State Highway Corridor Planning
California Case Study

SHRP2 Product Testing

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University of California, Davis
http://hwy37.ucdavis.edu
California Pilot Test of the Ecological Approaches to Environmental Protection Developed in Capacity Research Projects C06A and C06B

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Like much of the US, California relies upon 3 scales of planning for transportation – project, corridor, and region. Each scale informs the others, leading to the development of state programming of projects, described in corridor and regional plans. Highway 37 in the San Francisco Bay Area is currently the subject of corridor planning by the California Department of Transportation (Caltrans). The current project “Highway 37 Stewardship Study” is the test-case for the California evaluation of CO6 A&B (and other TRB) products. It will also inform the development of the corridor plan and model behaviors that Caltrans would like to include in future corridor plans. For example, the stakeholder process developed as the basis for the project could become de riguer for Caltrans’ future corridor planning. The project relies upon 3 inter-dependent processes: a stakeholder process to support scenarios descriptions and negotiated planning outcomes, a regional context description and assessment, and valuation/crediting approach to support scenarios comparison. Each of these project components links to a CO6 A&B product (e.g., the regional ecological framework). They are also foundational pieces for the development of a stewardship-oriented corridor plan, the first of its kind in California.

The lessons learned from this process included issues specific to CO6 and CO1 tools, as well as larger-frame issues with combining transportation planning and environmental stewardship. For example, typically long timeframes for planning and project delivery did not suit stakeholder expectations for getting started on obvious problems. Although the complete architecture of the Transportation for Communities (TCAPP) web site was not useful to project participants, it may be a useful library of important pieces of information. One important lesson from the potential application of CO1 or CO6 tools was that planning is best done in bite-sized pieces (e.g., focusing on a project study report), rather than the complete decade-long process from problem identification to programmed project. Overall, the ecological framework provided a useful and understandable rubric for organizing information and thinking about decision-making.
INTRODUCTION

Corridor planning is an important geographic and time-scale intermediate step between regional & long-range planning and project delivery. We chose this scale because it provides opportunities for including regional and local ecological, economic, transportation, and community information and needs early in transportation planning and project development.

In California, corridor plans form the basis for further study and development into pre-project initiation documents, the project initiation documents (PIDs) sponsored by either Caltrans or local agencies. The corridor plans and PIDs are used to develop the purpose and need for projects. A more thorough assessment of the facility development options, environmental mitigation needs and stakeholder plans and needs in the corridor plan process can ensure that a more comprehensive development of multimodal alternatives are developed in the early stages and that the necessary valuation is given to alternate modes and environmental enhancement. The purpose and need statement can benefit from a better understanding of the environmental and community needs that develop from the ecological approach and from bringing NEPA considerations and knowledge into the planning process. The PID purpose and need proceeds to the project development, design and delivery stages in Caltrans. For our specific test case (State Route-37), this is key to designing and implementing a facility that considers the tidal marshes, preservation and recreation needs, as well as the safety needs of the public.

California and federal government agencies and private organizations have invested millions of dollars in restoring marshlands in the North San Francisco Bay (North Bay). These coastal marshlands are among the most endangered habitat types in the US and home to a diverse assemblage of plants and animals, including species listed under state and federal Endangered Species Acts (ESA). State Route-37 was built as a conduit between the East Bay area (Richmond, Oakland, Berkeley) and the North Bay communities and counties (Napa, Sonoma, Marin). It currently serves multiple transportation purposes: goods movement, inter-county commuting, and recreational travel (Figure 1). It also passes through the marshes of the North Bay, separating the marshes from tidal influence and affecting natural flows and processes (Figure 2). State Route-37 is one of the lowest highways in the Bay Area and at its lowest elevation, the roadbed is currently only a foot or so above sea level. As climate change results in sea level rise, this highway is likely to face erosion, more frequent flooding during storms, and gradual inundation by the sea.
State Route-37 bisects the city of Vallejo, which is struggling economically and is populated by primarily non-white and poor people. The highway provides access to other areas and effectively divides the community geographically. Besides suffering economically, a recent study (Shilling et al., 2010) has shown that Vallejo residents also have little access to parks compared to nearby wealthier communities. State Route-37 could provide a solution to this as it enters one of the largest potential recreation areas in the vicinity, North Bay marshlands.

