U.S. Department of Transportation
Federal Railroad Administration

Grant/Cooperative Agreement

1. RECIPIENT NAME AND ADDRESS
California High-Speed Rail Authority
925 L St Ste 1404
Sacramento, CA 95814-3704

2. AGREEMENT NUMBER: FR-HSR-0037-11-01-02

3. AMENDMENT NO. 2

4. PROJECT PERFORMANCE PERIOD: FROM 08/01/2011 TO 12/31/2013

5. FEDERAL FUNDING PERIOD: FROM 08/01/2011 TO 12/31/2013

1A. IRS/VENDOR NO. [redacted]

1B. DUNS NO. [redacted]

6. ACTION Extension With or Without Funds

7. CFDA#: [redacted]

8. PROJECT TITLE
California High-Speed Train System – San Francisco to San Jose Project Section: Communications-Based Overlay Signal System/PTC System Project

9. TOTAL OF PREVIOUS AGREEMENT AND ALL AMENDMENTS 16,000,000.00

10. AMOUNT OF THIS AGREEMENT OR AMENDMENT 0.00

11. TOTAL AGREEMENT AMOUNT 16,000,000.00

12. INCORPORATED ATTACHMENTS
THIS AGREEMENT INCLUDES THE FOLLOWING ATTACHMENTS, INCORPORATED HEREIN AND MADE A PART HEREOF:
Amended Terms and Conditions, Attachment 1

13. STATUTORY AUTHORITY FOR GRANT/ COOPERATIVE AGREEMENT
Omnibus Appropriations Act, 2010, Public Law 111-117 (December 16, 2009)

14. REMARKS

GRANTEE ACCEPTANCE		AGENCY APPROVAL	
15. NAME AND TITLE OF AUTHORIZED GRANTEE OFFICIAL Mr. Jeff Morales		17. NAME AND TITLE OF AUTHORIZED FRA OFFICIAL Joseph C. Szabo Administrator	
16. SIGNATURE OF AUTHORIZED GRANTEE OFFICIAL Electronically Signed Jeff Morales	16A. DATE 05/29/2013	18. SIGNATURE OF AUTHORIZED FRA OFFICIAL Joseph C. Szabo	18A. DATE 6/6/13

AGENCY USE ONLY

19. OBJECT CLASS CODE: 41010

20. ORGANIZATION CODE: 9013000000

21. ACCOUNTING CLASSIFICATION CODES

DOCUMENT NUMBER	FUND	BY	BPAC	AMOUNT
FR-HSR-0037-11-01-00	27X0719000	2011	95010129Y0	0.00

AWARD ATTACHMENTS

California High-Speed Rail Authority FR-HSR-0037-11-01-02

1. Amended Terms and Conditions, Attachment 1

ATTACHMENT 3

Attachment 1 to Amendment No. 2

The parties, intending to be legally bound, agree to amend their Agreement of June 24, 2011 as follows:

1. In the Notice of Grant Award cover sheet, sections 4 and 5 are deleted and the following substituted therefor:

    4. Project Performance Period: FROM 08/01/2011 TO 12/31/2013

    5. Federal Funding Period: FROM 08/01/2011 TO 12/31/2013

2. Section 1.h. of Attachment 2 is deleted in its entirely and with the following substituted therefor:

h. Project means the task or set of tasks set forth in the approved Application as now reflected in and refined by the tasks set forth in Attachment 3 which the Grantee carries out pursuant to this Agreement.

