

Interstate 680/State Route 4 Interchange Project

Next Phase Study



Prepared for:



Prepared by:



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Table of Contents

1. INTRODUCTION	1
A. Background	2
B. Existing Conditions	3
C. Need and Purpose.....	4
2. Description of Improvements by Phase	5
3. Traffic Data	7
4. Environmental Considerations	10
5. Permit Requirements	11
6. Agreements	12
7. Right of Way	13
8. Preliminary Cost Estimate	16
9. Evaluation of Study Scenarios	17
A. Comparison of Benefits for each Scenario	17
B. Quantitative Evaluation of Study Scenarios.....	19
10. Recommendation	20
11. Schedule	21
12. Next Steps	22
List of Attachments	22

The purpose of this study is to perform a high-level assessment of the remaining phases of the Project and recommend to staff the next phase (or phases) of construction that would provide the most benefit to users of the facility within available funding.

1. INTRODUCTION

In February 2009 the California Department of Transportation (Caltrans) approved a Project Report to modify the Interstate 680/State Route 4 (I-680/SR 4) Interchange in Contra Costa County (Full Project). The Full Project area extends between Concord Avenue and East Martinez Underpass on I-680 and between Morello Avenue and 0.4 mile east of SR 242 on SR 4 (Attachment A). The proposed improvements were to be implemented over five phases. Each of the five phases could be independently constructed and provide incremental benefits in meeting the overall project goal to improve operational efficiencies and traffic flow, address safety concerns associated with the existing interchange configuration, and accommodate existing and planned growth. This provides flexibility for planning and implementing the improvements as funding becomes available.

The key engineering features of each phase are as follows and are shown on Attachment B:

- Phase 1 - northbound I-680 to westbound SR 4 connector.
- Phase 2 - eastbound SR 4 to southbound I-680 connector and improvements to the SR 4 interchange at Pacheco Boulevard.
- Phase 3 - SR 4 median widening between Morello Avenue in Martinez and SR 242 in Concord.
- Phase 4 - southbound I-680 to eastbound SR 4 connector.
- Phase 5 - westbound SR 4 to northbound I-680 connector.

Due to funding constraints, TRANSPAC asked CCTA to examine the benefits of improving operations and capacity on SR 4 east of the interchange with specific emphasis on Phase 3 improvements – since they would provide more extensive improvements compared to the other phases. In July 2013, CCTA elected to proceed with Phase 3 as the initial phase of construction. Construction of Phase 3 of the Project began in Winter 2018 and is widening the median of SR 4 in both directions from east of Milano Way/Glacier Drive (PM R11.2) to east of SR 242 (PM R15.1) and to add outside widening along SR 4 in both directions at Pacheco Boulevard and I-680. In addition, the Project proposes replacing Grayson Creek Bridge and raising the profile of SR4 from east of I-680 to east of Grayson Creek (PM 13.0).

A. Background

The I-680/SR 4 Interchange has long been identified as needing operational and capacity improvements. Since the interchange was constructed in the early 1960s, traffic patterns have changed significantly as eastern Contra Costa County has experienced tremendous growth. The interchange cannot adequately handle current or future projected traffic volumes or patterns, resulting in substantial congestion and travel delays and contributing to safety problems.

Contra Costa County has experienced both residential and business growth in the past two decades. Many businesses have expanded or relocated to Contra Costa County along the I-680 corridor. Contra Costa County anticipates additional growth in the coming decade and beyond. SR 4 serves additional regional travel demand as an alternate connection between the I-80 and I-680 corridors.

In April 2000, Caltrans approved a separate project to add HOV lanes on I-680 from south of SR-242 to the Marina Vista Interchange in Martinez. Construction was completed in late 2005. Modifications to the I-680/SR 4 Interchange included construction of a collector distributor (C-D) ramp on I-680 in both directions and the associated realignment of all of the existing loop and diagonal ramps.

In 2000, engineering studies were commenced to investigate potential improvements to the I-680/SR 4 Interchange. The studies examined both near-term operational improvements and long-term ultimate improvements. The study recommended development of an ultimate interchange facility, and that near-term alternatives be withdrawn from further consideration.

In February 2009 Caltrans approved a Project Report to modify the Full Project. Due to funding constraints, TRANSPAC asked CCTA to examine the benefits of improving operations and capacity on SR 4 east of the interchange with specific emphasis on Phase 3 improvements – since they would provide more extensive improvements compared to the other phases. In July 2013, CCTA elected to proceed with Phase 3 as the initial phase of construction.

Some components from Phases 1 and 5 were added to Phase 3 during the final design phase and were documented in a Supplemental Project Report. Phase 3 of the Full Project is now under construction and will widen the median of SR 4 in both directions from east of Milano Way/Glacier Drive to east of I-680 and from east of Grayson Creek to east of SR 242 and add outside widening along SR 4 in both directions at Pacheco Boulevard and I-680. In addition, the Project proposes replacing Grayson Creek Bridge and raising the profile of SR 4 from east of I-680 to east of Grayson Creek.