These issues and the circulation requirements for the highway make it an ideal test case for an integrated ecological assessment framework and collaborative plan development among a wide range of stakeholder types.

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**WHO: PARTNERS**

The project is led by UC Davis’ Road Ecology Center, in partnership with Caltrans. UC Davis sub-contracts to partner organizations who are leaders in their respective urban and rural communities in planning, conservation, and stakeholder process.

- Caltrans, District 4
- UC Davis Road Ecology Center ([http://roadecology.ucdavis.edu](http://roadecology.ucdavis.edu))
- Sonoma Ecology Center ([http://www.sonomaecologycenter.org](http://www.sonomaecologycenter.org))
- Sonoma Land Trust ([http://sonomalandtrust.org](http://sonomalandtrust.org))
- Southern Sonoma County Resource Conservation District ([http://ssrcrd.org](http://ssrcrd.org))
- Napa County Resource Conservation District ([http://naparcd.org](http://naparcd.org))

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**WHO: KEY STAKEHOLDERS**

Our partnership includes over 100 individuals and organizations that have joined us at one of our 6 stakeholder meetings. Their effort and input helps shape this study and understand how using the CO6 tools *in situ* results in transportation and ecological system stewardship. The stakeholder process has resulted in a cadre of committed individuals and organizations who attend stakeholder meetings and provide guidance and feedback for ways that regional concerns can be considered and addressed (Appendix 1). Their input is
critical to the development of the Regional Ecological Framework and description of plausible scenarios for the highway, which will become the foundation for crediting and agreements with regulators and others. In other words, our successful stakeholder process is a hallmark of the success we had carrying out Step 1 of the CO6 process and set the stage for an expanded version of COR-1, where the role of decision-maker is more broadly defined than in TCAPP.

WHERE IS THE STUDY AREA?

The North San Francisco Bay region includes Marin, Sonoma, Napa, and Solano counties. Highway 37 traverses Sonoma County, between Solano and Marin Counties, skirting Napa County on its Southern boundary. It crosses the lower Napa River, Sonoma Creek, Petaluma River, and other small watersheds that feed into the North Bay. It traverses urban, agricultural, woodland, grassland, and wetland habitats, connecting Interstate 80 and State Highway 101.

The highway itself approximates a curve through the North Bay (red box, Figure 1). The study area is larger, roughly a rectangle (pink square, Figure 1) bounded on the west by the east edge of the city of Petaluma, on the north by the south edge of the city of Napa, on the east by the intersection of SR-12 and I-80, and on the south by the city of Albany. This area includes other highways potentially affected by sea level rise and decision-making about highway 37. For example, planned or

![Figure 1. Highway 37 (within red box insert) in the North San Francisco Bay area (pink box insert).](image-url)
catastrophic reduction or elimination of traffic from the current right-of-way would displace traffic to state highway 29, 12, and 121 to the North and Interstate 580 to the South.

STATEMENT OF THE PROBLEM

Caltrans is studying options for the future of Highway 37. This scenic roadway links travel to the East & West San Francisco Bay regions and the Napa/Sonoma Wine Country. Commuters, truckers, tourists and many others travel on Highway 37, which is as vital for the land around it as the people it serves. This road passes through cities, endangered species habitat, rare marshlands, and rich farmland. Flooding risks on the highway are increasing due to rising sea levels, and increased traffic continues to impact all who use this roadway. Caltrans wants to work with others interested in the well-being of this corridor to create a plan and a vision that everyone can support. This vision must consider endangered species and their habitats; agriculture; increasing traffic; and sea level rise. It must also provide increased transportation choices and enhanced public access.

The highway 37 corridor planning process has so far prioritized expanding capacity at the expense of other considerations. The corridor is thought to be an important East-West connector in the Bay Area and is projected to become quite congested over the next 25 years. Even though it is a secondary highway compared to the mammoth interstates and state highways it is parallel and networked with, it relieves pressure on these other routes. At the same time, it passes through very sensitive lands and is itself at risk of flooding in the future. Corridor planning for this highway contributes to the regional transportation plan, which is the vehicle for funding any changes along the highway. Thus, the current corridor planning step is one of the earliest at which transportation demand, environmental constraints, and community preferences can be used to define strategies for improving transportation and stewardship of valued natural and human systems.

