity passenger rail service in the nation, with nearly 1.2 million passengers a year.

From Bakersfield to Oakland, the San Joaquin service includes thirteen stops (315 miles) and from Bakersfield to Sacramento the service includes ten stops (282 miles). The minimum scheduled running time between Oakland and Bakersfield is currently six hours and five minutes with an average speed of 52 mph. Between Sacramento and Bakersfield, the minimum running time is currently five hours and ten minutes with an average speed of 55 mph. Maximum speed for the service is 79 mph.

Amtrak Thruway buses connect passengers from Bakersfield to Southern California destinations, from Stockton to Sacramento, and from Emeryville to San Francisco. Additional Amtrak Thruway buses are

[4] The Authority's 2016 Business Plan and its associated technical reports include extensive analysis of the ridership and revenue forecasts on the Valley to Valley Line. These documents can be found here:

http://hsr.ca.gov/About/Business_Plans/2016_Business_Plan.html

Additionally, further technical information on the Authority's ridership and revenue forecasts is available on the Authority website here:

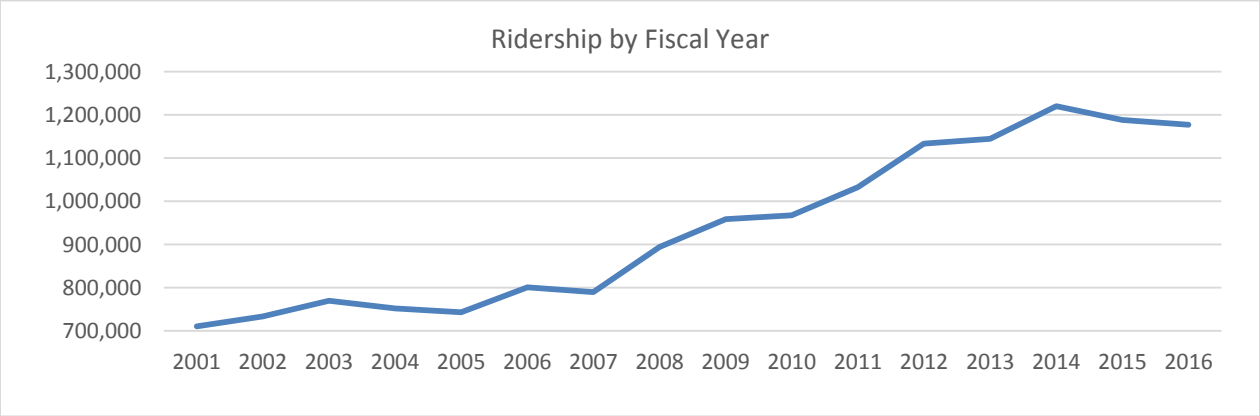
http://hsr.ca.gov/About/ridership_and_revenue.html

available at Oakland, Martinez, Merced and Hanford for other destinations around the state. Nearly 45% of passengers used the Amtrak Thruway bus service on one end of their travel.

Ridership and Operating Revenue

Ridership and operating revenue on the San Joaquin service has increased dramatically over the past 15 years. As **Exhibit C-1** indicates, ridership has increased 66% since 2000 and 47% since 2006.

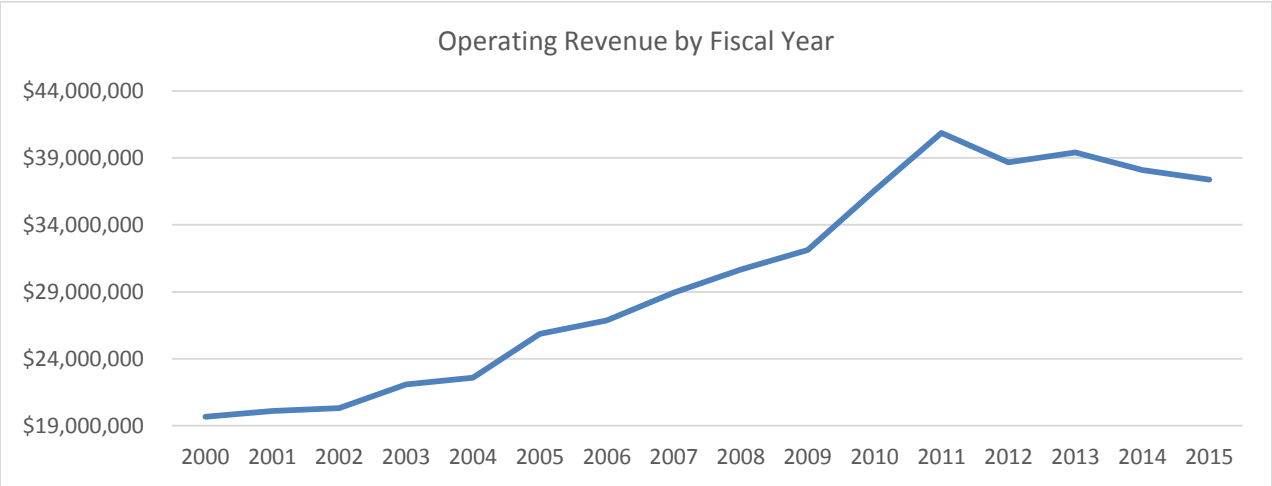
Exhibit C-1. San Joaquin Ridership



Note: Data is from several sources and includes slight difference in fiscal year definitions.

Operating revenues show a similar trend since 2000, with revenue increasing 90% since 2000 and 44% since 2006.

Exhibit C-2. San Joaquin Operating Revenue



Note: Data is from several sources and includes slight difference in fiscal year definitions.

Future Growth and Opportunity to Operate on High-Speed Rail Infrastructure

Only short-term projections are available for the San Joaquin service. Based on the San Joaquin Joint Powers Authority (SJJPA) 2016 Business Plan, Amtrak projects that for Federal FY'17 ridership will be 1.25 million (a six percent increase from their forecast for Federal FY'16) and operating revenue will be $41 million (a one percent increase from their forecast for Federal FY'16).

The SJJPA is also currently working with the State to secure funding for capital improvements and operating funds for an 8th daily roundtrip trip (potentially a mid-corridor start and end) that would increase ridership and revenue. There is also strong potential for additional service to Sacramento, depending on time of day, according to the SJJPA 2016 Business Plan.

Once the high-speed rail infrastructure is completed and if it is available for an extended period of time beyond testing of high-speed trains, the Authority will explore options for how best to put the infrastructure into service. One such option would be to transfer the San Joaquin service from the existing BNSF line to run on that new infrastructure. The newly built line would allow for faster speeds, decreasing the end to end run time by as much as 45 minutes. Faster service would improve the attractiveness of the service, increasing both ridership and operating revenue. The additional revenue that this could generate would reduce the amount of needed operating subsidy by Caltrans.

D. Projected Construction Cost

Streets and Highways Code section 2704.08, subdivision (d)(1)(D) requires inclusion of a construction cost projection including estimates of cost escalation during construction and appropriate reserves for contingencies.

The cost to complete the Central Valley segment and prepare the track for system testing is **$7.813 billion** in YOE$. This is equivalent to $7.395 billion in 2015$. Out of this amount, $1.434 billion has been spent through FY15/16 and $6.379 billion in (YOE $) remains. The capital costs include escalation which adds **$418 million** to the cost. Contingencies in the estimate include both allocated and unallocated contingency. The allocated and unallocated contingencies add up to **$923 million**.

As with any major construction project, capital cost projections are updated as the project progresses. Changes within the various line items to the capital cost projections for the portions of the Central Valley segment that are part of the grant agreement are updated quarterly and reported to the FRA as a requirement of the ARRA and FY10 grant agreements. Overall systemwide capital costs are updated through biannual Business Plans.

As described above, although not necessary for this Funding Plan and Usable Segment and as part of the Valley to Valley Line, the Authority plans to use funds appropriated in SB 862 or to submit a separate Funding Plan that would request Prop 1A funds to expand the system further and/or purchase the trains to begin service. The 2016 Business Plan estimates that the initial order of 16 trainsets will cost $865 million.

Capital Cost Approach and Methodology

The capital cost estimate is a Class 3 estimate as defined by the Association for the Advancement of Cost Engineering. Class 3 estimates are typically prepared to form the basis for budget authorization, appropriation, and/or funding. As such, they provide the initial control estimate against which actual costs and resources are monitored. The level of engineering ranges from 10% to 40% complete and typically includes: horizontal and vertical alignments, typical cross sections, preliminary roadway and structure design, preliminary assessment of utility impacts, preliminary identification of systems facilities, development of environmental footprints and right-of-way requirements and initial constructability reviews. Further detailed information on the cost estimating process is located at: http://hsr.ca.gov/docs/about/business_plans/2016_Business_Plan_Basis_of_Estimate.pdf

The methodology used for generating the capital cost estimate is consistent with FRA guidelines for estimating capital costs. The FRA guidance enables FRA-funded projects to develop budget baselines that summarize to the Standard Cost Category (SCC). Where the level of design did not support quantity

measurements, parametric estimating techniques were utilized. Parametric estimating techniques utilize historical data and other industry published materials to develop unit pricing for similar work scope. The methodology includes:

Historical Bid Price Method: Historical bid prices are typically used to develop costs for common construction elements. When using this method, the time of bid and conditions of the historical project used for pricing is taken into account and factors applied as needed

Unit Cost Analysis Method: The estimated unit cost analysis method is typically used to develop costs for complex construction elements including but not limited to viaducts, retained earth systems, tunneling and underground structures. This method allows for unit costs to be developed based on current local construction and market conditions, such as changes which might affect productivity or the cost of labor or materials

Contractor Mark Ups: Contractor margin is added on top of the fully burdened direct construction cost to have a complete in place cost. This approach is based on the contractor's field staffing which includes indirect costs such as office spaces, field consumables, bonds, insurance, and contractor's home office overhead and margin.

Quantity Take Offs: The development of construction costs for each construction activity was identified and quantified from the preliminary design documents developed by the Authority and its consultants. The task of material quantity takeoffs involved preparation of estimated quantities either by direct measurement and calculation of construction elements that are shown in design drawings, sketches, electronically calculated from Computer-Aided Design and Drafting files, or established as an allowance quantity based on professional experience and judgment

Allocated and Unallocated Contingencies: Contingency is typically added to a particular item or group of items by the use of percentage multipliers. Contingency is generally greatest for the early stage of project development and decreases with advancement in the level of engineering design and pricing detail. During the preliminary design of the high-speed rail project, the limited level of design information that is available requires the use of contingency allowances that are allocated against specific construction or procurement cost categories. The percentage selected for a given cost category are generally based on level of definition of the scope of work involved and substantiated by professional judgment and experience relative to level of uncertainty and historical cost variability typically seen for work within a particular cost category.

For the purposes of this estimating program, contingency is divided into two major categories – allocated and unallocated. Additionally, the specific contract contingencies approved by the Board for each construction contract are included as part of the allocated contingency. These contingencies were set based on a risk management approach that quantified the risks involved in each contract based on Monte Carlo simulations. Reporting against the contingencies is provided monthly through the Board's

Finance and Audit Committee.

Allowances and Other Costs: Inclusion of allowances to account for environmental clearance (which have been achieved and are included in the amounts spent to date), temporary facilities, and right of way costs.

Program Management and Implementation: Program implementation costs are included to represent the costs of engineering, project and construction management, contract administration, permits and fees, and training/start-up/testing. These add-on costs are calculated as a percentage of construction costs including allocated contingency (applied individually and not cumulatively and excluding right-of-way costs) and presented under the Professional Services cost category in the estimate.

Capital Cost Estimates by SCC

The cost estimate has been broken out into ten cost categories consistent with the SCCs. **Exhibit D-1** below provides the capital cost estimate for the segment by cost category, including everything necessary to complete the Central Valley segment. This estimate was created specifically for purposes of this Funding Plan and reflects the precise scope described here.[5]

Exhibit D-1 – Central Valley Segment Capital Cost by Category[6]

Capital Costs	Cost to Complete		Expended Through FY15/16	Total Capital Cost
	(2015 $)	(YOE $)	(YOE $)	(YOE $)
10 TRACK STRUCTURES & TRACK	1,228	1,305	202	1,507
20 STATIONS, TERMINALS, INTERMODAL	137	145	4	148
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	106	118	-	118
40 SITEWORK, RIGHT OF WAY, LAND, EXISTING IMPROVEMENTS	1,619	1,750	798	2,549
50 COMMUNICATIONS & SIGNALING	292	309	-	309
60 ELECTRIC TRACTION	512	540	-	540
70 VEHICLES	-	-	-	-
80 PROFESSIONAL SERVICES	1,191	1,289	431	1,720
Subtotal	5,087	5,456	1,434	6,890
Total Contingency	874	923	-	923
Central Valley Segment Total	**5,961**	**6,379**	**1,434**	**7,813**

Note: Totals may not sum due to rounding.

[5] This is a different summary of the cost estimates than what was included in the Business Plan since the scope and costs were built up in a different manner.

[6] Does not include already-expended project development costs (e.g. environmental clearance).

All the physical elements contemplated in this Funding Plan related to electric high-speed trains running, including for testing, on the Central Valley segment (*e.g.,* electrification equipment, etc.) are not necessary for San Joaquin service to operate. Without those elements, the total cost of the Central Valley segment would be $6.69 billion.

E. Material Changes

Streets and Highways Code section 2704.08, subdivision (d)(1)(E) requires inclusion of a report describing any material changes from the plan submitted pursuant to subdivision (c) for this corridor or usable segment thereof.

The Authority has continued to advance the program on all fronts since the release of the 2011 Funding Plan including in the areas of construction, environmental clearance, right-of-way acquisition, construction, funding, risk management and business model. This section discusses the changes between this Funding Plan and the Funding Plan submitted pursuant to S&H Code section 2704.08 subdivision (c) in November 2011.

Changes since the 2011 Funding Plan

Usable Segment

The Funding Plan submitted in November 2011 described two Usable Segments. The two Usable Segments described in the 2011 Funding Plan stretched from Merced to the San Fernando Valley and from San Jose and Merced to Bakersfield. Their descriptions as Usable Segments were aligned to the Draft 2012 Business Plan. This Funding Plan has updated the Usable Segment to more closely align with the Legislature's appropriation and guidance and the staging of the development of the entire Valley to Valley Line as described in the 2016 Business Plan. This Usable Segment also aligns with the construction that is currently underway in the Central Valley. This Usable Segment was included as part of both of the Usable Segments in the 2011 Funding Plan.

Funding and Appropriation

Subsequent to the release of the 2011 Funding Plan, SB1029 was approved by the Legislature and signed into law by Governor Brown on July 6, 2012. SB 1029 included the appropriation of the necessary Federal and State funding to begin construction and to match the Federal funds and the Prop 1A funds.

As discussed in **Section B** of this Funding Plan, in 2014, the Legislature approved SB 862, which continuously appropriated 25 percent of funds from the GGRF for the high-speed rail program. Additionally, the Authority received $250 million in FY 2014-15 and $400 million was made available starting in FY 2015-16. This provides the Authority with a continuous funding source for future sections of the project. For additional information, see **Section B** of this Funding Plan.

Construction Cost Projections

The 2011 Funding Plan included a construction estimate of $6.0 billion, inclusive of $150 million for pre-construction activities and right of way acquisition. The 2011 Funding Plan only contemplated the construction of civil works and track within the $6.0 billion cost estimate. However, this Funding Plan incorporates the full complement of civil works, track, infrastructure, systems, power, heavy maintenance facility and stations that will provide a fully operational segment. The capital cost estimate for this entire scope of work is $7.813 billion. This cost estimate has been revised to include up-to-date information from the executed contracts for CP 1, CP 2-3 and CP-4 infrastructure that will enable the segment to be ready for high-speed train system testing. Further information relating to the construction cost estimate can be found in **Section D** of this Funding Plan.

Business Model and Contracts

The Authority has executed the contracts for CP 1, CP 2-3 and CP 4 with bids coming in under engineer's estimates. See **Section F** of this Funding Plan for further information on these construction contracts and the business model.

Environmental Approvals

In order to proceed to construction, the Authority has completed all project-level environmental documents for this segment. These documents are as follows:

1. In September 2012 the FRA issued a Record of Decision (ROD) approving the "Hybrid Alternative" alignment for the Merced to Fresno project section, which was selected by the Authority's Board of Directors in May 2012. The Final EIR/EIS for the Merced to Fresno project section, which further describes the Hybrid Alternative, is available at: http://www.hsr.ca.gov/Programs/Environmental_Planning/final_merced_fresno.html

2. In June 2014 the FRA issued a ROD approving the alignment for the Fresno to Bakersfield project section, which was selected by the Authority's Board of Directors in May 2014. The Final EIR/EIS for the Fresno to Bakersfield project section is available at: http://www.hsr.ca.gov/Programs/Environmental_Planning/final_fresno_bakersfield.html

Risk Management Program

Since the 2011 Funding Plan was adopted, the Authority has implemented a robust Risk Management Program that uses state-of-the-practice risk management tools and analyses (such as Monte Carlo simulations) in order to flag early warning signs associated with potential risks related to construction and operation of high-speed rail service. These analyses are used to facilitate and drive prudent and timely risk response actions before program cost and schedule have the potential to be impacted.

- The Risk Management Program has a direct reporting relationship established with the Board Finance and Audit Committee. This direct reporting enables daylighting to the risk management approach and encourages informed decisions.
- Pre-bid schedule and cost risk analyses have been undertaken for each of the CPs. The identification of major risks and contingency recommendations in these pre-bid analyses were validated by the eventual contractor's scope and schedules.
- The risk management team is assisting other teams within the program in making significant decisions using a data-driven analysis approach. For example, the probabilistic analysis performed on the containment of railroad intrusion protection barrier walls provided us, the FRA, and adjacent railroads an additional mechanism to make informed decisions.
- Through ongoing efforts, various trends have been identified, both positive and negative, to the program cost and schedule milestones.
- The risk management team is working in concert with all parties involved in the delivery of the program to identify and implement risk mitigation strategies and potential savings such as alternative design and construction approaches.
- Lessons learned are being applied from early CPs to better quantify the uncertainties related to schedules and costs and improve the underlying risk analyses for future CPs and the program.

As discussed in the 2016 Business Plan, we have developed and implemented a risk management plan and a quality management system that are designed to manage and mitigate risks and to ensure that the high-speed rail program meets or exceeds acceptable industry and government standards. For more information on risk management refer to the 2016 Business Plan:
http://www.hsr.ca.gov/docs/about/business_plans/2016_BusinessPlan.pdf

F. Terms and Conditions of Agreements

Streets and Highways Code section 2704.08, subdivision (d)(1)(F) requires a description of the terms and conditions associated with any agreement proposed to be entered into by the authority and any other party for the construction or operation of passenger train service along the corridor or usable segment thereof.

The 2016 Business Plan describes the Authority's business model, construction contracts, funding agreements, and the anticipated roles of various parties in the development of the California High-Speed Rail program, including for the Central Valley segment. This section of the Funding Plan includes both details of the existing agreements and contracts as well as a subsection on the overall business model.

The Authority has moved forward with a range of agreements necessary for construction of the segment. This section describes the funding agreements between the Authority and its federal funding and oversight partners; construction agreements (both executed and planned); and other agreements anticipated for delivery of the other elements of the Central Valley segment as part of the Valley to Valley Line (although contractually, these elements would not depend upon the Valley to Valley Line).

Funding Agreements

The Authority has entered into agreements with the FRA (FRA Agreements) in connection with the two federal grants that the Authority has been awarded. **Exhibit F-1** describes key elements and terms of the FRA Agreements (ARRA Agreement, Amendment 6 and FY 10 Agreement).

Exhibit F-1. FRA Grant/Cooperative Agreements – Key Relevant Elements and Terms

Key Elements	Key Terms
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • US Department of Transportation, Federal Railroad Administration (FRA)
Agreements	• FR-HSR-0009-10-01-06 (ARRA Agreement, Amendment 6) • FR-HSR-0118-12-01-00 (FY 10 Agreement)

Key Elements	Key Terms
Performance Period	From 8/17/2010 to 12/31/2022 (ARRA) and from 12/16/2009 to 12/31/2022 (FY 10).
Total Funding Amount	**$3,481,176,231.00 total federal funds:** $2,552,556,231.00 from ARRA, and $928,620,000.00 from FY 10 programs
Scope of Project	• As used in the FRA Agreements, the term "Project" refers to the overall effort identified in Section 8 of the ARRA Grant/Cooperative Agreement and as that term is defined in Subsection 1(h) of Attachment 2. (ARRA Agreement, Attachment 2, General Provisions) • The ARRA Agreement Statement of Work, Attachment 3 incorporates Tasks 1-4 which define preliminary engineering and environmental work and pre-construction activities for seven Phase 1 sections, as well as project administration and indirect costs. • The ARRA Agreement Statement of Work, Attachment 3 also incorporates Tasks 5- 10 which defines activities for construction of the Initial Central Valley Section including: (5) Program, Project, and Construction Management; (6) Real Property Acquisition and Environmental Mitigation; (7) Early Work Program; (8) Final Design and Construction Contract Work; (9) Interim Use Project Reserve; and (10) Unallocated Contingency. Note: Task 7 is no longer applicable.

Key Elements	Key Terms
Delivery Responsibilities	The Grantee (the Authority) is responsible for furnishing all personnel, facilities, equipment, and other materials and services (except as otherwise specified in the agreement) necessary to perform the Project, as set forth in the Statement of Work (Attachment 3), and any supplements thereto *(ARRA Agreement, Attachment 1 Section 2. Scope, and Attachment 3)* The FRA will provide, on an "as available" basis, one professional staff person, to be designated as the Grant Manager, to review work or work products in progress, and arrange for the review of the Project results upon completion. Since the award was made as a cooperative agreement, FRA has substantial programmatic involvement. Substantial involvement means that, after award, technical, administrative, or FRA programmatic staff will assist, guide, coordinate, or otherwise participate in Project activities. *(Attachment 1, Section 3. Awarding Agency Participation)*
Payments	The ARRA agreement includes three payment provisions – reimbursement basis, advanced payment and working capital advance as defined in Attachments 1 and 2, Section 7 - Payments. Upon receipt of a payment request and adequate accompanying information (invoices in accordance with applicable cost principles), FRA will authorize payment to the Authority providing the Authority: (i) is complying with its obligations under the Agreement, (ii) has satisfied FRA that it needs the requested Federal funds during the requisition period, and (iii) is making adequate and timely progress toward Project completion. If all of these circumstances are present, FRA may pay allowable costs incurred consistent with the detailed Project Budget.
Environmental Responsibilities	Under Task 1 and working collaboratively with FRA, the Authority is responsible for preparing the environmental analysis and documentation for each Project Section necessary to comply with the National Environmental Policy Act (NEPA), and other associated Federal environmental laws including, but not limited to, Section 106 of the National Historic Preservation Act, Section 4(f) of the Department of Transportation Act, Section 7 of the Endangered Species Act, and the General Conformity requirements of the Clean Air Act. The Authority is also responsible for complying with state laws as applicable that may

Key Elements	Key Terms
	include the California Environmental Quality Act. FRA is the lead Federal agency responsible for NEPA compliance and the Authority is the lead state agency responsible with complying with all applicable state environmental laws. The Authority and FRA are jointly responsible for ensuring that the environmental review process is being conducted in accordance with relevant environmental laws. As part of the environmental review process, the Authority maintains all documents developed or received by the Authority that support agency decision making and makes them available to FRA upon request. In addition, the Authority has agreed to additional detailed provisions about how the work will be conducted with respect to its environmental responsibilities for the Project. *(Task 1 Environmental Review – Attachment 3, p 42)*
Reporting Responsibilities	The Authority's reporting responsibilities are found in Attachment 1, Section 11 – 12, Attachment 1B, Section 6 (ARRA Agreement, including progress reports, quarterly reports, and interim or final reports.)
Certification Responsibilities	The following are among the certification responsibilities imposed upon the Authority (or other agencies of the State of California, in some cases) under the provisions of American Recovery and Reinvestment Act of 2009 Clauses *(Grant/Cooperative Agreement, Attachment 1B)*: a. Maintenance of Effort Certification (Recovery Act Section 1201) b. Responsible Investments Certification (Recovery Act Section 1511) c. Appropriate Use of Funds Certification (Recovery Act Section 1607)
Governance Responsibilities	The Grant/Cooperative Agreement incorporates federal governing regulations. The Authority acknowledges that its performance shall be governed by and in compliance with the following Administrative and Cost Principles for State, Local and/or Tribal Governmental Entities: 1. 49 C.F.R. Part 18, "Uniform Administrative Requirements for Grants and Cooperative Agreements to State and Local Governments" 2. OMB Circular A-87, "Cost Principles for State and Local

Key Elements	Key Terms
	Governments," as amended.
Other Responsibilities	The Grantee shall comply with the Buy America provisions set forth in 49 U.S.C. §24405(a) for the Project requiring the use of steel, iron, and manufactured goods produced in the United States, in accordance with the conditions therein set forth. *(Attachment 1, Section 17. Buy America)* The Project also shall comply with various prevailing wage requirements. *(Section 16. Davis- Bacon Act Provisions)* To the extent applicable, the Authority agreed to comply with any Federal regulations, laws, or policy and other guidance that FRA or the United States Department of Transportation may issue pertaining to safety oversight in general, and in the performance of the Agreement, in particular. *(Section 18. Safety Oversight)* The Authority agreed to comply with all civil rights laws and regulations, in accordance with applicable Federal directives, except to the extent that the FRA determines otherwise in writing. *(Section 19. Civil Rights)*

Sources: ARRA Grant Agreement, No. FR-HSR-0009-10-01-06 (Amendment 6) and FY 10 Grant Agreement, No. FR-HSR-0118-12-01-00

As described in **Section A**, the Central Valley segment is being delivered through a series of agreements, commencing with multiple CPs summarized in **Section A** (See **Exhibit A-2**. Central Valley Segment – Planned Elements).

CP 1 is being delivered under a design-build (DB) model. See **Exhibit F-2** for key elements and terms of the Design-Build Construction Agreement for CP 1.

Exhibit F-2. Design-Build Construction Agreement for CP 1

Key Elements	Key Terms
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • Tutor-Perini/Zachry/Parsons, a joint venture, comprised of Tutor Perini Corporation, Zachry Construction Corporation and Parsons Transportation Group (a wholly owned subsidiary of Parsons Corporation)

Key Elements	Key Terms
Agreement Number	HSR 13-06 (CP 1)
Purpose of Agreement	Design-build construction
Performance Period	2013 to 2019
Total Contract Price	Current Contract price is $1,289,509,211, which consists of base bid of $969,988,000 + $53,000,000 provisional sums + $266,521,211 in current change orders (CO). This CO amount includes the $153,399,844 CO for the north extension and $49,900,000 for the 17-month time extension. The change order for acceleration in the amount of $13,612,000 has not been executed yet. *(Attachment B, p. 8 of 99 in Signature Document)*
Scope of Projects	The scope of CP 1 consists of civil works for the at-grade and aerial track sections over a 32-mile section from Avenue 19 near the Madera Amtrak Station in Madera County to East American Avenue in Fresno County. It includes 20 grade separations, 2 viaducts, 1 tunnel and a bridge river crossing over the San Joaquin River. Major design and construction elements for CP 1 include the following areas: • Surveys, Mapping and Geotechnical Studies • Site Clearing, Demolition and Removal of Hazardous Materials • Utility and Third Party Relocation • Railroad Relocation • Scheduling and Coordination • Grading, Embankment and Drainage • Structure Construction and Foundation Work • Environmental Compliance and Mitigation • Paving, Re-striping, Landscaping and Traffic Signals
Davis-Bacon Act	Compliance required *(Attachment H)*
Buy America	Compliance required *(Attachment J)*
Conditions of Payment	Pursuant to Invoicing and Payment Clauses of General Provisions for State Contracts and the Prompt Payment Act

Key Elements	Key Terms
Payment Bonds	100 percent of the Total Contract Price *(Attachment E, pg. 12 of 99 in Signature Document)*
Performance Bonds	50 Percent of the Total Contract Price (*Attachment F, pg. 24 of 99 in Signature Document)*
Guaranty	Parsons Corporation (Parent company of Parsons Transportation Group, a member of the Joint Venture) *(Attachment G, pg. 37 of 99 in Signature Document)*
Liquidated Damages	Cap on Liquidated Damages is 10% of the Total Contract Price (or $128,950,321) *(Attachment B, page 8 of 99 in Signature Document)*
Small Business Participation	The Authority has established a 30 percent goal for Small Business participation, which includes goals of 10 percent for Disadvantaged Business Enterprises (DBE) and 3 percent for Disabled Veteran Business Enterprises (DVBE). Small Business participation on CP 1 includes 30-plus small businesses, or DBE/DVBE firms, working on the project. *(Fact Sheet)*
Disputes	The Contract provides for the establishment and operation of a Disputes Resolution Board (DRB) to assist in resolving disputes and claims among Authority, Contractor, and others in respect to the Project. *(Attachment I, pg. 91 of 99 in Signature Document)* If the Parties cannot resolve claims informally or through the DRB process, then either Party has the right to bring unresolved claims where the amount in controversy exceeds $1,000,000 to mandatory binding arbitration.

For more information on CP 1 please refer to:
http://www.hsr.ca.gov/Programs/Construction/about_construction_package_1.html

CP 2-3 is being delivered under a DB model. See **Exhibit F-3** for key elements and terms of the Design-Build Construction Agreement for CP 2-3.

Exhibit F-3. Design-Build Construction Agreement for CP 2-3

Key Elements	Key Terms

Key Elements	Key Terms
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • Dragados/Flatiron, a joint venture, comprised of Dragados USA, Inc. and Flatiron West, Inc.
Agreement Number	HSR 13-57 (CP 2-3)
Purpose of Agreement	Design-build construction
Performance Period	2015 to 2019
Total Contract Price	$1,365,335,890 (includes Fixed Bid Price of $1,205,335,890 and Total Provisional Sums of $160,000,000, Hazardous Waste Remediation in the amount of $29,232,000 is authorized for change orders. Presently, there is $6,167,929 in executed change orders) *(Attachment B, pg. 7 of 186 in Signature Document)*
Scope of Projects	The scope of CP 2-3 consists of design and construction of civil works for a 65-mile section from the terminus of CP 1 at East American Avenue in Fresno to approximately one mile north of the Tulare-Kern County line. Major work elements include the design and construction of at-grade, retained fill and aerial sections of high-speed rail and will be performed in the following areas: • *Project Management, Scheduling, Investigation and Coordination* • *Geotechnical Engineering and Seismology Studies and Surveys* • *Surveys, Mapping and Investigations,* • *Clearing and Demolition of ROW* • *Utility and Third Party Relocation, Including Railroads* • *Environmental Compliance and Mitigation* • *Grading, Embankment and Drainage* • *Structure Construction and Foundation Work* • *Paving, Re-striping, Landscaping and Traffic Signals* *(Fact Sheet, June 2014)*
Davis-Bacon Act	Compliance required *(Attachment H, pg. 67 of 186 in Signature Document)*

Key Elements	Key Terms
Buy America	Compliance required *(Attachment J, pg. 163 of 186 in Signature Document)*
Conditions of Payment	Pursuant to Invoicing and Payment Clause of General Provisions for State Contracts and Prompt Payment Act
Payment Bonds	100 percent of the Total Contract Price *(Attachment E, pg. 13 of 1869 in Signature Document)*
Performance Bonds	50 Percent of the Total Contract / Price (*Attachment F, pg. 17 of 186 in Signature Document)*
Guaranty	Dragados, S.A. (Parent company of Dragados USA, Inc., a member of the Joint Venture) and Flatiron Constructors, Inc. *(Attachment G, pg. 58 of 186 in Signature Document)*
Liquidated Damages	Cap on Liquidated Damages is 10% of the Total Contract Price (or $136,533,589) *(Attachment B, page 7 of 186 in Signature Document)*
Small Business Participation	The Authority has established a 30 percent goal for Small Business participation, which includes goals of 10 percent for DBEs and 3 percent for DVBEs. The Authority Board of Directors' decision is in accordance with agreements with the FRA that require the Authority to develop and implement a Small and Disadvantaged Business Enterprise Program to ensure that small businesses, including DBEs, have an opportunity to bid on the rail contracts and participate in construction of the project. *(Fact Sheet)*
Disputes	The Contract provides for the establishment and operation of a DRB to assist in resolving disputes and claims among Authority, Contractor, and others in respect to the Project. *(Attachment I, pg. 156 of 186 in Signature Document)* If the Parties cannot resolve claims informally or through the DRB process, then either Party has the right to bring unresolved claims to arbitration.
Fact Sheet	http://www.hsr.ca.gov/docs/programs/construction/CP2_3_factsheet_FINAL_061014.pdf

For more information on CP 2-3 please refer to:
http://www.hsr.ca.gov/Programs/Construction/about_construction_package_2_3.html

CP 4 is being delivered under a DB model. See **Exhibit F-4** for key elements and terms of the Design-Build Construction Agreement for CP 4.

Exhibit F-4. Design-Build Construction Agreement for CP 4

Key Elements	Key Terms
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • California Rail Builders is a special purpose entity of Ferrovial Agroman US Corp
Agreement Number	HSR 14-32 (CP 4)
Purpose of Agreement	Design-build construction
Performance Period	2016 to 2019
Total Contract Price	Contract Price: $337,247,000 + $107,000,000 provisional sums for a total contract price of $444,247,000. $10,310,000.00 is also authorized for hazardous waste remediation change orders. Executed change orders to date = $1,434,127 *(Executed Signature Document: Attachment B: Prices)*
Scope of Projects (from Scope of Work Package – Contract Requirements)	The scope of CP 4 consists of design and construction of civil works for approximately 22-miles through the Central Valley beginning one mile north of the Tulare-Kern County line at the southern terminus of CP 2-3 to Poplar Avenue. Major work includes but is not limited to the following: • Project management and administration • Utility Investigation, Coordination and Protection and Relocation • Demolition and Clearing of Right-of-Way • Code Assessment • Completing, Coordinating, Securing Approval and Executing Final Permitting and Utility Agreements • Survey and Mapping • Subsurface Investigations • Geotechnical Engineering and Seismology • Design, engineering and analysis • Estimating

Key Elements	Key Terms
	• Value Engineering and Possible Accepted Alternative Technical Concepts Coordination with Jurisdictional Authorities (i.e. governments, FRA, the California Public Utilities Commission, etc.) • Coordination with Adjacent Railroads (BNSF) • Coordination with Local Communities • Coordination with Adjacent High-Speed Rail Works
Davis-Bacon Act	Compliance required *(Attachment H: Signature Document)*
Buy America	Compliance required *(Attachment J: Signature Document)*
Conditions of Payment	Pursuant to Invoicing and Payment Clause of General Provisions for State Contracts
Payment Bonds	100 percent of the Total Contract Price *(Attachment E: Signature Document)*
Performance Bonds	50 Percent of the Total Contract Price *(Attachment F: Signature Document)*
Guaranty	Ferrovial Agroman, S.A. and Griffith Company *(Attachment G: Signature Document)*
Liquidated Damages	Cap on Liquidated Damages is 10% of the Total Contract Price (or $44,424,700) *(Attachment B: Signature Document)*
Small Business Participation	The Authority has established a 30 percent goal for Small Business participation, which includes goals of 10 percent for DBEs and 3 percent for DVBEs. The Authority Board of Directors' decision is in accordance with agreements with the FRA that require the Authority to develop and implement a Small and Disadvantaged Business Enterprise Program to ensure that small businesses, including DBEs, have an opportunity to bid on the rail contracts and participate in construction of the project. *(Fact Sheet)*
Disputes	The Contract provides for the establishment and operation of a DRB to assist in resolving disputes and claims among Authority, Contractor, and others in respect to the Project. (Attachment I: Signature Document)
About CP 4	http://www.hsr.ca.gov/Programs/Construction/about_construction_package_4.html

For more information on CP 4 please refer to:
http://www.hsr.ca.gov/Programs/Construction/about_construction_package_4.html

Delivery Model Overview

The rest of this section describes the Authority's business model and overall delivery approach based on the 2016 Business Plan. The delivery model underpins the lease and franchise agreements that the Authority plans to enter for the construction and operation of the system. The delivery model for the Valley to Valley Line was developed based on best practices and industry feedback. Key objectives include:

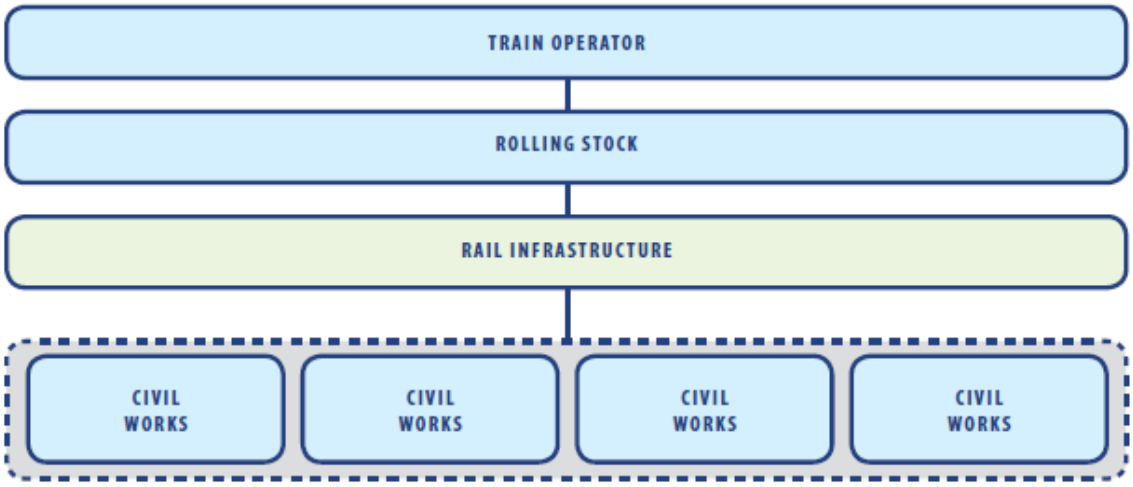
- Provide California citizens a highly safe, reliable and commercially successful system while reducing the cost of constructing and maintaining the system and transferring operations and asset performance responsibilities and related risks to the private sector.
- Designing, constructing and integrating complex component parts into a seamless, safe and commercially successful system. Work will be undertaken with two key private sector partners, a train operator and an infrastructure provider, to carefully manage technical and operational integration and connections between components and geographic segments to ensure efficiency and compatibility.