3. Attachment 3 of the Agreement: Attachment 3, Statement of Work, is deleted in its entirety and the following substituted therefor:

STATEMENT OF WORK

California High-Speed Train System – San Francisco to San Jose Project Section:

Communications-Based Overlay Signal System/Positive Train Control System
Project Development Phase

BACKGROUND

On October 16, 2008, President Bush signed the Rail Safety Improvement Act of 2008 ("RSIA") into law. RSIA reauthorized the Federal Railroad Administration's (FRA) safety programs and reemphasized that the highest priority of FRA is to ensure the safety of our Nation's railroad system. The Act also included a mandate that all Class I railroads and intercity passenger and commuter railroads implement positive train control (PTC) by December 31, 2015. This requirement applies to the California High-Speed Rail Authority's (CHSRA or Grantee) San Francisco to San Jose portion of the California High-Speed Train (CAHST) System, which may include[1] shared use of the Peninsula Corridor Joint Powers Board's (PCJPB) Caltrain corridor.

PTC is an advanced technologies collision avoidance system designed to monitor train location and to prevent collisions and other related safety incidents. In particular, the goals of PTC are to help prevent train-to-train collisions, speeding and overspeed derailments, incursions into track work zones, and the movement of trains through switches left in the wrong position. Through sophisticated technology, PTC is designed to keep a train under its maximum speed limit and within the limits of its authorization to be on a specific track.

CHSRA intends to establish an agreement with PCJPB, which is pursuing development and implementation of Communications Based Overlay Signal System/Positive Train Control (CBOSS/PTC), which will improve rail safety, provide enhanced operational benefits for passenger rail service, and fulfill federally mandated positive train control safety improvements along the Caltrain/CAHST San Francisco to San Jose corridor. The CBOSS/PTC communication system has been specified to provide a reliable means for PTC information exchange at speeds up to 125 mph between CBOSS/PTC-equipped vehicles, wayside devices, roadway worker employees-in-charge utilizing handheld devices, and the operations control center in San Jose.

The CBOSS/PTC system will prioritize the provision of the statutory PTC functionality: interoperability, automatic enforcement to protect against train-to-train collisions, overspeed derailments, intrusion into established work zone limits, and movement over misaligned switches satisfying the requirements of the RSIA. The CBOSS/PTC specification also includes a solution

[1] A decision on construction and operation of high-speed rail in the San Francisco to San Jose section of the CAHST system will be made only after all required environmental reviews under the National Environmental Policy Act, California Environmental Quality Act, and related laws and regulations have been successfully completed, and all required determinations have been made.

that will allow for improved schedule management, station stop enforcement, crossing safety improvements, and optimized operating performance.

Steps to completion of the CBOSS/PTC system include design development, final design and acceptance, material equipment manufacturing and procurement, field installation and testing, commissioning, and safety certification of an interoperable vital train control system. This Grant will contribute funding toward the design development of the CBOSS/PTC system and associated project administration that is necessary for the Critical Design Review (Project).

PCJPB has commenced the procurement of the CBOSS/PTC system. PCJPB issued a Notice to Proceed to their vendor integrator on Jan 27, 2012 for a design/procure/install system contract Consistent with the requirements of this Grant Agreement, the procurement will comply with the Buy America requirements contained in 49 U.S.C. § 24405(a).

GENERAL OBJECTIVE AND PROJECT BENEFIT

The Grantee intends to carry out the Project through an agreement with PCJPB to complete the design development necessary for the Project. PCJPB will manage the Project and provide direct oversight over the contractor; however, the Grantee is responsible for completing the Project. CHSRA and PCJPB contemplate that the Caltrain corridor CBOSS/PTC system would be provided on all main tracks between San Francisco (milepost [MP] 0.1) and CP Lick (MP 51.6) along the San Francisco to San Jose corridor of the CAHST System. As a result of this Project, the Grantee will have the information necessary to determine the design solution that prioritizes the statutory PTC functionality; a vital overlay system that satisfies the requirement of the RSIA but may also provide improved schedule management, station stop enforcement, crossing safety improvements, and optimized operating performance.

The Project will produce a detailed design development plan for implementing PTC in the Caltrain corridor, which when constructed would provide a safer and more functional work environment while reducing costs during construction of the San Francisco to San Jose section of the CAHST System. Moreover, the development of the CBOSS/PTC product supports the CAHST schedule because the CBOSS /PTC solution will be implemented in advance of currently planned CAHST implementation in the corridor.