Making stewardship decisions for
The Regional Ecological Framework from CO6A provides a useful mechanism to organize information about natural systems to help inform transportation planning. The framework is oriented toward spatial information about locations of species and habitats of concern, waterways, and other ecological attributes and processes that may be affected by transportation projects. We have adapted and expanded the Framework concept to include more information about other aspects of the integrated human and natural systems in our study area. The CO6 planning steps also provide a useful process for describing issues and using a stakeholder process to frame these issues in terms of combined transportation and environmental stewardship.

**Special Issue: Sea Level Rise**

Climate change brings with it sea level rise, which can impact natural and human communities in coastal areas. Because the study highway ranges from one or two meters above current sea level to slightly below sea level, the project rise of >1 meter in the next 90 years poses a threat to the highway itself. The highway also acts as a levee between the rising Bay and thousands of acres of marshes that must be allowed to adapt to changing sea levels to survive. These marshes are both nationally important and habitat for endangered species, so the role of the highway in their adaptation must be considered in corridor planning.

Regionally, there is broad political and institutional acceptance of the possibility of future sea levels requiring adaptive action in the near future. This was true in our stakeholder process where partner agencies and community members expressed concern that marsh adaptation be considered in new capacity planning. This resulted in broad support for a causeway option for the corridor; despite this being one of the more expensive possible constructed scenarios. This abandonment of the low-lying alignment was favored over armoring the existing footprint, which makes this an interesting case study for coastal areas in the US which are considering the same questions. It remains to be seen whether or not funding can be found to raise the alignment and thus reduce risk of the highway flooding and allowing the marshes to adapt to sea level rise.
Critical to the development of our corridor context, valuation approach, and foundation for agreements with regulatory agencies is the inclusion of stakeholders early in the process (Appendix 2). Over one hundred individuals and organizations are participating in our stakeholder process. So far, we have had 6 stakeholder meetings, including the World Café version (see below). At successive meetings we have encouraged people to share their needs and desires for corridor planning, understanding of the issues facing the transportation corridors, ecological and community well-being issues that should be considered, and values for the corridor. This information sharing has been very important in getting and keeping transportation and environmental regulatory interests at the table.

The intent of this study was to provide opportunities for internal collaboration among DOT Offices and Divisions, as well as external collaboration between the DOT and local agencies and organizations. Explicit support was provided at the proposal stage through the initial stages of the project from several DOT Offices, including system planning, environmental, and maintenance. Similarly, partner agencies included two Resource Conservation Districts (Napa County and Southern Sonoma County), a land trust (Sonoma Land Trust) and an environmental non-profit (Sonoma Ecology Center). This formal, structured partnering was intended to facilitate the working collaboration among the partner offices and agencies.

This partnership created a core group (hereinafter called “core team”) who have continually collaborated to broadly consider the best ways to move forward on the effort.
The core team decided that instead of hosting an official “kickoff” for a corridor that spans several counties and landscapes, it was more effective to host sequential “briefing” meetings that gathered data on participants’ interests, and offered opportunities for stakeholders to learn about the effort and ask questions. Five “briefing” meetings have been held and a sixth is scheduled for February. Following these briefings, Caltrans has proposed to continue the stakeholder process to integrate findings from the briefing meetings, foster increase communication among the stakeholders, and further develop potential corridor scenarios.

**COLLABORATION METHODS**

**Core Team Membership**

This project considers collaborative methods both through the project administration via a core team of agencies and non-governmental organizations, and through the overall involvement of stakeholders that range from private landowners to federal regulators to tribal representatives. Core team membership includes the California Department of Transportation, the University of California, the Sonoma Ecology Center, the Sonoma Land Trust, the Southern Sonoma County Resource Conservation District, and the Napa County Resource Conservation District. The diverse constitution of the core team encourages both broad outreach to stakeholders and also a range of views and experience in overseeing the project.