Through every stage of the process, the State will provide policy oversight and appropriately manage the program to ensure that the public's interests are served.

The delivery model consists of different strategies for delivering each of the major elements of a high-speed rail system – commercial and train operations, rolling stock, rail infrastructure (track, systems, and traction power), and construction of the civil works. Each element is unique and requires a delivery approach that is tailored to its characteristics and that, when combined, fit together into a commercially successful model. This subsection describes how our delivery model addresses each of these elements and the key tenets of each of the main contracts that the Authority plans to enter into.

The existing civil works contracts follow this delivery model and the remaining elements will be procured consistent with the approach laid out here. Details on the civil works contracts are included above.

Exhibit F-5. Delivery Model Structure



California High Speed Rail Operations

There will be one common operator for the entire system. While there are expected to be other users of joint system assets (for example in the Peninsula corridor), a single end-to-end operator will run the high-speed trains in California.

This operator will be procured early in the construction (Pre-Operations) phase under a flexible contract designed to support the maturing phases of the project. This will give the operator the opportunity to provide valuable input during the planning and development stages of the system that can increase asset performance and revenues while reducing costs. Key operating and cost risks will be transferred during the ramp-up phase and full revenue risk once revenues are proven. While the operator will be procured early, they will not begin to operate on the Central Valley segment until it is connected to a larger segment (i.e. the Valley to Valley Line) as described in other parts of this Funding Plan.

If the San Joaquin service will operate on the high-speed rail infrastructure, future agreements will describe the exact terms and conditions of that service's operations.

Rail Infrastructure (Track, Systems, Power)

Complex rail infrastructure elements, such as systems, track, traction power and overhead catenary should be compatible across the entire system and could be combined into a single procurement to enhance cost efficiency and reduce duplication and the number of integration points. Industry feedback was clear that the most integration and interface risk resides in the rail infrastructure components of a high-speed rail system. Through this contract, a major private sector company or consortium will be responsible for long-term rail infrastructure performance and integration with other elements of the system.

A single rail infrastructure provider will be procured under a long-term contract that could include financing. Feedback provided by industry indicated that there is strong opportunity to reduce construction and maintenance costs and improve performance through a model that uses large, integrated contracts combining construction and maintenance for several elements. The contract with the rail infrastructure provider will be on a long-term performance basis where payment deductions are incurred for failure to meet established objectives.

The initial procurement for the rail infrastructure will include the Central Valley segment as part of the Valley to Valley Line procurement and may include option pricing to extend the rail infrastructure to the rest of the Valley to Valley Line and the full Phase 1 build out. Providing the infrastructure for the Central Valley segment is not dependent on the rest of the Valley to Valley Line and could be delivered separately. The rail infrastructure provider will be a key long-term partner along with the operator and will be responsible for integrating the other elements of the high-speed rail system (rolling stock, civil works, facilities) such that the system works seamlessly both horizontally (across geographical segments) and vertically (between different elements). The infrastructure provider will be responsible for maintaining the underlying civil works across the system.

For further information relating to the procurement plan and the agreements for construction and operation of the system that the Authority plans to enter into please refer to the 2016 Business Plan: http://www.hsr.ca.gov/docs/about/business_plans/2016_BusinessPlan.pdf.

Appendix I – Source and Reference Documents

Source and Reference Documents
Air Resources Board, Summary Results Reports http://www.arb.ca.gov/cc/capandtrade/auction/auction.htm
Air Resources Board, California Post Auction Public Proceeds Report https://www.arb.ca.gov/cc/capandtrade/auction/aug-2016/ca_proceeds_report.pdf
Air Resources Board, Estimate of State-Auctioned Allowances, by Fiscal Year, December 2, 2012 http://www.arb.ca.gov/cc/capandtrade/stateauction.pdf
American Recovery and Reinvestment Act of 2009, Public Law 111-5 (February 17, 2009) http://www.gpo.gov/fdsys/pkg/PLAW-111publ5/pdf/PLAW-111publ5.pdf
Assembly Bill 32 (AB 32), Chapter 488, Approved by Governor on September 27, 2006. http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=200520060AB32
California High Speed Rail Authority, 2012 Business Plan http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2012_rpt.pdf
California High Speed Rail Authority, 2014 Business Plan http://www.hsr.ca.gov/docs/about/business_plans/BPlan_2014_Business_Plan_Final.pdf
California High Speed Rail Authority, 2016 Business Plan http://hsr.ca.gov/About/Business_Plans/2016_Business_Plan.html
California High-Speed Rail Authority, Resolution HSRA11-22 and Resolution HSRA11-23 of November 3, 2011 http://www.hsr.ca.gov/docs/brdmeetings/2011/November/brdmtg1111_agenda4_HSRA_1122.pdf **&** http://www.hsr.ca.gov/docs/brdmeetings/2011/November/brdmtg1111_agenda4_HSRA_1123.pdf
California High-Speed Train Program ARRA Grant, Grant/Cooperative Agreement No. FR-HSR-0009-10-01-06 (Amendment 6) http://www.hsr.ca.gov/docs/about/funding_finance/funding_agreements/HSRFRA_CooperativeGrantAgreement_Amendment6_051816_Redacted.pdf

Source and Reference Documents
California High-Speed Rail Authority, Funding Contribution Plan, for June 2016 quarter http://www.hsr.ca.gov/docs/about/funding_finance/funding_agreements/Q2_16_FCP_v4_3.pdf
California High-Speed Rail Authority, 2016 Business Plan Ridership and Revenue Technical Memorandum http://hsr.ca.gov/docs/about/business_plans/2016_Business_Plan_Ridersihp_Revenue_Forecast.pdf
CP 1 Information http://www.hsr.ca.gov/Programs/Construction/about_construction_package_1.html
CP 2-3 Information http://www.hsr.ca.gov/Programs/Construction/about_construction_package_2_3.html
CP 4 Information http://www.hsr.ca.gov/Programs/Construction/about_construction_package_4.html
Executive Order B-30-15, issued by Governor Brown on April 29, 2015 https://www.gov.ca.gov/news.php?id=18938
Final Environmental Impact Reports/Environmental Impact Statements (FEIR/EIS) for the Merced-Fresno section. http://www.hsr.ca.gov/Programs/Environmental_Planning/final_merced_fresno.html
Final Environmental Impact Reports/Environmental Impact Statements (FEIR/EIS) for the Fresno-Bakersfield sections. http://www.hsr.ca.gov/Programs/Environmental_Planning/final_fresno_bakersfield.html
Initial Central Valley Section: Madera County to Bakersfield (Kern County) of the California High-Speed Train Program FY 10 Grant, Grant/Cooperative Agreement No. FR-HSR-0118-12-01-00, November 18, 2011 http://www.hsr.ca.gov/docs/about/funding_finance/funding_agreements/FR-HSR-0118-12-01-00.pdf
Legislative Counsel Bureau, Opinion regarding high-speed rail project, June 8, 2012

Source and Reference Documents
Proposition 1A, the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century" (the Bond Act) ftp://www.leginfo.ca.gov/pub/07-08/bill/asm/ab_3001-3050/ab_3034_bill_20080826_chaptered.html
Safeguarding California, California Air Resources Board, updated implementation action plans by sector http://resources.ca.gov/docs/climate/Safeguarding%20California_Implementation%20Action%20Plans%202015%20(CNRA).pdf
Senate Bill 862 (SB 862), Chapter 36, Approved by Governor on June 20, 2014. http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201320140SB862
Senate Bill 1029 (SB 1029), Chapter 152, Approved by Governor on July 18, 2012. http://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120SB1029

Independent Financial Advisor Report
To California High-Speed Rail Authority Regarding:

Central Valley Segment Funding Plan

Project Finance Advisory Ltd. (PFAL)
December 8, 2016

PFAL Project Finance Advisory Ltd.

PFAL

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Key Terms and Definitions

AB 1889: Assembly Bill No. 1889, Stats. 2016, ch. 774

Authority: California High-Speed Rail Authority

DB: Design Build

FTA: Federal Transit Administration

Funding Plan: Central Valley Segment Funding Plan

High-Speed Train Operation: Authority high-speed train service as envisioned in the 2016 Business Plan and Ridership and Revenue Forecasting Technical Supporting Document to the 2016 Business Plan.

HSR: High-Speed Rail

OHLE: Overhead Line Equipment

Passenger Train Service: Conventional rail service such as San Joaquin service (operated by San Joaquin Joint Powers Authority) between Sacramento, Oakland, and Bakersfield

Phase 1: California High-Speed Rail Program Phase 1, as defined in 2016 Business Plan, from Los Angeles to San Francisco

Prop 1A: Proposition 1A, the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century, (added by Stats. 2008, ch. 267 (AB 3034)), codified at Streets and Highways Code 2704, et seq.

Report: Independent report pursuant to California Streets and Highways Code 2704.08(d)(2)

SB 1029: Senate Bill No. 1029 Budget Act of 2012

"**Operating and Maintenance Costs**," within the meaning of Streets and Highways Code section 2704.08, subdivision (d)(2)(D)) means: ongoing operating and maintenance costs, that is, the cost of running the trains and maintaining the infrastructure and rolling stock in a state of good repair. It does not include capital asset renewal (or lifecycle) costs, which is the cost of replacing or refurbishing worn out components at the end of their useful life.

“**The planned passenger service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy**” means: within a reasonable period of time after commencement of high-speed train operations on the usable segment, project revenues will reach an operating break-even point at which aggregate revenues up to that point in time equal Authority-borne operating and maintenance costs to that point in time and such revenues will continue to equal or exceed operating and maintenance costs thereafter.

“**Revenues**,” within the meaning of Streets and Highways Code section 2704.08, subdivision (d)(2)(D)) means: fare box revenues and ancillary revenues. Fare box revenue is income from ticket sales. Ancillary revenues include other income the Authority may receive from sources related to the everyday business operations of the high-speed rail, including but not limited to on-board sales (e.g., sales of foods or sundries), station-related revenues, advertising, and revenues from leases of excess or non-operating right-of-way parcels or areas, as well as areas above or below operating rights-of-way or of portions of property not currently being used as operating rights-of-way. Ancillary income does not include unexpected or “one time” events.

“**Suitable and ready for high-speed train operation**” means as stated in Assembly AB 1889 means: if the bond proceeds, as appropriated pursuant to Senate Bill 1029 of the 2011–12 Regular Session (Chapter 152 of the Statutes of 2012), are to be used for a capital cost for a project that would enable high-speed trains to operate immediately or after additional planned investments are made on the corridor or useable segment thereof and passenger train service providers will benefit from the project in the near-term.”

“Useable segment” means the 119 mile Central Valley segment from Madera to Poplar Avenue and includes stations at Fresno and Kings/Tulare.

Disclaimer

Project Finance Advisory Limited ("PFAL") has performed an independent review of the Central Valley segment Funding Plan ("Funding Plan") as required by the California Streets and Highways Code 2704.08(d)(2) and as described in PFAL's executed agreement with the California High-Speed Rail Authority ("Authority") dated December 2015. This independent review was performed using documents provided by the Authority (listed in the Bibliography and body of this Report) and developed using current accepted professional practices and procedures. PFAL, with the Authority's permission, has relied on the accuracy and completeness of the documents provided by the Authority. This Report does not serve as an accounting audit. Furthermore, this Report should not be relied on for any financing or investment decision. It is possible that there are other elements of risk associated with the Funding Plan beyond those presented. Any financial estimates, analyses or other information used by PFAL in connection with the Report represents the general expectancy concerning events as of the evaluation date and are based solely on the information reviewed by PFAL. However, the accuracy of any financial estimate, analysis or other information is dependent upon the occurrence of future events that cannot be assured. Additionally, these estimates and analyses rely on the assumptions contained therein, the accuracy of which remains subject to validation, further refinement and future events. Estimates should not be construed as statements of fact. There will usually be differences between the projected and actual results because events and circumstances do not occur as expected, resulting in possible differences.

Executive Summary

Project Finance Advisory Limited ("PFAL"), together with our team of subconsultants, was appointed by the California High-Speed Rail Authority ("Authority") to provide independent consultant services following a competitive procurement process that concluded in December 2015. Our role is to fulfill the legislative requirement to perform independent analysis of the Authority's funding plans and to determine if the funding plans meet the criteria listed below.

This Report provides our independent analysis of the Central Valley segment Funding Plan ("Funding Plan") dated December 2016 developed by the Authority pursuant to California Streets and Highways Code ("SHC") 2704.08(d)(1). The Funding Plan calls for $2.609 billion of Proposition 1A ("Prop 1A") bond proceeds as part of the funding for the Central Valley segment ("Segment"), the 119 mile segment from approximately adjacent to the Madera Amtrak Station to Poplar Avenue, as appropriated in Senate Bill ("SB") 1029.

The purpose of this Report is to fulfill the requirements to review the Funding Plan for the $2.609 billion Prop 1A bond proceeds appropriated in SB 1029 to indicate if:

a) Construction of the corridor or usable segment thereof can be completed as proposed in the Funding Plan;
b) If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation;
c) Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service;
d) The planned passenger train service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy; and
e) An assessment of risk and the risk mitigation strategies proposed to be employed.

As an independent consultant, PFAL and our team of subconsultants have a duty of care to the California State taxpayers to review the Funding Plan and to address the required indications listed above. In keeping with this responsibility, the analysis and conclusions in this Report are not prejudiced by any external interests; our conclusions are completely our own.

The analysis and conclusions provided in this Report are based on our review of material provided to us by the Authority as we describe in this Report. Our analysis and conclusions are based on our professional opinions and the opinions of subconsultants to PFAL that specialize in passenger rail operations and high-speed

rail ("HSR") delivery. These subconsultants include First Class Partnerships Limited ("FCP"), David Evans and Associates, Inc. ("DEA"), Anrab Associates ("Anrab"), and Infrastructure Development Strategies California ("IDSCA").

PFAL's review and development of this Report, as it pertains to forming an opinion for SHC 2704.08(d)(2), is limited in scope to the contents of the Funding Plan (and associated background information). Our role in this Report is not to render an opinion on the SHC 2704.08(c) funding plans or the projects required to complete the overall high-speed rail system outlined in the 2016 Business Plan.

The approach PFAL implemented, further described in Section 1.1, to independently verify the criteria in SHC 2704.08(d)(2) is based on industry best practices and PFAL's previous roles of comparable assignments as independent financial advisor and auditor for the Federal Railroad Administration's Railroad Rehabilitation & Improvement Financing ("RRIF") program, the US Department of Transportation ("USDOT"), the Virginia Office of Public Private Partnerships, and the USDOT's Transportation Infrastructure Finance and Innovation Act ("TIFIA") Program, as well as many other government agencies in the US and internationally.

The Funding Plan was developed to satisfy the statutory requirements of SHC 2704.08(d)(1), comply with the appropriations in SB 1029, and fulfill the Authority's implementation plan as specified in the 2016 Business Plan. The Funding Plan addresses the statutory requirements of SHC 2704.08(d)(1) by providing:

Table 1: Central Valley Segment Funding Plan Summary

SHC 2704.08(d)(1) requirements	Funding Plan Summary
Identification of the corridor or usable segment thereof, and the estimated full cost of constructing the corridor or usable segment thereof	Funding Plan sets out how Central Valley segment qualifies as a usable segment with supporting June 2012 Office of Legislative Counsel opinion (further described below); summarizes the civil works and rail infrastructure elements included in the funding plan; and provides projected capital cost of $7,813 million.
Identification of the sources of all funds to be used and anticipated time of receipt thereof based on offered commitments by private parties, and authorizations, allocations, or other assurances received from governmental agencies	Sources of Funds for the $7,813 million capital cost are identified as $2,609 million of Prop 1A funds, $2,970 of Federal grants, and $2,234 million of Cap-and-Trade proceeds.
Projected ridership and operating revenue report	The Funding Plan provides details of the projected ridership for the San Joaquins service as well as description of the Authority's need to connect the Central Valley segment to the rest of Silicon Valley

SHC 2704.08(d)(1) requirements	Funding Plan Summary
	to Central Valley Line before high-speed train operations can begin as envisioned in the 2016 Business Plan's ridership and revenue forecasts.
Construction cost projection including estimates of cost escalation during construction and appropriate reserves for contingencies	The Funding Plan provides a summary level costs estimates for the Central Valley segment and references the 2016 Business Plan's Basis of Estimate document for the details of the methodology for the cost estimate.
A report describing any material changes from the plan submitted pursuant to subdivision (c) for this corridor or usable segment thereof	Funding Plan details material changes from the 2011 Funding Plan including the update to the Funding Plan's shift to reflect the 2016 Business Plan implementation plan, inclusion of Cap-and-Trade funds, updated environmental clearances and revised risk management reports
A description of the terms and conditions associated with any agreement proposed to be entered into by the Authority and any other party for the construction or operation of passenger train service along the corridor or usable segment thereof	Funding Plan includes summaries of key contracts for Construction Packages 1-4 and funding agreements for the Federal grants. Provides a high-level summary of the 2016 Business Plan's implantation strategy for the rail infrastructure elements to be procured.

Besides the information included in the Funding Plan itself, PFAL requested, received, and reviewed a variety of additional documents and pieces of information including, but not limited to, the technical specifications and details, schedule, current reporting, details of cooperative grant agreements, the Authority's plan to meet the requirements under those agreements, and more detailed elements of the cost estimates.

In a letter dated June 8, 2012, the Office of Legislative Counsel documented their review of the 2012 Business Plan for compliance with Prop 1A. This letter confirmed the implementation plan proposed by the Authority and reflected in the Funding Plan complies with Prop 1A. It further determined the Central Valley segment meets the requirements to qualify as a usable segment for Prop 1A funds. Section A of the Funding Plan further defines the usable segment and the construction elements included in the Funding Plan.

The civil works described in the Funding Plan (collectively referred to as Construction Package 1-4) has been under construction since 2013 and makes up approximately 40% of the total costs described in the Funding Plan. A substantial amount of work

has already been completed on the civil works portion described in the Funding Plan, providing a high level of design, specifications, cost and schedule data to evaluate. The remaining elements included in the Funding Plan are still under development by the Authority and will be procured at a later date. PFAL's review of the rail infrastructure components yet to be procured is based on preliminary specifications, estimates and assumptions under development by the Authority, or in some instances, conceptual plans. It is likely the final contracts and specifications will vary from the preliminary specifications provided to PFAL, which may change the conclusions in this report.

The clarification included in the September 2016 Assembly Bill ("AB") 1889 further enabled the Central Valley segment to qualify as a segment that is "**suitable and ready for high-speed train operation**." Though the Office of Legislative Counsel has determined that the Central Valley segment meets the requisite criteria for Prop 1A funds, it will not provide standalone high-speed rail operations until it is connected to the wider high-speed rail system. Therefore, we are unable to comment on whether the eventual planned high-speed rail operations to be provided by the Authority, or pursuant to its authority, will or will not require an operating subsidy under this Funding Plan.

Key Findings

The Funding Plan sets out to satisfy SHC 2704.08, subdivision (d) for the commitment of $2.609 billion of Prop 1A bond proceeds to be used as a source of funding for the Central Valley segment. The Funding Plan complies with the statutory requirements insofar as it addresses each of the SHC 2704.08(d)(2) criteria. Table 2 summarizes PFAL's independent opinion on each component of SHC 2704.08(d)(2).

Table 2: SCH 2704.08(d)(2) PFAL Summary Opinion

SHC 2704.08(d)(2) requirements	PFAL Opinion
Construction of the corridor or usable segment thereof can be completed as proposed in the plan submitted pursuant to the Funding Plan	The Central Valley segment can be constructed as proposed in the Funding Plan subject to the Authority implementing its planned risk mitigation strategies, project management enhancements and effective execution of proposed contracts; See Section 2
If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation	When completed, the Central Valley segment will be suitable and ready for high-speed train operation as stated in AB 1889; See Section 3
Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service	Central Valley segment can facilitate passenger train service; See Section 4

SHC 2704.08(d)(2) requirements	PFAL Opinion
The planned passenger train service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy	The Authority does not contemplate passenger train service in this Funding Plan. Therefore, PFAL is unable to draw a conclusion regarding the potential requirement for an operating subsidy, see Section 5
An assessment of risk and the risk mitigation strategies proposed to be employed	Risks are identified and addressed by the Authority, see Section 6 for a risk summary

1. Funding Plan Overview

1.1 PFAL REVIEW APPROACH & METHODOLOGY

The Authority requested that the PFAL team perform a review of the Central Valley segment Funding Plan. PFAL initiated the review in conformance with SHC 2704.08(d)(2) on November 1, 2016 by requesting publicly available documents in support of the Funding Plan. These documents included, but were not limited to:

- California State bills
- Legislative opinions
- Authority business plans
- 2013 Project Risk Management Plan
- Peer Review Group review of work in progress on Risk Management
- Authority's 2015 Project Management Plan
- Construction Packages 1-4 contract documents
- Monthly status reports for each construction package
- Federal grant Cooperative Agreements
- Finance and Audit cash management and operations reports

The Funding Plan was not made available at that time, as it was still under review by Authority, but an overview was provided and there were numerous supporting documents relied upon in the Funding Plan that PFAL requested to verify the underlying assumptions and statements described by the Authority. After the initial review of these documents, PFAL and its subconsultants undertook an iterative process to pose questions and requests for clarification to the Authority with the Authority providing additional supporting information and clarifications as needed.

To facilitate the process, document and question requests were categorized by:

- Civil
- Electrification
- Capital Costs
- Construction Schedule
- Environmental
- Project Management
- Risk Management
- Operations
- Rolling Stock
- Legislation/Project Agreements
- Funding

The additional information requests included, but were not limited to:

- Authority's Track and System Specification
- General Provisions for the Track and Systems
- Integrated schedule
- Funding plan schedule by fiscal year
- Derivation of the contingency drawdown curve,
- Breakdown of costs for Funding Plan
- Basis of cost estimate for communications and signaling
- Third Party Agreements Report Summary
- Verification and Validation Management Plan
- Project & Construction Management Manual
- Updated Project Management Plan

The information was provided to PFAL by the Authority as it became available. As a result, the information requests were met at various stages of the review. As discussed in more detail in Section 6, the Authority made the determination that some confidential documentation related to the Authority's risk register was unable to be published or shared by the Authority. However, in response to PFAL's requests, the Authority walked PFAL through information that it deemed pertinent to allow PFAL to verify and confirm that the Authority had undertaken appropriate risk mitigation and/or that schedule and cost risks were appropriately addressed.

The project sources and uses funding plan was provided to PFAL by the Authority for the Central Valley Segment,

Following review of the provided documentation, PFAL and their subconsultants developed a register of questions to the Authority to seek explanation and clarification on a number of items. To expedite the process of clarifying open issues, PFAL and the Authority conducted two general funding plan meetings (one by teleconference and one in person) for PFAL to clarify open questions. The nature of the meetings was to facilitate the understanding of the Funding Plan in a factual manner that would aid PFAL's analysis and understanding. After the second meeting, it was determined a further teleconference specific to the Authority's technical standards was required (see Appendix II for summary notes).

A draft Funding Plan was provided to PFAL on November 14, 2016 and a second revised draft Funding Plan was provided to PFAL on November 29, 2016 by the Authority. PFAL then confirmed that the Funding Plan was consistent with the supporting documents previously reviewed.

Once the majority of supplemental information was provided and the draft Funding Plans were reviewed, the PFAL team and the Authority conducted teleconferences

on November 29, 2016 and again on December 2, 2016 to provide an opportunity for the Authority to clarify potential issues identified by PFAL. The purpose of these teleconference calls was to provide factual clarifications and respond to questions raised by the PFAL team regarding how the Authority identifies and manages risk and to clarify cost reporting with the Authority's Project Controls division. The outcomes of the teleconference calls have been incorporated into this Report.

The review of the documents and conversations as outlined above were limited to the scope of the Funding Plan for the purpose of this Report. PFAL's scope of work was limited to reviewing the content of the Funding Plan and its supporting documentation and information. **This means PFAL did not review procurement of high-speed trainsets or the infrastructure projects required to connect the Central Valley segment to the rest of the high-speed rail system because they are not included in the Funding Plan. Similarly, PFAL offers no opinion on projected Revenues for this segment nor Operations and Maintenance Costs because they are not included in the Funding Plan.**

To formulate an opinion on SHC 2704.08(d)(2), PFAL's Report is structured as set out in the following table.

Table 3: Report Structure

Report Section	Approach
Section 2	Analyzes the constructability of CP 1-4 and associated infrastructure elements included in the Funding Plan separately at first then in aggregate by determining the reasonableness of the following items to formulate an opinion on SHC 2704.08(d)(2)(a): • scope • procurement method • construction schedule • project management • project cost • funding • regulatory standings of the construction program
Section 3	Provides a review the Central Valley segment's ability to function as a foundation for HSR while providing near-term benefit to passenger rail service to formulate an opinion on SHC 2704.08(d)(2)(b).
Section 4	Evaluates the ability of the San Joaquins, or HSR, or both, to operate at prevailing speeds in the corridor to provide an opinion on SHC 2704.08(d)(2)(c).
Section 5	Addresses SHC 2704.08(d)(2)(d).
Section 6	Reviews the Authority's risk management plans for the Central Valley segment to form an opinion on SHC 2704.08(d)(2)(e).

1.2 PROPOSITION 1A FUNDING

In April 2012, the Authority published their 2012 Business Plan that outlined a phased implementation approach to reach high-speed rail operations. The phased implementation included early investments in the Central Valley segment that would later connect to what the 2012 Business Plan defined as the Initial Operating Segments ("IOS"). The IOS-North and IOS-South would ultimately be parts of the Phase 1 System, which would enables high-speed rail operations from San Francisco to Los Angeles and Anaheim[1]. The 2016 Business Plan describes the Authority's plan to start service on what is referred to the Silicon Valley to Central Valley Line ("Valley to Valley Line"), which is similar to the IOS-North from the 2012 Business Plan in the Funding Plan and 2016 Business Plan.

On June 8, 2012, the Office of Legislative Counsel provided an opinion that "the initial 130-mile (Central Valley) segment would qualify as a 'usable segment' under the (Prop 1A) bond act." The opinion was based on a number of factors, but most salient to this Report were:

- the Central Valley segment includes two planned stations at a minimum, and
- the completed Central Valley segment could be used by the San Joaquin passenger train service before providing high-speed rail service once the remaining segments of the HSR system are completed.

In July 2012, SB 1029 appropriated $2.609 billion of Prop 1A bond proceeds for the "Initial Operating Segment of the High-Speed Rail System". The Funding Plan addresses this $2.609 billion of Prop 1A bond proceeds appropriated by SB 1029, to help fund the Central Valley segment.

1.3 SUBJECT OF FUNDING PLAN

The usable segment as defined in the Funding Plan is the Central Valley segment. The geographical boundaries of the approximately 119 mile Central Valley segment is from the northern point in Construction Package ("CP") 1 near Madera Amtrak Station to the southern point in CP 4 near Poplar Avenue as seen in Figure 1.

[1] The IOS-North and IOS-South overlap in the Central Valley. The Central Valley Segment is the northmost segment of IOS-South and the southmost segment of IOS-North.

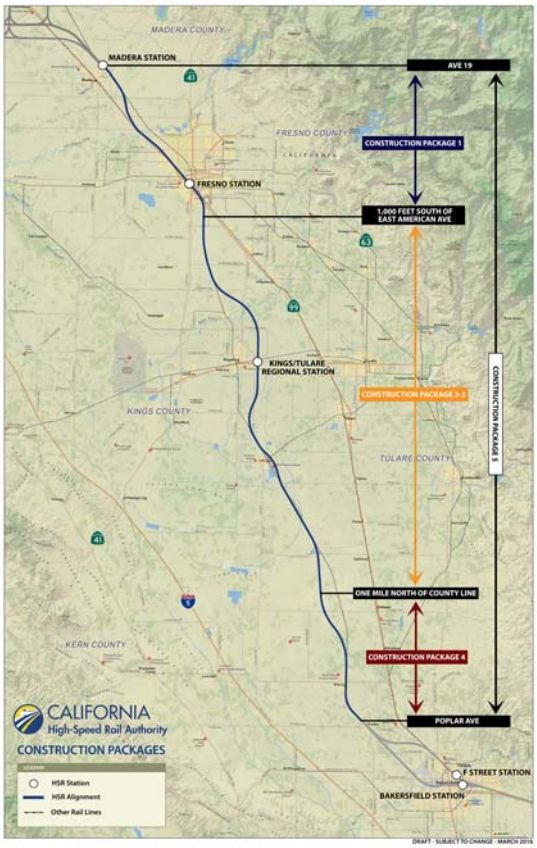

Figure 1: CP1-4 Map[2]

The Central Valley segment is predominantly a "greenfield"[3] project with the civil work currently under construction. The Central Valley segment will serve as a foundation for future high-speed rail operations once it is connected to the planned Valley to Valley Line. Prior to connecting to the Valley to Valley Line, the Authority will not operate stand-alone service on the Central Valley segment, but plans to eventually use it as a test track prior to high-speed train operations or for use by the San Joaquins.

The civil, track and system elements included in the Funding Plan are shown in Table 3. High-speed trains the Authority intends to procure are not included in this Funding Plan and are not subject to PFAL's review.

Table 4: Central Valley Segment Funding Plan Construction Elements

[2] Source: http://www.hsr.ca.gov/Programs/Construction/index.html

[3] A greenfield project typically refers to a project with no historic demand in the project location

Funding Plan Element	Scope	Procurement
CP1	• 32 mile stretch from Avenue 19 in Madera to East American Avenue in Fresno • 20 grade separations, 2 viaducts, 1 tunnel and river crossing	• Executed DB contract in August 2013
CP2-3	• 65 mile stretch from East American Avenue to north of Tulare-Kern County Line • 36 grade separations, viaducts, underpasses and overpasses	• Executed DB contract in June 2015
CP4	• 22 mile stretch from Tulare-Kern County Line to Poplar Ave. • construction of at-grade, retained fill and aerial sections of HSR alignment and relocation of four miles of BNSF track	• Executed DB contract in February 2016
Track	• All of the rails, fasteners, ties and interlockings required for the mainline, sidings and storage yards	• To be procured under one long term Track and Systems Provider contract
Railroad Infrastructure	• The additional infrastructure and any modifications to that provided under CPI to CP4 (or other civil contracts) required for the safe and efficient installation of the rail track	• To be procured under one long term Track and Systems Provider contract
Signaling and Communications System	• The technology and software required for the safe and efficient operations of passenger trains and maintenance rolling stock including positive train control requirements, the operations control center equipment and train/wayside communications	• To be procured under one long term Track and Systems Provider contract
Overhead Catenary System	• The electrical substations and overhead wiring required to enable the passenger trains to operate safely and efficiently	• To be procured under one long term Track and Systems Provider contract
Heavy Maintenance Facility	• The facility wherein the passenger trains are serviced and maintained	• To be procured as part of the Rolling Stock contract
Stations	• Locations where passengers can access and egress the passenger trains	• The Authority will provide the station buildings through a design-bid-build contracts. All station platforms are to be procured under one long term Rail Infrastructure Provider contract

The completion of the full scope of work proposed in the Funding Plan will provide a foundation for high-speed rail, but requires additional investments in high-speed trains (which is not included in this Funding Plan) to dynamically test, commission, and eventually run the planned high-speed rail operations. Before high-speed train passenger service can operate on the segment, the Authority plans to construct the Valley to Valley Line. These additional investments are not included in this Funding Plan or subject to PFAL's review under this Report.

Further description and analysis of the constructability of these Funding Plan elements is provided in Section 2 of this Report.

1.4 USE OF PROP 1A FUNDS

This Funding Plan pertains to the $2.609 billion of Prop 1A bond proceeds for the Central Valley segment as appropriated in SB 1029. A complete description of the sources and uses of funds for the Funding Plan is discussed in Section 2.6. As shown in the Authority's Central Valley Segment Sources & Uses Plan dated November 10, 2016 (based on the September 2016 Funding Contribution Plan) and summarized in Table 5, Prop 1A funds will be distributed starting in FY16-17 and fully expended by FY18-19.

Table 5: Central Valley Segment Use of Prop 1A Funds[4]

Fiscal Year (YOE $000')	Requested Amount	FY16-17	FY17-18	FY18-19
Prop 1A Yearly Expenditure		300,684	1,799,955	508,437
Balance	2,609,076	2,308,392	508,437	0

Prop 1A bond proceeds will fund various components of the Funding Plan scope of work, but will primarily fund site work, track and track structure. The uses of all funds including Prop 1A in the first three fiscal years is shown in Table 6.

[4] Central Valley Segment – Sources & Uses. California High-Speed Rail Authority. November 10, 2016.

Table 6: Central Valley Segment Uses of Funds in the First Three Years[5]

Fiscal Year (YOE $000')	FY16-17	FY17-18	FY18-19
Track	381,713	391,351	387,140
Stations	24,879	30,150	30,828
Support Facilities	0	32,635	32,185
Site work	370,140	670,232	577,957
Comms & Signaling	0	98,972	105,624
Electric Traction	0	49,721	150,701
Vehicles	0	0	0
Professional Services	297,102	433,662	254,175
Contingencies	0	272,075	454,037
Total	**1,073,834**	**1,978,798**	**1,992,647**

The above tables are indicative, and may change depending on demand given there are not yearly maximum or minimum thresholds set out by the Authority.

As outlined in Section D of the Funding Plan, Prop 1A bonds will be subject to a typical process for the sale of general obligation bonds. This includes the development of a biannual bond survey submitted to the Department of Finance. The Authority's cash flow projections are then submitted to the State Treasurer's Office through the Department of Finance to be included in the State's GO bond issuance.

[5] Central Valley Segment – Sources & Uses. California High-Speed Rail Authority. November 10, 2016.

2. Constructability

Having completed a review of all requested documentation, we have concluded that construction of the Central Valley segment can be completed as proposed in the Funding Plan, as specified, and in compliance with, environmental documents subject to the successful implementation of the planned risk mitigation strategies and project management enhancements.