B. Existing Conditions

The existing facility is a freeway-to-freeway cloverleaf interchange connecting I-680 and SR 4 in the Pacheco area of Martinez. I-680 is the only north-south corridor in Contra Costa County. It is also part of the Department of Defense Priority Network. SR 4 is the only east-west region-to-region route connecting Contra Costa County communities to San Joaquin County and the Central Valley.

I-680 is a six-lane freeway (three lanes in each direction) extending from the Benicia-Martinez Bridge to U.S. Highway 101 in San Jose. The I-680 has an HOV lane in each direction from the I-680/SR 242 split to Marina Vista Drive in Martinez in the NB direction and from Marina Vista Drive to North Main Street in Walnut Creek in the SB direction. Collector distributor roads were added on I-680 between the four loop ramps of the I-680/SR 4 Interchange and the interchange's eight loop and diagonal ramps then reconstructed.

SR 4 connects with I-80 in Hercules to the west and SR-160 in Oakley to the east and proceeds to Stockton and beyond. SR 4 has two mixed-flow lanes in each direction through the I-680 interchange, widening to three mixed-flow lanes in each direction west of the ramps at Pacheco Boulevard. Construction is underway to extend the three mixed-flow lanes in both directions from east of the SR 242 interchange to Glacier Drive. The eastbound HOV lane will also be extended from east of the SR 242 interchange to east of Grayson Creek.

Pacheco Boulevard lies approximately 1,200 feet west of, and runs parallel to, I-680 in the project area. Pacheco Boulevard links the Cities of Martinez and Pleasant Hill and becomes Contra Costa Boulevard at its intersection with Second Avenue, south of SR 4. There are closely spaced on- and off-ramps connecting SR 4 with Pacheco Boulevard, which contribute toward operational deficiency on SR 4, and they are located just west of the I-680 on- and off-ramps. This adds to the existing weaving and merging constraints on SR 4 in this area.

There are three other local connections from Pacheco Boulevard to I-680 and SR 4:

1. Arthur Road/Pacheco Boulevard north of the I-680/SR 4 Interchange
2. SR 4 adjacent to the I-680 Interchange, where hook ramps allow for direct access between Pacheco Boulevard and SR 4 and I-680
3. Pacheco Boulevard/Concord Avenue/Burnett Avenue Interchange split to the south.

Muir Road aligns parallel to and just south of SR 4, and functions as a frontage road to the highway. It also has on- and off-ramps to SR 4 just west of the I-680/SR 4 Interchange and just west of Pacheco Boulevard. Drivers on Pacheco Boulevard and Muir Road use these ramps to access or exit WB SR 4 and can connect to SB or NB I-680. Truck restrictions are in effect on Muir Road between Glacier Way and the SR 4 ramps due to a steep grade in this area.

C. Need and Purpose

The existing I-680/SR 4 Interchange has a number of deficiencies that contribute to traffic congestion and inefficiency of the interchange operations, including short weaving sections between the loop ramps. The weaving sections are inadequate for current and future traffic demand and create safety, operational, and capacity concerns. Other nonstandard features include the closely spaced interchanges, low-speed loop ramps for several freeway-to-freeway movements, narrow shoulder width on bridge crossings, and short merge and diverge lengths at ramp junctions.

The I-680/SR 4 Interchange has long been identified as needing operational and capacity improvements. Traffic patterns have changed significantly as eastern Contra Costa County has experienced tremendous growth. The interchange cannot adequately handle current or future projected traffic volumes or patterns, resulting in substantial congestion and travel delays and contributing to safety problems.

The existing cloverleaf configuration of the interchange is a capacity constraint to both I-680 and SR 4. The loop ramps have a tight radius, which limits travel speed. The auxiliary lane between the on- and off-ramps in each direction is very short, which limits the merging and weaving distance and causes backups that extend onto the freeway ramps during peak periods. Traffic on the ramps can back up and contribute to congestion on the freeway mainlines. In fact, this is the primary cause of congestion at the interchange on both I-680 and SR 4, and the resulting congestion limits the traffic volume that can pass through the interchange. A contributing operational deficiency on SR 4 is the close spacing of the Pacheco Boulevard on- and off-ramps, which are just to the west of the I-680 on- and off-ramps. Thus, within a short distance along SR 4, drivers must contend with congestion and merging actions at the loop on- and off-ramps with I-680, the I-680 diagonal on- and off-ramps, and the Pacheco Boulevard hook on- and off-ramps. An additional operational deficiency of the interchange occurs where the southbound I-680 collector-distributor ramps merge over a short distance prior to merging with I-680.