**Meeting Location**

To be responsive to differing travel distances, the core team decided to have the briefing meetings at varying locations along the Highway 37 corridor, thus encouraging greater participation.

**Website**

The core team determined that having a publicly accessible website was important in supporting stakeholder involvement and access to project-related resources. The University of California at Davis created a Highway 37 Corridor website using open-source software: [http://hwy37.ucdavis.edu](http://hwy37.ucdavis.edu).
ORGANIZATIONAL STRUCTURE

The core team holds monthly conference calls to consider project goals and structure. After the May 24th stakeholder briefing, the core team divided itself into three subgroups to more effectively address project goals outside of the monthly conference calls. The three subgroups are: Process, Development of a Regional Ecological Framework, and Development of a Crediting and Valuation Approach. The team's composition allows it to seek feedback from transportation, conservation/environmental, and land-use institutions. Having this internal network connected to external networks was incredibly valuable in rapidly identifying potential future problems and fielding potential solutions.

OUTREACH / EVOLUTION OF INVOLVEMENT

Initially, the core team targeted key stakeholders in particular organizations to brief them on the project and invite their participation. The core team recognized that these people may not be the actual attendees, but that they would need to designate staff who could attend, thereby supporting the overall meeting series. Initial letters were sent to state and federal environmental regulators; regional and state transportation agencies; local and regional government representatives, and non-governmental organizations. The core team hosted an initial briefing on March 10, 2011 at the Schell-Vista Fire Station in Sonoma County, and 17 participants (including core team members) attended. Following this initial meeting, the core team broadened their contact list and on April 28th, sent out a formal invitation letter to key stakeholders. This letter, sent from and signed by Caltrans Deputy District Director Lee Taubeneck, included the notes from the March meeting, a participant list, and an overall project briefing. Recipients were largely the same who received the previous, less formal invitation. Following the dispatch of this letter, core team members began personally contacting stakeholders to invite their attendance at subsequent meetings.

Thirty-five people (including core team members) participated in the May, 2011 meeting, demonstrating that the personal follow-up calls to stakeholders were effective in building strong attendance. At this meeting, core team participants presented the overall framework of the project and opened a discussion to further identify stakeholder interests and
concerns. At this meeting, in addition to regulatory, transportation and environmental interests, participants included tribal representatives and private landowners.

**World Café (“Collaborative Partnerships” & “Prioritize Actions”)**

In order to find out more about what various organizations and stakeholders value about the highway corridor and associated community and natural values, we engaged them in a café-style discussion (Appendix 3). This approach was developed for just such an occasion and elicited value statements about possible future scenarios for the highway corridor. The expressed values are useful for developing the valuation and crediting approach. Association of values with different scenarios assists in developing possible ecological actions and overall stewardship of the corridor and related natural and human systems.

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**DEVELOPMENT OF REGIONAL ECOLOGICAL FRAMEWORK**

The idea of the regional ecological framework (C06A) is that it captures the environmental context of transportation infrastructure, in order to improve stewardship of ecosystems associated with transportation systems. By developing and populating the framework, parties involved in discussions of planning for specific facilities can start from the same knowledge base.

For this study a sub-group of the core team met and discussed development of the REF. Ultimately we devised a different name for the Regional Ecological Framework. Around the Bay Area, “regional” means the whole Bay Area. Also, ideally the Framework should extend beyond ecological issues. After discussing concerns on connotations of “corridor” (not just used for transportation, but wildlife) and “regional” (Bay Area wide), the consensus was to name this framework the “Route 37 Corridor Context”. Other possible names discussed were “SR-37 Corridor Assessment Framework” and “Route 37 Context.” The Route 37 Corridor Context thus continues much of the intent of the REF, while expanding its database and mission to include environmental, transportation, agricultural, community, and economic considerations and information (Appendix 4).

The purpose of the Corridor Context is to create a shared understanding of the context of Route 37, with a common way of viewing information, to inform options and improve the ability to address stakeholder interests. The Corridor Context will include current
conditions and likely or desired future conditions. In Caltrans terms, the Corridor Context is a “corridor assessment.”