The majority of the work in the Funding Plan is under contact in terms of contract value, and the Authority has expressed plans to implement more effective project management and controls based on lessons learned from CP 1 for CP 2-3 and CP 4.

The remaining elements of the Central Valley segment are yet to be procured and pose potential challenges with regard to integration, the availability of contractors, and the schedule for delivery. The schedule is aggressive and we believe it needs additional float to account for potential delays. Although this can delay completion of the project and any elements on the critical path, we believe that the segment can be constructed as proposed, but that will require active management and mitigation of schedule risks by the Authority. The budget contingency appears to be reasonable, but the Authority will have to actively manage the interface between the civil contract and track and system contract in order to avoid potentially significant change orders.

The Authority has a number of existing monitoring tools focused on the current construction work. As elements are added, PFAL believes additional reporting would be helpful and the Authority is prepared to institute such reporting through its PMIS and other tools that are being developed.

We consider the cost estimates for the Central Valley segment, including the allowances for contingency, to be adequate (although some individual line items appear a bit high or low from our standpoint, offsetting each other) and the funding to be sufficient to pay for those capital costs, even under a less favorable scenario than what the Authority assumes.

Our more detailed assessment on each of these items is provided below:

2.1 PROCUREMENT

2.1.1 CP1-4

The civil works for the Central Valley segment have been procured using Design-Build ("DB") contracts denoted as Construction Packages ("CP"s). Three contracts have been executed:

- CP 1 – awarded 8/16/2013, with initial Notice to Proceed ("NTP") 10/15/2013[6]
- CP 2/3 – awarded 6/10/2015, with NTP 7/25/2015[7]
- CP 4 – awarded 2/29/2016, with NTP 4/15/2016[8]

CP 1 was awarded to the joint venture of Tutor Perini/Zachry/Parsons for $985.1 million, with other four other bidders' proposed prices ranging from $1,085 million to $1,537 million. CP 2-3 was awarded to the joint venture of Dragados/Flatiron/ Shimmik for $1,234.6 million, with two competing prices of $1,740 million and $2,066 million. CP 4 was awarded to California Rail Builders for $347.6 million, with three other responsive proposals ranging in price from $377.1 million to $581.9 million. The contracts were awarded through a competitive process that included extensive industry outreach. The Authority reported that the contract award amounts were below the engineer's estimate for each contract, and we view the awarded contracts as having favorable pricing. There is evidence the Authority is applying lessons learned from each CP contract to each subsequent CP contract.

Each of the DB contracts will be managed by a consultant Construction Management ("CM") firm. Contracts for Construction Management services were procured through a competitive process for each CP. The procedures and methods to be applied by the CM teams are documented in a Construction Management Manual.

In addition to civil works for High Speed Rail, implementation of the Central Valley segment requires relocation of a portion of State Route 99 ("SR 99") in the CP 1 segment of the project through an agreement between Caltrans and the Authority that was executed in February 2013[9]. A Construction Manager/General Contractor ("CM/GC") contract with Granite Construction is being managed to complete the relocation work. The Authority is funding this work through an interagency agreement in the amount of $225.9 million. The contract is divided into an early work package and a main package. The NTP for the main package was issued in August 2016. The November 2016 Finance and Audit Report for this project states that the interagency agreement will need to be amended to increase the budget and update the schedule,

[6] Monthly Status Report No. MR-038, Construction Package 1, Contract: HSR-13-06, CHSRA, November 2016
[7] Monthly Status Report No. MR-016, Construction Package 2-3, Contract: HSR 13-57, CHSRA, November 2016
[8] Monthly Status Report No. MR-3, Construction Package 4, Contract HSR 14-32 , CHSRA, November 2016
[9] Finance and Audit Report, State Route 99 Alignment, Contract HSR 12-06, CHSR, November 2016.

but the specific budget and schedule increases that are needed were not documented in this report.

As with any significant infrastructure project with more than one contract, interfaces among these civil works contracts and between the civil works and the follow-on rail infrastructure and the other elements of work must be effectively managed by the Authority to successfully deliver the Central Valley segment. These interfaces represent risks that could impact the cost and delivery schedule for the work, as discussed in Section 2.1.2. The Authority recognizes and is actively managing the interfaces and tracking the related risks in its program-level risk register.

2.1.2 Track and Systems Elements

The project delivery model chosen by the Authority uses a Track and Systems Contract ("TSC") to deliver, manage and maintain all the trackwork and the high-speed rail technology systems except for the passenger rolling stock. The TSC will also have major systems integration and very broad responsibilities which include[10]:

- Acting as the systems integrator for the rail infrastructure and the existing CP1 through CP4 civil works contracts as well as future civil works contracts that are needed to complete the high-speed rail network
- Acting as the systems integrator for the interfaces between the passenger rolling stock and the train control and communications systems
- Safely managing train operations using the operations control center technology that the TSC will supply (although this function may also be provided by the operator)
- Maintaining all the physical and technology rail infrastructure over a 30-year contract, and retaining operations and maintenance records for the HSR system
- Building station platforms
- Ensuring that the base civil works are "fit for purpose" and making corrections when appropriate

The TSC is at the center of the entire high-speed rail system and the scope and responsibilities are significant, although in line with how other HSR systems around the world have been successfully implemented, including in Taiwan (a system principally managed by the Authority's lead consultant, Parsons Brinckerhoff). The scope and risk also means that no single company is likely to have the physical,

[10] Section 7 of the Track and System Performance and Technical Requirements. California High-Speed Rail System. October 25, 2016.

intellectual or financial resources for the project. Accordingly, PFAL expects that large consortia will be formed to compete for the TSC.

The scope of work for the TSC includes both civil engineering construction and track and system supply elements. Currently, the Track and Systems Performance and Technical Specifications for the TSC are in the development stage and, as a result, are uneven in its detail. As part of the procurement process, the Authority needs to and will develop more details for the actual contract that will be entered into. PFAL understands that a more detailed the Track and Systems Performance and Technical Request for Proposal ("RFP") is being prepared for industry consultation, but was not available for our review. Therefore PFAL's review and ability to draw conclusions for this Report is limited to the current status of these document and does not reflect the final contract that will be executed from this procurement.

Section 7 of the Technical Specifications describes the scope of work for the various elements. There are some elements described where it is not clear from the description whether the TSC is required to supply, for example, the drainage system for the sections of the route constructed under CP 1 to CP 4. As the Authority develops the specification for procurement of the TSC, the Authority will need to (and plans to) clarify the scope of work for the TSC and scope of work to be provided by others.

Consistent with the industry-accepted DB model, the Authority has chosen the tone and tenor of those Specifications reflect an output rather than a prescriptive approach that places a higher burden on potential TSC competitors to fully define their approach during the bidding process. The use of output and performance based specifications reflects current best practices because this approach allows the contractor to propose the most cost effective designs and technologies. However, it is clear that the specifications need to be informed by a rail operating plan. PFAL understands the Authority plans to procure a railway operator, but recommends a railway operator be procured by the Authority as soon as possible to address this point to reduce the risks subsequently described. We understand the Authority is releasing an RFP for the Rail Operator in December 2016. We expect that the operator will be one that has experience with long distance intercity train operations on a commercial basis and experience in recruitment and training, designing and managing train timetabling, train control operation, terminal operations, safety management, degraded and emergency operations, commercial management and public relations management. Having a suitably experienced train operator on the project at this early stage will assist in the procurement and development of track and systems and will help to reduce risks to design and testing scheduling and implementation.

As the Central Valley segment construction proceeds, there will need to be more definitive information on the prospective TSC interfaces with the CP 1 through CP 4 civil works contracts – and how TSC contractors need to interface with those civil works contracts. For example, PFAL notes that the present civil contractors are making provision for OCS pole foundations at 30 ft spacing on aerial guideways. It is likely that the OCS designer will specify very high tensions in both the messenger and contact wire and it may be that additional supports are necessary particularly if mid-point anchors or terminating anchors are necessary. The Track and Systems Performance and Technical Requirements document is silent on the responsibility for providing any additional requirements, but we understand that the Track and Systems contractor may make use of this provision or provide alternative arrangements at its cost.

The Rail Infrastructure provider has a responsibility to coordinate with the train supplier to ensure the harmonic distortion at the point of common coupling with PG&E complies with the Energy TSI. It is unclear who has the responsibility for compliance and it is assumed to be the Authority.

The Track and Systems Performance and Technical Requirements document requires the contractor to undertake modeling of the traction supply arrangements taking into account the track alignment, gradient, proposed trains and service patterns. However, the only guidance in the document is that the system shall achieve the headway. We understand that the Authority has completed representative modeling work that it believes will provide for satisfactory feeding arrangements, but in the absence of an operator, service timetable and actual train design there is a risk that modelling work will be delayed and that the proposed feeding arrangements may not be adequate for full service. PFAL understands that the Authority has completed representative modeling using a service plan that has 9 double headed trains and 3 single headed trains operating continuously at 5 minute headways which is very conservative. The traction power characteristics of a modern representative high-speed trainset (AGV) has been used (and has been benchmarked against the trainsets offered by established high-speed trainset providers such as Siemens, Kawasaki, Bombardier and CRRC. We would expect that such information will be provided, as guidance, for the TSC contractor.

Finally, this will rank among the world's largest railway systems contracts and comes at a time when the five or six major contractors are all busy with other projects and opportunities. This means that there may be intense competition for experienced professional technical resources with consequential labor inflation - perhaps coupled with schedule delays as productivity should adjust to match available resources. The Track and Systems Performance and Technical Specifications require the TSC to undertake training programs to mitigate these labor concerns, but there are steps that

the Authority can take now to mitigate these risks. The Authority needs to consider stepping up outreach to California universities and colleges to foster courses in railway technology, maintenance and operations to build a larger labor pool that can be ready when required to support the high-speed rail program.

The PFAL team has reviewed some of the key contract terms and conditions and the processes and procedures being used by the Authority to procure the TSC. Those procedures can be effective. Our concern is that, given the complexity, scope and interfaces in the contract - and the availability of experienced resources - there are many opportunities for contractors to exploit the interface risks which could result in schedule delays and cost increases during a 30-year service period contractual relationship with a contractor whose contract scope will necessarily expand. This issue would be found on any contract of this magnitude and duration. Again, the Authority will require knowledgeable and experienced resources to oversee and manage those interfaces, notwithstanding the fact that they are contractually the responsibility of the TSC.

Although the Track and Systems contract will be a major infrastructure procurement that will require the Authority to further develop its procurement and management approach, we believe that the Authority is taking the necessary steps to do that. We see no technical issues that would prevent successful delivery of the Track and Systems contract and as long as the Authority stays on its current path, we believe that the infrastructure can be built as described in the Funding Plan.

2.2 SCHEDULE

2.2.1 CP1-4

The schedule for the awarded construction packages is summarized in the Authority's CHSR Program Summary, Central Valley[11]. The construction work associated with the NTPs in each contract (CP 1 has three separate NTPs) is represented by a single activity in this high-level schedule. At the very high level of detail presented in this schedule, no logic ties to the right-of-way acquisition work that must precede construction are shown. The review of this schedule was unable to confirm that these ties are included in the detailed critical path schedule that is being used to monitor and control the program. Such logic ties are best practices for effective schedule reporting and forecasting, as delays in the completion of property acquisition have been the primary reason for a 17-month extension to the completion

[11] Summ2 TILOS FCS.pdf, data date 9/1/2016.

date for CP 1. While we did not review the detailed workplans, the Authority's project controls team explained that they maintain workplans for each project that include logic ties for right-of-way acquisition and other critical path activities.

The timescale for the Program Summary schedule provided for this review is presented in years from an arbitrarily selected start time. The Authority presented a time and location scaled summary to the review team that was based on calendar dates. For effective tracking and control, all schedule presentations should use a timescale based on actual dates for easy assessment of the current status of the work.

The end dates for the active construction packages presented in the Program Summary appear to match the completion dates required in each of the contracts as reported in the November 2016 Finance and Audit Committee Monthly Status Reports (MSR):

- CP 1: 8/31/2019
- CP 2/3: 8/19/2019
- CP 4: 6/3/2019

The completion date for the realignment of SR99 by Caltrans is shown in late 2018, whereas the MSR for this project indicates a contract completion date of 6/30/2018. The MSR indicates that the existing agreement with Caltrans will need to be modified to extend the completion date, so the Program Summary may reflect the planned extension.

The baseline Program Summary does not include any schedule float for the CP 1-4 construction work. Logic ties to the Rail Infrastructure work that will follow these contracts are not indicated in the Program Summary, but the Authority has indicated that there is one to three months of float between the civil works contract completion dates and the start of construction for the Rail Infrastructure contract. The FTA's recommended scheduling practice[12] calls for schedule float equal to 25% of the remaining duration of project work be included in the projected completion date, and the current schedule float does not meet this recommendation. The planned schedule float could be "allocated" to individual work packages or included at the end of the schedule as combined program schedule float. Applying the FTA-recommended practice for the CP 1-4 construction work yields an overall completion

[12] Oversight Procedure 40b, Risk and Contingency Review (Abbreviated), Federal Transit Administration, September 2015

date of May 2020, about 250 calendar days later than the date indicated in the Program Summary, far more than the three months that is said to be available in the current program schedule.

Inclusion of a reasonable schedule float, as referenced above, in the Program Summary schedule is advisable, as the Authority has been challenged to control the schedule for CP 1 and has indicated that there is a risk of further schedule delays due to delayed right-of-way acquisition[13]. A further indicator of the potential for delayed completion of the civil construction work is the projection of earned value for CP 2/3 in the November Finance and Audit Committee Operations Report[14], which indicates that the cumulative earned value achieved in September 2017 will be only 67% of the planned value. The Authority has indicated work in CP 2-3 is on the critical path for completion of the Central Valley segment and the lower than planned earned value suggests that delays are likely. Given the potential risk, the impact of schedule delays pose to the Track and Systems work, the Authority indicated that the schedule for the Track and Systems work could be accelerated through a variety of strategies, including having multiple trackwork installation headways. Additionally, since the Track and Systems contract has not been procured, that Track and System contract's timeframe may be possible to adjust or resequence the contract timeframe to mitigate reasonable delays in the delivery of CP1-4 at this point with no cost impact besides escalation. However, this could delay other follow-on work accordingly.

The original completion date for CP 1 was March 21, 2018. The start of construction was delayed due to late completion of right-of-way acquisition by the Authority. The completion date in the CP 1 contract is now August 31, 2019, representing an extension of 17 months or 32% of the originally planned duration. This delay indicates insufficient planning of work to support the construction contract and inadequate schedule forecasting and control capabilities during the procurement of CP 1. Had sufficient schedule management resources and procedures been in place, the inadequate progress of right-of-way procurement would have been identified and either additional resources assigned or the CP 1 NTP delayed to avoid the significant delay and acceleration costs that have accrued.

We recommend that the Authority confirm that its master schedule includes sufficient logic ties between the active construction packages and the follow-on contracts to

[13] "Parcel acquisition is behind the dates specified in the Right-of-Way Acquisition Plan and continues to be a schedule risk.", Finance and Audit Committee Monthly Status Report, CP 1, Data Date 9/30/2016, CHSRA, November 2016.
[14] F&A Committee Operations Report, CHSRA, November 2016, page 72.

represent the possible impacts of further delays to CP 1-4. Furthermore, we recommend that the Authority use the results of its risk-informed contingency analysis (which includes an assessment of possible risk-related schedule delays) to produce risk-informed schedule forecasts. The Authority stated that it currently does not consider the potential schedule delays identified in the CP1-4 risk assessments to affect the available schedule float in the program schedule or to project likely program completion dates. The Authority further states that it intends to incorporate the CP 1-4 risk assessment results in its program schedule evaluation process after it completes the detailed contract level risk assessment and Monte Carlo modeling for the Rail Infrastructure contract. The Authority is encouraged to begin evaluating the impacts of likely delays to CP 1-4 on the Rail Infrastructure construction start date and the overall Central Valley segment completion now, rather than waiting for the Rail Infrastructure risk assessment to be completed.

The Authority has stated that enhanced program controls, including schedule forecasting and management are under development. As part of this effort, the Authority should develop and maintain a critical path schedule showing the current and future activities that need to stay on-track to achieve the forecasts project completion date. Routine monthly reports to decision-making bodies should include the status of the critical path work and identify mitigation strategies to recover from any delays.

2.2.2 Track and Systems Elements

The Authority has conducted extensive industry outreach on the Track and Systems. In addition to the one-on-one meetings arising from the formal RFEI process, the Authority has also held numerous one-on-one meetings with parties expressing interest in participating in the Track and Systems work – this has included those that could lead a JV, be part of the JV or to provide specialist support to the JV and included the major technology providers and large scale program management companies. While this is a good start, in our experience the complexity of the Track and Systems Performance and Technical Specifications, the broad responsibilities of the TSC and the 30-year contract term are likely to lead to a longer bidding cycle than the times given in the current schedule. The formation of consortia to address this contract will take a long time, both in terms of assembling the right team capabilities, but also in terms of obtaining the appropriate governance arrangements to manage the consortia. This means that the Authority should expect a lot of legal dialog, both within the consortia and with the Authority. That will take time that is not fully contemplated in the schedule. Furthermore, given the scope and complexity of the contract, even after a contract consortium is selected, it will take a long time to negotiate final terms, conditions, scope, indemnities and payment schedule. We

would expect that such negotiations will be akin to those of a full public private partnership ("P3) and could take as long as 12 months to bring to closure[15].

The PFAL team expects the risk of schedule overruns is more likely for the Track and Systems elements of the project than for the civil works elements. Experience of large projects of this type suggest that the schedule could overrun by as much as two years[16,17]. The Authority reported that there is a small amount of float in the current schedule (one to three months). This is likely to be absorbed during the procurement phase in the project. It will be necessary to re-examine the baseline schedule during the negotiations with the TSC to reduce the risk of further delays to the schedule. In our view, the Authority's schedule seems to be aggressive in that it ties directly to contract completion dates and does not allow for sufficient slack to account for potential contract delays. The TSC procurement may also require additional time. Although delivering the entire scope of work according to this schedule is feasible, we consider it challenging and would encourage the Authority to take active steps to manage and mitigate any schedule delays. We do not believe that schedule delays would have a significant impact on the Authority's overall ability to deliver the scope that is included in the Funding Plan.

2.3 PROJECT MANAGEMENT

2.3.1 CP1-4

The latest finalized and approved version of the Program Management Plan ("PMP") for the high-speed rail program[18] does not reflect the 2016 Business Plan or the Central Valley Funding Plan. The Authority has stated that an update of the PMP is underway and that publication of the revised document is expected after the Funding Plan is finalized. The updated PMP will reflect the 2016 Business Plan, the Central Valley Segment Funding Plan, the current integrated Program Delivery organization, an updated Program Controls Plan, along with updates to the supporting functional information necessary to deliver the 2016 Business Plan and Central Valley Segment Funding Plan. Current project management documents are crucial to the effective

[15] For example on the Gautrain contract which was similar in complexity it took 16 months after contract award to resolve commercial and technical issues related to operation requirements, interfaces, O&M payments, contractor changes that required environmental approval. etc
[16] London Underground Sub Surface Re-Signaling. RailEngineer. October 15, 2015.
[17] Moreton Bay Rail Link Will Not Open on Schedule Due to Signaling Faults. ABC. May 16, 2016.
[18] Program Management Plan, 2015 Annual Update Revised, California High Speed Rail Program, CHSRA, September 2015.

monitoring and control of major projects and programs and the Authority is encouraged to expeditiously complete its update of the PMP.

The PMP is a high-level document that addresses the overall high-speed rail program without details regarding the planned approach to managing specific projects within the program. The PMP includes references to appropriate supporting documents, including Quality, Safety and Security, and Risk management procedures. The Program Controls system is described as under development.

The review identified a need for more consolidated monitoring of the overall status of the cost and budget for the Central Valley segment. The Authority uses a combination of reports prepared each month and submitted to the Finance and Audit Committee to monitor progress against budget. The reports include the Capital Outlay, which provides Budget, Expenditure and current Project Forecast data for each active and planned work package; and the CP Monthly Status reports which provide additional detail on the original contract price and completion date and executed change orders for active construction contracts.

The review identified issues with the consistency or traceability of reported budget and cost information among the various reports that should be addressed in developing consolidated monitoring and control procedures for the Central Valley segment as a defined project. For example, the November 2016 Capital Outlay report indicates a single contingency amount of $89.1 million for all of the work in CP 1 (DB contract work, SR99 relocation by Caltrans, construction management services, right-of-way and third party contract work reimbursed by the Authority). The Authority acknowledged that additional contingency is included in the budgets for SR99 and the third party contracts that is not identified as separate line items in the report. It is strongly recommended that all contingencies be specifically identified and tracked over the life of the project to increase the likelihood of on-budget completion of all of project work.

Existing monitoring reports cover the individual work packages that are under construction and identified for procurement, but do not provide sufficient monitoring information for the combined cost performance of these work packages. Additionally, the work elements currently reported correspond to the work scope currently approved construction contracts, not the exact scope of the Funding Plan. The rest of the cost is at the estimate level and the Authority described its plans to add those other pieces into future reporting after approval of the Funding Plan and release of the other contracts for bid. It is recommended that the Authority adopt a monitoring and reporting process consistent with current practice that addresses the complete work scope for the Central Valley funding plan. The monitoring reports should include forward looking information, including pending contract changes and issues

(commonly referred to as trends) to project the cost of each work package and the full program at completion. Cost contingencies embedded in the estimates for all work elements should be explicitly reported. At present the only cost contingencies identified are for the active construction packages.

The Authority stated that the updated PMP will include a Program Controls Plan that includes the more detailed level of reporting and industry standard processes, terminology and indicators such as those recommended by this review. In addition, the Authority is developing a PMIS system to provide real-time access to the project status information. The Authority further noted that when the Funding Plan is approved, the approved budgets will be included in the Total Program Construction section of the Capital Outlay and Expenditure Report and as contracts are awarded, the contracts will be tracked in Monthly Status Reporting and in the PMIS. These improvements to the project controls procedures should enhance the Authority's ability to control both cost and schedule for the Central Valley segment.

Cost control has been a challenge for the Authority on CP 1, primarily due to delays in securing necessary right-of-way for the start of construction. The budget for CP 1 has increased by $303 million, or 26% to reflect an increased scope due to the extension of the work to Madera and the addition of extensive unanticipated utility coordination and relocation work. A further change order of $13.6 million to cover contractor costs for accelerating work is anticipated. The cost reports provided to the Finance and Audit Committee on a monthly basis include a summary line item for change orders that aggregates cost changes due to schedule delays, expanded geographic scope and added utility work. The Authority has stated that it has increased resources and improved procedures for right-of-way acquisition, and the Authority's latest risk information indicates that the cost and schedule impacts of any further delays in right of way acquisition to CP 1 should be minor.

Although the delays in right-of-way acquisition and the continuing risk of further delays highlight a need for better agency resource planning and schedule control, the Authority is implementing mitigation measures from the lessons incurred in CP1. These issues are discussed in Section 2.2.

The Authority's current management systems and planned enhancements are adequate to monitor and control the delivery of the scope of the Central Valley segment. Additional management reporting will need to be provided to address the full scope of work and the Authority appears to be planning to develop an industry standard project reporting capability with its plans for a PMIS and updates to the PMP.

2.4 REGULATORY STANDING

The regulatory and environmental review focused on the FEIR / FEIS documents, applicable records of decision ("RODs"), and on review of the design build contracts and associated documentation describing the projects and the design builders' progress. The focus is on the Central Valley sections of the project (CP 1, CP 2-3, and CP 4).

The FEIR / FEIS for the Merced to Fresno Central Valley section was published in 2012. The Federal Railroad Administration issued its ROD on September 18, 2012. The ROD selected the "Hybrid Alternative, Merced Downtown Station, and Fresno Mariposa Street Station" for the Project because the hybrid (1) "best [satisfies] the Purpose, Need, and Objectives" and (2) minimizes "impacts on the natural and human environment by utilizing an existing transportation corridor where practicable and incorporating other mitigation measures."[19]

The FEIR / FEIS for the Fresno to Bakersfield section was published in April 2014. The Federal Railroad Administration issued its ROD on June 27, 2014. The FRA via the ROD selected "portions of the BNSF Alternative with the Corcoran Bypass, Allensworth Bypass, and Bakersfield Hybrid alternatives." The Project also includes "the Kings / Tulare regional Station – East Alternative and the Downtown Bakersfield Hybrid Station Alternative." FRA did not select a Heavy Maintenance Facility alternative at the time of the ROD. The ROD states that these alternatives (1) "best satisfy the Purpose, Need, and Objectives" and (2) "minimize impacts on the natural and human environment by utilizing an existing transportation corridor where practicable and incorporating other mitigation measures."[20]

The ROD, thus, imposes specific environmental and regulatory requirements on the Authority and the three design / build contractors.

The Authority, in turn, assumed specific responsibilities based on the ROD and its associated documents when it entered into a design build agreement for CP 1, CP 2-3, and CP 4. These responsibilities, spelled out in the Special Provisions, included:

- For CP 1, per Part A.2, section 2, tiered Notices to Proceed that defined the completion deadlines (NTP 1, 2, and 3) allowed for escalation according to a specified formula and an allowance after 360 days for a negotiated change order

[19] FRA ROD, p.41
[20] FRA ROD, p.43

and time adjustment that accounted for environmental, regulatory, and other requirements and contingencies.

- For CP 2-3 and CP 4, per Special Provisions 2.0 and 3.0, Notices to Proceed that, in turn, defined completion deadlines were specified, allowing for escalation according to a specified formula, as well as an allowance after 360 days for a negotiated change order and time adjustment that accounted for environmental, regulatory, and other requirements and contingencies.
- Substantial Completion for CP 1 was set at 51.5 months after NTP-1 with the Final Acceptance Deadline defined as 53.5 months after NTP-1. CP 2/3 allowed 980 days after NTP for substantial completion and 1025 days for Final Acceptance. CP 4 allowed 740 days after NTP for substantial completion and 785 days for Final Acceptance.
- Contract CP 1 was signed with the Merced to Fresno section environmental documents already complete and covered by the FRA's Record of Decision (ROD) and other decision documents referenced in section 8.1. CP 2/3 and CP 4 were also tied to the Fresno to Bakersfield FEIR / EIS and its FRA Record of Decision of June 2014.
- All three design build contracts (in their Special Provisions) include specific allocations of responsibility for obtaining government approvals. Per these Special Provisions, the Authority committed to beginning "to implement all off site mitigation measures … as necessary to allow impacts to resources subject to … Governmental Approvals to proceed in compliance with applicable Laws." [quote extracted from Special Provision 6.1.1 for CP 2/3, with similar language included in CP 1 and CP 4]
- CP 2-3 and CP 4 included a specific reference to the Authority's Environmental Mitigation Management and Assessment ("EMMA") database to document compliance with all Environmental Requirements. The Authority required the CP 1 contractor, post-contract execution but consistent with the terms of the contract, to use EMMA. All three contracts include reference and required compliance with the Mitigation Monitoring and Enforcement Plan ("MMEP").
- The Authority's CP 1, CP 2-3, and CP 4 agreements appear to have addressed the environmental and regulatory requirements in an inclusive manner that links contractor requirements and the Authority's own requirements. The risks associated with achieving the commitments appear to be normal project risks that can be managed by EMMA and MMEP. Future contracts (after CP 4) should carry references to both EMMA and MMEP.

However, the Authority's obligations to obtain approvals and permits on a specific time frame imposes performance, cost, and schedule risks. Because CP 1 was the earliest contract, the Authority's exposure to cost and schedule risks were the greatest in relation to this contractor. The impact of those risks may have been eclipsed by the impact of right of way and third party agreements after CP 1 started work. Nonetheless, the schedule impacts may have contributed to the overall delay and extension of the CP 1 contractor's work (currently shown as approximately 1,690 days on the current CHSR Program Summary Schedule (CHSR Schedule) versus the original 1,115 days / 51.5 months in the CP 1 contract. CP 2-3 and CP 4 appear

to have avoided the schedule impacts that affected CP 1 and show projected completion dates in line with their original durations in the CHSR Schedule. As a mitigation measure, the Authority should follow the model used in CP 4 that provides a more complete set of references to EMMA and to MMEP for future contracts. Additionally, schedule provisions for future contractors should continue to include adequate time allowances for the Authority's efforts to meet environmental and regulatory commitments.

The Heavy Maintenance Facility ("HMF") was addressed in both FEIR / EISs for the Central Valley. However, the HMF was not included in the ROD. The future contract that will include the HMF should include any additional or new environmental commitments that may be imposed via a future FRA ROD or by CEQA.

The Authority's environmental documents included obligations that it and its contractors comply with. However, these obligations appear to be well managed and none of the obligations would appear to pose any serious issues for the Central Valley segment to be built as planned.

2.5 CONSTRUCTION COST

2.5.1 CP1-4

The total budgeted construction cost for the civil works for the Central Valley segment is $5,329,359,278. Of this amount, $3,214,467,635 or 60% is for the executed construction contracts not including remaining construction contingency. The remaining $2.1 billion in budgeted costs included right-of-way acquisition, construction management, and work by third parties, including $260.9 million for the realignment of SR99 by Caltrans. The budgeted cost also includes $512.5 million in approved contingency for the construction contracts, based on the November Capital Outlay Report. The reported remaining contingency represents approximately 16 % of the total DB contract amount.

Expenditures to date for the DB construction work as of the November 2016 Capital Outlay Report totaled $654,811,250 or 21% of the contract amount. The remaining contract amount to complete the civil works was $2,451,882,908. An important indicator of budget sufficiency is the available contingency as a percentage of the remaining work. The $512.5 million in apparent available contingency represents 21% of the remaining contract amount, which is above the industry-standard 10% for work that is under construction. The identified contingency is only related to the construction contract work. The Authority has indicated that additional contingency is embedded in the other budget line items (such as third Party Contract Work), which provides an additional level of confidence that the civil works can be completed within the identified budget. The Authority should explicitly identify and track all contingency amounts as part of its project controls process.

The Authority includes cost contingency draw-down curves for the active construction contracts in its Finance and Audit Committee Monthly Operations Report. The November 2016 reports indicate potential contingency shortfalls of up to $19 million for CP 1 and up to $8 million for CP 2-3. These relatively small contingency shortfalls, if realized, could be accommodated by the $276 million in unallocated contingency included in the overall budget for the currently planned construction work. The Authority reported that it intends to conduct an updated risk assessment and contingency evaluation for CP 1 following the execution of major contract change orders and updates to the CP 1 budget. It appears that there should be sufficient contingency, either in the allocated amounts for the construction work, or the unallocated contingency to accommodate any adjustments that are likely to be needed.

2.5.2 Track and Systems Elements

It is noted that in the 2016 Business Plan Basis of Estimate, it is stated that sources for bid prices have come from local, regional, statewide and national levels, as well as from international high-speed rail projects. It also states that prices were verified by looking at active projects in the state and that these were documented and adjusted for site, escalation or location factors.

The Funding Plan provides the following budget line items:

Table 7: Central Valley Segment Budget

Capital Costs	Cost to Complete (2015 $)	(YOE$)	Expected Through FY 15-16	Total Capital Costs
Track structures and track	1,228	1,305	202	1,507
Stations, Terminals, Intermodal	137	145	4	148
Support facilities, yards, shops, admin buildings	106	118	0	118
Site work, right of way, land, existing improvements	1619	1750	798	2,549
Communications and signaling	292	309	0	309
Electric traction	512	540	0	540
Vehicles	0	0	0	0
Professional services	1.191	1,289	431	1,720
Sub-total	5,087	5,456	1,434	6,890
Total contingency	**874**	**923**	**0**	**923**

Note: Totals may not sum due to rounding.

Benchmarking comparisons for new high-speed railway projects are very difficult to evaluate since not all agencies report costs or estimates in the same way. In many instances, internal costs are excluded and in some cases, civil engineering costs are regarded as construction costs and systems are treated separately. However, a survey by the World Bank[21] suggests that the costs for the Central Valley segment are high in comparison with European and Chinese high-speed rail projects. This may provide a certain degree of comfort in this review but only in respect of declared costs. In comparison with UK high-speed rail system costs, the Central Valley segment cost is low. This may be explained by the fact that most UK projects are driven by "brownfield" costs whereas the Central Valley segment is predominantly a "greenfield" project.

So, we find that the budget allocated to the Track and Systems portion of the project Central Valley segment is sufficient. However, we also find that the budget allocated to Signals and Communications line item in particular may be low for an ERTMS level 2 type of system design. PFAL was provided a detailed line item budget breakdown for the Signaling and communications system, dated December 1, 2016. The Signaling and Communications line item budget also has a category for the train control system that will be required on-board the passenger trains. However, no funding was allocated to this on-board system within the Signaling and Communications budget with the expectation that such a system will be supplied by the rolling stock provider. In the interests of effectively managing major technology interfaces, PFAL suggests that the Authority consider procuring the on-board systems as part of the Signaling and Communications package and then providing that system as "free issue" to the rolling stock provider for installation on the passenger trains.

The level of estimating detail for Signals and Communications provided to PFAL is parametric in nature. However, cost comparisons with other ERTMS projects are clouded by "brownfield" and "greenfield" considerations. We would expect that the Signals and Communications budget should be more in the order of $500 million (2015$). Accordingly, PFAL suggests that the Authority maintain a critical review of the line item budgets within the Track and Systems overall budget - and stay within that overall budget which PFAL considers achievable. PFAL believes that the total cost estimate for the Central Valley segment is adequate to deliver the Track and Systems scope of work for the Central Valley Segment.

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[21] Gerald Ollivier, Jitendra Sondhi, and Nanyan Zhou, *High-Speed Railways in China: A Look at Construction Costs*, report no. 89200, July 2014.

2.6 CENTRAL VALLEY SEGMENT FUNDING

The analysis of the Central Valley segment funding sources is important to demonstrate sufficient funding is available to meet the proposed construction schedule. The Funding Plan includes $7,813.26 million for the Central Valley segment as seen in Table 8. The Central Valley segment will be funded through three sources: Prop 1A , Federal grants, and State Cap-and-Trade proceeds.

Table 8: Central Valley Funding Sources

Sources	(YOE $ million)
Prop 1A	2,609
Federal	2,970
Cap-and-Trade	2,234
Total	**7,813**

2.6.1 Federal

Total Federal funding for the Central Valley segment is $2,969.80 million. The total Federal funding is comprised of two separate sources as shown in Table 9: the American Recovery and Reinvestment Act Grant as amended in May 2016 ("ARRA") between the FRA and Authority[22]; and the FY 2010 Cooperative Agreement between the FRA and Authority ("FY 2010")[23].

Table 9: Federal Grants for Central Valley Segment

Federal Funding	(YOE $ million)
ARRA	2,041.18
FY 2010	928.62
Total	**2,969.80**

Total Federal assistance under ARRA is $2,552.0 million, but only $2,041.2 million will be used in relation to the Funding Plan. To date, over 60% of the Funding Plan's

22 California High-Speed Train Program ARRA Grant (FR-HSR-0009-10-01-06). FRA. 2016.

23 Initial Central Valley Section: Madera County to Bakersfield (Kern County) of the California High-Speed Train Program (FR-HSR-0118-12-01-00). FRA. 2011.

ARRA funds are expended with the remaining portion to be expended in FY 16-17. According to the Authority, ARRA funds will be fully expended around Spring/Summer 2017, which is in compliance with the ARRA funding period end date of September 30, 2017. The ARRA Cooperative Agreement further sets a performance period end date of December 31, 2022. PFAL reviewed the Scope of Work in the ARRA Cooperative Agreement, as it pertains to the elements included in the Funding Plan, and found it is in compliance with the Funding Plan's schedule. Further discussion on the reasonableness of the Funding Plan schedule can be found in Section 2.2. Matching contribution requirements for the Authority to stay in compliance with the ARRA Cooperative Agreement are set out in the Funding Contribution Plan for period end June 30, 2016 and updated on August 31, 2016[24].

As required in the ARRA Cooperative Agreement, and reflected in the Central Valley segment Sources & Uses table, all ARRA funds will be expended before the Funding Plan utilizes the $928.6 million of FY 2010 funds. FY 2010 funds will be expended from FY 18–19 through FY 20-21. These funds are appropriated and agreed to fund the Central Valley segment.