The work funded by this Cooperative Agreement (Agreement) will identify the necessary interoperable interfaces that CHSRA must specify for its Automatic Train Control system procurement. This will reduce technical risk for CHSRA and reduce project cost contingencies for the shared corridor design and implementation.

The work funded by this Agreement, supports regulatory review and approval of the CBOSS/PTC system. FRA acceptance of work produced under this Agreement, however, does not constitute FRA's certification of the completely developed and implemented PTC system required by 49 U.S.C. § 20157(h).

DESCRIPTION OF WORK

The major tasks and deliverables of this Project to be carried out and completed by the Grantee through the agreement with PCJPB are as follows:

- Task 1 – project execution plan and project administration (Project scope description and detailed work breakdown structure (WBS); Interoperability Coordination Plan; Design, Procurement, Installation, and Testing Management Plans and Quality Assurance/Quality Control Plan; Project Safety and Security Management Plan, Configuration Management Plan, and Risk Management Plan; Training Plan and Project Baseline Schedule; System Engineering Plan; and related activities);
- Task 2 – development of PTC data that includes corridor mapping update, data gathering, and PTC database development;
- Task 3 – system architecture and concept design and approval (system integration and interface requirement specifications, system utility plan, and related activities);
- Task 4 – PTC Development Plan (PTCDP);
- Task 5 – system hardware and software critical design and approval (field, onboard, data communications, and back office system critical design packages including software report, software testing plan, and procedure); and
- Task 6 – PTC Product Safety Plan (PTCSP) outline.

Project Limits:

This Project consists of design and development work up to the critical design review and does not include implementation, final design, construction, or PTC certification (49 U.S.C. § 20157, 49 C.F.R Part 236, Subpart I, or any other domestic or foreign statutory or regulatory requirement). The Project will advance development of a CBOSS/PTC system that, once implemented, will provide vital overlay of its existing wayside block signal and centralized traffic control systems on the mainline tracks between the northern terminal located at 4th and King Street Station in San Francisco and CP Lick south of San Jose.

Task 1: Project Adminstration and Project Execution:

The Grantee, through agreement with PCJPB, shall oversee Project administration and execution. PCJPB shall review contractor's key personnel resumes and approve the contractor's Project organization structure, which addresses relationships among the PCJPB Caltrain corridor project management team, contractor's project team, and third parties.

PCJPB will provide track access training material for all personnel participating in the design development phase of the Project on the PCJPB standards and Roadway Worker Protection and will conduct proficiency tests.

The Grantee, through agreement with PCJPB, shall submit for FRA's review and approval the Project Execution Plan, which will demonstrate the work scope, baseline budget, schedule, its precise execution methods, and the administration processes and procedures, and include the following:

- Project scope description and its WBS for delivery of the CBOSS/PTC system;
- Development and approval of the Contractors' Contract Deliverables Requirements List (CDRL);
- Development and approval of the Project Integrated Baseline Schedule;
- Integrated Work Plan;
- Interface Management Plan;
- Quality Assurance and Control Plan;
- Health and Safety Plans;
- Risk Management Plan that addresses project risk identification, assessment, evaluation, and mitigation process; Project risk register;
- PTC Safety Program to achieve Caltrain corridor PTC system certification;
- Caltrain System Safety Security Management Plan;
- Engineering Management Plan;
- Procurement Management (Material and subcontract) and Material assignment schedule (MAS);
- Testing and Commissioning Plan;
- System Cutover and Implementation Plan;
- Project Controls Plan (Budget/Cost, Schedule, Change Management);
- Configuration Management System;
- Training Plan;
- System Engineering Plan; and
- Interoperability Coordination Plan

The Grantee, through agreement with PCJPB, shall complete the specification and system design for PTC, giving priority to the PTC statutory functions (prevent train to train collisions, prevent overspeed derailments, protect roadway workers [operating within their established work limits], prevent movement of trains through misaligned switches, and interoperability with other railroads PTC systems).