- The types of content that are part of the Corridor Context includes:
  - Quantified/mapped traffic patterns and noise model products
  - Lists/maps of attributes that stakeholders value
  - Narratives for topics that can’t be readily mapped; e.g. restoration history of wetlands, issue of appraised land value for agricultural formerly tidal lands, etc. Trends in conditions may be hard to map.
  - Information that is better conveyed as graphs and diagrams.

**DESCRIPTION OF DATA AND METHODS USED**

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**WETLANDS**

Highway 37 is surrounded by salt-water, brackish, and fresh-water wetlands along approximately half of its length. The highway cuts across the Bay-side of many wetlands that otherwise would be subject to tidal flows. Because these wetlands vary in elevation relative to the sea, certain wetland areas are maintained artificially in fresh-water or brackish conditions when they would otherwise be salt-water tidal marshes. The marshes are often adjacent to agricultural, urban, and other natural lands. Many are connected to nearby creeks, rivers, and the Bay through a network of artificial and natural sloughs and drains. (Appendix 4)

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**ENDANGERED SPECIES**

The wetlands, waterways and grasslands surrounding the corridor are habitat for a wide variety of native fauna and flora, including several state and federally-protected species (Figure 2). Protected species include: the Delta smelt, green sturgeon, California black rail, California clapper rail, and salt marsh harvest mouse. These species all raise permitting issues in conventional transportation planning and project delivery (Appendix 5). One thing that is noteworthy is that environmental regulatory agencies described one future scenario for the corridor as “self-mitigating” when it came to endangered species – the causeway option.
SEA LEVEL RISE

As a coastal highway, this corridor is under threat from sea level rise. It also poses a threat to the ability of nearby marshes to adapt to sea level rise. A state agency that is responsible for land-use and conservation planning in the Bay Area (the Bay Conservation and Development Commission, BCDC) recently developed a model of the inundation that could occur under likely climate change scenarios. This model shows much of the North Bay landscape under water, including most of the highway 37 corridor. This “bathtub model” did not take into account the locations and elevations of berms and levees and therefore provides only an approximation of where sea level rise impacts might occur. However, when released it garnered a lot of negative and positive attention because of the risk that was apparent to various kinds of infrastructure and land-ownership.
SR 37 constitutes a major regional east-west vehicular transportation corridor in the northern Bay Area, connecting the North Bay from US 101 in Marin County to Interstate-80 (I-80) in Solano County (Figure 3). Stretching west to east for approximately 22 miles, SR 37 connects Novato in Marin County to Vallejo in Solano County. SR 37 runs along the northern shore of San Pablo Bay. It primarily serves commute and recreational traffic between Marin, Sonoma, and Solano Counties.

![Figure 3](Position of the corridor in the Bay Area regional network of highways.)

Traffic volumes are currently below capacity for the entire length of the corridor (Table 1). By 2035, with or without capacity enhancement, segments of the corridor is anticipated to be operating at or above capacity. Increasing capacity is expected to alleviate congestion along segment B, which is the segment that runs without intersection through the marshes, between I-80 and state highway 121.
Table 1  Traffic volumes as average annual daily travel (AADT) for the 3 segments of the highway corridor. “2035 (existing)” refers to the highway with its existing capacity. “2035 (inc. capacity)” refers to the highway with increased capacity in segment B (2 lanes to 4 lanes). The orange highlight indicates traffic volumes that exceed capacity at peak times.

<table>
<thead>
<tr>
<th>Segment Description</th>
<th>Segment</th>
<th>2010</th>
<th>2035 (existing)</th>
<th>2035 (inc. capacity)</th>
</tr>
</thead>
<tbody>
<tr>
<td>US-101 to SR121</td>
<td>Segment A</td>
<td>37,933</td>
<td>67,823</td>
<td>72,181</td>
</tr>
<tr>
<td>SR121 to Mare Island in Vallejo</td>
<td>Segment B</td>
<td>36,970</td>
<td>66,145</td>
<td>72,896</td>
</tr>
<tr>
<td>Mare Island to I-80</td>
<td>Segment C</td>
<td>92,382</td>
<td>114,932</td>
<td>119,366</td>
</tr>
</tbody>
</table>

(Exceeds peak volume/capacity ratio of 1)

WHAT WE FOUND OUT

... coming soon ...