2.6.2 Cap-and-Trade

The Funding Plan includes $2,234 million in Cap-and-Trade proceeds, roughly 29% of the total Central Valley segment funding, starting in FY 16-17 through FY 22-23. We understand that the Cap-and-Trade funding amounts and timings were provided to the Authority by the Air Resources Board ("ARB"). The ARB funding estimates and the methodology for their development was not provided to PFAL for review.

A majority of this source of funds is still required to be acquired through quarterly State Cap-and-Trade auctions. The Authority is assuming, based on ARB information, that it will receive $500 million per year from Cap-and-Trade proceeds[25] for this Funding Plan and other anticipated funding needs for the Phase 1 system.

The quarterly Cap-and-Trade auction has insufficient historical information or comparable benchmarks that would allow us to independently verify the Authority's Cap-and-Trade planning assumption. Despite this, PFAL made best efforts to analyze the reasonableness of the Funding Plan's use of Cap-and-Trade proceeds given the recent volatility in Cap-and-Trade auction results.

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[24] Funding Contribution Plan (FCP). California High-Speed Rail Authority. August 31, 2016.

[25] Cap-and-Trade proceed budget based on California Air Resources Board

The high-level analysis of the Funding Plan's Cap-and-Trade use is based on the assumption that these funds will be used on a pay-go basis (as indicated in the Funding Plan), Cap-and-Trade funds will be spent according to the Central Valley segment Sources and Uses schedule dated November 10, 2016 (though funding can be distributed on an as needed basis per year), and makes no assumptions for committed or planed Cap-and-Trade expenditures outside of this Funding Plan. This analysis is considered to be indicative of the level of Cap-and-Trade proceeds in potential scenarios given the limited time, scope and information available for this Report.

The large Cap-and-Trade expenditure in FY 18-19 and the fact Cap-and-Trade funds will be expended on a pay-go basis requires reserving to meet the FY 18-19 demand. Besides the Authority's baseline scenario, PFAL looked at an additional scenario to determine the potential Cap-and-Trade reserving required. PFAL assumed the cash balance of $874 million as reported in the Funding Plan. The first four years would require the Authority to receive a minimum of approximately $202 million Cap-and-Trade proceeds to sufficiently reserve for the projected Cap-and-Trade expenses.

Table 10: Potential Cap-and-Trade Proceeds Required Assuming Cash Balance as of December 2016

	FY15-16	FY16-17	FY17-18	FY18-19	FY19-20	FY20-21	FY21-22	FY22-23
C&T Proceeds		202,088	202,088	202,088	202,088	210,482	109,922	90,285
C&T Expenditures		24,879	178,843	1,069,996	408,634	210,482	109,922	90,285
C&T End Balance	874,000	1,051,209	1,074,454	206,546	-	-	-	-

In summary, we have not had access to the methodology behind the original ARB estimates for Cap-and-Trade proceeds, so we offer no opinion on the reasonableness of their forecasts. However, we do have confidence that Cap-and-Trade proceeds will be made available to the Authority to support this Funding Plan and that the Authority will use these funds to build their funding reserves as indicated in the Funding Plan.

It is outside the scope of this Funding Plan to evaluate the feasibility of Cap-and-Trade proceeds to fund other elements of the Phase 1 system. However the $500 million per year projection will require additional scrutiny in subsequent funding plans due to the volatility seen in recent auctions, the ongoing court case regarding the

legality of state-auction allowances, and the uncertainty regarding the Air Resource Board's authority to continue Cap-and-Trade past 2020.[26]

2.7 DESIGN

Design and construction documents included within the Construction Packages CP 1, CP 2-3 and CP 4 were reviewed to identify issues that could impact cost and schedule requirements indicated within the Funding Plan. Design Criteria, Specifications, Directive Drawings, Guidelines, 15% Preliminary Design Plans, Composite Utility Plans, Design Reports, and other relevant documentation were reviewed as part of the analysis to develop findings. Engineering judgment and past experience from major transportation projects and programs of projects were used as a barometer of Authority design progress and status to date. Although the management of the following findings is considered critical to project success, no fatal design flaws have been identified based on the information that was available and reviewed. The project is still in the early phase of implementation and can be delivered successfully within the budget and schedule requirements identified in the Funding Plan.

Preliminary Engineering designs were developed by the Authority's consultants during the environmental review stage, that establish project footprint including typical sections, alignment plan and profile, roadways and grade separations, preliminary structure layouts and elevations, and major utility relocations among other project features. Based on past experience and to minimize risk, design-build contract documents are typically developed close to a 30% level of completion. As a result, potential conflicts and other design issues cannot be fully evaluated with this review or by the Authority at this time. The risk assessment conducted by the Authority has captured and adequately addressed various risks related to geotechnical, utilities, hazardous materials and other less developed design components and budget contingencies have been allocated. If the Authority manages risks and the risk process is carried out as described, completing the project in accordance with the Funding Plan is possible.

Stations designs or typical sections, from PFAL's review, were not provided with CP 1 through CP 4 Civil Contract package and cannot be evaluated for potential design issues at this time. The Authority reports that station design will be conducted under a separate design-bid-build project delivery method with the platform construction advertised for construction through the systems related design and construction

[26] Legislative Analyst's Office. December 1, 2016

procurements. Since design-bid-build procurements can result in reduced risks to the Authority, evaluation of stations' design packages can be deferred to a later time without increasing the overall risk profile to budget and schedule. Additionally, above ground station construction that occurs before trains reach the testing and operations phase comprise a smaller overall percentage of construction and risks can be controllable.

Structural reviews were also based upon the available information from the Directive Drawings, the Design Criteria Manual, Baseline Geotechnical Reports, and others design documents. The 15% Utility Impact Reports and 15% Design Plans and Profiles designs, including bridge and wall layouts are less developed than would be desired to substantially mitigate design risks. These risks can be controlled through the Authority's continued and comprehensive risk reviews and mitigation processes. Therefore, the probability that the project can be constructed within the cost and schedule required by the funding plan increases. The Authority has demonstrated strong collaboration with the contractor to identify areas of risk, solicit contractor input and incorporate risk mitigation into the design as project development advances.

The aesthetics manual provides guidelines, but not prescriptive aesthetic directives. The Authority reports that the scope of work requires the Contractor to adhere to aesthetic design guidance to implement aesthetic design and visual resource mitigations and enhancements to structures. The Aesthetic Design and Review for Non-Station Structures Report will describe Contractor's approach to implementing these mandatory guidelines.

Geotechnical boring spacing is approximately 1.3 miles between borings. Obtaining additional borings and more detailed geotechnical information could be considered to better inform bidding contractors, reduce cost and reduce risk to the Authority. The Authority has adopted a two-step geotechnical baseline report process where the contractor is to further develop those areas where more detailed geotechnical information is required. The Authority reports that geotechnical data is being improved through follow-on contracts which could reduce some of the risk moving forward. This includes further determination of soil types and conditions. According to the CP1-CP4 Construction documents, the contractors are required to access right-of-way parcels (private at the time of contract execution but scheduled for acquisition by the Authority) and acquire the additional information required to complete the designs. Continued mitigation of these risks into the Authority's risk management and mitigation process will increase the probability to complete the project within the parameters of the Funding Plan.

Several hazardous materials are identified in the Baseline Geotechnical Report and direction is provided to the Contractor to determine the actual hazardous quantities

(5-10% of total soil volume assumed in 6.1.4) of contamination and disposal. The Authority reports that these provisional quantities of hazardous materials will be confirmed by the contractor as the project design is developed and that the risk assessment incorporates contingency to compensate for actual contaminated soil percentages that may be encountered. The existence of hazardous materials can significantly impact budget and schedule if not properly managed.

The PMP and other contract documents include the assignment of liquidated damages in the event of potential contractor non-performance. To better facilitate partnering processes and to support the effectiveness of liquidated damages, the contract documents should include contractor incentives for contractor performance that is ahead of schedule and under budget. In general, contractor incentives may be effective in reducing the occurrence of claims. Incentive compensation can support contractor partnering and offset the reality that collection of liquidated damages (disincentives) is unlikely and often requires costly litigation. However, we do believe the Authority's use of liquidated damages is not an impediment to completing the project as stated in the Funding Plan.

If effectively managed, the CP1-CP4 Construction Packages can be delivered according to the schedule and budget requirements identified in the Funding Plan and we consider the Authority's current management structure and approach as appropriate for these contracts.

3. Suitable and Ready for High-Speed Rail

With the Funding Plan and the associated contract documents and Specifications, the Central Valley segment will be suitable and ready for high-speed train operations as stated in Assembly Bill ("AB") 1889 and as proposed in the Funding Plan as well as the 2016 Business Plan. As described in Section 2.2, the civil works elements of the Funding Plan are under construction and the remaining rail infrastructure elements for the Central Valley segment are planned and accounted for in the Funding Plan. On completion of the project, the usable segment will be suitable for testing of high-speed trains. The implementation of the additional investments required by the Authority to begin high-speed train operations, such as completion of the remaining portion of the Valley to Valley Line between San Jose and Madera, are planned and accounted for in the 2016 Business Plan – an approach confirmed in the June 8, 2012 Office of Legislative Counsel Letter[27].

The civil and track elements in the Funding Plan, from a technical point of view, could accommodate the San Joaquin service at an earlier date than the full scope proposed in the Funding Plan. This is driven by the fact that the San Joaquin service will operate diesel locomotives and so therefore would not require the associated electrification infrastructure.

This opinion is based on the preliminary Track and Systems Performance and Technical Specifications provided to PFAL, and is subject to change depending on the final specifications and designs for the rail infrastructure elements.

[27] Office of Legislative Counsel Letter, June 8, 2012: "the initial (Central Valley) segment by itself is not proposed to be used for high-speed train service until the later completion of the IOS."

4. Passenger Service Compatibility

Based on the material PFAL has reviewed, there are no expected impediments to passenger train service in the Central Valley segment once it is connected to other parts of the high-speed rail network or conventional rail trackage.

4.1 SUITABILITY OF SIGNALING SYSTEM

The signaling system adopted by the Authority must be fit for the purpose of operating high speed passenger trains. To understand the suitability of the train entitled control system specified for the HSR system, the review has examined the document Track and Systems Performance and Technical Requirements. There are some requirements in that document that do not reflect contemporary practice for the deployment of ERTMS systems. For example, the line item budget for Signaling and Communications shows an expectation that track circuits would be used. However, modern signaling projects are taking advantage of communications based technology that avoid the use of track circuits because those technologies can reliably and safely determine train positions. Track circuits then become superfluous and the system life cycle cost is reduced because track circuits do not need to be maintained. Discussions with the Authority suggest that track circuits were intended to provide reliable broken rail detection. Experience indicates that broken rails mostly appear at or near rail joints. In these cases, the track circuits are unaffected because, although the rail is fractured, the fracture occurs within the limit of rail bonding or securing and is therefore not detected. Only 30-50% of broken rails are detected by track circuits. There are modern forms of broken rail detection that do not require reliance of track circuits but these would not necessarily be supplied by a signaling contractor.

While track circuits will not prevent HSR service, other approaches may be more efficient.

4.1.1 Positive Train Control

The Authority's specifications provide for continuous train detection, interlocking of turnouts and junctions, limit of movement Authority commands and on board monitoring of train speed and train responses to commands. These specifications are consistent with the federal legislation requiring positive train control for all rail systems.

4.1.2 Signaling and Communications Risk

As discussed in Section 2.5.2 above, it is the finding of this review that the signaling and communications budget is insufficient to provide all the design, software preparation and equipment installation required to provide an effective working

solution. Nevertheless, PFAL believes that the total cost estimate for the Central Valley segment is adequate to deliver the Track and Systems scope of work for the Central Valley Segment.

4.2 ROLLING STOCK COMPATIBILITY

The rolling stock for the Authority is specified in the document “Schedule 1 Part A: Authority Tier III Trainsets Performance Specification”. This document provides a basic performance specification for the passenger fleet and it appears to be compatible with the other systems described in “Track and Systems Performance and Tech Requirements” document. The responses to the expression of interest notice showed that there are enough companies available and interested (9) to provide a good base for competitive tendering. Accordingly, PFAL does not expect any issues with respect to rolling stock compatibility.

4.3 SUITABILITY OF THE ELECTRIFICATION SYSTEM

The use of the Energy TSI (or equivalent) standard should ensure that a supplier will offer a proven product that will provide for interoperability and that is compatible with the proposed trains.

5. Operating Subsidy

Any high-speed train service contemplated by the Authority is outside the scope of this Funding Plan. Section C of the Funding Plan indicates the Authority will not operate stand-alone High-Speed Train Service in the Central Valley segment until the rest of the Valley to Valley Line, as defined in the Authority's 2016 Business Plan, is completed and connected to the Central Valley segment. This is also reflected in the Ridership and Revenue Forecasting Technical Supporting Document to the 2016 Business Plan which assumes High-Speed Train Service after the Valley to Valley line is connected. Since no standalone Authority High-Speed Train Service will be provided in the usable segment as defined in the Funding Plan, no operating subsidy is contemplated by the Authority. We understand that passenger rail service provided by San Joaquins will not result in any unreimbursed operating or maintenance cost to the Authority.

6. Risks and Risk Mitigation Strategies

The Authority has a well-developed risk management process that includes industry standard risk identification, quantification and assessment procedures for the work elements that are in construction and ready for procurement. The risk analysis includes cost risks and schedule risks with their associated cost impacts. The risk assessment results are used to establish cost contingency amounts for each work package. Although the risk assessment process identifies potential time extensions due to schedule risks, it is not apparent how or if these results are used to inform the schedule forecast for completion of the work packages or the overall program.

DB contracts have been awarded and NTP has been issued for all of the civil works for the Central Valley segment as CP 1-4. Caltrans is managing and has issued a CM/GC contract for realignment of a portion of SR99 required to accommodate HSR. Construction is underway on CP 1 and SR99 and design is in progress on the other construction packages. With the execution of the DB contracts for $3.2 billion of the $7.8 billion total budgeted cost for the Central Valley segment, a substantial amount of design and construction risks have been transferred to the contractors completing CP 1-4. The remaining risks for the civil works include third Party coordination (primarily railroads and utility companies), differing site conditions risks and risks associated with Authority support of construction (primarily right-of-way delivery delays), and interface risks among the civil works contracts and between the civil works and follow-on work for the installation of rail infrastructure.

Risks that have impacted the cost and schedule of the civil works to date include delayed delivery of right-of-way resulting in delayed start of construction and expanded scope for relocation of utilities for CP 1. The CP 1 budget also was increased to extend the line northward toward Madera. The Authority reports that delayed delivery of right-of-way for construction remains a risk that could further impact the cost and schedule of the civil works, but the overall impact has been reduced through mitigation measures including targeting acquisition efforts to critical right of way parcels.

Detailed descriptions of specific risks, probabilities of occurrence, projected impacts and mitigation strategies are considered confidential information by the Authority and were not transmitted for review. The Authority provided an overview of the current risk registers for CP1-4. Based on the overview provided, the risk registers appear to identify the significant risks for each work package and they are being used by

project managers to mitigate the cost and schedule impacts of the potential risk events.

The review finds that the budgeted costs for the active construction packages reflect industry standard risk assessment. The level of contingency appears adequate to address the cost impact of the identified construction risks, including impacts to construction management and other costs not included in the construction contracts. With respect to the project schedule, the review concludes that there is no evidence that the results of the risk assessment have been used to establish risk-based forecasts of the completion dates for the active construction packages or to determine potential schedule delays for follow-on work. It is recommended that the Authority incorporate the results of the risk assessments in its schedule forecasting process.

Project level risk assessment are only conducted for construction packages that are nearing procurement or are underway. The budget values for the cost of other elements of the program are established using typical percentage mark-ups to the base cost estimate. These percentages and the resulting contingency amounts are not divulged in routine cost reports, being embedded in a total cost forecast. The Authority reported that the cost estimate for the Rail Infrastructure work currently reflects a 10 to 25% contingency for individual line items and an overall contingency of 5% for the work package. The resulting 15 – 30% contingency amount is within the range of the FTA recommended contingency range level for projects that are early in the engineering phase of development.

The Authority is initiating a risk assessment for the Rail Infrastructure work package. The Authority reported that its risk informed contingency analysis led it to update the contingency level for CP 2-3 from that carried during the project development phase. Although the risks for the Rail Infrastructure work are different from those for the civil works, the contingency for this upcoming contract may well need to be increased after the risk assessment is completed.

Risk-informed contingency assessment has not been completed for non-construction components of the program budget, such as real estate, construction management services and program-level costs and the budgets for these items do not disclose any embedded contingencies. Given the Authority's robust risk management approach to the construction packages, the expectation is that a streamlined version of the risk-based cost approach would be applied to all aspects of the program and that the resulting contingency values would be presented in cost monitoring reports. This approach would facilitate a more robust contingency management and evaluation process that could inform better cost estimates for future elements of the overall HSR

program. At a minimum we recommend that embedded contingency amounts be reported for all components of the Central Valley program.

After our review of the Central Valley segment and its associated risk management approach, we believe that while risks certainly exist, the Authority has developed an appropriate industry-standard risk management process to manage and mitigate those risks. We find that additional steps will need to be taken to manage the risks that come with the upcoming Track and Systems procurement but the Authority appears to be taking those steps as that contract advances. The overall cost, funding, and contingency appears adequate and our overall assessment is that the major risks have been recognized and measures are being taken to mitigate or account for those risks in the project budget.

6.1 INTERFACE RISKS

There is a wide range of interfaces and therefore a wide range of risks. In this review, this is observed particularly in the Track & Systems specification, where a number of technical disciplines are included and where it is specified that the contractor will be responsible for integration. The Authority will need to monitor this integration and assist in mitigation where necessary, particularly in respect of dealing with interfaces with utilities and other bodies external to the main contract.

6.2 TRACK AND SYSTEM BUDGET RISK

Our review has noted that the overall Track and Systems budget should be sufficient for the project to be successfully completed. However, our review of the details of the Signaling and Communications line item budget will require additional precision as the project progresses to provide the level of detail for oingoing project management oversight and control. Accordingly we recommend that each line item undergo a detailed review with “best in class” benchmarking.

7. Conclusions

Having completed our analysis of the Funding Plan, PFAL's conclusions are as follows:

SHC 2704.08(d)(2) requirements	PFAL Opinion
Construction of the corridor or usable segment thereof can be completed as proposed in the Funding Plan	We have made observations on areas where we believe certainty in available funding and the construction program delivery could be improved. Overall, our conclusion is that the Central Valley segment can be completed from a technical and financial perspective as proposed in the Funding Plan subject to the Authority implementing its planned risk mitigation strategies, project management enhancements and effective execution of proposed contracts.
If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation;	We conclude that the Central Valley segment, upon completion, will meet the requirement of being "suitable and ready" for high-speed train operation as defined in Assembly AB 1889.
Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service;	Following completion of the work described in the Funding Plan, our conclusion is that there will be no expected impediments to passenger train service on the Central Valley segment.
The planned passenger train service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy;	The Authority does not contemplate passenger train service in this Funding Plan. Therefore, PFAL is unable to draw a conclusion regarding the potential requirement for an operating subsidy.
An assessment of risk and the risk mitigation strategies proposed to be employed.	We have made observations on specific risk mitigation strategies that the Authority has in place or will undertake in the prosecution of the work described in this Funding Plan. Based on the information we reviewed, PFAL concludes that the Authority has a well-developed risk management process that includes industry standard risk identification, quantification and assessment procedures for the work elements that are in construction and ready for procurement.

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Appendix II – Document Request

Notes of a Telephone Conference Call

Date: Thursday 10 November 2016

Subject: CHSR Technical Discussion: Shared Use Corridor

Call Participants:

John Popoff -HSR	(NB)
Greg Tseng - PFAL	(GT)
Les Elliott - FCP	(LE)
Piers Connor - FCP	(PC)
Noel Broadbent - FCP	(NB)

Discussion centered mainly around the details contained in a brief produced by NB, key issues discussed were noted as follows, additional post meeting comment provided by JP has been incorporated in these notes

1. The Capltrain specification and contract with the DB Contractor does not comply with some of the initial CHSRA requirements (dated 2010) for the electrification of the shared use corridor. JP said that the authority was aware of this and had been party to the decision to award the DB contract. Additionally JP has commented that the 2010 requirements assumed a dedicated HSR alignment to be constructed, owned and operated by CHSRA – as a result, the technical specifications were CHSR specs. When the Legislature required that the section from SJ-SF be a blended operation (i.e., CHSR would be operating on Caltrain property and the train operations blended) we became tenants on the Caltrain property. At that time we reviewed the Caltrain proposed specifications to make sure that they were suitable for the CHSR equipment and planned operations and are satisfied that our trains will work satisfactorily on the Caltrain Electrification.
2. The HSR refers to the use of international standards,(see response to 1.) the ones contained in the Caltrain specification were out of date. JP said that he expected the current standards to be applied.
3. Noted that legal requirements in California requires compliance with PUC general orders that the Authority believes need amending to allow the construction of a 25 kV railroad. The risk of any amendments in the Caltrain corridor lies with the JPB. JP said that the Authority view now was that these requirements did not apply to the high speed route. We need to keep the Caltrain territory and the CHSR territory separate. CHSR has a new GO 176 that covers the electrification of a dedicated high-speed line – we were the proponents of that GO and will comply with it. GO 176 does not apply to the Caltrain blended section (where there are freight trains, Caltrain trains, ACE, Amtrak and CHSR trains operating – Caltrain has filed with the PUC an application for a GO to cover this territory. CHSR has reviewed Caltrain's application and has provided minor comments to CPUC- but see no reason why we could not operate within the confines of the proposed GO. We expect that the CPUC will implement the new GO for the Caltrain blended sections imminently.
4. The specification for traction power was for 110 mph running, not 125 mph. JP explained that the existence of many at grade crossings meant that they accepted 110 mph was acceptable. (post meeting note - is any capacity being built into the supply for any future load growth?) JP has commented It is extremely unlikely that the SF-SJ route will be fully grade separated and the curves aligned to allow 125 mph running (the curve adjustment would require significant deviation from the existing ROW. In any event, the increase in electrical demand from 110 mph to 125 mph is easily covered by the thermal capacity of the Power Transformers.
5. The OCS design is for 79 mph and will accommodate running at 110 mph in future. JP believes that it is being built to allow 110 mph without further modification.
6. The Authority specified a sagged construction of OCS but a non-sagged design has been specified by Caltrain. (See note 1) JP said that provided current collection was satisfactory they will accept this. At low speeds we do not foresee a problem with current collection.
7. The contact wire height specification is at variance with CHRSA requirements. JP explained that the need to accommodate other trains determined the difference in height. See notes 1 & 3. CHSR specs assume that only CHSR train are operated. The Caltrain specs assume that a variety of train dynamic envelopes must be accommodated including double stack freight traffic – hence the different contact wire height
8. NB noted that back to back cantilevers were not to be used on the high speed line but were likely to be used by Caltrain. Such cantilevers did not provide for mechanical independence necessary for reliable performance. JP understood the reasons why Caltrain might use them and confirmed they would not be

used on the high speed sections. (See note1) Back to back cantilevers are undesirable but, due to environmental constraints Caltrain has been forced into using them in selected (limited) areas. They are not contemplated for use on the CHSR sections.

9. NB noted that the DB contractor was at risk for meeting unspecified PG&E quality standards for harmonic distortion etc. JP explained that the Authority had carried out work with PG&E at a weak point in their 115 kV distribution system and was satisfied that requirements could be met. He further said that the results of this work would be made available to the DB Contractor and that the supply system was more robust in the San Francisco area.
10. NB commented that the lack of a final OCS design had caused cost and program overruns with other projects and that geotechnical surveys were paramount in getting foundation design right first time. JP said that there was good geotechnical knowledge of likely ground conditions along the Caltrain corridor and that the DB contractor seemed to be relaxed about the issue.
11. PC queried the program to remove at grade crossings and noted that any such work after electrification would have to fund necessary changes to the OCS. JP noted that it had been an aspiration for many years to eliminate such crossings but the reality is that the work is not funded and is extremely unlikely to be funded before the PCEP is completed.
12. PC asked what leverage could be exerted by the DB contractor with local utility owners. JP commented that Caltrain has granted the licenses/easement to the utilities, Caltrain had good knowledge of the position of utilities and had influence with the owners.

Noel Broadbent
(Associate FCP)

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CALIFORNIA
High-Speed Rail Authority

San Francisco to San Jose Peninsula Corridor Funding Plan

Final – January 1, 2017

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Appendices

I. Anticipated Timing of Receipt of Funds

II. Source and Reference Documents

Glossary of Key Defined Terms

Agreement Regarding Commitments Toward Peninsula Corridor Electrification Project	Agreement Regarding Commitments Toward Peninsula Corridor Electrification Project approved by CHSRA Board (Resolution 16-21), signed and effective August 9, 2016, that provides further detail to the 7-party Supplement to 2012 MOU with regard to funding arrangements between the Authority and JPB.
Blended System	A blended system approach refers to the integration of high-speed trains with non-high-speed intercity and commuter/regional rail systems via coordinated infrastructure (the system) and scheduling, ticketing, and other means (operations).
California High Speed Rail Program Phase 1	The corridor of the high-speed rail system from Los Angeles and Anaheim to San Francisco including the blended system between San Francisco and San Jose.
California High Speed Rail Program Silicon Valley to Central Valley Line ("Valley to Valley Line" or "V2V")	As defined in the 2016 Business Plan, this is the segment of the California High-Speed Rail System that runs from San Jose Diridon Station to just north of Bakersfield, which will connect with the Peninsula Corridor from San Jose to San Francisco.
Peninsula Corridor (also referred to as "San Francisco to San Jose Peninsula Corridor Segment" or "Corridor")	Railway and facilities comprising the rail corridor between San Jose and San Francisco.
Caltrain Modernization Program ("CalMod")	A group of rail improvement projects, (including electrifying the railroad, installing an advanced signal system, and procuring high-performance electric trains) in order to enable electrified commuter rail service from San Francisco to San Jose and to prepare the corridor for high-speed rail.
Carl Moyer Memorial Air Quality Standards Attainment Program ("Carl Moyer Program")	A state-funded program that offers grants to reduce air pollution emissions from heavy-duty engines.
Communications Based Overlay Signal System ("CBOSS") (also referred to as "PTC" and "Advanced	A project within the CalMod program involving the installation of a federally mandated Positive Train Control system, referred to as the CBOSS, to equip the corridor with safety technology and increase system capacity to help accommodate future increases in service and ridership demand.

Signaling”)	
Electric Multiple Units (“EMU”)	An electric multiple unit or EMU is a train where each carriage is powered separately and runs on electricity. An EMU requires no separate locomotive, as electric traction motors are incorporated within one or a number of the carriages.
High-Speed Passenger Train Finance Committee (“The Committee”**)**	The Committee consists of the State Treasurer, the Director of Finance, the Controller, the Secretary of Transportation, and the Chairperson of the Authority. The State Treasurer serves as Chairperson of the Committee.
Peninsula Corridor Electrification Project (“PCEP” or “Caltrain Corridor Project”)	A project within the CalMod program involving the installation of new electrical infrastructure and the purchase of electrified vehicles called Electric Multiple Units (“EMU”) for services in the Peninsula Corridor.
Peninsula Corridor Joint Powers Board (“PCJPB”, “JPB” or “Caltrain”)	The governing body for the Caltrain commuter rail transit service between San Francisco, San Jose and Gilroy.
SB 1029	Senate Bill 1029, a “trailer bill” to the State Budget Act of 2012, under which Prop 1A bond proceeds in the amount of $600 million were appropriated by the Legislature for the PCEP.
SB 557	Senate Bill 557, enacted in 2013, adds detail to provisions governing the expenditure of the funds appropriated under SB 1029. The bill requires any track expansion for the San Francisco to San Jose segment beyond the blended system approach to be approved by all parties to the 9-Party MOU.
2013 Memorandum of Understanding	Agreement between the Authority and Caltrain to form a new partnership for the planning, environmental review, design, and construction of improvements in the Corridor using the blended system.
7-Party Supplement to the 2012 MOU (“Seven Party MOU Supplement” or “MOU Supplement”)	A 2016 supplement to the 2012 9-Party Memorandum of Understanding for Financial Commitments to address the funding gap for the Peninsula Corridor Electrification Project.
9-Party Memorandum of Understanding (“Nine Party MOU” or “2012 Nine Party MOU”)	A 2012 agreement between the Authority, Caltrain, and seven other entities to describe, identify and work to fully fund an interrelated program of projects to modernize Caltrain and enable high speed rail service in the Corridor.

Acronyms and Abbreviations

ABAG	Association of Bay Area Governments
APTA	American Public Transportation Association
Authority	California High-Speed Rail Authority
BAAQMD	Bay Area Air Quality Management District
Cap & Trade TIRCP	California State Transportation Agency's Transit & Intercity Rail Capital Program
CBOSS	Communications Based Overlay Signal System
CCSF	City and County of San Francisco
CEQA	California Environmental Quality Act
CEM	Crash energy management
CTP	San Mateo Countywide Transportation Plan
DB	Design Build
EIR	Environmental Impact Report
EMU	Electric Multiple Units
FFGA	Full Funding Grant Agreement
FOCS	Fiber Optic Communications System
FRA	Federal Railroad Administration
FTA	Federal Transit Administration
FY	Fiscal Year
GGRF	Greenhouse Gas Reduction Fund
GO	General Obligation
HMI	Human machine interface
IED	Intelligent end device
JPB/PCJPB	Peninsula Corridor Joint Powers Board
LNTP	Limited Notice to Proceed

MOU	Memorandum of Understanding
MTC	Metropolitan Transportation Commission
LCTOP	Low Carbon Transit Operations Program
PCEP	Peninsula Corridor Electrification Project
PD	Project Development
PMFA	Project Management and Funding Agreement
Prop 1A	Proposition 1A, also known as the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century"
Prop 1B	Proposition 1B, Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act of 2006
PTC	Positive Train Control
PTMISEA	Public Transportation Modernization, Improvement, and Service Enhancement Account Program
RIMP	Risk Identification and Management Plan
ROCS	Rail Operations Control System
RTU	Remote Terminal Unit
SB	Senate Bill
SCO	State Controller's Office
SFCTA	San Francisco County Transportation Authority
S&H Code	Streets and Highways Code
SMCTA	San Mateo County Transportation Authority
TASI	Transit America Services Inc.
TJPA	Transbay Joint Powers Authority
VTA	Santa Clara Valley Transportation Authority
YOE	Year of Expenditure

Introduction

Proposition 1A, the "Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century" (the Bond Act) was approved by voters in November 2008. The Bond Act authorizes $9.95 billion in general obligation (GO) bonds to pay for the capital costs of the high-speed rail system and improvements to regional services which will connect to the system. The Bond Act is codified in Streets and Highways Code Section (S&H) section 2704 et seq. S&H section 2704.08, subdivision (d) requires that, prior to committing any proceeds of bonds described in paragraph (1) of subdivision (b) of Section 2704.04 for expenditure for construction and real property and equipment acquisition on each corridor, or usable segment thereof, other than for costs described in subdivision (g), the authority shall have approved and concurrently submitted to the Director of Finance and the Chairperson of the Joint Legislative Budget Committee the following: (1) a detailed funding plan for that corridor or usable segment thereof...(as further described herein); and (2) a report or reports prepared by one or more financial services firms, financial consulting firms, or other consultants, independent of any parties, other than the authority, involved in funding or constructing the high-speed train system, making certain indications.

Purpose of the Funding Plan

The California High-Speed Rail Authority (Authority) is submitting this Funding Plan in satisfaction of Streets and Highways Code section 2704.08, subdivision (d) for the commitment of $600 million of Proposition 1A (Prop 1A) bond proceeds for expenditure on improvements to the San Francisco to San Jose Peninsula Corridor Segment ("Peninsula Corridor" or "Corridor") between San Francisco 4th and King and San Jose Tamien Stations. These improvements will both electrify and modernize the Caltrain system and at the same time provide the necessary foundational improvements for the Authority to run high-speed rail service to San Francisco.

As the Legislature directed in making the appropriation of the funds in Senate Bill (SB) 1029 and reaffirmed in SB 557, the Authority plans to use these Prop 1A bond proceeds to electrify the Corridor. Caltrain has embarked on the Caltrain Modernization (CalMod) program, which includes the following components:

1. Installation of a federally-mandated Positive Train Control (PTC) system, otherwise known as the Communications Based Overlay Signal System (CBOSS). CBOSS construction is almost complete and will be finished before the electrification project that is the subject of this Funding Plan.

2. The Peninsula Corridor Electrification Project (PCEP) that includes electrification of the corridor as well as the purchase of Electric Multiple Units (EMUs) that will upgrade the fleet from diesel to electric.[1]

Together, the CalMod projects are essential for creating the necessary capacity for high-speed trains to run on the corridor. All of the CalMod components (CBOSS, electrification, and EMUs) are necessary to create the capacity and slots to allow for high-speed rail services in the corridor.

PCEP is the subject of this Funding Plan and is estimated to cost **$1.980 billion** (in Year of Expenditure (YOE) dollars).

The project follows the "Blended System" approach outlined in the Authority's 2012 Business Plan (approved by the California High-Speed Rail Board (Board) on April 12, 2012, Resolution HSR#12-13) and established in SB 1029. The blended system approach refers to the integration of high-speed trains with non-high-speed intercity and commuter/regional rail systems via coordinated infrastructure (the system) and scheduling, ticketing, and other means (operations). Upon completion of the projects described in this Funding Plan, full connectivity will be provided between the Caltrain system and the Silicon Valley to Central Valley Line (Valley to Valley Line), a segment on which the Authority has begun construction and plans to run service. After completion of the PCEP, both electrified Caltrain trains and high-speed trains would (extending from the Valley to Valley Line) be able to start using the corridor. However, the Authority plans to make further improvements to speed up service and meet other goals in the corridor and is working to environmentally clear those improvements right now.

Although this Funding Plan describes Caltrain's plans and estimates for how they will implement the PCEP, the Authority's key interests in the corridor are governed by the 2016 Business Plan and the agreements that the Authority either has or will execute with Caltrain. The Business Plan lays out the Authority's plans to begin Valley to Valley service in 2025, by which point if PCEP is complete, the Authority could begin to run trains in the corridor. Additionally, the Authority's agreements with Caltrain spell out the Authority's responsibility to contribute a specified and maximum amount of funding (including the $600 million that is the subject of this Funding Plan) to the project in return for Caltrain delivering the PCEP, granting the Authority the rights that are available to them to operate in the corridor, and collaborating with the Authority on future improvements that will be made to enhance the blended service. Thus the Authority's plans in the corridor only require Caltrain to fulfill their commitments from the Authority's agreements with them and complete PCEP by 2025, several years after its currently planned completion.

Background

In January 2004, the Authority and the Peninsula Corridor Joint Powers Board (PCJPB or JPB) entered into a memorandum of understanding (MOU) to establish a framework for future cooperation between

[1] Prop 1A funds will only be used for the electrification piece of PCEP and not the purchase of EMUs.

the two agencies for the development of a high-speed train system for California that would share the rail corridor between the City of San Jose and the City and County of San Francisco (CCSF).

The Authority's 2012 Business Plan established a policy to develop the high-speed rail system utilizing a blended approach consisting of primarily a two-track blended system that would accommodate future high-speed rail trains, existing freight, and modernized PCJPB commuter rail service in the Corridor.

The Authority and the PCJPB, together with the Metropolitan Transportation Commission (MTC), the San Francisco County Transportation Authority (SFCTA), the Santa Clara Valley Transportation Authority (VTA), the City of San Jose, the CCSF, the San Mateo County Transportation Authority (SMCTA) and the Transbay Joint Powers Authority (TJPA) entered into an MOU that adopted an early investment strategy for the Blended System in the San Francisco to San Jose Peninsula Corridor ('2012 Nine Party MOU'). The 2012 Nine Party MOU includes the Authority's commitment to secure approval and release of $600 million of Proposition 1A funds and $106 million of Proposition 1A "connectivity" funds to complete, at the earliest possible date, the CalMod program. In July 2012, the Legislature passed and the Governor signed SB 1029 that appropriated the $600 million of Proposition 1A funds for PCEP and $106 million of connectivity funds for CBOSS, as contemplated in the 2012 Nine Party MOU. The Authority's funding for the project is being matched by a variety of federal, state, and local sources.