The purpose of this project is to:

- Improve operational efficiency of the I-680/SR 4 Interchange and reduce traffic congestion and delays
- Improve safety by eliminating short weaving and merging sections
- Provide direct local access between I-680 and Pacheco Boulevard
- Accommodate existing and planned growth in travel demand within these segments of I-680 and SR 4

2. Description of Improvements by Phase

Phase 3 is currently under construction. A Supplemental Project Report was completed as part of the Phase 3 Final Design efforts and it slightly modified the original scope of work for each phase. Phases 1, 2, 4, and 5 have been updated to reflect these changes and their key engineering features are as follows:

Phase 1

- Construct a two-lane direct-connector flyover from NB I-680 to WB SR 4
- Remove the existing NB I-680 to WB SR 4 loop ramp
- Construct auxiliary lanes as follows:
 - Along WB SR 4 from the entrance of the direct connector stated above to the Morello Avenue Interchange
 - Along NB I-680 from 930 feet south of the Center Street Undercrossing to the direct connector stated above
- Construct a slip ramp from NB I-680 to Pacheco Boulevard
- Relocate the Blum Road/Pacheco Blvd Intersection 300 feet to the north
- Install ramp metering facility for WB SR 4 on-ramp

Phase 2

- *Phase 2A*
 - Extend SB I-680 collector-distributor (C-D) ramp southward 1460 feet
 - Install ramp metering facility for WB SR 4 on-ramp
- *Phase 2B*
 - Construct a two-lane diagonal ramp from EB SR 4 to SB I-680
 - Construct a slip ramp from Pacheco Boulevard to SB I-680
 - Remove the existing EB SR 4 to SB I-680 diagonal ramp
 - Construct Auxiliary Lane on EB SR 4 from the Morello Road Interchange to the new 2-lane diagonal stated above

Phase 4

- Construct direct connector from SB I-680 to EB SR 4
- Realign northern portion of SB I-680 to WB SR 4 diagonal ramp
- Remove existing loop ramp from SB I-680 to EB SR 4
- Construct auxiliary lanes as follows:
 - Along SB I-680 from 640 feet north of the East Martinez Underpass to the existing lane addition 1350 feet south of the Underpass
 - Along EB SR 4 from the entrance of the direct connector stated above to the SR 4/SR-242 Interchange
- Install ramp metering facility for EB SR 4 on-ramp

Phase 5

- *Phase 5A*
 - Construct remainder of NB I-680 widening leading to realigned NB I-680 to EB SR 4 connector
- *Phase 5B*
 - Construct WB SR 4 to NB I-680 diagonal ramp. This conflicts with the existing NB I-680 to WB SR 4 loop ramp and thus will require prior completion of Phase 1
 - Remove existing diagonal ramp from WB SR 4 to NB I-680
 - Extend auxiliary lane on WB SR 4 (from WB SR 4 to SB I-680 loop ramp) to the west by 700'
- *Phase 5C*
 - Widen WB SR 4 to SB I-680 loop connector to two lanes
 - Realign remaining portion of SB I-680 to WB SR 4 diagonal ramp

3. Traffic Data

A planning level traffic evaluation was conducted by Fehr & Peers to help determine which unconstructed phase or combination of phases of the I-680 / SR 4 Interchange Project should be implemented next. The results of the study are provided in Attachment C. A more detailed traffic operations analysis will be performed during final design to support the environmental reevaluation of the project and confirm the operational and safety benefits of the proposed improvements.

The following mainline bottleneck and queueing locations were identified at or near the I-680/SR 4 Interchange:

- Eastbound SR 4 to southbound I-680 diagonal ramp (AM peak) -due to nonstandard merge distance
- Westbound SR 4 between the SR 242 on-ramp and Solano Avenue off-ramp (AM peak) – this is expected to be eliminated by Phase 3
- Eastbound SR 4 between I-680 and Solano Avenue off-ramp (PM peak) – this is expected to be eliminated by Phase 3
- Northbound I-680 to eastbound SR 4 diagonal ramp (PM peak) – Phase 3 is expected to reduce congestion at this location
- Southbound I-680 eastbound SR 4 loop ramp (PM peak) – Phase 3 is expected to reduce congestion at this location
- Eastbound and westbound SR 4 between Pacheco Boulevard interchange and I-680 interchange (AM and PM peak) - Phase 3 will help reduce congestion at these locations, however, the short weaving sections will remain, and drivers will still need to decrease speeds while they search for available gaps.
- Eastbound and westbound SR 4 between I-680 loop on- and off-ramp (AM and PM peak) - Phase 3 will help reduce congestion at these locations; however, the short weaving distance (fewer than 450 feet) will remain, and drivers will still need to decrease speeds while they search for available gaps.

Collision Data

During design development for Phase 3 improvements, mainline and ramp accident rates were obtained from Traffic Accident Surveillance and Analysis System (TASAS) of the Caltrans-Transportation System Network (TSN) for the three-year period from April 1, 2009 to March 31, 2012. There were 229 reported accidents on SR 4 between Morello Avenue and Bailey Road during this period. 7.4% occurred in wet conditions and 26.2% in dark conditions. Most of the mainline accidents were associated with congested conditions. About 22.3% of the accidents occurred during the morning peak hours, and 47.6% during the afternoon peak hours. 84.8% of the accidents occurred during weekdays. The majority of collisions were attributed to rear-end accidents. These types of collisions are often associated with congested freeway conditions when traffic operates in a stop-and-go fashion. SR 4 also has a relatively high percentage of sideswipe and hit object collisions. Accident concentrated areas on SR 4 occur from west of Pacheco Boulevard Interchange to east of

Grayson Creek Bridge. During final design, collision history at the short weaving section locations will be examined to identify any potential safety issues associated with the short weaving sections

Future Traffic Analysis

The most recent version of the CCTA Travel Demand Model was used to prepare year 2045 AM and PM peak period travel demand forecasts. The CCTA Model showed negative or very minimal growth rates at several of the ramps for both the AM and PM peak period. For this evaluation a minimum annual growth rate of 0.5% per year was agreed to at locations where the model was showing negative or very minimal growth. A more detailed forecasting approach will be used during final design.