Task 2: PTC Data Management

PTC Data Management is actual development of a PTC database and ongoing effort of managing PTC data. To meet FRA's safety requirements and to ensure the implementation of the safest possible CBOSS/PTC system, the Grantee, through agreement with PCJPB, shall develop or

cause to be developed a reliable and accurate CBOSS/PTC database with spatially enabled maps of all railroad components relevant to rail operations. This CBOSS/PTC database will contain information including, but not limited to: railroad subdivisions, track centerlines, track gradients, control points, switches, mileposts, grade crossings, curves, time table speed limits, turnout speeds, clearance/fouling points, operational constraints, passenger platforms, work zone limits, etc. The data from the database would be loaded into the back office server and onboard computers within locomotives and cab cars. The database must be accessible in a format that works in the CBOSS/PTC system and can be plainly understood by those who will operate, maintain, and update the data in the future. The CBOSS/PTC database must be compatible for all railroads, both freight and passenger, since the railroads operate on each other's territories and share tracks.

The database must have up-to-date mapping to establish the indispensable foundation for a CBOSS/PTC system. To accomplish this, the Grantee will ensure current PCJPB track charts and composite maps from San Francisco to San Jose or Gilroy are updated with high-accuracy track centerline stationing and mileposts and establishment of coordinates (latitude and longitude) for all required CBOSS/PTC data points. The track charts, composite maps, and operating characteristics will allow the vital CBOSS/PTC database to be established and maintained as a CBOSS/PTC "controlled" document and to ensure the data meets or exceeds the minimum requirements of 49 C.F.R. Part 236, Subpart I – Positive Train Control system.

Task 3: System Architecture and Concept Design

The Grantee, through agreement with PCJPB, shall complete or cause to be completed the Preliminary Design, which shall represent the architecture of hardware and software elements and their interfaces both internal and external to the appropriate level of detail as defined by FRA. Comprehensive product specifications are to be included as well as Interface Control Documents that establish how the design elements connect and work with one another. Successful completion of the Preliminary Design Reviews provides assurance that the follow-on work to develop the Critical Design Review packages can be commenced with minimum risk.

Before Preliminary Design begins, a site survey of the Center Control Facility and signal and grade crossing equipment enclosures shall be performed to verify that the configuration of the signal system corresponds to the current (at the time of survey) as-built information for all locations where Caltrain CBOSS/PTC system equipment will be needed.

The Preliminary Design documentation will provide the basis for an initial evaluation of the System's operational performance and its reliability and availability. A suite of approved engineering, design, and quality assurance plans governs the entire design process.

Task 4: Caltrain PTC Development Plan (PTCDP)

The Grantee, through agreement with PCJPB, shall develop or cause to be developed a Caltrain corridor PTCDP in accordance with FRA's regulation at 49 C.F.R. 236.1015. The PTCDP shall consist of a detailed description of the CBOSS/PTC system itself and a Concept of Operations document describing the use of CBOSS/PTC for railroad operations in this corridor. Any

supporting materials, including development-related deliverables, will be included as part of the PTCDP. Delivery of the PTCDP documentation under this Agreement does not constitute FRA's 49 C.F.R. 236.1013(b) approval of the PTCDP.

Task 5: System Hardware and Software Critical Design and Approval

The objective of the Critical Design Phase is to define at a detailed level each type of element that makes up the system, both from a hardware and software (including data) perspective. The detailed definition of element types and the interfaces that join them allow functional and system operating performance verification to be achieved.

The Grantee through the agreement with PCJPB shall complete or cause to be completed the Critical Design Review (CDR) package, which includes updated analyses demonstrating that system performance, including operating, reliability, availability, and maintainability, will meet the contract requirements and that equipment layout information is acceptable for all installation locations and each type of vehicle. Verification of the design is typically done within simulated equipment environments and/or by document review. Successful completion of the CDR allows Final Design efforts to be commenced for all installation locations and train types following the CDR accepted element type designs at minimum program risk.