Since 2012, PCJBP has certified a California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) for the PCEP and has engaged in a competitive procurement process for the PCEP which has led to separate design build (DB) contracts for the Corridor electrification and the purchase of EMUs. Both of these contracts have been executed. After receiving bids on the contracts, PCEP is now projected to cost $1.980 billion (this does not include the cost of CBOSS), which is higher than the original cost estimate in the 2012 Nine Party MOU.

To fill the funding gap, PCJPB has applied for, and significantly advanced in the process of receiving, a $647 million grant from the Federal Transit Administration's (FTA) Core Capacity Program, which did not exist at the time of the 2012 MOU. Execution of the Full Funding Grant Agreement (FFGA) that would finalize the grant is expected in early 2017. Additionally, seven of the original nine parties to the 2012 Nine Party MOU have approved additional funds to pay for the increase in project cost. Those parties and corresponding commitments are:

1. California High-Speed Rail Authority: $113 million
2. PCJPB: $9 million
3. The MTC: $28.4 million
4. The SFCTA: $20 million total with CCSF
5. The VTA: $20 million
6. The CCSF (see SFCTA)
7. The SMCTA: $20 million.

On August 9, 2016 the Authority Board approved a funding agreement and the 7-party Supplement to the 2012 MOU that further reiterates the Authority's commitment to provide to $600 million in Prop 1A funds (as directed by the Legislature in 2012), and an additional $113 million from Cap-and-Trade or other sources, approved by the Authority Board to support the PCEP. An electrified corridor is foundational to the Authority running its electrified trains, in a blended system with Caltrain. Along with approving the agreement, the Board (as a CEQA responsible agency) adopted CEQA findings regarding PCEP.

Finally, PCJPB was awarded $20 million of California State Transportation Agency's Transit & Intercity Rail Capital Program (Cap & Trade TIRCP) funds. With the combination of these additional funds, the PCEP is now fully funded.

Exhibit I-1: Sources of Funds Summary

Source	$ Amount	%
Federal	977.7	49.4%
State	741	37.4%
Local	261.6	13.2%
Total Project Funding	**1980.3**	**100%**

Source: PCEP Funding Plan

Current Status

Throughout 2016 the PCEP team continued to advance the project. As planned in the procurement process for the electrification contract, an apparent best value proposer was selected and negotiations were initiated in April. The project team worked extensively to negotiate technical and commercial sections with the apparent best value proposer. The negotiations were successfully completed at the end of June. The JPB awarded the electrification contract to Balfour Beatty Infrastructure, Inc. at its meeting on July 7, 2016. It was fully executed on August 15, 2016.

The PCJPB procurement process also continued for the EMU manufacturer. PCJPB staff began negotiations in late April with Stadler US, Inc. Negotiation discussions focused on technical exceptions and contractual / legal exceptions. The project team issued a letter to Stadler on May 20, 2016 to request a proposal in response to negotiations. Stadler submitted a revised proposal on June 17, 2016 after which negotiations were successfully completed. The JPB awarded the EMU Vehicle contract to Stadler US, Inc. at its meeting on July 7, 2016. The contract was fully executed on August 15, 2016.

Organization of the Funding Plan

This Funding Plan is organized consistent with the requirements of S&H Code section 2704.08, subdivision (d).

Section A of this Funding Plan describes the San Francisco to San Jose Peninsula Corridor Segment as the Usable Segment for this Funding Plan.

Section B of this Funding Plan describes the sources of funds to be used for the improvements to the Corridor.

Section C of this Funding Plan provides the projected ridership and operating revenue for the Caltrain service in the Corridor.

Section D of this Funding Plan describes the construction cost estimates, including cost escalation and reserves for contingencies, for the PCEP.

Section E Since the Legislature made the appropriation for the PCEP without a separate subdivision (c) Funding Plan, there are no material changes to report.

Section F of this Funding Plan describes the terms and conditions of agreements that the Authority has executed or intends to enter into with Caltrain for the construction and operation of the Corridor. It also describes certain other existing agreements between Caltrain and/or the Authority and other parties.

A. The Usable Segment

Streets and Highways Code section 2704.08, subdivision (d)(1)(A) requires identification of the corridor, or usable segment thereof, and the estimated full cost of constructing the corridor or usable segment thereof. A usable segment is defined as a portion of corridor that includes at least two stations.

The Usable Segment – Requirements

This subsection outlines the requirements for a Corridor or Usable Segment and illustrates how the Peninsula Corridor, with the improvements included in the CalMod program and PCEP, meets these requirements. The Board has identified and selected the Corridor as a Usable Segment by its adoption of this Funding Plan. As part of the selection process, the Board considered the criteria for prioritization set forth in Section 2704.08, Subdivision (f).

The Peninsula Corridor meets the requirements of a Usable Segment, which is defined in Section 2704.01 as "a portion of a corridor that includes at least two stations." The Corridor runs from the current line's northern terminus at the 4th and King Street Station in the City of San Francisco to Tamien Station in San Jose, a total distance of approximately 51 miles. The usable segment includes high-speed rail stations at 4th and King Street in San Francisco and at Diridon Station in San Jose. Eventually, through additional investments, the service will be expanded to a permanent terminal at the San Francisco Transbay Transit Center and will serve a station at Millbrae. That extension is not part of this Funding Plan.

The scope of the PCEP is summarized in **Exhibit A-1.** Additional details also may be found in Section D, Projected Construction Cost, in this Funding Plan. **Exhibit A-2** provides a map of the CalMod program construction boundaries.

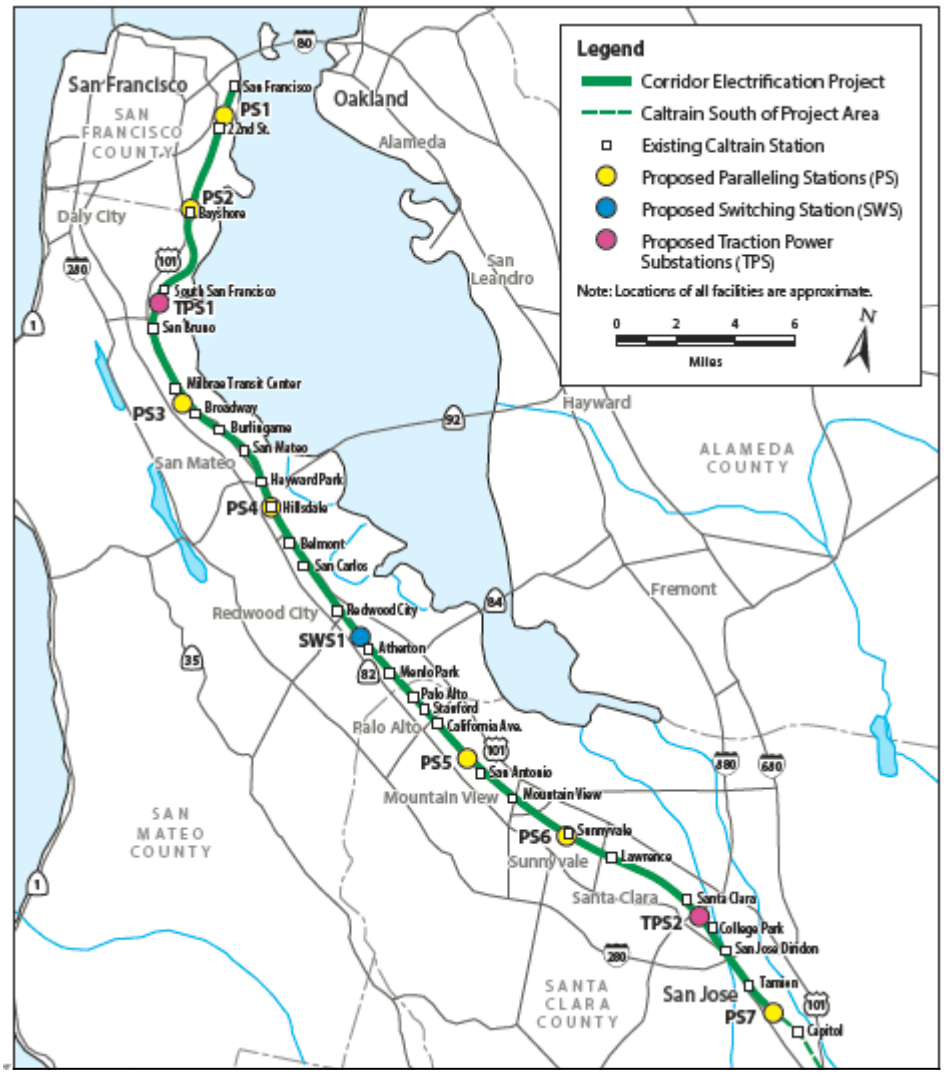
Exhibit A-1. Peninsula Corridor Electrification Project – Major Elements

Section / Scope	Description	Estimated Cost (YOE $)	Delivery Method & Current Status
Electrification Infrastructure	Design and construction of the electrified infrastructure including the Overhead Catenary System, substations, switching stations, paralleling stations and management reserve	$1,316 million	DB contract executed and Limited Notice to Proceed (LNTP) for design and some advanced material purchases approved
Purchase of EMUs	Purchase of up to 96 EMU's	$664 million	Contract for bi-level EMUs has

Section / Scope	Description	Estimated Cost (YOE $)	Delivery Method & Current Status
	to replace Caltrain's fleet of diesel rolling stock		been executed and LNTP has been approved.
Total PCEP Cost		**$1,980 million**	

Source: Caltrain (includes capital costs, retained costs and contingencies)

Exhibit A-2. Peninsula Corridor Modernization Project Construction Boundaries



Source: Caltrain EIR Executive Summary

Caltrain Modernization Program

Caltrain is completing the CalMod Program to electrify and modernize the railroad and allow for high-speed rail blended service in the corridor. CalMod encompasses the delivery of CBOSS to be completed

in 2017 and PCEP to be completed by December 2021. Additionally, planning efforts will prepare for the shared use of the Peninsula Corridor by both Caltrain and high-speed rail service in a blended system.

The electrification system envisioned for the corridor will be configured in such a way that it would enable the future operation of high-speed rail service. The power supply system of choice for a steel wheel-on-steel-rail high-speed train operation is 25-kV, 60-Hz, single-phase AC electrification, which is also what the JPB needs for its EMUs and which is what PCEP will install. The Corridor is currently rated for a maximum of 79 mph and high-speed trains would be able to run at that speed after the PCEP improvements are made. However, to make the service faster and safe at higher speeds, track and other system upgrades will be needed in the future in order to support higher speeds. High-speed rail service in the corridor has never been envisioned at 220mph so the upgrades that will be needed in the future will achieve more modest speed increases. Those upgrades and higher speed operations are the subject of a separate environmental analysis being conducted by the Authority and Federal Railroad Administration (FRA).

Exhibit A-3 describes the major milestones achieved or to be reached toward completion of the PCEP improvements on the Corridor.

Exhibit A-3. Major Milestones Achieved in Advancing the Usable Segment

Milestone	Description	Date
1	Federal Environmental Review / 35% Design	Complete-2009
2	2012 Nine Party MOU	Complete-2012
3	Board Action for Selection of Contracting Method (DB for electrification, Best Value for Vehicles)	Complete-2013
4	Procurement of Owner's Team	Complete-2014
5	Request for Qualifications for Electrification and Request for Information for Vehicles	Complete-2014
6	State Environmental Review	Complete-Jan. 2015
7	Approval of Entry into Core Capacity Program/Project Development (Federal Funding)	Complete-Apr. 2015
8	Inclusion of $125 million Core Capacity Funding in FY17 President's Budget.	Feb. 2016
9	Caltrain Board Approves Electrification and EMU Contracts	Complete – Jul. 2016
10	Design / Manufacture / Build / Test	2016-2020-21
11	Open for Revenue Service	2020-21

B. Sources of Funds and Anticipated Time of Receipt

Streets and Highways Code section 2704.08, subdivision (d)(1)(B) requires identification of the sources of all funds to be used and anticipated time of receipt thereof based on offered commitments by private parties, and authorizations, allocations, or other assurances received from governmental agencies.

This section describes the sources of funds for the PCEP, summarizes key conditions to receipt of funds, including timing constraints and matching funds requirements, and presents the anticipated time of receipt of such funds. A more detailed breakdown of the anticipated timing of each funding source is provided in the PCEP Funding Plan included in **Appendix I**.

Overview of Sources of Funds

SB 1029 appropriated $600 million from Prop 1A for the PCEP. Additional funds for the project were approved by the Authority Board of Directors in the 7-Party Supplement to the 2012 MOU. **Exhibit B-1** summarizes the sources of all funds contributing to PCEP from all sources.

Exhibit B-1. Sources of Funds for PCEP ($ millions)

Type	Source of funds	Funding Level ($millions)	% of Total	Evidence of Commitment
Federal	FTA Formula Program Funds	330.7	16.7%	CA-03-0598: $960K CA-03-0542: $2.7M CA-03-0565: $16.8K CA-90-Y246: $12M CA-54-0034: $5.23M (part of $315M) CA-95-X074: $4M (SF Transfer to JPB-part of SF local commitment) Funds to be provided by MTC as part of 9-Party MOU
Federal	Section 5309 Core Capacity	72.9	3.7%	FY16 Apportionment: $14.3M FY14 and FY15 Apportionments: $58.6M
Federal	Section 5309 Core Capacity	574.1	29.0%	FY17 President's Budget: $125M FFGA anticipated in early 2017
State	Prop 1B Public Transportation Modernization,	8.0	0.4%	California Department of Transportation Allocation Letter

	Improvement, and Service Enhancement Account Program			
State	Prop 1A	600.0	30.3%	SB 1029 and SB 557
State	Cap-and-Trade or other Authority/State Sources	113.0	5.7%	August 9 2016 Authority Board Action Agenda Item 2
State	Transit and Intercity Rail Capital Program	20.0	1.0%	Grant award announced 8/16/16
Local	Carl Moyer Program	20.0	1.0%	Signed Funding Agreement with BAAQMD
Local	JPB Members	193.2	9.8%	9-Party Funding MOU + 7 Party Supplement
Local	MTC Bridge Tolls	39.4	2.0%	MTC Resolutions 3195 and 4243
Local	Caltrain (LCTOP)	9.0	0.5%	7 Party Supplement
Total Project Funding		**1,980.3**	**100.0%**	

Source: PCEP Funding Plan

Federal Funds

FTA Section 5309 Core Capacity Funds

As part of the FTA Section 5309 Core Capacity Program, the JPB submitted a request for $647 million (YOE$) in capital funding from for the PCEP, equal to 33 percent of the project's total cost of $1,980.25 million for electrification and EMUs (YOE$). The JPB expects to negotiate a FFGA with the FTA for the Core Capacity grant funds in early 2017. The funds would be subject to annual appropriation by Congress with the funding currently programmed through Federal Fiscal Year 2020 through the Fixing America's Surface Transportation Act. The Core Capacity program's process includes three steps: Project Development (PD), Engineering, and FFGA. Once an FFGA is approved, funds are requested each year in the President's budget and are approved through appropriation by Congress.

On April 16, 2015, the JPB received notification from the FTA that the project had been accepted into the PD phase of the Core Capacity program. With this approval, JPB has pre-award authority to incur costs for PD activities prior to the receipt of an FFGA from FTA. PD activities include all work necessary to complete the environmental review process and as much engineering and design activities as JPB believes is necessary to support the environmental review process. Upon completion of the environmental review process FTA extends pre-award authority to project sponsors in PD to incur costs for as much engineering and design as necessary to develop a reasonable cost estimate and financial plan for the project utility relocation, real property acquisition and associated relocations. This pre-award authority does not constitute a commitment that future federal funds will be approved for PD or any other project cost. As with all pre-award authority, relevant federal requirements must be met prior to incurring costs in order to preserve eligibility of the cost for future FTA grant assistance.

On February 9, 2016, President Obama released his FY 2017 federal budget which included $125 million for PCEP through the FTA Core Capacity Program. In addition, the FTA announced that the project will receive more than $72 million in prior year Core Capacity funding apportionments. The funding announcement signaled progress toward an FFGA between Caltrain and FTA. Based on Caltrain's application process with FTA, the FFGA is expected to be approved in early 2017 with funds available over the course of the construction period based on the grant agreement.

On August 12, 2016, the FTA approved the PCEP's entry into Engineering with an overall rating of "medium-high". This approval provides additional pre-award authority for non-construction activities including completing engineering work, procuring long-lead time items and any specialized equipment required for the project. Entry into Engineering has locked the share of federal funds that Caltrain can apply for at $647 million. Both PD and Engineering are important steps in the process of getting an FFGA. Caltrain's significant efforts in moving the program forward and the quick advancement through the Core Capacity application process shows the likelihood that the grant will be approved.

FTA Formula Program Funds

FTA Formula Program funds include prior/current year grants of $24.91 million and future year commitments of $309.77 million. These Federal funds are committed by the MTC through the 2012 MOU.

State and Local Funds

Over $700 million in State and local funding for PCEP is committed through a regional agreement (the 2012 Nine Party MOU) between the following Funding Partners:

1. The Authority
2. MTC
3. PCJPB
4. SFCTA
5. SMCTA
6. VTA
7. City of San Jose
8. CCSF
9. TJPA

The 2012 MOU is the result of a collaborative effort between the JPB, the Authority, the MTC and San Francisco Bay Area local agencies to identify early investments projects along Caltrain's existing rail corridor that improve service, safety and efficiency, and create linkages between the planned state high-speed rail system and local passenger rail service.

In addition to the funds identified in the 2012 MOU, additional funding sources have been committed by the Authority and the other funding partners through a supplemental agreement. This MOU Supplement provides an additional $210 million in funding and involves seven funding partners, including the

Authority, JPB, MTC, SFCTA, CCSF, VTA, and SMCTA. The MOU Supplement was approved by the JPB in May 2016 and was approved by the Boards of the other signatories between June and August 2016.

State General Obligation Bonds -- Proposition 1A

The Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century approved by the voters as Proposition 1A on November 4, 2008, provides over $9 billion in bond funding for construction of a high-speed rail system in California. In 2012, SB 1029 appropriated $600 million in Proposition 1A funds to the construction of the PCEP. These funds require, at project completion, a dollar-for-dollar match of other Federal, State, or local funding.

Pursuant to S&H Code section 2704.08, in order for the Authority/Caltrain to use the bond funds, the Director of Finance must review this Funding Plan and find that the plan is likely to be successfully implemented as proposed. Additionally, under S&H Code section 2704.12 and subsequent sections, the High-Speed Passenger Train Finance Committee[2] (Committee) must first authorize the issuance of the bond funds. In 2013, the Committee authorized Prop 1A Bond funds in the amount of $8.6 billion. In 2015, the Sacramento Superior Court entered judgment validating that authorization.

State Non-Prop 1A Funding

The Authority has also committed up to $113 million in additional funds, which will come from Cap-and-Trade or other sources available to the Authority and the State, to the PCEP, above and beyond the original $600 million commitment of Proposition 1A funding. The Authority Board approved the commitment of these funds at their August 9, 2016 meeting. On November 18, 2016 the Authority and PCJPB executed an agreement to make these funds available.

On June 20, 2014, the Governor signed the Budget Act of 2014 (SB 852 and SB 862), which included an appropriation of proceeds from the State's Cap-and-Trade Program to various programs and projects that will reduce greenhouse gas emissions in furtherance and accordance with Assembly Bill 32 (Global Warming Solutions Act of 2006). Specifically, SB 852 appropriated $872 million in Cap-and-Trade auction proceeds from the Greenhouse Gas Reduction Fund (GGRF) in Fiscal Year (FY) 2014-15, with $250 million going to the high-speed rail project. SB 862 also appropriated $400 million to the Authority to be made available starting in FY 2015-16, and continuously appropriated until expended. These one-time appropriations are further augmented by SB 862, known as the Cap-and-Trade Expenditure Plan, which established a programmatic structure for the continuous appropriation of annual Cap-and-Trade proceeds from the GGRF including 25% of all proceeds for the high-speed rail program.

In making the continuous appropriation, the Legislature determined that these funds could be used to pay for planning and construction costs for the Phase 1 Blended System and/or to repay loans made to

[2] The Committee consists of the State Treasurer, the Director of Finance, the Controller, the Secretary of Transportation, and the Chairperson of the Authority. The State Treasurer serves as Chairperson of the Committee.

the Authority. The Authority has already received the Cap-and-Trade proceeds necessary to meet its obligations for the additional funding.

Proposition 1B/Public Transportation Modernization and Improvement Account

The Public Transportation Modernization, Improvement, and Service Enhancement Account Program (PTMISEA) was created by Proposition 1B, the Highway Safety, Traffic Reduction, Air Quality, and Port Security Bond Act, approved by California voters in 2006. PTMISEA funds may be used for transit rehabilitation, safety or modernization improvements, capital service enhancements or expansions, new capital projects, bus rapid transit improvements, or rolling stock (buses and rail cars) procurement, rehabilitation or replacement. Funds in this account are appropriated annually by the Legislature to the State Controller's Office (SCO) for allocation through the State Transit Assistance formula (contained in Public Utilities Code Article 6.5) distributions: 50% allocated to Local Operators based on fare-box revenue and 50% to Regional Entities based on population. In November 2014, the JPB committed $8 million in formula funds from the PTMISEA to the PCEP.

On November 7, 2014, the JPB received a letter from the Department of Transportation confirming that the award had been made in full and that funds would be allocated directly.

Carl Moyer Program

The Carl Moyer Memorial Air Quality Standards Attainment Program (Carl Moyer Program) is a state-funded program that offers grants to reduce air pollution emissions from heavy-duty engines. The program is administered by the Bay Area Air Quality Management District (BAAQMD), which approved and allocated $20 million in Carl Moyer Program funds for the PCEP in July 2015. The JPB anticipates receiving $4M per year for five years.

JPB Member Contributions

The JPB member agencies provide equal shares of local capital funds for system-wide improvement projects. Funding from the respective partners comes from their local sources. JPB members contributed a total of $133 million in the Nine Party MOU from the following sources:

- San Mateo County ½ cent sales tax
- VTA Measure A sales tax
- San Francisco County Proposition K sales tax, Regional Transportation Improvement Program, and San Francisco County GO Bond proceeds.
    - SFMTA - will disburse up to $39 million of GO Bond proceeds, inclusive of the initial $7.76 million disbursement, to the JPB's account as eligible capital costs are incurred.

It should be noted that $4 million of San Francisco's commitment to the project is included in FTA grant CA-90-X074. These funds were transferred to the JPB in lieu of an equivalent amount of local funds from the City and County of San Francisco.

JPB Member Contributions—7-Party Supplement

VTA, SMCTA, SFCTA and CCSF are providing an additional $20 million each (a total of $60 million) for the project. These funds have been committed through the 7-Party Supplement that was approved by the JPB in May 2016 and was approved by the Boards of the other signatories between June and August 2016.

MTC Bridge Tolls

Bridge toll revenues provide funding for transit projects on or near bridge corridors that help to relieve bridge traffic and/or provide alternative public transit services. These funds are administered by the MTC, which has committed $39.4 million to the project through Resolutions 3195 and 4243, passed by the MTC Board in June 2016.

The JPB approved the allocation of these funds at their July 2016 meeting. Funds are currently available for both the electrification and EMU components of the project and are available in their entirety on a reimbursement basis.

Caltrain LCTOP

The LCTOP program provides state Cap-and-Trade proceeds on a formula basis to transit agencies to help fund transit projects and transit operations that reduce greenhouse gas emissions. The JPB will allocate $9 million of its formula share of LCTOP funds to the Project as indicated in the 7-Party Supplement. These funds are received on an annual basis and so far $1.9 million in Fiscal Years 2015 and 2016 funds has been committed. All of JPB's annual LCTOP formula funding will be directed to costs associated with the procurement of EMU's until the $9 million commitment has been reached.

Additional Funding for Cost Overruns or Funding Shortfalls

As part of its review of Caltrain's Core Capacity Grant evaluation, FTA recommended that Caltrain have a plan in place to address either a 10% cost overrun or a 10% funding reduction, which equates to about $198 million. In a November 22, 2016 letter to FTA, Caltrain confirmed that the PCEP local and regional funding partners including MTC, SMCTA, VTA, and CCSF and SFCTA have agreed to provide a commitment of up to an additional $50 million each to fund any potential cost overruns up to $200 million. These commitments, if necessary, would provide funding over and above the $1.98 billion budget, which already includes $316 million in overall project contingency.

C. Projected Ridership and Operating Revenue

Streets and Highways Code section 2704.08, subdivision (d)(1)(C) specifies inclusion of a projected ridership and operating revenue report. There are several provisions of the Bond Act that contemplate use of newly constructed high-speed rail line segments for non-high-speed passenger train service, as distinguished from high-speed train service. (see § 2704.08, subd. (f)(3) [referring to "the utility of those corridors or usable segments thereof for passenger train services other than the high-speed train service"]; see § 2704.08, subd. (c)(2)(I [referring to "one or more passenger service providers ... using the tracks or stations for passenger train service"]; see Sec. 2704.08, subdivision (d)(2)(C) [referring to "one or more passenger train providers ... using the tracks or stations for passenger train service"]).

Caltrain has developed tools to forecast the projected ridership and revenue for its system. Caltrain will operate its service between San Francisco, San Jose, and Gilroy.[3] The Authority will run its high-speed rail service on the San Francisco to San Jose Corridor using a blended system approach once it is connected with the Valley to Valley Line, as described in the 2016 Business Plan. The Authority is not planning to run stand-alone service in the San Francisco to San Jose Peninsula Corridor Segment.[4]

Peninsula Corridor Projections

Caltrain has projected ridership and revenue for its own rail operations in the Corridor. Implementation of the Caltrain Modernization project is anticipated to result in increased ridership. Caltrain expects its improved electrified service on the Corridor to increase daily weekday ridership from 47,000 per year in 2013 to 69,000 per year in 2020 and 111,000 in 2040 (*Source: Final EIR, Vol. 1, PG. 2-14, Table 2-3)*.

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[3] PCEP only electrifies the Corridor between San Jose and San Francisco so service to Gilroy will be operated using diesel trains. The Authority is developing its own plans to connect San Jose and Gilroy that will be separate from Caltrain's diesel service.

[4] The Authority has conducted extensive analysis of ridership for the Valley to Valley Line and those forecasts are included in the 2016 Business Plan. The ridership forecasts for the Authority's service that will use the Corridor are provided in the Business Plan as well as associated technical documents available on the Authority's website at http://hsr.ca.gov/About/Business_Plans/2016_Business_Plan.html.

Additionally, further technical information on the Authority's ridership and revenue forecasts is available on the Authority website here:

http://hsr.ca.gov/About/ridership_and_revenue.html

Table C-1. Caltrain Estimated Daily Weekday Ridership with the Project

Daily Weekday Ridership	2013	2020	2040
Existing/No Project	47,000	57,000	84,000
With Project	n/a	69,000	111,000

Source: Caltrain FEIR, Appendix I, Ridership Technical Memorandum.

Note that the following assumptions have been made in relation to the production of the above data[5]:

- Ridership above is based on boardings, not boardings *and* alightings.
- 2020 was used for ridership analysis to ensure full operation of the new electrified service.
- Existing / "No Project" analysis assumes the same schedule as at present (5 trains per peak hour; 1 train per off-peak hour per direction; total of 92 trains per day) for both 2020 and 2040
- For 2020, analysis assumed 75% electrified and 25% diesel service from San Jose to San Francisco.
- For 2040, analysis assumes fully electrified service between San Jose and San Francisco. PCEP only has sufficient funding at present to provide 75% electrified service between San Jose and San Francisco. Caltrain anticipates that it will obtain additional funding to allow full electrified service between San Jose and San Francisco to occur by 2040

The Caltrain ridership projections are based on a travel demand model. The travel demand model used to prepare the systemwide ridership forecasts to support PCEP is a version of the VTA Model developed for the San Mateo City/County Association of Governments in 2011. This version of the VTA Model was originally developed in 2009 by the VTA to support the Grand Boulevard Initiative Corridor Project and the San Mateo Countywide Transportation Plan (CTP) update. The VTA Model used in the CTP update was validated to year 2005 conditions and made use of the Association of Bay Area Governments (ABAG) Committed Regional Plans socioeconomic data forecasts (informally known as ABAG projections 2011) to develop forecast year 2035 projections *(Source: Caltrain Ridership Technical Memorandum).*

The model incorporates enhancements and considerations including:

- Updated to reflect 2013 base year conditions
- Adjusted and validated to year 2013 Caltrain system ridership
- Updated from the original base year 2005 for both transit and highway network changes, including a comprehensive update of both public and private shuttles serving the Corridor.

[5] At the time when forecasts were provide Caltrain assumed an opening date of 2020

- Used to prepare forecast year ridership and output for the project horizon years of 2020 and 2040, using updated socioeconomic data forecasts prepared by ABAG and updated background transportation improvements as defined in the recently adopted Bay Area Regional Transportation Plan.

The inputs to the model included:

- ABAG Socioeconomic Data Projections
- Roadway and Transit Networks
- Pricing
- Caltrain Schedules and Service Levels for Base Year 2013 and 2020 Project and 2040 Project + Transbay Transit Center Conditions.

(Source: Final EIR Appendix I, Ridership Technical Memorandum, pp. 1-10)

The EIR Appendix I, Ridership Technical Memorandum, contains more complete information that is the basis for the modeling and the results. **Exhibit C-2** below describes the forecast revenue and ridership for the Corridor (Caltrain services only) from 2015 through 2024. Revenue forecasts are based on annualized ridership estimates and an assumed schedule of fare increases. Annualized ridership estimates are interpolated from 2013 project-level ridership forecasts and have been adjusted based on updated project schedule and actual ridership trends.

Exhibit C-2 – Caltrain Annual Ridership and Operating Revenue

Year-by-Year Caltrain Revenues & Ridership										
	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Farebox Revenue ($ millions)	$80.0	$83.7	$91.1	$92.5	$100.9	$102.8	$121.4	$128.9	$142.3	$146.7
Non-Farebox Revenue ($ millions)	$9.3	$9.2	$9.5	$9.6	$9.9	$10.0	$10.9	$11.2	$11.5	$11.7
Ridership (millions)	19.2	20.5	20.8	21.1	21.5	21.9	24.5	26.1	26.1	27.7

Source: Caltrain SRTP Tables 4.1 and 4.3

D. Projected Construction Cost

Streets and Highways Code section 2704.08, subdivision (d)(1)(D) requires inclusion of a construction cost projection including estimates of cost escalation during construction and appropriate reserves for contingencies.

This section provides the cost estimate for construction activities for the PCEP.

Construction Cost Projections

The cost for the PCEP is estimated at **$1.980 billion YOE$** ($1.855 billion in $2015)**.** A breakdown is provided in **Exhibits D-1 and D-2** below. At this point, contracts have been awarded for both the electrification design-build contract and the EMU purchase. The estimated construction costs include an escalation component of **$125 million**. Allocated and unallocated contingencies in the estimate add up to **$316 million.**

Exhibit D-1 below sets out the cost of construction for the PCEP in both Base Year 2015 and YOE dollars. The data is presented in the FTA's Standard Cost Categories.

Exhibit D-1 – PCEP Capital Costs

STANDARD COST CATEGORIES (COSTS IN X$000)	Base Year (2015) Dollars	YOE Dollars
10 GUIDEWAY & TRACK ELEMENTS	13,373	14,257
20 STATIONS, STOPS, TERMINALS, INTERMODAL	0	0
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	2,124	2,265
40 SITEWORK & SPECIAL CONDITIONS	240,001	255,253
50 SYSTEMS	476,697	504,812
60 ROW, LAND, EXISTING IMPROVEMENTS	36,615	37,316
70 VEHICLES	577,400	630,535
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	353,409	368,084
90 UNALLOCATED CONTINGENCY	150,353	162,620
100 FINANCE CHARGES	4,822	5,110
Total Project Cost (10 - 100)	**1,854,794**	**1,980,253**

Cost Estimating Methodology

The PCEP capital cost estimate was updated in 2014 based on the 2008 35% design documents, as well as taking into account infrastructure upgrades, CBOSS, and new understanding of the project. The capital cost estimate was primarily a bottoms-up estimate, using detailed labor, material, equipment and productivity inputs. As new information has become available, the estimate has been updated. The capital cost estimate for the PCEP is $1.98B comprised of electrification and vehicles.

Exhibit D-2 – Total PCEP Budget

Description of Work	Budget (in YOE USD thousands)
Electrification Work	1,316,125
Vehicles Total	664,127
PCEP Total	**1,980,253**

Both electrification and vehicles include the design-build contracts, agency costs, required projects, contingency, and other costs.

The costs associated with the electrification design-build (including overhead catenary, traction power, signals, grade crossings, communications, design, environmental mitigation and Transit America Services Inc. (TASI) force account) is taken directly from the final negotiated design-build contract, and shown in the table below. The balance of the electrification portion of the project includes agency costs (including environmental mitigations, real estate, utilities, management oversight, Railroad Protective Liability Insurance, required projects, and TASI Support), as well as contingency and finance charges. **Exhibit D-3** provides a high level summary of the electrification costs.

Exhibit D-3 – Electrification Infrastructure Budget

Description of Work	Budget (in YOE USD thousands)
10 GUIDEWAY & TRACK ELEMENTS	14,257
20 STATIONS, STOPS, TERMINALS, INTERMODAL	-
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	18
40 SITEWORK & SPECIAL CONDITIONS	255,253

50 SYSTEMS	504,812
60 ROW, LAND, EXISTING IMPROVEMENTS	37,316
70 VEHICLES	4,541
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	362,827
90 UNALLOCATED CONTINGENCY	133,933
100 FINANCE CHARGES	3,168
Total Project Cost (10 - 100)	**1,316,125**

The management oversight and TASI support costs are based on staffing plans and actual direct and indirect employee costs. Environmental mitigation costs are based on the tasks identified in the EIR, with a combination of conceptual and bottoms-up costs. The costs associated with utility relocations have recently been updated based on discussions with local utilities. Real estate costs are based on 2014 plans depicting specific locations required for foundations, as well as easements required to maintain proper electrical clearances.

The vehicle (EMUs) cost is taken directly from the final negotiated vehicle contract, and shown in **Exhibit D-4**. Similar to electrification, management oversight and TASI support costs are based on staffing plans and actual direct and indirect employee costs.

Exhibit D-4 – EMUs Budget[6]

Description of Work	**Budget (in YOE USD thousands)**
10 GUIDEWAY & TRACK ELEMENTS	-
20 STATIONS, STOPS, TERMINALS, INTERMODAL	-
30 SUPPORT FACILITIES: YARDS, SHOPS, ADMIN. BLDGS	2,247
40 SITEWORK & SPECIAL CONDITIONS	-
50 SYSTEMS	-
60 ROW, LAND, EXISTING IMPROVEMENTS	-
70 VEHICLES	625,994
80 PROFESSIONAL SERVICES (applies to Cats. 10-50)	5,257

[6] The Authority is not providing funds for procurement of vehicles.

90 UNALLOCATED CONTINGENCY	28,687
100 FINANCE CHARGES	1,942
Total Project Cost (10 - 100)	**664,127**

E. Material Changes

Streets and Highways Code section 2704.08, subdivision (d)(1)(E) requires inclusion of a report describing any material changes from the plan submitted pursuant to subdivision (c) for this corridor or usable segment thereof.

In 2012, the Legislature passed SB 1029 appropriating $600 million of Prop 1A proceeds from S&H Code section 2704.04 for the PCEP without a subdivision (c) Funding Plan. As there was no Funding Plan developed under subdivision (c) prior to the Legislature's appropriation, there are no material changes to report.

F. Terms and Conditions of Agreements

Streets and Highways Code section 2704.08, subdivision (d)(1)(F) requires a description of the terms and conditions associated with any agreement proposed to be entered into by the authority and any other party for the construction or operation of passenger train service along the corridor or usable segment thereof.

The Authority has entered into agreements with the PCJPB to support and implement the improvements necessary to fund, construct, and begin operating the blended system in the Peninsula Corridor. The PCJPB has executed the actual design-build contracts for the PCEP. The sections below describes some of the key terms and conditions of agreements governing the planning, construction, and operation of improved and electrified service over the Corridor, as described elsewhere in this Funding Plan.