DESCRIPTION OF CREDIT AND VALUATION APPROACH

The crediting system described by CO6 Step 6 is intended to provide a consistent approach to measuring impacts and using a formal equivalent to impacts (e.g., acres) as an exchange unit in a crediting system. The crediting system then forms one basis for negotiations over mitigation requirements and tradeoffs between ecological and transportation functions. Our implementation of this concept was based on a method developed by the Road Ecology Center and Sustainable Transportation Center at UC Davis, under contract with Caltrans. It was refined during this study in collaboration with a visiting scholar from the French Ministry of Transportation (Appendix 6). The approach is based on twin pillars of accurately measuring impacts of transportation on ecological and human systems and using stakeholder and community preferences as one way to value attributes of the overall system and prioritize among possible choices or scenarios. Impacts of transportation were estimated using the “road effect zone” approach, which is a geographically-explicit
expression of road effects. Valuation and preferences were elicited using formal surveying of stakeholder-advisors and community members.

**Measuring Impacts ("Assess Transportation Effects")**

We used the “Road Effect Zone” model to measure the effects of the highway corridor and associated highways in the region. One type of effect is excess noise from traffic. We modeled traffic noise for all highways in the region that provide similar access and mobility as highway 37. We used traffic projections for 2035 to anticipate traffic noise impacts in order to improve valuation of the noise impact for future highway capacity scenarios. Traffic noise impacts wildlife and people, though at different sound intensities and frequencies.

**Valuation ("Prioritize Actions" & "Crediting Strategy")**

Values for existing uses and objectives for the corridor and associated ecosystems and communities were compared among the future scenarios. In the first step, World Café stakeholder participants applied their values to different transportation, wetlands, open space, and management attributes (A). In addition, changes in indicators for these attributes are quantified for each scenario, to facilitate scenario comparison (B). Café participants were asked to compare their values for each of 4 types of concern (and specific concerns): Transportation systems (congestion, regional system impacts, safety), Wetlands (wetland habitat, wildlife, sea level rise adaptation), Open Space (open space, agriculture, recreation), and Management (decision reversibility, cost). The votes for each type of concern were summed to give an estimate of how much stakeholders valued the different ways of viewing the corridor. Despite the fact that only one environmentalist was present among the 58 participant stakeholders, the dominant concern was for wetlands as habitat for wildlife and for the capacity of the tidal marshes to adapt to sea level rise.

The value of this finding is primarily in developing weights for the valuation approach. One way to calculate weights would be to compare the relative values for each type of concern in the “high” category (Figure 4). This calculation results in the following: Wetlands, 45; Transportation, 28; Management, 15; and Open Space/Ag, 12. Another approach is to multiply the number of votes in each category by the value (from 1 to 5), then sum the weighted votes within each type of concern. This calculation results in the following: Wetlands, 30; Transportation, 26; Management, 23; and Open Space/Ag, 22. With either
approach, the relative ranking among types of concern stays the same, but the differences are smoothed out by taking into account lower value categories.

Community members were surveyed during February and asked to describe their activities and preferences for the corridor (n = 525 completed surveys). The preferences questions began with getting them to describe their feelings about traffic conditions, environment, rural character, and highway management. Then participants were asked their opinions about specific future scenarios for the highway and how well they felt these scenarios supported different possible values for the corridor context. The results of the survey provides away to both gauge broad community support for different values that could come into play along the corridor, as well as how different constructed highway alternatives might serve different needs. These findings can be presented in two ways, both
presenting the same idea of how much each future scenario supports each main value area (Figure 5).
Figure 5  Support from each future scenario for different values. (A) Contribution of each value to each scenario. (B) Contribution of each scenario to each value.
The proposed valuation approach is a combination of weighted values among concerns and quantification of the concerns among alternative scenarios (Appendix 6). By combining what stakeholders value with quantification of impacted benefits (e.g., wetland function) among alternative futures for the corridor should improve the social/political acceptability of the decision outcome, as well as the potential environmental-stewardship benefits.