The Grantee, through agreement with PCJPB, shall complete the specification and system design for PTC giving priority to the PTC statutory functions (prevent train-to-train collisions, prevent over speed derailments, protect roadway workers operating within their established work limits , prevent movement of train through misaligned switch, and interoperability with other railroads PTC systems).

Task 6: PTCSP Outline

The Grantee, through agreement with PCJPB, shall develop or cause to be developed the CBOSS/PTC PTCSP in accordance with the requirements of 49 C.F.R Part 236 regulations pertaining to the PTC Safety Plan (PTCSP). Since the PTCSP must be developed to address the complete system, baseline product safety management activities addressing product-specific or product-related issues shall be provided that describes how the CBOSS/PTC system will be safely supported and operated. The PTCSP Outline shall focus on the following areas:

- The description of the system architecture that satisfies the safety requirements. The system architecture documentation shall describe both hardware and software aspects.
- A list of system components and their physical relationship within the system. Safety-critical functions performed by the system shall be identified.
- The description of hazard assessment and mitigation; subsystem and system hazard analyses process.
- Summary-level description of major tasks and activities of system safety management and system safety engineering required to identify, evaluate, and eliminate/control hazards.

- Major system safety program milestones.

The PTCSP shall be developed so as to be consistent with the Notice of Product Intent (NPI) filed by PCJPB for the Caltrain corridor, and the PTCDP.

PROJECT SCHEDULE

WBS ID	Task Descriptions	Complete Date
	PCJPB Award CBOSS/PTC Contract	Oct. 2011
	PCJPB Notice to Proceed to Subcontractor	Jan 27, 2012
	Submit Match Funding Documentation	October 2011
1818-01-980	Task 1: Complete Project Administration and Project Execution	August 2012
1818-01-150	Task 2: Complete PTC data mapping and PTC critical data verification	November 2012
1818-01-110	Task 3: Complete and Approve System Architecture and Concept Design	November 2012
1818-01-180	Task 4: Submit PTCDP	June 2013
1818-01-120/130	Task 5: Complete and Approve Critical Design	June 2013
1818-01-820	Task 6: Submit PTCSP outline	April 2013
	FRA Review (Tasks 4, 5, and 6)	August 2013
	Administrative and Financial Closeout	December 2013

Schedule of Work:

The period of performance for the above work shall begin August 1, 2011 and end December 31, 2013.

Prerequisites:

1. Provisional approval of PCJPB PTCIP and PTCNPI issued on September 30, 2010.

2. PCJPB PTCIP progress report submitted on March 25, 2011.

PERFORMANCE OBJECTIVES AND DELIVERABLES

This Project is being undertaken because development and ultimately installation of the CBOSS/PTC system will reduce cost and risk for the high-speed rail and other operations on the corridor and will contribute to eventual implementation of future high-speed rail service by ensuring signal priority as well as throughput and roadway worker safety protections by creating the work windows necessary for construction of California's high-speed train project while passenger and freight rail service continues to operate.

Deliverables by Task are listed in the following:

Task 1: PTC System Project Administrative and Project Execution

1. Approved Project Org. Chart
2. Interoperability Coordination Plan;
3. System Engineering Plan;
4. Contractor's Project Execution Plans:
    a. Project Scope Description and its WBS;
    b. Contractors' Contract Deliverables Requirements List (CDRL);
    c. Project Integrated Baseline Schedule;
    d. Integrated Work Plan;
    e. Interface Management Plan;
    f. Quality Assurance and Control Plan;
    g. Health and Site Safety Plan;
    h. Risk Management Plan & Risk Register;
    i. Caltrain System Safety Security Management Plan;
    j. Engineering Management Plan;
    k. Procurement Management Plan and Material Assignment Schedule;
    l. Testing and Commissioning Plan;
    m. System Cutover and Implementation Plan;
    n. Project Controls Plan (Budget/Cost, Schedule, Change Management);
    o. Configuration Management System; and
    p. Training Plan.