Interagency Agreements

The Authority entered into a MOU in 2012 with eight other parties in the Bay Area to fund improvements in the Corridor. A supplementary seven party MOU was subsequently entered into in 2016. The Authority also entered into an additional MOU in 2013 with the JPB for the planning, environmental review, design, and ultimate construction of the improvements (2013 MOU). These MOUs describe the terms and conditions of the agreements entered into by the Authority and Caltrain for the construction and operation of passenger service in the Corridor. These MOUs also describe some of the terms and conditions of further agreements planned to be entered into by the Authority and Caltrain as improvements in the Corridor advance.

2012 MOU

In 2012, the Authority and eight other public entities entered an MOU to implement an early investment strategy to support the blended system in the Corridor. The key terms and conditions of the 2012 MOU are summarized below.

Exhibit F-1. 2012 Memorandum of Understanding – Key Terms and Conditions

2012 Memorandum of Understanding	
Key Elements	**Key Terms**
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • Peninsula Corridor Joint Powers Board / Caltrain (JPB or Caltrain) • Metropolitan Transportation Commission (MTC) • San Francisco County Transportation Authority (SFCTA) • San Mateo County Transportation Authority (SamTrans)

2012 Memorandum of Understanding	
Key Elements	**Key Terms**
	• Santa Clara Valley Transportation Authority (VTA) • City of San Jose • City and County of San Francisco (CCSF) • Transbay Joint Powers Authority (TJPA)
Purpose of Agreement	The parties will jointly support and pursue implementation of statewide high speed rail that utilizes a blended system and operational model on the Peninsula Corridor, running from Transbay Transit Center in San Francisco to milepost 51.4 at the Tamien Station in San Jose.
Scope of Projects	The parties will describe, identify and work to fully fund an interrelated program of projects including the following: • Electrification Infrastructure Project • Advanced Signal System Project • Downtown Extension to the Transbay Transit Center (the Prop 1A designated northern terminus of high-speed rail) • New high-speed rail stations at San Jose Diridon Station and a Millbrae BART/Caltrain Station with a connection to San Francisco International Airport • Core Capacity project of needed upgrades to stations, tunnels, bridges, potential passing tracks and other track modifications and rail crossing improvements, including improvements and selected grade separations required to accommodate the mixed traffic capacity requirements of high-speed rail service and commuter rail services.

2012 Memorandum of Understanding	
Key Elements	**Key Terms**
Funding Responsibilities	The Authority and appropriate parties will obtain funding using mutually agreed strategies and notify each other if funding for the program is constrained. The following are the key funding plan components: Authority Funding Commitments • $600 million in Prop 1A funds • $106 million in Prop 1A "connectivity" funds Other Funding Commitments • Variety of local, state, and federal funding sources to be obtained by the funding partners (described in **Section B** above based on updated information since 2012)
Environmental Clearance Responsibilities	Caltrain has environmentally cleared the PCEP under CEQA, including updating the Caltrain Environmental Assessment/Final EIR completed in 2009

2013 MOU

The Authority entered into the 2013 MOU with the JPB for the planning, environmental review, design, and ultimate construction of the improvements.

Exhibit F-2 2013 Memorandum of Understanding – Key Terms and Conditions

2013 Memorandum of Understanding	
Key Elements	**Key Terms**
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • Peninsula Corridor Joint Powers Board / Caltrain (JPB or Caltrain)
Purpose of Agreement	To form a new partnership for the planning, environmental review, design and construction of improvements in the Peninsula Corridor using the blended system (as previously defined).
Scope of Projects	• Corridor electrification (as described in 2012 MOU) • CBOSS

2013 Memorandum of Understanding	
Key Elements	**Key Terms**
	• Accommodation of high-speed rail service
Environmental Clearance Responsibilities	JPB will be lead agency for all aspects of the CalMod program. The Authority will be lead agency for environmental clearance of blended system projects.
Delivery Responsibilities	• JPB is the lead agency for implementation, final completion and delivery of the PCEP and CBOSS • JPB is the lead agency for all aspects of the Corridor electrification project, including environmental clearance and arranging for design, construction, and implementation. • Authority will assist to facilitate funding, environmental review, and project delivery. • The parties will develop construction and implementation plans designed to preserve freight service in the Corridor.
Operational Responsibilities	The blended system will be developed while JPB rail service remains operational. JPB owns the Peninsula Corridor and will operate the commuter rail service on it.
Additional terms	• To terminate previously entered-into agreements (2004 MOU and 2009 MOU) • Authority to include 2012 and 2013 MOUs in its Business Plan • To secure $600 million of Prop 1A funds and $106 million of Prop 1A connectivity funds under Senate Bill 1029 to enable PCEP and CBOSS to proceed • Assure compliance with statutory and regulatory reporting requirements and deadlines from funding agencies • JPB will independently support interests of the communities along the Peninsula Corridor through environmental, planning, design and construction.

Seven-Party Supplement to the 2012 MOU

In August 2016, the Authority and six parties – MTC, SFCTA, SMCTA, VTA, the City of San Jose, and the CCSF – entered into a Supplement to the 2012 MOU in order to fully fund the PCEP based on updated cost estimates.

Exhibit F-3 Seven-Party Supplement to the 2012 MOU – Key Terms and Conditions

Seven-Party Supplement to the 2012 MOU	
Key Elements	**Key Terms**
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • Metropolitan Transportation Commission (MTC) • Peninsula Corridor Joint Powers Board (JPB) • San Francisco County Transportation Authority (SFCTA) • San Mateo County Transportation Authority (SMCTA) • Santa Clara Valley Transportation Authority (VTA) • City and County of San Francisco (CCSF)
Purpose of Agreement	• The parties will jointly support and pursue implementation of statewide high speed rail that utilizes a blended system and operational model on the Peninsula Corridor, running from Transbay Transit Center in San Francisco to milepost 51.4 at the Tamien Station in San Jose. • The parties to the Supplement commit to make funding available to fully fund the PCEP. • Supplemental MOU follows actual bids received and a 2014 cost estimate to update the 2008 cost estimate on which the 2012 Nine-Party MOU funding strategy for the PCEP was based.
Funding Responsibilities	• SMCTA will contribute an additional $20 million • VTA will contribute an additional $20 million • SFCTA and/or the CCSF will contribute an additional $20 million • MTC will program $28.4 million from Regional Measures 1 and 2 • JPB will contribute $9 million from funding provided by formula to Caltrain through the LCTOP • The Authority will contribute an additional $113 million • This funding is in addition to funding commitments previously made by these parties.
Removal of Funding	• The parties to the Supplement also agreed that, with the additional funding sources, $125 million in FTA funds identified in the 2012 Early Investment Strategy funding plan will no longer be needed for the PCEP, and will instead be programmed by the MTC to the JPB to advance critical Caltrain state of good repair improvements through MTC's established regional Transit Capital Priorities process.
Other Funding	• The Parties to the Supplement also support the PCJPB's efforts to obtain $647 million from FTA's Core Capacity Grant Program for the PCEP as a regional priority. The $647 million would help provide

Seven-Party Supplement to the 2012 MOU	
Key Elements	**Key Terms**
	funding needed for the PCEP, as well as provide funding to support a larger contingency set-aside for the PCEP program.
Other key terms	• If overall program costs require a financial commitment that is below the funding plan of $1.980 billion, funding commitments from the parties to the Supplement will be reduced proportionally according to their respective additional shares as stated in the Supplement. • In the event the contract awards reflect a financial commitment that is above the funding plan of $1.980 billion, or if the FTA Core Capacity funds are awarded at less than $647 million, the parties to the Supplement will discuss with all parties to the 2012 Nine-Party MOU how to secure additional funding beyond what is presently identified, and/or discuss project scope adjustments to match to funding availability.

Agreement Regarding Commitments Toward Peninsula Corridor Electrification Project

In August 2016, the Authority Board approved Agenda Item 2 and Resolution 16-21 that provides further detail to the 7 Party Supplement with regard to funding arrangements from the Authority to Caltrain.

Exhibit F-4. Agreement Regarding Commitments Toward Peninsula Corridor Electrification Project – Key Terms and Conditions

Agreement Regarding Commitments Toward Peninsula Corridor Electrification Project	
Key Elements	**Key Terms**
Parties to the Agreement	• California High-Speed Rail Authority (Authority) • Peninsula Corridor Joint Powers Board / Caltrain (JPB or Caltrain)
Purpose of Agreement	• For the parties to reaffirm and further the Partnership Principles and Action Plan pertinent to implementation of the Early Investment Projects and implementation of the Blended System service according to a set of stated principles.
Funding Responsibilities	• The Authority will provide $600 Million of Proposition 1A funding to the JPB to be used to cover eligible costs related to the implementation of the PCEP as contemplated by the 2012 Nine-Party MOU, Proposition 1A and SB 1029, provided the prerequisite requirements and intent of SB 1029 and related governing legislation

Agreement Regarding Commitments Toward Peninsula Corridor Electrification Project	
Key Elements	**Key Terms**
	are satisfied. • Following execution of the contract with the PCEP contractor, $600 million in Proposition 1A funding, as well as an additional $113 million of funds available from Cap-and-Trade and/or other sources, shall be made available to the JPB on a reimbursement basis as contemplated by the 2012 Nine-Party MOU and SB 1029. • The parties recognize it is in the best interest of all parties involved in the funding of the project to understand and agree on cash-flow requirements and to identify all sources of funding, including federal, local and other state sources that can meet those needs. • JPB commits to working with regional and federal funding partners to obtain funding on a timely basis to address cash flow needs to avoid sole reliance on state funding. Pending availability of Proposition 1A funds, funding derived from other sources will be made available to JPB through the Authority to enable the State's share of PCEP cash flow requirements to be met. • The estimated cash flow funding required from the State for the 2016-2017 fiscal year is $117,460,000 with the understanding that July 1, 2016 constitutes the effective date for the commencement of the cash flow funding payments from the State. On an annual basis thereafter JPB will provide the Authority with the estimated cash flow funding needed to ensure requisite progress and ultimate completion of PCEP.
Partnership Principles	• The $600 million in Proposition 1A funds will be dedicated to PCEP between the 4th and King Street Station in San Francisco to Tamien Station in San Jose, and will be implemented by PCJPB in a manner consistent with Proposition 1A and applicable legislation. • It is the shared goal of the parties to enable PCEP to be constructed in a manner that obviates the necessity for the Authority to have to make material changes to the PCEP infrastructure during the Authority's future construction of the Blended System. • Blended System operations in the Corridor will consist primarily of a two-track system substantially within the existing JPB right-of-way. • The JPB and the Authority will collaborate to develop Blended System operations plans that comport with all applicable statutory and regulatory requirements. • The Authority and the JPB will continue to work cooperatively on

Agreement Regarding Commitments Toward Peninsula Corridor Electrification Project	
Key Elements	**Key Terms**
	additional improvements necessary to facilitate their respective operations in accordance with the provisions of SB1029 and the Authority's business plans. • The JPB will make its best efforts to complete the PCEP in amounts less than budgeted.

Project Management and Funding Agreement

In the coming months, the Authority and PCJPB will enter into a Project Management and Funding Agreement (PMFA) as required in SB 1029. The PMFA will spell out the Authority's and PCJPB's rights and responsibilities in the corridor in more detail and will require the PCJPB to report to the Authority on a quarterly basis to ensure that all bond-funded activities are within the scope and cost outlined in the agreement. The PMFA will be submitted to the Department of Finance for approval.

Construction Agreements

On July 7, 2016 the Caltrain Board of Directors approved $1.25 billion in contracts to begin work on the PCEP. The contract for design and construction of the corridor's electrification infrastructure was awarded to Balfour Beatty Infrastructure, Inc. The contract for the manufacture of high-performance electric trains was awarded to Stadler US, Inc.

Exhibit F-6. DB Contract - Electrification – Terms and Conditions

Design-Build Contract	
Key Elements	**Key Terms**
Parties to the Agreement	• JPB/Caltrain • Balfour Beatty Infrastructure, Inc.
Scope of Services	• The project involves modernizing the Caltrain passenger rail service by converting from diesel powered locomotives to electrical power and upgrading the Caltrain right-of-way which would enable potential future operations of California High Speed Rail service on the same corridor. • The contract documents include commercial and technical provisions. Commercial provisions and certain technical requirements are prescriptive. The technical drawings and specifications set forth design concepts and baseline requirements for the project. These technical drawings and specifications are preliminary in nature and to

Design-Build Contract	
Key Elements	**Key Terms**
	be developed to 100% Issued-for-Construction documents, sealed by the Engineer of Record. The Contractor shall assume full responsibility and liability with respect to final design, construction, installation, testing and commissioning of the electrification project in accordance with the requirements of the Contract Documents. • LNTP activities will include, but are not limited to, utility and geotechnical investigations, design development, and advancing certain critical procurements and contracts in support of construction. The Final Notice to Proceed will authorize all remaining scope of work activities including, but not limited to, final design, construction, resting and integration with a new electrified vehicle and existing diesel fleet of vehicles. This work will include new substations and overhead catenary wiring systems to electrify over 50 miles of the rail corridor at 25 kV AC, and necessary modifications to existing rail signaling systems to accommodate electrification. The DB services for electrification of the railroad between San Jose and San Francisco are for a not to exceed amount of $696,610,558. Limited-Notice-to-Proceed - $108,482,000 and Notice-to-Proceed - $588,128,588. • The term of the contract, irrespective of the Contractor's warranty obligations, is 1450 calendar days. • Date of overall substantial completion: 1330 calendar days after date of issuance of LNTP. Date of final acceptance: 120 calendar days after overall substantial completion.

Design-Build Contract	
Key Elements	**Key Terms**
Caltrain's Role	• Caltrain will supply the following items and services as part of the new SCADA System: • Technical review of Contractor's designs. • Coordination of Contractor's activities with Caltrain's rail operations. • Participation in factory and field acceptance tests. • Communication circuits between interface locations and to corporate network equipment; connection of communications to modular distribution termination facilities and fiber nodes. • Conduct oversight testing at JPB discretion with Contractor support, as needed. • Support testing conducted by Contractor, as needed. • Facilitate systems integration with the EMU Contractor, CBOSS Contractor and the Rail Operations Control System (ROCs) Contractor.
Contractor's Role	• The Contractor's obligations include, but are not limited to, the responsibilities in the following list and those required to meet all requirements described in the Technical Provisions of the contract: • System engineering and project management. • Software analysis and programming. • Coordination of all Contractor activities to minimize interference with the concurrent work of other contractors along with the JPB's and Operating Railroad of Record's own forces when the Contractor's activities overlap the other contractors' activities. JPB may, at its sole discretion, assist in resolving disputes between contractors. • Supply, configuration, and integration of Substation Gateway, intelligent end device (IEDs), Remote Terminal Unit (RTU), human machine interface (HMI), peripherals, networking devices, signal and power cabling (except as noted being supplied by others), the interconnection of all Contractor-supplied equipment plus cabling to the termination panels where field communications lines will be terminated. • Operating system software and application software for all Substation Gateways, IEDs, RTUs, HMI, networking devices, and all other devices. • Provision of source code for all software produced specifically for the Contract. • Provision of source code or installation images sufficient to, together with the source code, regenerate complete, working copies of any

Design-Build Contract Key Elements	Key Terms
	system supplied under this contract. • Configuration of all hardware and software for all Substation Gateways, RTUs, HMI, networking devices, IEDs, and all other devices. • Communication hardware and software interfaces to Contractor-supplied monitoring and control system equipment to allow the Substation SCADA system to communicate to the Traction Power devices located in the traction power facilities and the Office SCADA system. Where that interface to the Fiber Optic Communications System (FOCS) is not located at the substation, wayside power cubicle, or other field SCADA equipment location, the Contractor is responsible to design and install the necessary compatible branch circuits to connect to the existing FOCS splice enclosures or design new splice enclosures to break in to the existing FOCS cables, with prior written approval by the JPB, at locations required by the Contractor's design. • Shipment of JPB-supplied equipment, if any, to the Contractor's test facilities, and subsequent return shipment to the JPB with the SCADA System shipment. • Delivery of all equipment, installation, and startup for all sites. • Power distribution within Contractor-supplied equipment and between equipment enclosures. • Tests and inspections. • Maintenance of all hardware and software up to the availability test period. • Availability of service for all hardware and software, as installed, and the availability of standby parts for a 10-year period from the date of system acceptance. • Notification of field updates to all hardware and software for a 5-year period. • Instruction manuals, drawings, and all related documentation for diagnostics, maintenance, reference, and operations, including electronic copies for JPB-generated enhancements in the future.
Liquidated Damages	There will be an assessment in the amount of $1,000 per five-minute increment, or portion thereof, of interruption or delay greater than five minutes per train up to a cumulative daily maximum of $50,000 for all trains. Contractor shall pay specified liquidated damage amounts, for

Design-Build Contract	
Key Elements	**Key Terms**
	each calendar day of delay to the Contract Completion Milestone Date for which the Contractor is responsible. The liquidated damages amounts are independent of each other and are cumulative but not incurred simultaneously. Liquidated damages for late completion are calculated against each established Contract Completion Milestone Date, as that date may be extended by the JPB, and shall be the only damages available to the JPB with regard to delayed project completion. JPB capped the total, cumulative amount of liquidated damages for delay that the JPB may assess under the Contract at $3,600,000.

Exhibit F-7. EMU Contract – Terms and Conditions[7]

Design-Build Contract	
Key Elements	**Key Terms**
Parties to the Agreement	• JPB • Stadler US, Inc. (Rolling Stock)
Purpose of Agreement	• Procurement of 96 electric multiple unit vehicles for a not to exceed amount of $550,899,459. • The EMUs will consist of both cab and non-cab units configured as sixteen six-car trainsets. Power will be obtained from the overhead contact system (OCS) via roof mounted pantographs which will power the axle-mounted traction motors. The EMUs will replace a portion of the existing diesel locomotives and passenger cars currently in use by Caltrain.
Scope of Services	• The criteria and procedures described in the contract are specifically intended to apply to trainsets operated at speeds up to 125 mph. • In accordance with requirements in § 238.111, the equipment is subject to the prerevenue service acceptance testing. Pursuant to that section, a test plan is required for passenger equipment that has

[7] Prop 1A funds will only be used for the electrification piece of PCEP and not the purchase of EMUs.

Design-Build Contract	
Key Elements	**Key Terms**
	not been used in revenue service in the United States. Although the criteria and procedures are generally applied to the applicable individual structures of the trainset undergoing analysis, the overall intent of § 238.111 is to result in a cohesive design in which all parts function appropriately together. FRA notes that with respect to a trainset utilizing a crash energy management (CEM) design, testing of the components incorporated with any CEM system may also be performed as part of a prerevenue service acceptance testing program. • These trainsets may require similar treatment under American Public Transportation Association (APTA) standards, such as APTA SS-C&S-016-99, Rev. 1 (updated 3/2004), Standard for Row to-Row Seating in Commuter Rail Cars, and the contract addresses these standards where appropriate. • All designs, engineering, manufacturing, operations, materials, equipment, parts and labor required to properly, timely and to the satisfaction of JPB, provide the completed new vehicles and provide all other items of work indicated or referenced in the Contract Documents, including all alterations, amendments or extensions thereto made by Change Order; successfully complete all required tests and all reliability periods; remedy all defects which occur during, at least, the two (2) year warranty period for each of the new EMUs; and complete all necessary repairs and modifications resulting from the tests, the reliability periods and warranties as required by the Contract Documents. • LNTP Scope of Work: initial work necessary to advance the contract within the scope of budgetary availability. • Full Notice to Proceed Scope of Work: all remaining scope of work activities including the procurement of the base order of 96 vehicles, in accordance with the terms of the Contract. All work will be completed in full compliance with FTA requirements.

Design-Build Contract	
Key Elements	**Key Terms**
Roles & Responsibilities	• JPB may, at its option, monitor any or all Contractor activities, review any or all designs, and inspect and test any or all equipment. • Stadler is responsible for delivery of a complete and properly functioning fleet of EMUs, and for all necessary resources and expertise to provide specified Maintenance Services for both the new EMUs and existing diesel rail vehicles if the Option is exercised by the JPB, all in accordance with the respective contract requirements. Stadler will perform all necessary activities required under the respective contracts including, but not limited to, management, administration, planning, design, documentation, manufacturing/assembly, service, quality control/assurance, systems integration, safety, scheduling, cost control, coordination, outreach, training, testing, commissioning, and warranty.
Liquidated Damages	The Contractor understands that time is of the essence, and that the JPB will suffer significant damages if the schedule is not met. Because of the difficulty of determining at the time of contracting the actual damages to JPB resulting from Contractor's delayed performance, the parties agreed that the JPB may assess liquidated damages in the amounts set forth below: • $6,359 per calendar day for late delivery of the 1st trainset, • $2,186 per calendar day for late conditional acceptance of each trainset including the 1st trainset. The total amount for liquidated damages shall not exceed ten percent (10%) of the Total Base Order Price. JPB may deduct the sum of liquidated damages from payments or other amounts due under this Contract.

Federal Funding

In February 2016, the Obama Administration allocated $72 million in prior-year funding to the project and asked Congress for an additional $125 million in the 2017 Federal Budget through the FTA Core Capacity Grant Program. These funds are part of a larger $647 million request for a FFGA that is currently in the Engineering Phase and the FFGA is expected in early 2017. Contracts for the electrification project are structured so that full authorization to proceed with construction is issued following the approval of the FFGA by the FTA.

California High-Speed Rail Delivery Model Overview

The delivery model for Phase 1 of the California High-Speed Rail System is described in the Authority's 2016 Business Plan. It was developed based on best practices and industry feedback. After completion of the Valley to Valley Line and upon the commencement of high-speed service along the Peninsula Corridor it is contemplated that an operator running pursuant to the authority of the California High-Speed Rail Authority will pay to Caltrain an access fee for the right to operate the service. The details of a future agreement will specify the exact terms of compensation based on access and usage.

Appendix I – Anticipated Timing of Receipt of Funds

PCEP FUNDING PLAN--FOR PLANNING PURPOSES ONLY								11/7/2016
	FY16 and Prior	FY2017	FY2018	FY2019	FY2020	FY2021	FY2022	Total
2036 Electrification Cost (Estimated)	**68.806**	**296.516**	**366.412**	**323.667**	**197.406**	**61.772**	**1.547**	**1,316.125**
Nine-Party MOU Funding								
FTA Formula Funds (Prior Grants)	15.677							15.677
Prop 1A	-	87.227	209.960	194.103	108.710	-	-	600.000
Prop 1B PTMISEA	8.000							8.000
Carl Moyer	-	4.000	4.000	4.000	4.000	4.000	-	20.000
JPB Prior Local Funds	9.019						-	9.019
JPB Members	36.110	29.869	16.673	22.255			-	104.908
San Mateo	*13.035*	*5.960*	*4.907*	*5.518*			-	*29.419*
*San Francisco**	*10.040*	*13.159*	*6.860*	*11.220*			-	*41.279*
Santa Clara	*13.035*	*10.750*	*4.907*	*5.518*			-	*34.209*
Bridge Tolls	-	10.809						10.809
Seven-Party Supplemental Funding								
HSR/State Non 1A funding		22.600	26.240	18.920	26.920	18.320		113.000
Bridge Tolls--RM1	-	8.400						8.400
Potential Funding								
FTA Core Capacity		133.611	109.539	84.389	57.776	39.452	1.547	426.313
Total Funding	**68.806**	**296.516**	**366.412**	**323.667**	**197.406**	**61.772**	**1.547**	**1,316.125**
	FY16 and Prior	**FY2017**	**FY2018**	**FY2019**	**FY2020**	**FY2021**	**FY2022**	**Total**
2061 EMUs Cost (Estimated)	**15.445**	**100.174**	**74.255**	**99.968**	**162.985**	**190.460**	**20.841**	**664.127**
Nine-Party MOU Funding								
FTA Formula Funds (MTC)**	5.234	22.620	56.880	70.857	96.014	61.875	1.521	315.000
JPB Members	10.211	9.038						19.249
San Mateo	*4.925*	*6.918*						*11.844*
San Francisco	*0.360*	-						*0.360*
Santa Clara	*4.925*	*2.120*						*7.045*
Seven-Party Supplemental Funding	-	13.640	13.500	13.500	13.500	13.360	1.500	69.000
Caltrain (LCTOP)	-	*1.940*	*1.800*	*1.800*	*1.800*	*1.660*	-	*9.000*
San Mateo	-	*3.900*	*3.900*	*3.900*	*3.900*	*3.900*	*0.500*	*20.000*
San Francisco	-	*3.900*	*3.900*	*3.900*	*3.900*	*3.900*	*0.500*	*20.000*
Santa Clara	-	*3.900*	*3.900*	*3.900*	*3.900*	*3.900*	*0.500*	*20.000*
Transit Intercity Rail Capital Program (TIRCP)	-	8.753		-	11.247			20.000
RM1 and RM2	-	20.191						20.191
Potential Funding								
FTA Core Capacity	-	25.932	3.875	15.611	42.224	115.225	17.820	220.687
Total Funding	**15.445**	**100.174**	**74.255**	**99.968**	**162.985**	**190.460**	**20.841**	**664.127**
PCEP Funding Total	**84.251**	**396.690**	**440.667**	**423.635**	**360.391**	**252.232**	**22.387**	**1,980.253**
PCEP Cost Total	**84.251**	**396.690**	**440.667**	**423.635**	**360.391**	**252.232**	**22.387**	**1,980.253**

Notes

*Prior SF Funding Includes $4M CMAQ transfer to JPB

**$5.23M in FY16 5337 funds and $22.62 in FY17 5337 funds transferred to South San Francisco Station Project and Replaced with Local Funds

Appendix II – Source and Reference Documents

Source and Reference Documents	
2-Party Memorandum of Understanding dated 2013	Link
7 Party MOU and Funding Agreement	Link
9-Party Memorandum of Understanding dated 2012	Link
Caltrain Final Environmental Impact Report (Final EIR)	Link
Caltrain FEIR Appendix I, Ridership Technical Memorandum	Link
Caltrain Short Range Transit Plan	Link
High Speed Rail Authority, 2012 Business Plan	Link
High Speed Rail Authority, 2014 Business Plan	Link
High Speed Rail Authority, 2016 Business Plan	Link
July 2016 Monthly Progress Report	Link
Peninsula Corridor Electrification Project Quarterly Update #7	Link

Independent Financial Advisor Report
To California High-Speed Rail Authority Regarding:

Peninsula Corridor Funding Plan

Project Finance Advisory Ltd. (PFAL)
December 6, 2016

PFAL Project Finance Advisory Ltd.

PFAL

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Key Terms and Definitions

AB 1889: Assembly Bill No. 1889, Stats. 2016, ch. 774

Authority: California High Speed Rail Authority

CalMod: Caltrain Modernization Program

CBOSS: Communications Based Overlay Signal System

DB: Design Build

EMU: Electric Multiple Units

FFGA: Full-Funding Grant Agreement between FTA and JPB

FTA: Federal Transit Administration

Funding Plan: San Francisco-San Jose Peninsula Corridor Funding Plan dated December 5, 2016

High-Speed Train Operation: Authority high-speed train service as envisioned in the 2016 Business Plan and Ridership and Revenue Forecasting Technical Supporting Document to the 2016 Business Plan.

HSR: High-Speed Rail

JPB or Caltrain: Peninsula Corridor Joint Powers Board, the legal entity responsible for passenger rail service referred to as Caltrain

OHLE: Overhead Line Equipment

PCEP: Peninsula Corridor Electrification Project

Peninsula Corridor: Railroad and facilities comprising the rail corridor between San Jose and San Francisco also referred to as the Caltrain Corridor

Phase 1: California High-Speed Rail Program Phase 1 as defined in 2016 Business Plan

PMFA: Project Management and Funding Agreement

PMP: Program Management Plan

Prop 1A: Proposition 1A, the Safe, Reliable High-Speed Passenger Train Bond Act for the 21st Century, (added by Stats. 2008, ch. 267 (AB 3034)), codified at Streets and Highways Code 2704, et seq..

Report: Independent report pursuant to California Streets and Highways Code 2704.08(d)(2)

SB 1029: Senate Bill No. 1029 Budget Act of 2012

SB 557: Senate Bill No. 557 (added by Stats. 2013, ch. 216) codified at Streets and Highways Code section 2704.76, 2704.77).

2013 MOU: 2013 Memorandum of Understanding entered into by the Authority and JPB

7-Party MOU: 2016 7-Party Supplement to 2012 MOU entered into by the Authority, JPB, Metropolitan Transportation Commission, San Francisco County Transportation Authority, San Mateo County Transportation Authority, Santa Clara Valley Transportation Authority, and City and County of San Francisco.

9-Party MOU: 2012 9-Party Memorandum of Understanding entered into by the Authority, JPB, Metropolitan Transportation Commission, San Francisco County Transportation Authority, San Mateo County Transportation Authority, Santa Clara Valley Transportation Authority, City of San Jose, City and County of San Francisco, and Transbay Joint Powers Authority.

"**Revenues**," within the meaning of Streets and Highways Code section 2704.08, subdivision (d)(2)(D)) means: fare box revenues and ancillary revenues. Fare box revenue is income from ticket sales. Ancillary revenues include other income the Authority may receive from sources related to the everyday business operations of the high-speed rail, including but not limited to on-board sales (e.g., sales of foods or sundries), station-related revenues, advertising, and revenues from leases of excess or non-operating right-of-way parcels or areas, as well as areas above or below operating rights-of-way or of portions of property not currently being used as operating rights-of-way. Ancillary income does not include unexpected or "one time" events.

"**Operating and Maintenance Costs**," within the meaning of Streets and Highways Code section 2704.08, subdivision (d)(2)(D)) means: ongoing operating and maintenance costs, that is, the cost of running the trains and maintaining the infrastructure and rolling stock in a state of good repair. It does not include capital asset renewal (or lifecycle) costs, which is the cost of replacing or refurbishing worn out components at the end of their useful life.

"**Suitable and ready for high-speed train operation**" means, as stated in AB 1889: "if the bond proceeds, as appropriated pursuant to Senate Bill 1029 of the 2011–12 Regular Session (Chapter 152 of the Statutes of 2012), are to be used for a capital cost for a project that would enable high-speed trains to operate immediately or after additional planned investments are made on the corridor or useable segment thereof and passenger train service providers will benefit from the project in the near-term."

"**The planned passenger service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy**" means: within a reasonable period of time after commencement of high-speed train operations on the usable segment, project revenues will reach an operating break-even point at which aggregate revenues up to that point in time equal Authority-borne operating and maintenance costs to that point in time and such revenues will continue to equal or exceed operating and maintenance costs thereafter.

"Useable segment" means the Peninsula Corridor between 4th and King Streets in San Francisco and Tamien Station in San Jose, and includes the Caltrain station at 4th and King Streets in San Francisco and Diridon Station in San Jose.

Disclaimer

Project Finance Advisory Limited ("PFAL") has performed an independent review of the Peninsula Corridor Funding Plan ("Funding Plan") as required by the California Streets and Highways Code 2704.08(d)(2) and as described in PFAL's executed agreement with the California High-Speed Rail Authority (Authority) dated December 2015. This independent review was performed using documents provided by the Authority (listed in the Bibliography and body of this Report) and developed using current accepted professional practices and procedures. PFAL, with the Authority's permission, has relied on the accuracy and completeness of the documents provided by the Authority. This Report does not serve as an accounting audit. Furthermore, this Report should not be relied on for any financing or investment decision. It is possible that there are other elements of risk associated with the Funding Plan beyond those presented. Any financial estimates, analyses or other information used by PFAL in connection with the Report represents the general expectancy concerning events as of the evaluation date and are based solely on the information reviewed by PFAL. However, the accuracy of any financial estimate, analysis or other information is dependent upon the occurrence of future events that cannot be assured. Additionally, these estimates and analyses rely on the assumptions contained therein, the accuracy of which remains subject to validation, further refinement and future events. Estimates should not be construed as statements of fact. There will usually be differences between the projected and actual results because events and circumstances do not occur as expected, resulting in possible differences.

Executive Summary

Project Finance Advisory Limited ("PFAL"), together with our team of consultants, was appointed following a competitive procurement process by the California High Speed Rail Authority ("the Authority") to provide independent consultant services. Our role is to fulfill the legislative requirement to provide an independent analysis of the Authority's funding plans.

This Report is an independent analysis of the San Francisco-San Jose Peninsula Corridor Funding Plan ("Funding Plan") dated December 5, 2016 provided by the California High Speed Rail Authority ("Authority") pursuant to California Streets and Highways Code ("SHC") 2704.08(d)(1).

The purpose of this Report is to fulfill the requirements to review the Funding Plan for the $600 million Prop 1A bond proceeds appropriated in SB 1029 and later reaffirmed in SB 557 to indicate if:

a) Construction of the corridor or usable segment thereof can be completed as proposed in the Funding Plan;
b) If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation;
c) Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service;
d) The planned passenger train service to be provided by the Authority, or pursuant to its authority, will not require an operating subsidy; and
e) An assessment of risk and the risk mitigation strategies proposed to be employed.

As an independent consultant, PFAL and our team of sub-consultants have a duty of care to the California State taxpayers to uphold the SHC 2704.08(d)(2) requirements. In keeping with this responsibility, the analysis and conclusions in this Report are not prejudiced by any external interest; our conclusions are completely our own.

The analysis and conclusions provided in this Report are based on our professional opinions and the opinions of subconsultants to PFAL that specialize in passenger rail operations and high-speed rail ("HSR") delivery. These subconsultants include First Class Partnerships Limited ("FCP"), David Evans and Associates, Inc. ("DEA"), Anrab Associates ("Anrab"), and Infrastructure Development Strategies California ("IDSCA").

The approach PFAL implemented, further described in Section 1.2, to independently verify the criteria in SHC 2704.08(d)(2) is based on industry best practices and

PFAL's previous roles of comparable assignments as independent financial advisor and auditor for the Federal Railroad Administration's Railroad Rehabilitation & Improvement Financing ("RRIF") program, the US Department of Transportation ("USDOT"), the Virginia Office of Public Private Partnerships, and the USDOT's Transportation Infrastructure Finance and Innovation Act ("TIFIA") Program, as well as many other government agencies in the US and internationally.

Caltrain's electrification program is a "bookend" project. "Bookend" projects are contemplated in the Authority's 2012 Business Plan, which is referenced in the Legislature's appropriation of $1.1 billion in 2012 via SB 1029. A "bookend" project is described in the 2012 Business Plan as "a project which makes improvements in existing rail systems in the metropolitan regions prior to or, in some cases, in lieu of, high-speed infrastructure." Bookend projects can also "service to connect high-speed rail to already existing modes of transportation." The intent of bookend projects is to "deliver improved service in terms of reliability, safety, and efficiency to users of existing rail systems, providing tangible benefits in the near-term and building rail ridership for the long-term."

The Authority developed the Funding Plan for this PCEP bookend project to contain the information the Authority believes complies with SHC 2704.08(d)(1). PFAL offers no opinion on whether or not the Funding Plan is compliant. PFAL's review and development of this Report, as it pertains to forming an opinion for SHC 2704.08(d)(2), is limited in scope to the contents of the Funding Plan.

The Funding Plan contemplates that upon completion of the planned improvements, Caltrain will operate electric trains in the Usable Segment, defined as the Peninsula Corridor in the Funding Plan and further described in Section 1.2 of this Report. It is the Authority's intent, after completion of the Silicon Valley to Central Valley Line ("Valley to Valley Line"), that high-speed trains will operate in the Usable Segment once connected to the Valley to Valley Line. That work is not contemplated in this Funding Plan.

Because the Authority does not plan to have high-speed trains operating in the Usable Segment until after completion of and connection to the Valley to Valley segment, the planned Authority Revenues or Operations and Maintenance Costs referenced in the 2016 Business Plan are not relevant to the analysis of this Funding Plan. Therefore we are unable to comment on whether the eventual planned passenger train service to be provided by the Authority, or pursuant to its authority, will or will not require an operating subsidy.

We are able to comment on Caltrain's risk mitigation strategies for the PCEP. However, to the extent that unmitigated risk could harm the Authority's interests (for example, pushing PCEP completion date past the Authority's 2025 planned operation

date) and the Authority plans to mitigate that risk in the PMFA, we cannot evaluate the effectiveness of such mitigation because the PMFA has not yet been finalized. We do offer in Section 6 suggestions for certain risk mitigations to be addressed in the PMFA but make no representation that these suggestions are comprehensive or exhaustive.