SR 4 (in both directions) and the I-680/SR Interchange ramps were evaluated for the No-Build and Build conditions at a number of locations.

The weaving sections between the I-680 and Pacheco Boulevard ramps were found to operate at or over capacity in the No Build condition. Also, traffic operations would be worst at the NB I-680 to WB SR 4 and SB I-680 to EB SR 4 loop ramp connectors, the EB SR 4 diagonal / WB SR 4 loop ramp merge, and WB SR 4 diagonal / EB SR 4 loop ramp merge.

Six Build scenarios were then evaluated and the findings are summarized below:

Scenario 1 - Phase 1 Only would eliminate the westbound weaving section between the NB I-680 loop on-ramp and SB I-680 loop off-ramp (location 13). Phase 1 would also result in a lower westbound traffic volume at the weaving section between the SB diagonal on-ramp and Pacheco Boulevard off-ramp. Phase 1 would substantively improve traffic operations on westbound SR 4 at the I-680/SR 4 interchange and access to Pacheco Boulevard.

Scenario 2 - Phase 1 and Phase 2A would provide similar traffic operations on SR 4 as Phase 1, however, Phase 2A would improve the merge between the EB SR 4 to SB I-680 diagonal ramp and WB SR 4 to SB I-680 loop ramp and primarily address the existing and future congestion at these ramps. Depending on future traffic congestion, Phase 2A may improve traffic operations on EB SR 4 by reducing vehicle queue spillback impacts from the ramp.

Scenario 3 - Phase 2 Only would eliminate the eastbound weaving section between the Pacheco Boulevard on-ramp and SB diagonal off-ramp resulting in improved operations on EB SR 4 compared to No Build conditions. However, the weaving section between the SB I-680 loop on-ramp and NB I-680 loop off-ramp would remain and operate at LOS F. It is likely that the weaving section between the SB I-680 loop on-ramp and NB I-680 loop off-ramp would operate as a bottleneck in the future, resulting in long vehicles queues on EB SR 4 thereby diminishing the operational benefits of Phase 2.

Scenario 4 - Phase 4 Only would eliminate the eastbound weaving section between the SB I-680 loop on-ramp and NB I-680 loop off-ramp resulting in improved operations on EB SR 4 compared to No Build conditions. However, the weaving section between the Pacheco Boulevard on-ramp and SB diagonal off-ramp would remain and operate at LOS F. It is likely that the weaving section between the Pacheco Boulevard on-ramp and SB diagonal offramp would operate as a bottleneck in the future, resulting in long vehicles queues on eastbound SR 4 and diminishing the operational benefits

of Phase 4. Nonetheless, given the projected traffic volumes and existing weaving distances, the maximum operational benefit would be gained by implementing Phase 4 before Phase 2.

Scenario 5 - Phase 1, Phase 4 and Phase 2A Combined - out of all the scenarios evaluated, *Scenario 5 would provide the most operational benefit*. Traffic operations would be improved on both eastbound and westbound SR 4. Furthermore, this scenario would eliminate the I-680/SR 4 interchange cloverleaf configuration altogether and remove the two most critical weaving sections. The near-term benefit of Phase 2A would also be provided under this scenario.

Scenario 6 - Phase 5 Only would improve traffic operations on westbound SR 4 west of I-680 compared to No Build conditions. However, it would not improve any of the weaving sections at the I-680/SR 4 interchange, which would remain bottleneck locations and result in congestion on both eastbound and westbound SR 4. While Phase 5 is an important component to addressing existing and future congestion at the I-680/SR 4 Interchange it would need to be constructed after Phase 1 (when the northbound I-680 to westbound SR 4 loop ramp is removed).

4. Environmental Considerations

Based on the changed conditions and supporting information, the approved Initial Study with Negative Declaration (CEQA) and the Environmental Assessment with Finding of No Significant Impact (NEPA) will be in need of updating during final design.

To evaluate the changes, an Environmental Revalidation form is prepared in accordance with Caltrans' environmental procedures, as well as State and federal environmental regulations. A summary of the environmental technical studies expected to be required to support the Environmental Revalidation is summarized in Table 1.