Task 2: PTC Data Management

1. Outlined Data Management Plan.
2. Updated plans including maps and track charts with relevant CBOSS/PTC track, signal, and operation data.
3. Outline of standards and requirements for database infrastructure and cyber-security.

Task 3: System Architecture and Concept Design and Approval

1. Preliminary design package – vehicle

a. Vehicle subsystem architecture;
b. Vehicle subsystem layouts for revenue cars, locomotives, and work trains;
c. Vehicle hardware designs;
d. Vehicle software designs including on-board database;
e. Vehicle interface designs; and
f. Vehicle human interface design.

2. Preliminary design package – wayside

   a. Wayside subsystem architecture and layout;
   b. Wayside subsystem hardware designs;
   c. Wayside subsystem software & database designs;
   d. Wayside subsystem interface designs; and
   e. Wayside subsystem installation drawings including transponder placement, if used.

3. Preliminary design package – wireless network

   a. Wireless network architecture;
   b. Wireless network system design and layout;
   c. Radio coverage design;
   d. Radio licensing requirements;
   e. Data coding, message structure, protocol;
   f. Wireless network back-haul and other network and network interface designs;
   g. Data communications system architecture; and
   h. Data communications system layout.

4. Preliminary design package – back-office subsystem(s)

   a. Office system architecture;
   b. Office equipment layouts at ROCS;
   c. Office hardware designs;
   d. Office software designs;
   e. Office database designs;
   f. Office interface designs; and
   g. Office human interface design.
   h. ROCS – CBOSS/PTC functional design;
   i. ROCS – CBOSS/PTC interface design; and
   j. ROCS – CBOSS/PTC human interface design.

Task 4: Caltrain Corridor PTC Development Plan

1. Caltrain Corridor Proposed PTCDP

Task 5: Critical Design and Approval

1. Critical design package – vehicle (each type of locomotive and train end)
    a. Vehicle subsystem architecture;
    b. Vehicle subsystem layouts for revenue cars, locomotives, and work trains;
    c. Vehicle hardware designs;
    d. Vehicle software designs including onboard database;
    e. Vehicle interface designs; and
    f. Vehicle human interface design.
2. Critical design package – wayside (each type of wayside location)
    a. Wayside subsystem architecture and layout;
    b. Wayside subsystem hardware designs;
    c. Wayside subsystem software & database designs;
    d. Wayside subsystem interface designs; and
    e. Wayside subsystem installation drawings including transponder placement, if used.
3. Critical design package – wireless network
    a. Wireless network architecture;
    b. Wireless network system design and layout;
    c. Radio coverage design;
    d. Radio licensing requirements;
    e. Data coding, message structure, protocol;
    f. Wireless network back-haul and other network and network interface designs;
    g. Data communications system architecture; and
    h. Data communications system layout.
4. Critical design package – back-office server(s)
    a. Office system architecture;
    b. Office equipment layouts at ROCS;
    c. Office hardware designs;
    d. Office software designs;

e. Office database designs;

f. Office interface designs; and

g. Office human interface design.

h. ROCS – CBOSS/PTC functional design;

i. ROCS – CBOSS/PTC interface design; and

j. ROCS – CBOSS/PTC human interface design.