Key Findings

The Funding Plan sets out to satisfy SHC 2704.08, subdivision (d) for the commitment of $600 million of Prop 1A bond proceeds for the PCEP. The Funding Plan complies with the statutory requirements insofar as it address each of the SHC 2704.08(d)(2) criteria. Table 1 summarizes PFAL's opinion on each component of SHC 2704.08(d)(2).

Table 1: SCH 2704.08(d)(2) PFAL Summary Opinion

SHC 2704.08(d)(2) requirements	PFAL Opinion
Construction of the corridor or usable segment thereof can be completed as proposed in the plan submitted pursuant to the Funding Plan	PCEP can be constructed as proposed in the Funding Plan; See Section 2
If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation	When completed, the PCEP will be suitable and ready as defined in AB 1889; See Section 3
Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service	PCEP can facilitate passenger service; See Section 4
The planned passenger train service to be provided by the authority, or pursuant to its authority, will not require an operating subsidy	No high-speed rail service is contemplated on a stand-alone basis in the Peninsula Corridor; See Section 5
An assessment of risk and the risk mitigation strategies proposed to be employed	Risks are identified and addressed by JPB, see Section 6 for risk summary

1. Funding Plan Overview

1.1 PROPOSITION 1A FUNDING

In 2012, Senate Bill ("SB") 1029 appropriated $1.1 billion of Proposition 1A ("Prop 1A") bond proceeds in "bookend" funding for projects that were deemed necessary to advancing and facilitating the implementation of California's HSR system.

In 2013, SB 557 reaffirmed SB 1029 by specifically approving $600 million of bookend funding for the San Francisco to San Jose Peninsula Corridor without a SHC 2704.08 subdivision (c) Funding Plan. SB 557 acknowledged the Nine Party Memorandum of Understanding ("MOU") entered into by the California High-Speed Rail Authority ("Authority"), the Peninsula Corridor Joint Powers Board ("JPB"), and seven other local public entities in 2012. The purpose of the MOU was to jointly pursue blended service on the Peninsula Corridor and the modernization of the Peninsula Corridor (further described in Section 1.3). The MOU commits the Authority to $600 million of Prop 1A funding.

The Funding Plan addresses this $600 million of Prop 1A bond proceeds appropriated by SB 1029, reaffirmed in SB 557, and agreed upon in the MOU to partially fund the $1,980 million Peninsula Corridor Electrification Project ("PCEP").

1.2 PFAL REVIEW APPROACH & METHODOLOGY

PFAL initiated this review in conformance with SHC 2704.08(d)(2) on September 27, 2016 through a limited task order by obtaining publicly available documents in support of the Funding Plan from the Authority and JPB's website. The intent of the limited task order was to determine what additional information was required for PFAL's independent review. The publically available documents initially reviewed included, but were not limited to:

- California State bills, legislative opinions;
- Authority business plans, memoranda of understanding; and
- PCEP documents available on JPB's website.

On October 21, 2016, the Authority executed remaining task order for PFAL's review of the Funding Plan. The Funding Plan was not made available at that time, as it was still under review by the Authority, but there were numerous supporting documents relied upon in the Funding Plan that PFAL requested to verify the underlying assumptions and statements described by the Authority. After the initial review of the previous documents, there followed an iterative process with PFAL and its

subconsultants posing additional questions, and the Authority providing additional supporting information and clarifications as needed.

To facilitate the process, document and question requests were organized by the following categories:

- Civil;
- Electrification;
- Capital Costs;
- Construction Schedule;
- Environmental;
- Project Management;
- Risk Management;
- Operations;
- Rolling Stock;
- Legislation/Project Agreements; and
- Funding.

The additional information requests included, but were not limited to:

- Risk identification and management plans;
- Project management plans;
- Detailed cost estimates;
- PCEP specifications;
- PCEP implementation schedules;
- Rolling stock specifications;
- Authority's electrification standards;
- PCEP track commissioning and inspection regime;
- PCEP funding plan;
- PCEP FTA quarterly updates;
- Details of the Project Management and Funding Agreement ("PMFA"); and
- PCEP quality management plan.

The additional information was provided to PFAL by the Authority as it became available to the Authority. As a result, the information requests were met at various stages of the review.

Due to the volume of information to process, PFAL and their subconsultants developed questions to the Authority for clarification. PFAL and the Authority conducted two general funding plan meetings (one by teleconference and one in person) for PFAL to clarify any ongoing questions. The nature of the meetings was to facilitate the understanding of the Funding Plan in a factual manner that would aid PFAL's analysis and understanding. After the second meeting, it was determined a

further teleconference specific to the Authority's technical standards was required to verify whether the Peninsula Corridor would be deemed suitable and ready for HSR (see Appendix II – Technical Meeting Notes for summary).

A draft Funding Plan was provided to PFAL on November 14, 2016 and a second revised draft Funding Plan was provided to PFAL on November 29, 2016 by the Authority. PFAL then confirmed that the Funding Plan was consistent with the supporting documents previously reviewed. Once the majority of information was received, PFAL and its subconsultants conducted a teleconference on November 17, 2016 to provide an opportunity for the JPB to clarify six PFAL risk issues. The JPB made available its resources and information to PFAL in a timely manner to address those six risk issues, including the JPB's Risk Register dated November 11, 2016. JPB's responses and information are included in the final opinions of this Report.

The final Funding Plan submitted to the Authority's Board was provided to PFAL on December 5, 2016. PFAL reviewed the changes between the November 29, 2016 version and the December 5, 2016 version to adjust and verify the conclusions in this Report. The relevant changes between previous Funding Plan versions provided to PFAL and the Funding Plan provided on December 5, 2016 were updates to the sources and uses of funds and the JPB's response to the FTA's recommendation for funding or cost overruns or funding shortfalls.

The review of the documents and conversations as outlined above were limited to the scope of the Funding Plan for the purpose of this Report. PFAL's scope of work was limited to reviewing the content of the Funding Plan. **This means PFAL did not review future improvements to the Corridor which may be required to operate at speeds above the current imposed speed in the Peninsula Corridor because they are not included in the Funding Plan. PFAL also did not review any projected Revenues or Operations and Maintenance costs that are relevant to the eventual operation of the high-speed rail system as these were also not contemplated in the Funding Plan.**

To formulate an opinion on SHC 2704.08(d)(2), our report is structured as set out in the following table.

Figure 1: Report Structure

Report Section	Approach
Section 2	Analyzes the constructability of the elements included in the Funding Plan by determining the reasonableness of the following items to formulate an opinion on SHC 2704.08(d)(2)(a): • scope • procurement method • construction schedule • project management • project cost • regulatory standings of the construction program
Section 3	Provides a review the corridor's ability to function as a foundation for HSR while providing near-term benefit to passenger rail service to formulate an opinion on SHC 2704.08(d)(2)(b).
Section 4	Evaluates the ability of Caltrain, or HSR, or both, to operate at prevailing speeds in the corridor to provide an opinion on SHC 2704.08(d)(2)(c).
Section 5	Addresses SHC 2704.08(d)(2)(d).
Section 6	Reviews the risk management plans of both Peninsula Corridor Joint Powers Board ("JPB") and the Authority for the corridor to form an opinion on SHC 2704.08(d)(2)(e).

1.3 SUBJECT OF FUNDING PLAN

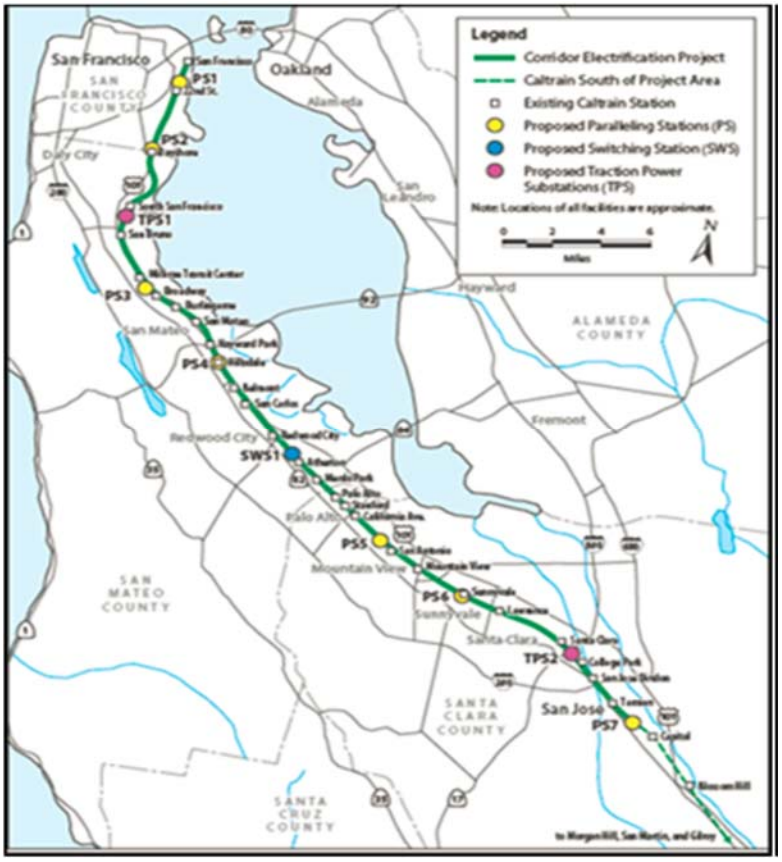
The Usable Segment as defined in the Funding Plan is the Peninsula Corridor, which is the rail corridor between 4th and Kings Streets in San Francisco and Tamien Station in San Jose and includes the Caltrain station at 4th and King and Diridon Station.

The Funding Plan is intended for the construction of improvements to the Peninsula Corridor from the Caltrain Modernization Program ("CalMod"), including the PCEP. CalMod is intended to electrify and upgrade the performance, operating efficiency, capacity, safety and reliability of JPB's commuter rail service through a series of projects outlined in Table 2 and shown in Figure 2. Integration of the Peninsula Corridor, PCEP and the Authority is discussed in Section 2, 3 and 4 of this Report.

Table 2: CalMod Program of Projects Summary

Program	Scope	Approximate Value
CalMod	• CBOSS • PCEP	• $2.2 billion
CBOSS	• Advanced Signal System • Positive Train Control	• $231 million
PCEP*	• **Electrification Infrastructure** • Purchase of EMU's	• **Electrification Infrastructure: $1.3 billion** • EMU: $664 million

*Electrification infrastructure is the only use of Prop 1A funds



- Peninsula Corridor Electrification Project ("PCEP"); and
- Communications Based Overlay Signal System ("CBOSS").

The scope of the PCEP includes:

- Electrification of the Peninsula Corridor; and
- Purchase of electric multiple units ("EMU's")

The subject of the Funding Plan is PCEP, and the focus of this Report is the electrification infrastructure component of the PCEP, the only portion of the project that Prop 1A bond proceeds will fund. Funding for the EMU's is the responsibility of the JPB and is included in the PCEP sources and uses tables in Section 2.4, but will not use Prop 1A funds.

The PCEP will enable the replacement of the existing diesel service with a fully electrified service from the 4th and King Street station in San Francisco to the Tamien station in San Jose. The PCEP's electrification infrastructure components include the installation of two substations for traction power, poles and an overhead contact system, signal and grade crossing circuitry changes, and yard electrification. The project will extend for approximately 51 miles from San Francisco to San Jose. Its intent is to improve Caltrain's ability to provide faster and more frequent service, reduce air emissions, reduce noise and vibration, and provide a foundation for HSR.

The JPB is a legal entity with title to the right of way between San Francisco and Tamien station in San Jose. The JPB is responsible for the passenger service operations, referred to as Caltrain, in the Peninsula Corridor, and is the responsible agency for the implementation of the PCEP. The JPB is the owner and integrator for all the projects that encompass, and may have an interface with, the PCEP including:

- The Balfour Beatty Infrastructure Inc. electrification contract valued at approximately $697 million.
- A separate contract (with a yet un-named contractor to be selected by JPB) to physically modify and install overhead line equipment ("OHLE") in four (4) tunnels at the northern end of the electrification project. This design-build contract will be procured in late 2017 or early 2018 based on the Master Program Schedule. The value of this work is estimated to be $11.02 million..
- The Stadler US Inc. contract which will deliver 96 EMU's configured as sixteen 6-car trains and is valued at approximately $551 million.
- Separate contracts to modify the yard and utility infrastructure for the OHLE.

Several components of the CalMod are not part of PCEP, so are not included in the Funding Plan. Those components will not utilize the $600 million Prop 1A Funding

and were, therefore, not considered in our analysis. Components of the CalMod program that are beyond the scope of the Funding Plan include:

- The Parsons Transportation Group Inc. CBOSS contract
- Several civil works contracts including the Hillsdale grade separation

1.4 USE OF PROP 1A FUNDS

This Funding Plan pertains to the $600 million of Prop 1A bond proceeds appropriated in SB 1029 and again in SB 556. The $600 million allocated to the PCEP will help to fund the electrification infrastructure but not the purchase of the EMUs. Table 3 shows the sources of funds for the PCEP electrification infrastructure and the full allocation of the $600 million. The complete sources and uses of funds for the $1,980 million PCEP (including purchase of the EMU's) is outlined in Section 2.4.

Prop 1A bond proceeds will be distributed from fiscal year 2017 to fiscal year 2020[2] to the JPB in order to partially fund the PCEP. The timing distribution of Prop 1A funds if further described in Section 2.4. The $113 million in Cap-and-Trade or other Authority/State Sources committed to by the Authority in the Seven-Party MOU Supplement is not subject to PFAL's review. Table 4 below provides the uses of PCEP electrification funds, including the $600 million Prop 1A bond proceeds. Section 2.4 provides additional detail on the total PCEP sources and uses of funds as it pertains to the deliverability of the PCEP program.

Table 3: Electrification Infrastructure Estimated Funding Plan Sources[3]

Sources	$ million
FTA Formula Funds	15.68
Prop 1A	600.00
Prop 1B	8.00
Carl Moyer	20.00
JPB Prior Local Funds	9.02
JPB Members	104.91
Bridge Tolls	10.809

[2] *PCEP Funding Plan.* PCJPB. November 7, 2016.
[3] *PCEP Funding Plan - For Planning Purposes Only*. PCJPB.2016.

Sources	$ million
Cap and Trade or other Authority/State Sources	113.00
Bridge Tolls – RM1	8.40
FTA Core Capacity (FFGA Still Outstanding)*	426.31
Total	**1,316.13****

*FFGA risk addressed in Section 2.4; **Total does not include purchase of EMUs

Table 4: PCEP Electrification Infrastructure Fund Uses (excluding EMU associated uses)[4]

Uses	$ million
Electrification	696.61
Tunnel Notching	11.03
Real Estate	28.50
Private Utilities	63.52
Management Oversight	141.51
TASI Support	55.28
RRP Insurance	3.50
Environmental Mitigations	17.69
Required Projects	17.34
Maintenance Training	1.02
Finance Charges	3.17
Contingency	276.97
Total	**1,316.13**

1.5 AUTHORITY COMMITMENT

Pursuant to the guidance in SB 1029 and SB 557, further reflected in the 2012 9-Party MOU, 7-Party Supplement to 2012 MOU, and 2013 MOU, the Authority has

[4] *Caltrain Peninsula Corridor Electrification Project Funding Plan Section 2704.08, Subdivision (d) Funding Plan*. California High-Speed Rail Authority. 2016.

memorialized a number of key funding agreements for the investment of the $600 million in Prop 1A bond proceeds. These documents were reviewed along with the Outline of Desired Basic Terms and Conditions, dated November 15, 2016, provided by the Authority intended to reflect the commercial terms the Authority would like to see included in the final documentation of further agreements with the JPB.

These agreements contemplate the Authority's interest in the Corridor, Authority's oversight of PCEP, and Authority's right to use the Corridor. Additional elements still need to be formalized in a Project Management and Funding Agreement ("PMFA") between the Authority and JPB and approved by the Department of Finance.

The PMFA is under negotiation between the Authority and JPB and will not be executed prior to publication of this Report. The analysis and opinions in this Report are based on the 2012 9-Party MOU, 7-Party Supplement to 2012 MOU, and 2013 MOU and the assumption that all terms in the above-referenced Outline of Desired Basic Terms and Conditions will be included. **Any changes between the November 15, 2016 Outline of Desired Basic Terms and Conditions, which form the key commercial elements of the PMFA, and the executed PMFA may change the conclusions and opinions in this Report, to the extent such changes relate to the five indications this Report is required to address from SHC 2704.08(d)(2).**

2. Constructability

Having completed a review of all requested documentation, we have concluded that construction of the PCEP electrification infrastructure in the Peninsula Corridor can be completed as proposed in the Funding Plan submitted pursuant to SHC 2704.08(d)(2)(a), as specified in, and in compliance with, environmental documents.

PFAL has several observations regarding the implementation of the electrification project:

2.1 PROJECT PROCUREMENT

2.1.1 Overall Procurement Plan

The PCEP will be implemented using four primary construction and equipment procurement contracts:

- Electrification Design-Build Services – awarded to Balfour Beatty Infrastructure, Inc., Limited Notice-to-Proceed (LNTP) issued September 6, 2016.
- Tunnel Modifications – planned to be delivered through a Design-Bid-Build Procurement. Design is underway and construction planned to begin in early 2018.
- EMU Procurement – manufacture, delivery, testing and training for 16 electrically powered trainsets. Awarded to Stadler USA
- Centralized Equipment Maintenance and Operations Facility Modification Contractor – planned to be delivered through a Design-Bid-Build Procurement. Design underway and construction planned to begin in late 2017.

In addition to these major contracts, the JPB will manage smaller contracts for modifications to existing infrastructure and implementation of measures to mitigate potential environmental impacts of the project. Third parties will implement the supply of utility power for the traction electric system and will complete necessary public utility relocations.

With the electrification DB and EMU contracts awarded, 79 percent of the project budget (excluding unallocated contingency) is under contract and not subject to design or market risks. The remaining risks, including contract interfaces, agency-caused delays and scope changes, third party issues and differing site conditions could still impact the planned schedule and cost of the project, but eliminating the

market and design risks for the majority of the work increases the probability of successful completion of the program within schedule and budget.

2.1.2 Electrification Contract

The Electrification Design-Build ("DB") contract will implement the elements of the PCEP that are included in the Funding Plan that is the subject of this review. The Authority reviewed and approved the PCEP electrification performance specifications that make up the basis of the Electrification DB contract to ensure it meets their needs. Interfaces between this DB contract and the other elements of work must be effectively managed by the JPB to successfully deliver the electrification program. These interfaces represent risks that could impact the cost and delivery schedule for the work, as discussed in Section 2.10.

The current Project Management Plan for the PCEP documents an extensive outreach program to industry, with multiple rounds of questions and answers and many instances of agency acceptance of industry recommendations for clarifications and improvements to the contract. This outreach program contributed to a clear definition of the scope of work and responsive proposals from three design-build teams.

The Engineers Estimate ("EE") for the Electrification DB contract was $599.3 million and the Balfour Beatty proposed price was $704.1 million – 17.5 percent higher than the EE. The price is a combination of a lump sum amount and a not to exceed amount for work that will be compensated based on unit price and actual quantities. Two other bids were received, with one slightly higher and the second substantially higher than the Balfour Beatty price. The final negotiated price is $696.6 million, which is composed of a lump sum amount and a provisional, not to exceed amount based on unit prices for work that will be paid based on measured quantities. There is a 5 percent contingency identified in the DB contract, which is under the control of the JPB Executive Director. This contingency is included in the total contingency for the PCEP program. While the executed DB contract price exceeded the EE, the most recent program budget[5] reflects the DB contract award prices for both the Electrification DB and EMU contracts.

Implementation of the Electrification DB project delivery method transfers significant risks from the JPB to the DB contractor, while leaving many other risks to be absorbed by the JPB. As discussed in the Construction Risk Section, the contract terms limit the contractor's risk exposure for differing site conditions, third party

[5] Final PCEP FTA Quarterly Update_October 2016.pdf, page 20.

interfaces and other risks that are retained by the JPB. The contract is favorable to the contractor, as it does not require it to assume risks that are beyond its immediate control. With the DB contract price negotiated and limited notice to proceed ("LNTP") issued, Balfour Beatty Infrastructure Inc., the DB contactor, has taken on the design risk for the work, including risks associated with the constructability of its design as well as market risks for subcontracts and material prices. The notice to proceed ("NTP") is expected in March 2017 as further described in Section 2.4. The DB contract specifies the time from NTP to substantial completion and final completion of the work. The DB contractor is responsible for planning its work to complete the scope, subject to changes that may occur as the result of risks retained by the JPB as outlined in the Electrification DB Contract.

The Electrification DB contract provides for liquidated damages ("LDs") in the event of schedule delays that are the responsibility of the DB contractor and for impacts to rail services by contractor activities. The contract specifies the following LDs related to contract milestones:

- Overall substantial completion - $20,000 per day of delay in achieving substantial completion
- Intermediate milestone 1 (test track completion) - $10,000 per day of delay in completing milestone 1
- Final acceptance - $10,000 per day of delay in achieving final acceptance

LDs for rail service interruption are $1,000 per five minute increment of delay to each train, with a daily maximum of $50,000. The combined LDs for service delays and contract are capped at $7.3 million or on the order of one percent of the contract value, which is consistent with industry practice. A delay of 360 days in achieving substantial completion would result in $7.2 million in LDs for contract delays. The contract notes that the LD amounts have been negotiated, rather than based on a calculation of the actual damages that the JPB would suffer as a result of delayed completion, as these damages could not be determined.

The Electrification DB contract scope of work clearly identifies what is required of the DB contractor and also specifies key areas of work which are the responsibility of others, including:

- Aerial utilities are to be relocated by others and are not in the DB contact. JPB will relocate aerial utilities that will be impacted by the installation of the electrification facilities; and aerial utility relocations are not in Contract.
- The design shall minimize or negate the impact to underground utilities, and the DB contractor shall be responsible for underground utility relocations required due to design decisions to ease the DB contractor's construction effort. The DB contractor is responsible for contacting utility companies to

request location information. The DB contractor is to conduct potholing or otherwise confirm location of the utilities.

- There are four tunnels on the northern end of the Project that are not included in this Project's Scope of Work, however the interface with each tunnel's existing systems are included and they will be an existing constraint for movement of construction equipment. The interface will include dead-ending of the OHLE, feeders and static wire onto the termination structures at each tunnel portal installed under a separate contract. The Contractor shall field verify the installation of these systems and design and construct the required systems to interface with them.
- The DB Contractor shall, as part of its design, locate, design, and install underground cable system infrastructure, including under track ductbanks, surface cable troughs and supporting manholes to coordinate with future Caltrain projects within the Project limits. Final locations and designs for the underground and under track conduits and ductbanks shall be coordinated by the Contractor with the other projects.

The Electrification DB contract includes appropriate management and control requirements on the Contractor, which are consistent with project and quality control procedures documented in the PCEP PMP, including:

- Variances from the Design Criteria are not authorized without specific written approval from the JPB, and require the formal request specified in Volume 3, Part A, Section 15, Design Variance. Design Variances must be approved by the JPB Project Delivery Director.
- Interface coordination with other operators is defined in the contract. There also are requirements for coordination of work with other contractors. Where this coordination results in restriction to the Contractor's Work Site access, the Contractor shall provide for reasonable work-arounds to allow the continuance of construction. The workarounds shall not constitute the basis for a Contractor delay, time extension claim or for additional cost to JPB in any way.
- The DB contractor shall design, build, install and document the systems provided under the Project that shall achieve the required reliability, availability, maintainability ("RAM") goals and accessibility of the work. No aspect of the work shall cause a failure or a condition which can affect passenger service or make the work unavailable during the hours of operation. Additionally, no aspect of the work shall preclude the future operating railroad system from achieving the requirement of no service-affecting failures caused by the work. RAM and accessibility for inspection and maintenance activities shall be ensured through application of federal, state, and city codes and best practices per the Design Criteria, other Contract Documents, and quality control and assurance processes. It shall be in compliance with the requirements of Volume 3, Part A, Section 14. Although the above quoted contract language requires achievement of RAM goals, no values related to RAM performance are identified in the contract.

The JPB and the Authority are urged to agree RAM performance specifications to mitigate any risk to the suitability and readiness of the system to accommodate Authority service.

- A very well developed requirements management system is included in the contract. Change and Requirements Management processes are identified in the contract, with specific requirements. The contract requires use of a tailored software package for requirements management. The contract requires that the contractor provide an Independent Checking Engineer and Independent Site Engineer to verify compliance with requirements.
- Requirements in the contract regarding contractor schedules are consistent with good scheduling practice. Any float included in the contractor's baseline schedule is considered to be shared between JPB and contractor. This is good schedule management practice.
- The DB contractor's QC manager reports to an officer of the firm, not the contractor's PM – consistent with accepted practice. Personnel responsible for ensuring quality shall be independent of those directly related for the work being performed and shall have no other work activities assigned except for ensuring quality. Personnel shall be free from the pressure of costs, construction scheduling, and production, and shall have the necessary independent authority to perform their roles effectively.
- A specific process for identifying, tracking, dispositioning and resolving non-conforming work is provided in the contract.

The review finds that the Electrification DB contract was awarded through an effective process that included substantial industry outreach. The contract terms and conditions are appropriate for a contact of this type and scale and include well-developed quality and requirements control systems that increase confidence that the contract will deliver the intended facilities and functions. The contract terms and conditions assign a substantial number of identified risks to the JPB, which could result in increased costs and delayed completion of the project as documented in Section 2.10. These risks have been identified by JPB in the November 11, 2016 Program Risk Register. Mitigation measures are identified in the register for all risks, but not all mitigations have been implemented and the mitigations may not be fully effective in completely eliminating the risks. However, it is unlikely that the completion of the construction would be delayed to the extent that use of the Peninsula Corridor by Authority trains by 2025 would be precluded.

2.2 PCEP SCHEDULE

The PCEP program is projected to achieve a revenue service date of August 2021 (inclusive of slack for the impact of schedule risks, the master program schedule risks, the master program schedule projects a revenue service date of December

2021) - well in advance of the introduction of Authority trains into the corridor in 2025. Furthermore, there are planned grade separation activities along the route, including the Hillsdale station and a new station for high-speed rail at Millbrae, they are not included in the current PCEP Master CPM Schedule. In San Mateo, 25th Ave., the construction phase is due to take place between "Summer 2017 and Spring 2020"[6]. This could seriously impact the progress of electrification along the affected area. Other capital projects with potential schedule interface risks include the South San Francisco Station and Los Gatos Creek Bridge Replacement that present opportunities for schedule slippage. JPB staff members are aware of this risk and their ability to manage the schedule interface through system integration workshops, monthly schedule reviews and prioritizing CalMod projects. It may not be likely that such slippage will affect the start of Authority rail service in 2025, but the PCEP schedule management will present significant challenges to the JPB. Based on our current understanding of the desired risk allocation between the JPB and the Authority, we do not expect that schedule delays would impact the Authority's plans to implement high speed rail provided that any delays do not exceed a 5-year time period.

Table 5: PCEP Electrification Schedule

Electrification Contract Dates	Date
Limited Notice To Proceed	9/6/2016
Duration to Substantial Completion	1330 days
Date of Substantial Completion	4/28/2020
Duration to Final Completion	1450 days
Date of Final Completion	8/26/2020

[6] Peninsula Corridor Electrification Program, Request for Proposal for Electrification Design-Build Services RFP No.: 14-PCJPB-P-053, CONTRACT DOCUMENTS, CONFORMED, JULY 5, 2016, Volume 2, Part A, Section 1, pages 7 and 8.

Table 6: PCEP Master Program Schedule Dates

PCEP Master Program Schedule Dates	Date
Initial 6 Trainsets Complete	9/21/2020
Additional 10 Trainsets Complete	7/23/2021
PG&E Infrastructure Complete	9/4/2020
Integrated Testing Start	2/26/2020
Integrated Testing Complete	4/24/2020
Pre-Revenue Service Start	9/22/2020
Revenue Service Date (RSD) w/Contingency	12/15/2021

The following items are noted that pertain to the schedule:

2.2.i Access for Construction

DB contractor for the electrification infrastructure, excluding the tunnel work, is generally required to construct the OHLE when given access to one track while the other track is open to operations. Double track availability during the week varies between 2 and 4 hours, which does not allow significant time for safe, productive work. Even during JPB non-revenue hours, the DB contractor must allow Union Pacific Railroad ("UPRR") freight traffic to pass which can affect worker productivity because work must be suspended while trains pass the construction site, including JPB passenger services. This means that mechanized plant used in construction must be suitable for single line operation and must be prevented from fouling the open track. It can be difficult to obtain safety approvals in such situations. Furthermore, the locations for crossovers, anchoring of wires and erection of back-to-back cantilevers will require access to both tracks, which will also impact the construction schedule. It may prove to be difficult to achieve an acceptable rate of construction depending on the number of times that construction must be suspended to allow trains to pass with a consequential risk that construction timescales may not be met and may affect the final cost of the PCEP.

2.2.ii Overhead Line Equipment (OHLE)

Installation of catenary cannot take place until all the poles in a tensioned length are in place. Contractors usually set out to achieve good progress by installing the "easy" locations first, which can give an overly optimistic impression of construction rates early in the project not representative of construction rates later in the project. Locations where utilities must be moved, or where there is conflict with signal sighting, or where special designs/bridge attachments may be needed in a span slow overall progress and the DB contractor progress reports should be studied carefully

for these details to ensure the project will be completed within the timeframe outlined in the Funding Plan.

Installation of the catenary can be done by high output methods by using special equipment so the conductors are run out together under tension and effectively the tensioned length is installed in one pass, or by more traditional methods that require several passes. Depending on the method chosen to install the catenary, the contractor's rate of progress will be affected by the need to cease work to pass trains.

The need for night and weekend working can lead to increased complaints from local residents and the need to string wires over the at-grade crossings will involve their closure to road traffic. This will require a proactive community communications program. JPB is aware of these risks and is confident in their ability to manage them.

2.3 PCEP COST

The Electrification DB contract was awarded based on a completive process with three firms participating at the best and final offer ("BAFO") stage. The final results were:

Table 7: Electrification Bid Results[7]

Company	Total BAFO Price Proposal Amount	Total BAFO Total Proposal Score
Engineer's Estimate	$599,304,916	N/A
Balfour Beatty Infrastructure, Inc., SSF, CA	$704,070,706	186.5
Mass Electric/Siemens JV.	$1,001,776,130	159
Shimmick/Alstom JV	$793,197,862	133.5

The Balfour Beatty price was the lowest overall bid compared to the other bidders, but approximately 17.5% above the Engineer's Estimate. So it is clear that the Balfour Beatty price is very competitive in an emerging railroad electrification market. That said, the JPB is assuming many of the major risks, like utilities, land acquisition and the responsibility of the owner. If risks that are the responsibility of the JPB are not well managed, there will be many opportunities for Balfour Beatty to increase its contract value through change orders.

[7] Caltrain. *Summary of Proposals RFP 14-PCJPB-P-053*. 2016.

Table 8 shows the current PCEP cost estimate. With the Electrification and EMU contracts awarded, 79 percent of the project budget (excluding unallocated contingency) is under contract and not subject to design or market risks. The remaining risks, including contract interfaces, agency-caused delays and scope changes, third party issues and differing site conditions could still impact the planned schedule and cost of the project, but elimination of the market and design risks for the majority of the work increases the probability of successful completion of the program.

Table 8: PECP Capital Costs (including electrification and EMUs)[8]

Uses	$ million (Year of Expenditure)
Guideway & Track Elements	14.257
Stations, Stops, Terminal, Intermodal	0
Support Facilities	2.265
Sitework & Special Conditions	255.253
Systems	504.812
ROW, Land, Existing Improvements	37.316
Vehicles	630.535
Professional Services	368.084
Unallocated Contingency	162.620
Finance Charges	5.110
Total	**1,980.253**

FTA's risk assessment supporting the approval to enter Engineering indicated that the project budget provides a 50 – 65% probability of covering the risk-adjusted project cost. The Funding Plan indicates a contingency of 20%, but was indicated to currently be 19% from PFAL's call with the JPB on November 17, 2016 and PCEP's October 2016 FTA Quarterly Report[9]. The JPB did not report a confidence level for the adequacy of the cost contingency included in the current budget. This level of contingency would be considered low at the start of Engineering (FTA recommends 25%)[10], but the successful award of the two largest contracts in the program

[8] PCEP Cost Estimate. JPB. May, 18, 2016
[9] Peninsula Corridor Electrification Project Quarterly Update. JPB. October 2016. Pg 20.
[10] Federal Transit Administration, Oversight Procedure 40b, Risk Assessment, Abbreviated, September 2015.

mitigates the design and market risks that are associated with traditional Design-Bid-Build project delivery and we are informed by the Authority that FTA agreed that the contingency included in the project budget was appropriate for the current level of project definition. Additionally, JPB provided the FTA a letter on November 22, 2016[11] stating local partners agreed to fund up to $200 million (10% of the PCEP total cost) for any potential cost overruns or funding reductions.

The MOU states that the Authority's contribution to the electrification project is capped at $600 million and that cost increases will be the responsibility of the JPB. SB 1029 requires Caltrain to provide the Authority quarterly reports, and the November 15, 2016 PMFA Outline of Desired Basic Terms and Conditions further protects the Authority by requiring Caltrain to provide a remediation plan to address any cost overruns. The JPB's ability to absorb cost overruns is described in Section 2.4.

2.4 PCEP FUNDING SOURCES

The analysis of the PCEP funding sources is important to demonstrate that sufficient sources of funds are available to meet PCEP's construction schedule needs. Total PCEP funding is $1,980.25 million as seen in Table 9. Federal sources constitute nearly half of the funding, with the remainder coming from State and local sources as shown in Table 9 below.

[11] FTA's Financial Capacity Assessment Recommendations. JPB. November 22, 2016. Page 3.

Table 9: Sources of PCEP Funds from JPB dated October 31, 2016

Source	Amount ($ millions)
Electrification	
FTA	15.68
Prop 1A	600
Prop 1B	8.00
Carl Moyer	20.00
JPB Prior	9.02
JPB Members	104.72
Bridge Tolls	11.00
HSR/State Non 1A funding	113.00
Bridge Tolls – RM1	8.40
FTA Core Capacity	426.31
EMU	
FTA	315.00
JPB	19.44
7-Party member	69.00
TIRCP	20.00
Bridge Tolls – RM2	20.00
FTA Core Capacity	220.69
Total PCEP Funding	**1,980.25**

The background of each of the committed funding sources is described in the Funding Plan, which identifies the funding party, the level of committed funds, agreements that have been signed, how the parties are committed to working together on issues such as cash flow, and any funds that have already been received. However, uncertainty remains around future funding sources as we describe in further detail below.

2.4.1 Prop 1A Bond Proceeds

The JPB's indicative funding plan for the PCEP dated November 7, 2016 shows the $600 million Prop 1A bond proceeds will be distributed as listed in Table 10. During the November 4, 2016 meeting, the Authority indicated there were no restrictions on the yearly distribution amounts requested by JPB, but annual requests are required

to go through the Authority. The Authority will then submit a biannual bond survey to the Department of Finance for sale of the Prop 1A bonds through the State Treasurer's Office. The Funding Plan generally addresses the anticipated timing of bond proceeds in Appendix I of the Funding Plan, and the Outline of Desired Basic Terms and Conditions provided by the Authority provides for a pro-rata even metering of spend rate of all PCEP funding sources. As mentioned in Section 1 of this Report, the terms of the PMFA are under development and PFAL believes further requirements need to be stipulated to protect Prop 1A funds. This is described further in Section 6.