Table 1 - Environmental Impacts

Type of Impact	Avoidance, Minimization, or Mitigation Measures
Water Quality	A water quality revalidation and updated Storm Water Data Report is prepared. Information from similar studies performed for Phase 3 will be utilized to the extent feasible.
Hydraulics and Hydrology	An updated Location Hydraulic Study will be prepared for Grayson Creek and Walnut Creek using hydraulic data and the hydraulic model developed for Phase 3. A critical focus of the hydraulic analysis will be to confirm there is adequate freeboard to widen the I-680 / Grayson Creek Bridge crossing. Placing bridge columns for the new connector ramp structures within levee areas of both creeks will be avoided if possible. Construction of the Phase 4 ramp connector structure is also expected to impact the 100-year flood plain where it merges with EB SR 4.
Noise	A Noise Study Report (NSR) is prepared in compliance with current state and federal procedures to reassess existing and future traffic noise levels at noise sensitive receptors in the project area. A Noise Abatement Decision Report is also prepared to confirm the cost-effectiveness of feasible noise barriers identified in the NSR. A similar study was required for Phase 3 and utilized updated traffic data. New and replacement sound walls are anticipated.
Air Quality Conformity	An Air Quality Impact Study will be prepared for the next phase. The project will need to be added to the next TIP and adopted by MTC for a TIP conformity determination. The Project will be submitted to FHWA for project-level conformity determination prior to Environmental Revalidation approval.
Transportation and Traffic	A Traffic Operations Analysis Report for the next phase will be prepared to document existing and future travel conditions for the proposed improvements and confirm they meet the purpose and need of the project.
Community Impact Assessment	Right of way impacts and relocation assistance will be assessed for the next phase. The right of way relocation study prepared during PA/ED will be updated to reassess impacted residences and businesses and associated relocation obligations.
Hazardous Materials	An Initial Site Assessment will be prepared to reassess the project area for the next phase for the presence of hazardous materials. Based on the findings of that study, a Preliminary Site Assessment will be prepared to sample soils and other materials within the project for the potential presence of hazardous materials and if encountered, remediation measures to be implemented
Cultural Resources	Area of Potential Effects (APE) mapping will be developed for the project area. A Historic Property Survey Report and Historic Resources Memorandum is anticipated to be required. The Contra Costa Canal is considered a historic resource.

Type of Impact	Avoidance, Minimization, or Mitigation Measures
Biological Resources	<p>The following biological surveys and reports will be prepared for the next phase:</p> <ul style="list-style-type: none"> • Updated Wetlands Delineation Report (Grayson Creek and Walnut Creek) • Fish passage assessment for steelhead (Grayson Creek and Walnut Creek) • California Tiger Salamander Survey Report • Tree Survey • Bat Species Survey • Botanical Rare Plant Surveys • Natural Environmental Study

Information developed from similar technical studies performed for Phase 3 will be utilized to the extent feasible. Environmentally sensitive areas include Grayson Creek, Walnut Creek and Contra Costa Canal. In addition, a large wetland is present in the northeast quadrant of the interchange.

5. Permit Requirements

The following table summarizes the permits and approvals required for construction of the Project.

Table 2 – Permit Requirements

Agency	Permit/Approval	Status
United States Army Corps of Engineers	Section 408 Permit (Minor)	Issued during the Final Design Phase
United States Army Corps of Engineers	Section 404 Permit – Nationwide	Issued during the Final Design Phase
California Department of Fish and Wildlife	Section 1602 – Notification of Lake or Streambed Alteration	Issued during the Final Design Phase
California State Water Resources Control Board	Section 402 National Pollutant Discharge Elimination System (NPDES) Permit	Statewide Permit (does not require application)
Regional Water Quality Control Board	Section 401 Certification	Issued during the Final Design Phase
MTC Air Quality Conformity Task Force/ Federal Highway Administration (FHWA)	Regional Air Quality Conformity	Complete
	Project Level Air Quality Conformity	Update for Environmental Reevaluation

Agency	Permit/Approval	Status
Contra Costa Flood Control & Water Conservation District	Construction Permit (Grayson Creek and Walnut Creek)	Issued during the Final Design Phase

Additional permit requirements may be identified during the preparation of the design documents. Generally, permits will be processed during the preparation of PS&E.

6. Agreements

The I-680/SR 4 Interchange Project is one of the projects covered under the Measure J Master Cooperative Agreement No. 04-2221 for planning, design and right of way activities. The agreement was executed between Caltrans and CCTA on 2/18/2011. A Cooperative Agreement for right of way engineering and acquisition will be required for the next phase. If CCTA plans to advertise, award and administer construction, a separate Cooperative Agreement will be prepared for the construction phase.

Existing maintenance agreements between the State and County would need to be updated to address maintenance responsibilities for proposed signalized ramp intersections, local street undercrossings, sound walls and retaining walls abutting local right of way.

A revised Freeway Agreement is anticipated for change of access. The northeast and southwest loop ramps are removed and replaced with direct connector ramps. New access from NB I-680 to Pacheco Boulevard is also proposed.

7. Right of Way

Right of Way Required

Details of right of way requirements are provided in Attachments E1 and E2 and summarized below:

- Phase 1 requires partial acquisition from three properties (including removal of 8 mobile homes), and full acquisition from two properties.
- Phase 2A requires partial acquisition from four properties.
- Phase 4 requires partial acquisition from four properties.
- Temporary Construction Easements and Utility Easement were not assessed but are anticipated

Based on right of way acquisition required for Phase 3, a right of way condemnation process is expected for one or more parcel acquisitions (e.g. Solano Way public storage facility).

Grayson Creek is owned by the US Army Corps of Engineers and operated/maintained by Contract Costa Flood Control and Water Conservation District. Right of way acquisition from Grayson Creek is required for Phases 1 and 2A to accommodate bridge widening. Right of way acquisition from Grayson Creek for Phase 4 was acquired under Phase 3 (this needs to be confirmed).