**IMPACT OF THE FRAMEWORK AND CREDIT/VALUATION APPROACH ON TRANSPORTATION DECISIONS AND PROJECT DEVELOPMENT FOR THIS CORRIDOR**

Caltrans is currently developing a Corridor Management Plan for state highway 37. This plan will be informed by this study and stakeholder process. The Plan does not currently have formally-described alternatives yet, however, the study has used the idea of “future scenarios” for the corridor as a way to solidify some of the discussions with stakeholders. These scenarios have been discussed from the points of view of impacts and benefits to different constituencies, environmental impacts and permits, cost and feasibility, and potential corresponding ecological and mitigation actions.

**Five Possible Futures for the Corridor**

During discussion within Caltrans and among stakeholders in this Transportation Research Board-funded study, five scenarios have arisen as possible futures for Highway 37. These 5 are intended to provide alternatives suitable for future transportation needs and also recognize the sensitivity of the environment in the area surrounding this transportation corridor. In developing the scenarios, consideration was given to multi-modal travel, impacts to tidal and brackish marsh habitat in San Pablo Bay, adjacent land-uses, traffic flows, climate change-induced sea level rise, and what constitutes “sustainable transportation”.

a) “No Highway Expansion”: Caltrans would continue to manage the corridor with maintenance and repair activities and minor operational improvements (but no significant change in the footprint or capacity). This scenario has the least new permitting and regulatory requirements. Although regulatory agencies saw this scenario as having few new impacts, they recognized that existing impacts would continue and impacts from repairs were likely.

b) “Expanded Footprint”: The height and width of the corridor through the marshes would double and the corridor would be expanded to 4 lanes to address current and projected future traffic. This was originally the first choice of Caltrans for improving the highway – by both reducing impacts from sea level rise and flooding and expanding capacity. Through the study, Caltrans staff have recognized that other scenarios must also be considered. Regulatory agencies expressed the opinion during meetings that this was the scenario least-likely to receive the necessary permits because of its high-level of continued and new impacts.

c) “Napa-Sonoma Causeway”: The corridor (2 or 4 lanes) would be elevated onto a causeway across
the tidal marshes (option 1) or across the San Pablo Bay (option 2) between Vallejo and Novato. Despite the expense that is likely to construct this option, it has remained the main focus of discussion among transportation and conservation organizations. Existing and new impacts would be reduced compared to scenario (b) and possibly (a). Some regulators described the project as self-mitigating, while others recognized that the elevated roadway would still project traffic noise into sensitive habitats.

d) “Strategic Co-alignment”: The corridor would be re-aligned away from marshes & wetlands between Vallejo and Novato, with I-80 and 580 to the south, or with Highways 29 and 12/121/116 to the north. This novel approach would require de-construction of the existing road-bed and combination of the numbered highway (37) with another regional highway. Improvements to this alternate combined route may need to be made. Regulators regarded this scenario as having the least impact, with some concern over displaced impacts to other highways.

e) “San Pablo Bay Tunnel”: The corridor would be routed through a tunnel at the shortest feasible distance between the Vallejo and Novato areas. This scenario was suggested by a Caltrans environmental scientist because of its technological feasibility and very low impacts. This may be the highest cost scenario and is generally regarded by stakeholders as infeasible from that point of view. Regulators had trouble discussing this scenario because of perceived infeasibility but described as very-low impact.

These scenarios describe fairly exclusive and different possible futures. However, it is possible that various components of these scenarios could be combined to better address key issues identified by stakeholders during this study (such as multi-modal travel, sea level rise, agriculture, re-establishment of tidal flow, ecosystem and habitat restoration and protection).

REACTION/INVolVEMENT/INTEGRATION OF RESOURCE AGENCIES TO APPLICATION OF ECOLOGICAL METHODS

We have approached the involvement of resource/regulatory agencies in the study by first interviewing them, then holding a joint meeting where they could discuss potential regulatory issues associated with potential actions along the corridor. We used a basic template of questions for each interview. In several cases, we spoke to more than one staff person from each agency.