Table 10: JPB's Funding Plan for Prop 1A

Prop 1A ($ millions)	FY17	FY18	FY19	FY20
Approximate Yearly Allocation	$87.23	209.96	194.10	108.71

2.4.2 Other Funding Sources

As noted in the Funding Plan and recognized in JPB's risk register, the Section 5309 Core Capacity funds are awaiting a Full-Funding Grant Agreement ("FFGA") from the Federal Transit Administration ("FTA"). The FFGA is expected in early 2017[12], which is seen as a low risk to JPB and further mitigated by issuing a limited notice to proceed. The heavy reliance on FTA Core Capacity funding does provide a timing risk to JPB funding sources. Once the FFGA is executed, yearly appropriations from Congress are still required. Appropriations delays could have an impact on JPB's funding plan. JPB recognizes this risk, and mitigates this risk through PCEP's contingency and other funding sources. In the JPB's November 22, 2016 letter to the FTA, the JPB has a $150 million revolving credit facility for short term financing needs to cover such events. PCEP contingency's resilience to mitigate any funding timing risk is strong in the early stages of the project, where the highest likelihood of risk lies for timing of funds, but is less resilient at later stages of the project depending on the number of change orders.

The risk of delivery of the Cap and Trade proceeds from the Low Carbon Transit Operations Program ("LCTOP") is mitigated largely by the fact the LCTOP funding will be used only for procuring the EMUs. Therefore, a delayed or reduced delivery of this source of funds will not impact the electrification works. This risk if further mitigated by the contingency carried in PCEP and relatively low quantum of funding

[12] *PCEP Risk Register*. PCJPB. November 11, 2016.

from LCTOP. Any cost overruns or funding shortfalls are expected to be addressed as described below.

We believe that there is a low likelihood that any additional Prop 1A funding would need to be made available to fund cost overruns. In the JPB's November 22, 2016 letter to the FTA, the JPB indicated local funding partners agreed to fund any cost overruns up to $200 million which would cover a 10% cost overrun. The risk of obtaining funds from local, State or Federal agencies is unlikely to affect the delivery of the PCEP beyond 2025, but highlights the importance of executing the PMFA in line with the November 15, 2016 Outline of Desired Basic Terms and Conditions to protect the Authority.

2.5 PROJECT MANAGEMENT

The review addressed the latest version of the PCEP Program Management Plan ("PMP").[13] Project management information for the PCEP from the latest FTA Quarterly Review presentation (ibid) by the JPB was also reviewed.

The PMP was evaluated against recommended project management capability, capacity and procedures documented in the latest versions of the Federal Transit Administration's Construction Project Management Handbook[14] and Project and Construction Management Guidelines.[15] The review followed portions of the review procedures for Project Management Plan reviews documented in the latest Oversight Procedures published by the Federal Transit Administration ("FTA").[16] The PMP was approved by FTA on August 12, 2016 as documented in the latest FTA Quarterly Review materials.

The review concluded that the PMP includes the necessary elements for successful management of the PCEP program, which is consistent with FTA's recent approval of the PMP. The PMP references numerous sub-plans and companion documents, most of which were not reviewed as part of this assessment. Observations and suggestions for improvement of the procedures documented in the PMP from the review are documented in the following paragraphs. None of the suggested

[13] Peninsula Corridor Joint Powers Board, Peninsula Corridor Electrification Program, Program Management Plan, Revision 1.1, October 12, 2016.
[14] Kam Shadan and William Plumpton (Gannett Fleming), Michael Eidlin (Kal Krishnan Consulting Services), David Sillars (Sillars), Paul Krogh (K2 Construction Consultants), Dain Pankratz (Boyd Caton & Grant), and Robin Hazy (Raul V. Bravo + Associates), Construction Project Management Handbook, February 2016.
[15] Kam Shadan, William Plumpton (Gannett Fleming), Michael Eidlin (Kal Krishnan Consulting Services), David Sillars (Sillars), Paul Krogh (K2 Construction Consultants), Dain Pankratz (Boyd Caton & Grant), and Robin Hazy (Raul V. Bravo + Associates), Project and Construction Management Guidelines, March 2016
[16] U.S. DOT Federal Transit Administration, TPM-20 Office of Capital Project Management, Project Management Oversight, Oversight Procedure 20 - Project Management Plan Review, September 2015.

procedural improvements are considered critical to the requirements of the Funding Plan that is the subject of this review, but they could help to mitigate risks and enhance the probability of on-time and on budget completion of the program.

- Page 1-2 of the PMP Overview references FTA Construction Guidelines dated 2011. These were updated in March 2016 (ibid) and should be updated accordingly in the PMP. The PMP also should mention the FTA requirement for reporting the status of all management plans to FTA on a Quarterly basis.
- The PMP should reference a comprehensive fleet management plan (FMP) that demonstrates the technical capacity to manage vehicles, meet FTA requirements, efficiently operate and maintain vehicle investments, on time performance and other metrics. Section 17 addresses some operational interfaces; however, this information does not remove the need for a reference to the FMP. The review noted that the latest Quarterly Review presentation indicates that a Rail Fleet Management Plan has been submitted to FTA for review. Furthermore, we have been informed that JPB has performed a movement analysis to ensure that the new EMUs can be brought into the maintenance yard, tested and commissioned without impact on Caltrain's revenue service operations.
- Professional services contracts are appropriately identified, including Program Management (AECOM), Electrification (Gannett Fleming), EMU (LTK) and Systems Safety Specialist (B&G). The PMP documents the proposed program delivery approach and major construction and equipment contracts.
- The PMP identifies interfaces to be managed in delivering PCEP.
- The PMP documents a well-developed document control system, including a centralized document control platform that should help to assure that users have access to the latest versions.
- Project Delivery and Program Management functions are separated in the PCEP organization. This is an effective way to assure independence of the Project Controls function from day-to-day delivery.
- Real Estate Acquisition function reports to Caltrain Planning Manager, which is independent from Project Delivery Manager. There is one Senior Real Estate Officer (agency employee) and 10 real estate consulting firms. Real estate acquisition progress should be monitored to avoid delays to construction work.
- The Program Master Schedule should be reviewed and updated to reflect the provisions of the awarded contracts, as discussed in Section 2.4.
- A Change Control Board (CCB) is established to review and approve/reject proposed changes. Board includes Directors of: Project Delivery, Program Management, Planning and Engineering and Construction (Infrastructure Program Manager in the PCEP organization chart). This is an appropriate control mechanism.

- In general, the JPB does not approve design, material, and equipment submittals. The contractor is responsible for reviewing and self-certifying its own design according to Verification, Validation and Self-Certification process, as specified in its contact. The PMP and sub-plans should document the JPB's process and procedures for verifying that the contractor has completed its obligations for self-certification.
- The Infrastructure Program Manager is responsible for tunnel modifications and yard modifications. This individual reports to the same manager as the Electrification Program Manager (Director of Project Delivery). This is an appropriate reporting relationship that should facilitate coordination and interface management.
- The PCEP Operations Planning Manager is assigned to oversee coordination of construction and testing work with railroad operations.
- The JPB (not the contractor) is responsible for coordination with UPRR for any activity that might impact UPRR operations or facilities.
- 3rd Party Agreements are identified in the PMP and a tracking methodology is described.
- Section 11 discusses safety and security and hazard analysis. It should also include threat and vulnerability analysis to address natural disasters, protection from terrorist activity, and resiliency from both.
- Section 20 addresses testing, startup and Third Party Training. Section 10 also makes reference to training. A description of training, certification and retention of internal Caltrain forces to maintain an adequate bench of specialized skillsets that meet the level of resource required should be provided as part of a Force Account Plan.
- The PMP should describe the process of how and when an operating plan will be developed. This discussion should support the options of how operations will be implemented and maintained on the corridor. A methodology for attracting specialized skillsets to carry-out agency oversight of contractor activities should be presented. This should include operators, maintainers, and others. The review noted that the Quarterly FTA presentation indicates that an Operating Plan and a Start-up and Testing Plan have been provided to FTA for review.

A May 2016 APTA Peer Review Panel of the CBOSS project raised serious questions about Caltrain's project management capabilities and JPB oversight that have similar implications to PCEP. These include:

- *"The panel notes that the PTC CBOSS project is just one of several complex infrastructure projects that will require Caltrain to take a serious look at in-house technical management resources."*

- *"Caltrain needs to directly hire a project manager with requisite technical experience and provide that person with the authority to manage the interests of Caltrain"*

- *"…this has consequently led to unresolved technical and contractual issues. Despite the recent partnering session, there continues to be a lack of commitment to resolving contractual issues such as scheduling and cost."*

The PCEP Organization Structure provided by JPB on November 17, 2016 and dated August 4, 2016 shows consultants in most key roles. The review noted that the majority of the PCEP project management team members are consultants, including the Chief Officer, who reports directly to the JPB's General Manager. The highest ranking positions that are filled with agency staffer members are the Deputy Chief Officer and Caltrain/PCEP Program Management Director. The Organization Chart also indicates a "Mod-Squad" of senior officials that includes the Chief Communications Officer, Chief Operating Officer/Rail, Chief Financial Officer/Treasurer, Chief Officer of Planning and Grants for the Transportation Authority and the General Counsel.

However, we note that one of the issues on the CBOSS project was that, while consultants were in project management positions, they were not mandated and empowered to make commitments on behalf of the JPB and this led to project delays.

With few agency staff members in the overall project organization and senior executive leadership provided by consultants, there is a question whether the consultant staff will have sufficient authority to act on behalf of the agency for effective management of the various design and construction contracts. There also is a question whether the organization provides adequate representation of agency and public interests. The agency's Executive Director and the Mod Squad will need sufficient time and understanding of project technical and management issues in order to provide the necessary oversight and authority for effective program delivery. The agency is aware of this situation and have informed the reviewers that they believe that they have the means and processes in place to manage the project.

2.6 REGULATORY STANDING

PCEP Final Environmental Impact Report ("FEIR") was approved by JPB on January 8, 2015 and Finding of No Significant Impact ("FONSI") on December 17, 2009 from the FTA. See section 3.1 for further information on the FEIR.

2.7 SYSTEM INTEGRATION

Interface coordination and design integration are, at best, ambiguous within the Electrification DB contract. For example:

- “The Contractor shall be responsible for coordinating the interfaces and performing integration with adjacent contractors, third parties, UPRR….” (Volume 3, Part A, Section 1, Scope of Work, Page 10)
- General Obligations of JPB: “Facilitate systems integration with the EMU Contractor, CBOSS Contractor and ROCs Contractor” (Volume 3, Part A, Section 1, Scope of Work, Page 22)
- “The Design Build Contractor…shall be responsible for the System-wide integration of all hardware and software within their scope of work” (SP 01800 Systems Integration and Integrator Requirements Page 1)

However, the initial Risk Allocation Matrix in the design build contract clearly assigns many major interfaces and risks, and the responsibility for their management to the JPB (Volume 2, Part A, Section 9, Page 3). The Caltrain Risk Identification and Management Plan, dated June 26, 2015, is too generic and academic to be effective for the size of the PCEP. However, the PCEP Risk Register, dated November 11, 2016, contains most of the risks of concern in the PFAL review. Actively managing the PCEP with that Risk Register is expected to mitigate the program’s risks.

PFAL believes excluding the tunnel work in Section 1 of the PCEP from the DB Contractor’s scope creates an unnecessary interface that outweighs the benefits.

Furthermore, there is a broader systems integration challenge in integrating the PCEP with all the remainder of the CalMod program. We have not seen an Integrated Master Schedule, covering all related activities along the corridor or systems integration plan for the entire CalMod program.

2.8 TRACK IMPROVEMENT COMPATABILITY WITH CATENARY INSTALLATION

It is good practice for any track improvements (including renewals) to be carried out in advance of electrification so that only the final alignment can be designed and wired. It is also essential that the track centerline is fixed and identified, particularly at curve transition points, so that the catenary can be designed, installed and maintained as specified. Allowance should be made by the designer for known track projects that have not been completed before installing the catenary. Though the JPB has identified this, it is of particular concern to point out with respect to the Hillsdale grade separation and the need to fully incorporate that project into the PCEP Master CPM Schedule. To support that view, the PFAL team was informed by JPB in a teleconference on November 17, 2016, that there were plans for the Hillsdale contractor to install the foundations for the catenary poles as part of its work. Consistent with our comments on interface management in this report, PFAL would expect that the JPB will prepare an interface management diagram for use by both the Hillsdale contractor and Balfour Beatty.

Track maintenance crews must be trained to understand that they are no longer free to move the alignment, cant or elevation of the track except in accordance with allowed tolerances from the designed position and that this discipline should be applied before catenary design takes place, to avoid abortive design or construction work. Permanent markers should be installed on poles that should record the track running edge to face of steel dimension, cant and contact wire height so that maintenance teams can readily check if movement has taken place. If reduced track tolerances are applied in places to ease OHLE construction they must also be marked at the site. This is particularly important because PFAL understands that Caltrain and/or the Authority will make track upgrades to enable 110 mph speeds in the foreseeable future. Though the track improvements compatibility risk described here mainly poses a risk to the PCEP schedule for the purposes of this review, a secondary issue is the potential for throw away costs due to the possibility of replacing electrification infrastructure.

2.9 RELIABILITY, AVAILABILITY AND MAINTAINABILITY (RAMS) PERFORMANCE

The decision to operate blended services on the Peninsula Corridor from San Jose to San Francisco means that high-speed trains will be operating on JPB property and subject to the consequences of JPB design decisions and JPB maintenance activities. The specification[17] requires the DB Contractor to perform a RAMs analysis but, unlike the CBOSS contract, there are no reliability, availability and maintainability performance requirements. In our experience, this is a very unusual approach and leaves what would normally be key acceptance criteria unstated. The Authority should consider working with JPB to establish RAMs performance targets including response time to incidents and repair time in the case of de-wirements -- and getting those requirements agreed with the Contractor.

2.10 CONSTRUCTABILITY SUMMARY

The review finds that there is very little risk that the PCEP can't be constructed as currently designed. Most of the design and construction risks for the electrification program have been transferred to a DB Contractor with experience in the delivery of similar rail electrification projects. The interface of the work in this contract with the CBOSS work now being completed will be facilitated by the presence of Alstom as a key subcontractor on both the CBOSS and Electrification contracts. The remaining

[17] Volume 3, Part A, Section 14, RAMS

risks potentially impacting the constructability of PCEP, as independently identified by PFAL and addressed in JPB's risk register, include the following:

- Interface risks among the contracts being used to implement the program (e.g. tunnel contract and electrification contract) and with other capital projects in the corridor
- Interface risks between the electrification work and work by 3rd parties
- Management risks associated with JPB activities supporting the various contracts (e.g. operations staff supporting stipulated work windows)
- Time extensions (and associated costs) related to delayed completion of predecessor work, including right-of-way acquisition and utility relocation
- Delayed completion of utility power supply
- Differing site conditions requiring specialized construction operations (e.g. hazardous materials), redesign or rework (e.g. unidentified utilities or inaccurate data and assumptions regarding clearances and structural capacity of overhead structures)
- Unanticipated work restrictions due to community complaints
- Changes in regulatory requirements for system performance or testing
- Unanticipated restrictions due to ongoing operations and maintenance work
- Force majeure

The Electrification DB Contract spells out 60 individual risks covering these categories and assigns ownership between the JPB and the contractor. The JPB retains ownership of 32 of the risks and the combined effects of these risks are likely to impact the project cost and duration. The PCEP has a well-developed Risk Management Process, which is described in general terms in the Risk Identification and Mitigation Plan. The specific risk mitigation program is defined in the risk register for the project. All of the risks called out as JPB-owned in the contract are included in the risk register with appropriate mitigation strategies. However, not all of the mitigation strategies have been implemented and some of the mitigations may not be fully effective in eliminating the identified risks or preventing them from impacting the project cost and/or schedule.

This review concludes that the constructability risks do not threaten the eventual completion of the PCEP as proposed in the Funding Plan, but that there is a potential for project delays beyond the planned RSD of December 2021 and there is a potential for the cost to exceed the established budget. It is unlikely that the project would be delayed to such a degree that the Funding Plan requirement for Authority operation in the corridor in 2025 could not be

met. Furthermore, any cost overruns are likely to be covered by the available contingencies and the additional $200 million committed to by local agencies[18].

[18] FTA's Finance Capacity Assessment Recommendations. JPB. November 8, 2016.

3. Suitable and Ready for High-Speed Rail

The Peninsula Corridor along with the PCEP is suitable and ready for HSR under the definition stipulated in AB 1889 and as proposed in the Funding Plan submitted pursuant to SHC 2704.08(d)(2)(b).

However, PFAL has several observations regarding the usable segment:

In principle, from a technical point of view, there is no reason why “high-speed trains” of the type proposed by the Authority could not operate over the existing Caltrain route between Tamien and San Francisco, provided the necessary OHLE was installed and commissioned as specified in the scope of work defined in the PCEP RFP document[19], and the electrification of the four tunnels at the northern end of the route had been completed, commissioned and linked to the catenary.

The “high-speed trains” would be limited to a maximum of 79 mph within the present limitations of the signaling and grade crossing technology. Higher speeds, up to 110 mph, will only be permitted when the Authority makes the necessary improvements to the grade crossings and other improvements, all of which are still under development and subject to environmental approval. The Authority’s traffic analysis indicates that there is no need for additional passing tracks.

For the Authority’s trains to operate in the Peninsula Corridor, they will need to be fitted with automatic train protection (“ATP”) equipment (or Positive Train Control [“PTC”]) that is compatible with the Caltrain CBOSS signaling overlay project. From discussions with the Authority, it is our understanding the Authority intends to include all communication systems on Authority trains which are required to operate over the Peninsula Corridor. In addition, the on-board CBOSS safety modules must be integrated with the HSR signaling system interfaces that monitor and control train speed. The Authority has indicated to us that it intends to do this.

The implementation of PCEP will provide significant near term benefit to the JPB’s passenger service operations. Benefits from the PCEP include faster and more frequent service, reduction of air pollutant emissions, reduction of noise and vibration, and providing a foundation for eventual HSR service.

[19] 14-PCJPB-P-053 DB Elect RFP - Vol 3 - 2-27.pdf

3.1 FUTURE IMPROVEMENTS

The environmental documentation (particularly the Final Environmental Impact Report ("FEIR") dated January 2015) is written for the PCEP and incorporates provisions and assessments to accommodate future HSR. Accommodating, as used in the FEIR:

- Involves "providing the electrical infrastructure compatible with HSR and not precluding HSR."
- Provides for blended service for up to "six Caltrain trains per peak hour per direction and up to four HSR trains per peak hour per direction" in accordance with the JPB, Authority, and the MOU partners' agreement
- Anticipates that "other improvements needed to enable high-speed trains would be evaluated in a separate environmental process led by the Authority as the lead agency for HSR."

The FEIR further states that PCEP would not preclude HSR. PCEP, however, does not include other improvements that might or might not be (still under evaluation) necessary for blended operations that include high-speed trains "such as platform improvements, high-speed rail maintenance facilities, passing tracks, or other Core Capacity projects." Furthermore, the FEIR does not address speeds greater than 79 mph or high speed operations, although the document does include a conceptual cumulative impact assessment of blended service. The Authority currently plans to have separate rolling stock maintenance and stabling facilities. The Authority will have separate high-level platforms at Diridon Station (San Jose), Millbrae, and TTC dedicated to CHSR service. The Authority is also considering the construction of a high-level platform in the tunnel section at 5th & Townsend. This platform could be shared with Caltrain if desired by Caltrain. Caltrain and the Authority rolling stock both provided for level boarding on a 51-inch high platform.

The Authority obtains considerable benefit from the PCEP FEIR and from the associated electrification project. The investment that the Authority makes in PCEP will deliver, as stated above, infrastructure compatible with HSR and not preclude HSR. These benefits, however, are contingent upon JPB (1) meeting its environmental mitigation commitments in accordance with the FEIR; (2) delivering the PCEP in accordance with all of its agreements with the Authority and other partners (including the JPB, Authority, and the MOU partners); and (3) meeting its commitments to the FTA, FRA, and to the standards embodied in NEPA and CEQA.

Key environmental risks that the Authority will continue to face in order to deliver HSR on the Peninsula Corridor include:

- Successful development of CEQA and NEPA documentation for HSR on the peninsula

- Developing appropriate mitigations for environmental impacts associated with “other improvements needed to enable high-speed trains” and the following issues
- Addressing:
    - Cumulative impacts beyond the conceptual impacts of Blended Service that are addressed in the FEIR, including those that are beyond noise, traffic, and intersection and roadway impacts for which Caltrain alone can commit resources
    - Impacts of speeds greater than 79 mph and committing to the simulations needed to address speeds between 100 and 125 mph
    - Traffic impacts at intersections beyond those required for Caltrain’s EMUs

4. Passenger Service Compatibility

The implementation of PCEP as proposed in the Funding Plan will provide passenger service compatibility pursuant to SHC 2704.08(d)(2)(C) (*i.e.*, upon completion, one or more passenger train service providers can begin using the tracks or stations for passenger train service) and is consistent with AB 1889.

PFAL has several observations regarding the compatibility of the electrification project:

4.1 PCEP COMPATABILITY WITH JPB PASSENGER SERVICE

Integration risk of PCEP and CBOSS is critical to the ability of PCEP to deliver passenger service compatibility for JPB passenger service. The integration risk between PCEP and CBOSS is mitigated by the incorporation of Alstom, the signaling manufacturer of CBOSS, onto the DB Contractor team. PFAL believes the integration risk between PCEP and CBOSS is well mitigated by this arrangement, and should enable the JPB to provide passenger service, thus meeting the requirements of SHC 2704.08(d)(2)(c).

4.2 PCEP COMPATABILITY WITH AUTHORITY FUTURE HIGH-SPEED TRAIN SERVICE

The Authority set out its requirements for electrification infrastructure in the shared use corridor in their Project Technical Memorandum TM 3.2.1. Revision 1 dated 16 August 2010. The PCEP technical requirements for the DB Contractor are set out in their document 14-PCJPB-053 (conformed) dated 5 July 2016. Examination of these documents indicates that not all of the Authority requirements have been incorporated into the PCEP project. PFAL wishes to bring the following matters to the attention the Authority.

- Use of standards such as the EU Energy TSI for Interoperability would guarantee that whoever supplies the high-speed trains for the Authority would have a defined interface for the pantograph. The PCEP specification does refer to this standard but not to the current version.
- The Authority's original intent that the design for the shared corridor and the high-speed route be generally similar is not being realized. The use of similar designs would have been of economic advantage in the provision of spares, training and maintenance operations. The PCEP has specified a non-sagged catenary design while the high-speed catenary will be a pre-sagged design.

Sagged designs are more appropriate for good current collection at higher speeds and it remains to be seen what commonality, if any, will be finally achieved between the designs.

- Despite this difference in approach to OCS design the shared corridor design will be suitable for HSR operating in the speed range of 79 to 110 mph

It has not been possible to provide a complete assessment for Authority operations since no technical details are available on the catenary to be installed in the tunnels. The RFP issued by JPB shows the possibility that conductor rail may be used. But, at the time of this report, the contractor for the tunnel modifications and the catenary installation has not been chosen.

We recommend that the Authority satisfies itself that the proposed tunnel OCS will allow HSR to run, when this information is available. We address this in Section 6.

4.3 CLEARANCES

The specification allows the DB Contractor to work to closer electrical clearances than those specified by the Authority. The Authority's electrical clearances reflect a green field site while the PCEP electrical clearances reflect the realities of installing OCS onto an existing railway. The PCEP electrical clearances are consistent with recognized electrical clearances as adopted by AREMA. However, Caltrain and the Authority need to take care these closer electrical clearances do not increase the incidence of flash over or bird strikes, risking the possibility of damage to the OHLE and disruption to rail services.

4.4 PCEP STATION IMPROVEMENT COMPATABILITY WITH PASSENGER SERVICE

The issue of station improvement compatibility with passenger service presents a number of issues as follows:

- Elimination of the "hold out rule" and any stations which are subject to it;
- Caltrain and the Authority will evaluate each station with a "hold out rule" on a case-by-case basis using a risk based methodology.;
- Platform heights.
- Civil engineering works related to stations such as grade crossing elimination. Caltrain and the Authority will design modifications to stations will be planned and designed as an integral part of the design of the grade crossing project;
- Civil engineering works related to stations such as grade crossing elimination;
- Timing of any station works relative to the electrification program.

4.5 SIGNALING COMPATABILITY WITH PASSENGER SERVICE

The CBOSS system is a train control system that is overlaid on the existing track circuit based fixed block signaling system. It is therefore assumed that the track occupancy status is provided to the CBOSS in parallel with the GPS positioning signals generated by the movement of individual trains. It seems, from the scope of work for the electrification contractor that it will be responsible for testing these links after its work on track circuits is finished. This is a high risk safety area.

In our experience, any work requiring safety related technical interfaces with signaling already installed on an existing system is high risk in terms of interface management, approvals for designs by the operator and regulators and in the installation `ment by the electrification contractor for intrusive access to a new and complex system like CBOSS is bound to cause some delay to the project completion date, particularly if the alteration (e.g. track circuit replacement) involves interfaces with other operators like the UPRR.

The Authority has informed us that the electrification contractor has Alstom as its subcontractor for signaling equipment and interfaces. Alstom is also the main contractor for the CBOSS project. The PFAL team believes that this is an appropriate mitigation for the risks involved.

4.6 ROLLING STOCK COMPATABILITY WITH PCEP

In the adoption of a rolling stock design for the HSR services, there are a number of possible designs from which to choose and any of these will be suitable for the Peninsula Corridor provided that:

- The wheel rail interface of the HSR train is compatible with the existing Caltrain rail profile.
- The train fits inside the Caltrain structure gauge and dynamic envelope. The Authority confirms that it will work closely with the JPB on this matter.
- The traction system is compatible with the planned 25kV 60Hz traction supply system being installed along the Peninsula Corridor. The Authority confirms that the traction power systems of the PCEP are compatible with Authority rolling stock requirements.
- The HSR train overhead contact pantograph design matches the Caltrain OHLE design and installation.
- The traction equipment of the train meets the EMI/EMC requirements of the Peninsula Corridor. The Authority confirms that the rolling stock technical specification meets the latest requirements of PG&E, FCC, IEEE and the applicable specifications.

- The train is provided with the necessary ATP equipment to allow it to conform to the Caltrain signaling and train control requirements. The Authority
- The HSR train is provided with the necessary communications equipment to allow it to operate with the Caltrain communications systems.
- The train design meets the platform height requirements of the stations where it is planned the HSR services will stop along the Peninsula Corridor (see para. 4.3 above) The Authority confirms that this will be the case.
- There are sufficient stabling and maintenance facilities at or near the San Francisco terminal of Caltrain that are available for HSR trains when or if required. The Authority confirms this case.
- Suitable breakdown and train/passenger rescue arrangements are in place along the Peninsula Corridor. The Authority confirms that this will be the case.

The Authority has taken all of these elements into consideration in its plans for the purchase of high-speed rail rolling stock and operations on the blended infrastructure in the Corridor. We see no issues that would preclude such operations.

5. Operating Subsidy

Section C of the Funding Plan indicates the Authority will not operate stand-alone high-speed train service in the Peninsula Corridor until the Silicon Valley to Central Valley Line ("Valley to Valley"), as defined in the Authority's 2016 Business Plan, is completed and connected to the Peninsula Corridor. This is also reflected in the Ridership and Revenue Forecasting Technical Supporting Document to the 2016 Business Plan which assumes High-Speed Train Service after the Valley to Valley line is connected.

Any High-Speed Train Service contemplated by the Authority is outside the scope of this Funding Plan because no Authority High-Speed Train Service will be provided in the usable segment. As such, no Revenues and no Operating and Maintenance Costs have been contemplated in the Funding Plan. We are therefore unable to comment on whether or not an operating ubsidy is required.

Passenger rail service provided by JPB in the usable segment will be JPB's responsibility, not the Authority's. Neither the 2013 MOU, nor the 7-Party MOU, nor the 9-Party MOU, nor the November 15, 2016 Outline of Desired Basic Terms and Conditions, suggest that the Authority intends to assume any obligation to fund any operating or maintenance costs incurred by JPB in the Peninsula Corridor or prior to commencement of Authority service on the Corridor.

6. Risks and Risk Mitigation Strategies

6.1 JPB RISKS AND RISK MITIGATION STRATEGIES

PFAL reviewed JPB's June 26, 2015 Risk Identification and Mitigation Plan ("RIMP") and JPB's PCEP Risk Register dated November 11, 2016. Though we note the RIMP has not been updated in over a year, JPB's risk register is up to date. We find JPB has identified many of the same risks that we have described in Sections 2 - 5 and provided mitigating actions for each risk.

There are additional risks in PFAL's view that should be considered for inclusion in the risk register:

- The risk of implementing the measures necessary for the control of stray AC and DC currents in the vicinity of other railway operators (BART etc.) is not included in the risk register. The risk for identifying and implementing the necessary measures is with the DB Contractor who will have to engage with the other operators. This is another example where an interface schedule would provide clarity.

- The risk of signal sighting issues arising with the addition of the electrification infrastructure is identified in the risk register but if it is found to be necessary to move any existing signals a further risk arises in ensuring that other operators on the route are properly advised of the changes and that their train drivers are trained accordingly.

6.2 AUTHORITY RISKS AND RISK MITIGATION STRATEGIES

The Authority has not developed a Project Risk Management Plan specific to the PCEP since delivery and management of PCEP is the responsibility of the JPB. The Authority's main risk mitigation is governed by its agreements with the JPB including the PMFA, which is yet to be finalized. The timely execution of the PMFA and the ability for the Authority to negotiate all terms in the November 15, 2016 Outline of Desired Basic Terms and Conditions provided by the Authority is critical to mitigating any risks to the Authority. The ability of the Authority to successfully negotiate the PMFA is the main risk to protecting Prop 1A funds from the Authority's perspective.

There are additional risks in PFAL's view that the Authority should consider for inclusion in the PMFA.

- Specify the schedule of Prop 1A bond distributions to the JPB and the events in which funding could be accelerated or halted to ensure Prop 1A funds are protected. The Authority has recognized this risk, but no formal procedure or criteria to accelerate funding or restrict funding is outlined. To address this, we recommend ensuring the PMFA limits Prop 1A funding to the timing from Table 10.

- The PMFA should specify and outline voting representation for the Authority on the PCEP Change Control Board to provide the Authority greater certainty. The PMFA Outline states that the Authority must approve material changes to contract specifications, such as through change orders, which we would view as a useful risk mitigation.

- The PMFA should specify that the Authority must approve the design for electrification in the tunnels.

7. Conclusions

The Funding Plan sets out to satisfy SHC 2704.08, subdivision (d) for the commitment of $600 million of Prop 1A bond proceeds for the PCEP. The Funding Plan complies with the statutory requirements insofar as it address each of the SHC 2704.08(d)(2) criteria. Table 11 summarizes PFAL's opinion on each component of SHC 2704.08(d)(2).

Table 11: SCH 2704.08(d)(2) PFAL Summary Opinion

SHC 2704.08(d)(2) requirements	PFAL Conclusion
Construction of the corridor or usable segment thereof can be completed as proposed in the plan submitted pursuant to the Funding Plan	PCEP can be constructed as proposed in the Funding Plan
If so completed, the corridor or usable segment thereof would be suitable and ready for high-speed train operation	When completed, the PCEP will be suitable and ready as defined in AB 1889
Upon completion, one or more passenger service providers can begin using the tracks or stations for passenger train service	PCEP can facilitate passenger service
The planned passenger train service to be provided by the authority, or pursuant to its authority, will not require an operating subsidy	No high-speed rail service is contemplated on a stand-alone basis in the Peninsula Corridor
An assessment of risk and the risk mitigation strategies proposed to be employed	Risks are identified and addressed by JPB, and execution of the PMFA is important for the Authority to undertake as soon as possible

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Appendix II – Technical Meeting Notes

Notes of a Telephone Conference Call

Date: Thursday 10 November 2016

Subject: CHSR Technical Discussion: Shared Use Corridor

Call Participants:

John Popoff -HSR	(NB)
Greg Tseng - PFAL	(GT)
Les Elliott - FCP	(LE)
Piers Connor - FCP	(PC)
Noel Broadbent - FCP	(NB)

Discussion centered mainly around the details contained in a brief produced by NB, key issues discussed were noted as follows, additional post meeting comment provided by JP has been incorporated in these notes

1. The Capltrain specification and contract with the DB Contractor does not comply with some of the initial CHSRA requirements (dated 2010) for the electrification of the shared use corridor. JP said that the authority was aware of this and had been party to the decision to award the DB contract. Additionally JP has commented that the 2010 requirements assumed a dedicated HSR alignment to be constructed, owned and operated by CHSRA – as a result, the technical specifications were CHSR specs. When the Legislature required that the section from SJ-SF be a blended operation (i.e., CHSR would be operating on Caltrain property and the train operations blended) we became tenants on the Caltrain property. At that time we reviewed the Caltrain proposed specifications to make sure that they were suitable for the CHSR equipment and planned operations and are satisfied that our trains will work satisfactorily on the Caltrain Electrification.
2. The HSR refers to the use of international standards,(see response to 1.) the ones contained in the Caltrain specification were out of date. JP said that he expected the current standards to be applied.
3. Noted that legal requirements in California requires compliance with PUC general orders that the Authority believes need amending to allow the construction of a 25 kV railroad. The risk of any amendments in the Caltrain corridor lies with the JPB. JP said that the Authority view now was that these requirements did not apply to the high speed route. We need to keep the Caltrain territory and the CHSR territory separate. CHSR has a new GO 176 that covers the electrification of a dedicated high-speed line – we were the proponents of that GO and will comply with it. GO 176 does not apply to the Caltrain blended section (where there are freight trains, Caltrain trains, ACE, Amtrak and CHSR trains operating – Caltrain has filed with the PUC an application for a GO to cover this territory. CHSR has reviewed Caltrain's application and has provided minor comments to CPUC- but see no reason why we could not operate within the confines of the proposed GO. We expect that the CPUC will implement the new GO for the Caltrain blended sections imminently.
4. The specification for traction power was for 110 mph running, not 125 mph. JP explained that the existence of many at grade crossings meant that they accepted 110 mph was acceptable. (post meeting note - is any capacity being built into the supply for any future load growth?) JP has commented It is extremely unlikely that the SF-SJ route will be fully grade separated and the curves aligned to allow 125 mph running (the curve adjustment would require significant deviation from the existing ROW. In any event, the increase in electrical demand from 110 mph to 125 mph is easily covered by the thermal capacity of the Power Transformers.
5. The OCS design is for 79 mph and will accommodate running at 110 mph in future. JP believes that it is being built to allow 110 mph without further modification.
6. The Authority specified a sagged construction of OCS but a non-sagged design has been specified by Caltrain. (See note 1) JP said that provided current collection was satisfactory they will accept this. At low speeds we do not foresee a problem with current collection.
7. The contact wire height specification is at variance with CHRSA requirements. JP explained that the need to accommodate other trains determined the difference in height. See notes 1 & 3. CHSR specs assume that only CHSR train are operated. The Caltrain specs assume that a variety of train dynamic envelopes must be accommodated including double stack freight traffic – hence the different contact wire height
8. NB noted that back to back cantilevers were not to be used on the high speed line but were likely to be used by Caltrain. Such cantilevers did not provide for mechanical independence necessary for reliable performance. JP understood the reasons why Caltrain might use them and confirmed they would not be

used on the high speed sections. (See note1) Back to back cantilevers are undesirable but, due to environmental constraints Caltrain has been forced into using them in selected (limited) areas. They are not contemplated for use on the CHSR sections.

9. NB noted that the DB contractor was at risk for meeting unspecified PG&E quality standards for harmonic distortion etc. JP explained that the Authority had carried out work with PG&E at a weak point in their 115 kV distribution system and was satisfied that requirements could be met. He further said that the results of this work would be made available to the DB Contractor and that the supply system was more robust in the San Francisco area.
10. NB commented that the lack of a final OCS design had caused cost and program overruns with other projects and that geotechnical surveys were paramount in getting foundation design right first time. JP said that there was good geotechnical knowledge of likely ground conditions along the Caltrain corridor and that the DB contractor seemed to be relaxed about the issue.
11. PC queried the program to remove at grade crossings and noted that any such work after electrification would have to fund necessary changes to the OCS. JP noted that it had been an aspiration for many years to eliminate such crossings but the reality is that the work is not funded and is extremely unlikely to be funded before the PCEP is completed.
12. PC asked what leverage could be exerted by the DB contractor with local utility owners. JP commented that Caltrain has granted the licenses/easement to the utilities, Caltrain had good knowledge of the position of utilities and had influence with the owners.

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