Transfer of rights (Section 83) for portions of public streets is anticipated (e.g. new NB I-680 / Pacheco Boulevard off-ramp intersection under Phase 1).

Relocation Impact Studies

A Relocation Impact Study was prepared during the PA/ED phase. Relocation assistance would be required for displaced residences and businesses, as follows:

Phase 1

Right of way acquisition is needed along Berry Drive for the NB I-680 to EB SR 4 connector ramp to relocate utilities and remove several mobile homes located in the Concord Cascade Mobile Home Park. Right of way acquisition is also needed from the trailer sales business at the corner of Blum Road and Pacheco Boulevard to accommodate the proposed off-ramp.

Phase 2A

Right of way acquisition is needed from the Affordable Storage business on the west side of I-680 just south of Grayson Creek. Removal of two large storage buildings would be required to accommodate the widening needed for the SB I-680 on-ramp.

Phase 4

The proposed SB I-680 to EB SR 4 connector ramp requires a partial acquisition of the CHP parcel on Blum Road through a land swap between State and CHP. The CHP refilling facility may need to be

relocated; also an “Agreement for the Transfer of Control and Possession of Land Owned by the State for Highway Purposes” would be required for the land swap. Maintenance access through the CHP site would also be required to access portions of the direct connector ramp structure.

Airspace Lease Areas

Phase 4 includes widening the EB SR 4 / Solano Way Undercrossing structure that crosses over a public storage facility. Based on right of way acquisition performed on this property during project development for Phase 3, no airspace lease was identified. This will be confirmed during final design.

Utility and Other Owner Involvement

The project requires relocation of several high and low risk utilities including sanitary sewer, potable water, high pressure gas, and high voltage electrical. Details of utility relocation requirements are provided in Attachments E1 and E2., and summarized below:

- Phase 1 impacts 14 underground and 5 overhead utilities. Major utilities affected are 84-inch sanitary sewer and 21kV underground electric line adjacent to the mobile home park.
- Phase 2A impacts 1 underground and 1 overhead utility.
- Phase 4 impacts 4 underground utilities.

Utility owners affected by the project are expected to include Contra Costa Central Sanitary District, Contra Costa Water Board, PG&E, Kinder-Morgan, Phillips 66, AT&T, city storm drain and sanitary sewer mains.

During PS&E, existing utilities within the project limits will be positively located, conflicts identified, and relocation concepts developed in close coordination with the utility owners.

Existing utilities and utility relocations identified as being inconsistent with Caltrans Policy on Longitudinal Utility Encroachments will need to be addressed in an Encroachment Policy Variance Request.

Railroad Involvement

The PA/ED design proposed to construct an auxiliary lane on SB I-680 between Pacheco Boulevard on-ramp and the proposed SB I-680 / EB SR 4 connector ramp as part of the Phase 4 improvements. This would impact the BNSF railroad bridge over I-680 which is planned to be replaced under a future County CIP project. If Phase 4 is included in the next phase, a standard branch connector would be provided for the new connector ramp which would begin just south of the BNSF railroad bridge.

Flight Path Clearance

Buchanan Field Airport is located in the southeastern quadrant of the I-680/SR 4 Interchange.

Part 77 of the Federal Aviation Regulations establishes mandatory standards to determine impacts to navigable airspace by temporary and permanent obstructions and applies to aircraft approaching the runway. Obstructions include any object of natural growth, terrain, permanent or temporary construction, or alteration, including equipment or materials and apparatus of a permanent or temporary character.

The project does not propose any permanent features that will affect the navigable airspace; however, during construction, the contractor will be held responsible for obtaining a temporary permit from the FAA if navigable airspace would be obstructed. Similar permits were required to construct Phase 3.

The SB I-680 to EB SR 4 connector ramp in Phase 4 would merge with EB SR 4 and continue as an auxiliary lane to the Solano Way off-ramp. To maintain airspace clearances, the proposed ramp profile will need to be designed to conform with EB SR 4 below the runway protection zone (RPZ). This will be confirmed during final design.

8. Preliminary Cost Estimate

A preliminary cost estimate was prepared for each phase and combinations of phases of the I-680 / SR 4 Interchange Project (see Attachment D). Quantities are based on updated project geometry developed for this study and account for recent changes made to Phase 3. Replacement of the I-680 / BNSF Overhead is assumed to be a future project and is not included

Cost estimates were prepared using Caltrans 11-Page Estimate template. The cost for each phase and how it relates to the cost previously prepared during the PA/ED phase is summarized in Table 3.