Task 6: Outline JPB PTC Product Safety Plan

1. Preliminary draft of outline PTC Product Safety Plan

PROJECT ESTIMATE/BUDGET

The total estimated cost of the Project (CBOSS/PTC Development Phase) is $20,000,000, for which FRA will contribute an estimated 80% of the total cost but not more than $16,000,000. Any additional expense required beyond that provided in this grant/cooperative agreement to complete the Project shall be borne by the Grantee. The Project cost summary by Task is described in the table below:

WBS ID	Task Descriptions	US$ (Millions)
	PCJPB Award CBOSS/PTC Contract	Jan 2012
1818-01-980	Task 1: Project Administration and Project Execution	2.13
1818-01-150	Task 2: PTC data management development	0.80
1818-01-110	Task 3: System architecture and Concept Design	2.62
1818-01-180	Task 4: Caltrain Corridor PTCDP	0.68
1818-01-120/130	Task 5: PTC system hardware and software Critical Design	8.4
1818-01-820	Task 6: Caltrain Corridor PTCSP outline	0.4
1818-01-999	CHSRA and JPB Project Management and Oversight	4.77
1818-01-940	Project Contingency*	0.2
	Total Project cost	**20.00**

* The total for project contingency is the aggregate of individual task contingencies.

CBOSS/PTC System Project – Development Phase (FRA Grant)

FRA (80% of project cost):	$ 16,000,000
Grantee Contribution - State Prop 1B & Local funds (20% of project cost):	$ 4,000,000
Total Project Cost	**$ 20,000,000**

PROJECT COORDINATION

Coordination with other Railroads:

The Caltrain/CAHST San Francisco to San Jose corridor is host to the following tenant railroads and the PTC equipment on these operators' trains must be interoperable with the Caltrain and CAHST wayside system:

South of Quint Street lead interconnects with:

- Union Pacific Railroad (UPRR)

South of CP Coast, Caltrain interconnects with:

- National Railroad Passenger Corporation (Amtrak) and California Department of Transportation (Caltrans)
- Capital Corridor Joint Powers Authority
- San Joaquin Regional Rail Commission, managing agency for Altamont Commuter Express (ACE)

The Caltrain services operate as a tenant railroad on a portion of track owned by UPRR between CP Lick and Gilroy Station, and will require interoperability with the UPRR PTC system. The freight railroads will provide for the core requirements of PTC, however, they also have specific needs such as energy management, train health status and train dynamics management that are not required for interoperability from a tenant railroad and regulatory perspective.

The Caltrain/CAHST San Francisco to San Jose corridor PTC system will consist of an existing Automatic Block Signal (ABS) system and Centralized Traffic Control (CTC), which will be supplemented by the addition of a vital communications-based system designed to be interoperable with Interoperable Electronic Train Management System (I-ETMS). Caltrain corridor tenant railroads will be utilizing I-ETMS onboard equipment.

The Caltrain/CAHST San Francisco to San Jose corridor PTC system will be designed, built, tested, and placed into service as part of a larger PTC system contract effort awarded by PCJPB. Various provisions of the contract will be used as the vehicle to accomplish the requirements of this SOW. The PTC system design that PCJPB intends to implement is outlined in PCJPB's PTC

Notice of Product Intent (NPI). These design requirements include specific requirements for interoperability between the Caltrain corridor/CAHST San Francisco to San Jose project section's PTC system and the PTC technology used by the tenant railroads, I-ETMS. FRA and Grantee recognize that PCJPB compliance with the requirements of 49 U.S.C. § 20157 will include elements (*e.g.*, system implementation and construction) beyond the Grant Project Limits that are not funded or covered by this Agreement.

Coordination with FRA

The Grantee, through agreement with PCJPB, shall maintain a close relationship with FRA during the Project. Informal presentations, discussion and draft documents should be provided to FRA to receive guidance and endorsement of the processes being used for meeting FRA safety requirements.

Coordination with PCJPB

The Project is proposed to be funded by Federal, State (non-Prop 1A), and local sources, including the FRA High-Speed Intercity Passenger Rail funds being provided through this Agreement. PCJPB is the railroad owner and operator. CHSRA is the Grantee and the funding partner with FRA for the Project. CHSRA and PCJPB will enter into a separate cooperative or joint development agreement to complete the Project (CHSRA/PCJPB Agreement). CHSRA will administer this Agreement, process reimbursements, monitor the Project, and provide status reports as needed to FRA. Through the CHSRA/PCJPB Agreement, the PCJPB will be responsible for managing the Project and will work directly with the Grantee to provide any information requested by FRA.