Table 3 – Construction Cost Estimates

Phase	PA/ED Cost ¹	Updated Costs ¹
1	\$69 M	\$164 M
2	\$43 M	\$82 M
4	\$41 M	\$107 M
5 ²	\$32 M	\$49 M
1 + 2a	-	\$179 M
1 + 2a + 4	-	\$264 M
All Phases	-	\$371 M

Notes:

1. Capital costs only (Roadway, Structures, and Right of Way)
2. Requires prior completion of Phase 1

Cost differences between the PA/ED and updated construction cost estimate are primarily due to the following:

- Bridge Unit costs were updated to be consistent with current Caltrans methodology for calculating Pre-cast Box Girder structures detailed in the “January 2019 Comparative Bridge Costs” Guidelines. This increased bridge costs by approximately 280 percent
- Construction cost changes in unit prices and escalation between 2003 and 2023
- Right of way and utility relocation requirements not identified in the PA/ED phase
- Required Utility Relocations not identified in the PA/ED were included in the updated estimate

Funding for the project will be from Contra Costa County Measure J and RM-3 funding sources. CCTA will also seek additional state and federal funding sources to fully fund the project.

9. Evaluation of Study Scenarios

A. Comparison of Benefits for each Scenario

A qualitative comparison of the benefits of each scenario is summarized in the table below:

Table 4 – Comparison of Benefits by Scenario

Scenario	Advantages	Disadvantages
PHASE 1 Only	<ul style="list-style-type: none"> • Substantially improves traffic operations on WB SR 4 through the I-680/SR 4 Interchange • Eliminates loop ramp and removes short weaving section on WB SR 4 between loop ramp connectors • Reduces weaving traffic volumes from WB SR 4 to Pacheco Boulevard • Separates traffic movements on NB I-680 to EB SR 4 and WB SR 4 • Improves route continuity between NB I-680 and WB SR 4 	<ul style="list-style-type: none"> • Short weaving sections between loop ramp connectors on EB SR 4 would continue to operate poorly and not address associated safety concerns • Significant Right of Way Acquisition and Utility Relocation requirements • High cost to construct 3,200 feet long freeway-to-freeway ramp connector and 870 feet long slip ramp structures
PHASE 1 + 2A	<ul style="list-style-type: none"> • Same as Scenario 1 • Relieves existing congestion at the EB SR 4 / SB I-680 ramp merge and avoids queue spillback on to SR 4 	<ul style="list-style-type: none"> • Same as Scenario 1 • Short weaving sections between loop ramp connectors on EB SR 4 would continue to operate poorly and not address associated safety concerns • Environmental impacts at Grayson Creek crossing
PHASE 2 Only	<ul style="list-style-type: none"> • Eliminates short weaving section on EB SR 4 between Pacheco Blvd. on-ramp and SB I-680 off-ramp • Relieves existing congestion at the EB SR 4 / SB I-680 ramp merge and avoids queue spillback on to SR 4 	<ul style="list-style-type: none"> • Short weaving sections between loop ramp connectors on WB and EB SR 4 would continue to operate poorly and not address associated safety concerns • Significant Right of Way Acquisition and Utility Relocation requirements • Environmental impacts at Grayson Creek crossing

Scenario	Advantages	Disadvantages
<p style="text-align: center;">PHASE 4 Only</p>	<ul style="list-style-type: none"> • Eliminates loop ramp and removes short weaving section on EB SR 4 between loop ramp connectors and on SB I-680 collector-distributor ramp between WB SR 4 /SB I-680 loop off-ramp and SB I-680 / EB SR 4 loop on-ramp • Improves route continuity between SB I-680 and EB SR 4 	<ul style="list-style-type: none"> • Short weaving sections between loop ramp connectors on WB EB SR 4 would continue to operate poorly and not address associated safety concerns • Significant Right of Way Acquisition and Utility Relocation requirements • Environmental impacts at Grayson Creek crossing • High cost to construct 2,500 feet long freeway-to-freeway ramp connector structure • Reconstruct BNSF Railroad Bridge across I-680 (this can be deferred to a future project, however) • Maximum operational benefit would only be gained by implementing Phase 4 before Phase 2
<p style="text-align: center;">PHASE 1 + 4 + 2A [RECOMMENDED]</p>	<ul style="list-style-type: none"> • Eliminates I-680/SR 4 Interchange cloverleaf configuration and associated short weaving sections • Substantially improves traffic operations on WB and EB SR 4 through the I-680/SR 4 Interchange • Reduces weaving traffic volumes from WB SR 4 to Pacheco Boulevard • Separates traffic movements on NB I-680 to EB SR 4 and WB SR 4 • Relieves existing congestion at the EB SR 4 / SB I-680 ramp merge and avoids queue spillback on to SR 4 • Improves route continuity between SB I-680 and EB SR 4 and NB I-680 and WB SR 4 	<ul style="list-style-type: none"> • Significant Right of Way Acquisition and Utility Relocation requirements • High cost to construct 3,200- and 2,500-foot long freeway-to-freeway ramp connectors and 870 feet long slip ramp structure • Environmental impacts at Grayson Creek crossing
<p style="text-align: center;">PHASE 5 Only</p>	<ul style="list-style-type: none"> • Improves WB SR 4 west of I-680 • Improves route continuity between WB SR 4 and NB I-680 and NB I-680 to EB SR 4 by completing direct connector ramps • Reduced cost compared to other scenarios • No environmental impacts to creek areas 	<ul style="list-style-type: none"> • Short weaving sections between WB and EB SR 4 loop ramp connectors would continue to operate poorly and not address associated safety concerns • WB SR 4 /NB I-680 connector cannot be constructed until Phase 1 is complete and the NW loop ramp is eliminated.

B. Quantitative Evaluation of Study Scenarios

A quantitative evaluation of the study scenarios was also conducted. The methodology of this quantitative evaluation of the study scenarios preserves the primary original project objective – to accommodate future growth and improve safety in the most cost-effective manner.

The approach to this study includes the following considerations:

- Consider splitting Phases 2 and 5 into sub-phases and review several hybrid combinations
- Consider implementing multiple phases at one time to increase efficiency and reduce mobilization costs
- Compare each phase (or combination of phases) based on value

Based on the planning-level traffic analysis (see Attachment C), a performance score for each scenario was calculated based on the improvement of the Level of Service (LOS) of each freeway segment of SR 4 over the “No Project” condition. In other words, the more LOS was improved – the greater the performance score.

According to a 2015 Safety Analysis Study, the following sections along SR 4 have a high concentration of collisions that exceed the statewide average:

- WB SR 4 between the Pacheco On-Ramp and Diagonal Off-Ramp to Sb I-680 (Location #20)
- WB SR 4 between the loop on-ramp from SB I-680 to the loop Off-ramp to NB I-680 (Location #22)
- EB SR 4 between the loop on-ramp from NB I-680 to the loop Off-ramp to SB I-680 (Location #13)
- EB SR 4 between Diagonal On-Ramp from SB I-680 to Pacheco Off-ramp (Location #15)

These locations are all short weaving sections (less than 600 feet in length) where weaving maneuvers are more difficult and drivers decrease speeds where they search for available gaps leading to additional collisions and congestion. Because these locations have a disproportionately large impact on the safety and traffic operations of SR 4, additional weighting was assigned to them in calculating the performance score for each alternative.

After the performance score was calculated, the value of each phase was calculated based on the following:

$$(\text{Value Index} = \text{Performance Score}/\text{Cost} * 100)$$

The value index score was used to compare overall values between the scenarios with the highest value index score representing the best “bang for the buck”.

Table 5 – Alternative Value Indexes

Scenario	Performance Score	Costs*	Value Index
1	436	\$164 M	266
2	205	\$82 M	251
4	274	\$107 M	256
1 + 2A	436	\$179 M	244
1 + 2A + 4	709	\$264 M	269
All Phases	1,000	\$371 M	269

*Costs include Capital Costs Only (Roadway, Structural, and Right of Way)

10. Recommendation

Based on the findings of the planning level traffic evaluation, the greatest operational benefit is provided by Scenario 5 (i.e. Phase 1 + Phase 4 + Phase 2A combined). This scenario would improve traffic operations on both eastbound and westbound SR 4. Furthermore, this scenario would eliminate the I-680/SR 4 interchange cloverleaf configuration and remove the two most critical weaving sections.

The current construction of Phase 3 will improve near-term and long-term operations on SR 4 in both directions through the I-680/SR 4 Interchange area. However, Phase 3 does not address the existing congestion on the EB SR 4 to SB I-680 diagonal ramp. Phase 2A, included as part of Scenario 5, would address the congestion on the diagonal ramp and, depending on the final design of Phase 2A, it may improve both near-term and long-term operations at the EB SR 4 to SB I-680 diagonal ramp.

11. Schedule

This project was Environmentally approved in 2009 and will require the completion of Environmental Revalidation and Final Design prior to construction. A milestone schedule is as follows:

Table 6 – Preliminary Milestone Schedule

Project Milestone	Anticipated Completion Date
Begin Final Design	December 2019
35% PS&E / Bridge Type Selection	July 2020
Environmental Revalidation	November 2020
65% PS&E	February 2021
95% PS&E	July 2021
Final PS&E	October 2021
Approved Regulatory Permits	November 2021
Complete PS&E	January 2022
R/W Certification	March 2022
Advertise Contract	May 2022
Begin Construction	August 2023
End Construction	December 2024

The following assumptions were made to develop the preliminary milestone schedule:

- Funding will be in place for each phase of the project (PS&E, Right of Way, and Construction).
- Communities along the corridor will support the preferred alternative without litigation or extended eminent domain processes.
- Phase “1+ 2A + 4” will be constructed under one contract
- CCTA will advertise, award and administer construction
- Two dry seasons for work in Grayson and Walnut Creeks

A detailed CPM Schedule will be prepared at the start of PS&E to refine the project schedule in close coordination with CCTA, Caltrans and affected stakeholders.

12. Next Steps

With completion of the study, the recommended next steps are:

- Obtain stakeholder consensus on preferred improvements for the next phase of the project (Caltrans, TRANSPAC and CCTA Board)
- Secure funding to initiate final design and right of way engineering
- Execute Cooperative Agreement with Caltrans for PS&E and Right of Way Engineering

List of Attachments

Attachment A – Location Map

Attachment B – Schematic Layout of Phased Improvements (Phases 1 through 5)

Attachment C – Planning Level Traffic Evaluation

Attachment D – Preliminary Cost Estimate (11-page format)

Attachment E1 – Preliminary Right of Way and Utility Impact Layouts (Phases 1, 2A and 4)

Attachment E2 – Preliminary Right of Way and Utility Impact List (Phases 1, 2A and 4)