PROJECT MANAGEMENT

The Grantee intends to perform all Project Management (PM) services described in this Section through the CHSRA/PCJPB Agreement but remains ultimately responsible for ensuring that the following PM services are carried out. The Grantee's costs for its share of PM and grant administration services may be chargeable against the Total Project Cost.

Project Execution Plan (PEP) – The PEP and Project System Engineering Plan submitted by PCJPB's Contractor as described in Task 1 above shall be reviewed and approved. Project execution planning is a continuous, iterative process, and PEP is intended to be a living document that will be revised periodically to fully describe evolving aspects or phases of the project.

Contract Deliverable Requirement List (CDRL) – The selected contractor's CDRL will be reviewed and approved within 45 days of NTP. The CDRL shall be consistent with and support the project Baseline Schedule and reflect the relationship with the project WBS. The CDRL is a living document and is required to be updated to reflect any changes to the work and to be expanded corresponding to design, analysis, and test-related documents as the project evolves. Approved CDRL will be used as a tool for tracking and monitoring deliverable and submittal status.

Design Review and Approval – During the evolution of design, the Grantee, through agreement with PCJPB, will monitor the Contractor's efforts to determine the degree to which objectives of

the Contract are being achieved through the use of design reviews and audits. The Contractor must establish validity, compatibility, and conformance with interface requirements, through the performance of system design demonstrations, at the physical, functional, and operational program levels. Design reviews, audits, and inspections shall be conducted jointly by PCJPB, through the Grantee, and the PCJPB Contractor.

Risk Register – All credible risks shall be recorded and evaluated in the risk register. The risk register shall be continually updated to indicate newly identified risks as well as risks that are considered closed. The Contractor shall submit its risk register as part of the Monthly Progress Report submittal.

Change Management – A formalized process and procedure for identifying and evaluating trends (a deviation from the established baseline) for budget or schedule throughout the life of the project shall be established so that timely appropriate action can be taken by the project team without cost or wasted effort. The essence of cost-trending is timeliness rather than precision, enabling PCJPB and the Contractor to make timely decisions that can influence the direction of project costs. A Trend Report, which identifies scope or nonscope changes, cost, and schedule impact for each trend, shall be submitted by the Contractor and reviewed by PCJPB and the Grantee. Trends, which are identified and approved by PCJPB for scope changes, will be processed as a Change Order. The Contractor will identify which changes and trends are attributable to the Owner/Project and which are at no-cost to the project.

Project Forecast – The entire project shall be periodically reevaluated to ensure that all elements of the project properly interrelate and that the forecasted overall project cost and schedule reflect the best, most current judgment of the project team. The objectives of a project forecast are to evaluate the current status of the total project cost (to-date and to-go) and the project schedule to determine critical items for review and action and to provide a sound basis for future project control. Project forecast typically includes budget, schedule and scope change reviews, escalation, contingency analyses, etc.

Monthly Progress Report – Contractor's Monthly Progress and Performance Report highlights key/major events accomplished, critical project issues (areas of concern), and proposed corrective actions (including PCJPB's actions), project major milestones planned versus actual/forecast, key milestones and/or events for the next month. The monthly report shall include discipline highlights and a table showing plan versus actual progress for the development phase of the project. If significantly behind plan, the report shall include a brief explanation as to why progress has fallen behind and what corrective action is in progress or being planned to recover. Emphasis should be placed on addressing current events impacting the execution of the work and the proposed work around. An Overall Total Project Cost Summary that reflects total contract value to-date, contract payment status, Project Management Schedule along with critical path analyses, Project Change Log, Quality Compliance Report, and Safety Report and Risk Register shall also be part of the monthly report submittal. PCJPB shall submit a project Monthly Progress Report to Grantee in support of Grants management and reporting.