We have so far completed full discussion calls to one or more staff member from each agency. We worked first with environmental permitting staff at Caltrans to develop and review a list of contacts for the agencies. As a result, the final list of contacted and interviewed agencies was: a) Federal -- U.S. Army Corps of Engineers (ACOE), U.S. Environmental Protection Agency (EPA), National Oceanic and Atmospheric
Administration (NOAA), and U.S. Fish and Wildlife Service (FWS); and b) State -- San Francisco Bay Conservation and Development Commission (BCDC), California Department of Fish and Game (CDFG), and San Francisco Regional Water Quality Control Board (RWQCB).

**Results:**

**Early Participation**

Most permitting agencies are not used to a process of early engagement with infrastructure agencies to improve planning and decision-making. Generally, the responses to our query regarding early participation in corridor planning fell along a continuum ranging from great interest in early involvement to little interest until a strategy was defined. NOAA and FWS were enthusiastic about being involved in the development process. EPA was interested, and still learning about the project. CDFG is also interested in early involvement, and their regular attendance at the meetings seems to confirm this. FWS and NOAA both expressed their support for any efforts to discuss projects earlier, noting this had not been the norm, and they welcomed the opportunity to work on potential ideas at the formative stages. The RWQCB has a strong preference toward certain strategies (causeway, strategic realignment of highway), but noted their real interest is how any idea affects water quality - roadway runoff in particular. BCDC expressed a desire to be “circumspect” in their participation, and did not want to help frame a project they would be permitting. While they have been more involved in other projects, BCDC staff felt the magnitude of this effort warranted that strategies come from county boards of supervisors, landowners, and others more directly affected by the results. ACOE noted a strong preference to wait until there was a specific plan in place, along with identified impacted acres, before it would be worthwhile to offer their opinion.

**One-on-One Meetings**

Most of the agencies noted that it was not necessary to meet separately prior to the World Café, since this meeting was “the first bite of the apple.” Once there are some ideas on the table, most staff said that would be the better time to consider direct meetings. FWS said they would welcome early, direct conversations any time about how to work together better. Their staff has a strong interest in seeing some up-front studies that will help Caltrans have more information now for implementing measures later for the project, particularly as they relate to wildlife connectivity. Despite the federally-funded liaison program, FWS noted that for some time, there has been increasing tension between Caltrans and FWS, and it would be extremely helpful to identify policy measures now that could provide some context for various connectivity efforts rather than addressing each issue through a separate biological opinion later. FWS staff who are Caltrans liaisons
assigned only to Caltrans projects, though willing to participate in stakeholder meetings, have no identifiable Expenditure Authorization (EA) to which they are allowed to bill their time for this project. One of the Caltrans Chiefs noted that he also does not have an EA to assign for his own staff to participate. Having some mechanism to support staff, both at regulatory agencies and within Caltrans, is essential in supporting earlier communication and participation for transportation projects.

**Attendance at an early December stakeholder meeting focused on regulators**

Without exception, all contacted agencies were interested in participating in a stakeholder meeting in early December to discuss the strategic ideas that emerge from the World Café in October. ACOE noted that the more detailed the proposal, the more ACOE could commit to time for comments. ACOE noted that even if adding details would mean meeting a month later, it might be worthwhile to wait and discuss a more refined proposal. The other agencies I spoke with seemed comfortable commenting on draft strategies in general, and did not emphasize specificity.

FWS noted that one benefit of a public meeting with regulators as the focus is that stakeholders can better understand how much Caltrans actually does to mitigate impacts. This person noted that there is a perception that all projects are bad for the environment, when in fact Caltrans is under strict requirements to take measures to mitigate impacts. Such a public meeting may help with the overall understanding that Caltrans does in fact do many good things in association with a project. CDFG noted that having all the regulatory staff in the room at the same time with the applicants is ideal because it avoids intra-agency confusion about impacts and allows for potential collective mitigation strategies among agencies.
CO6 AND CO1 TOOLS ASSESSMENT

Most project team members reported difficulty with taking advantage of the SHRP-2 materials available either as reports from CO6, or on the TCAPP web-site. However, at the same time, all project team members thought the CO6 process, as implemented, was both an excellent way to get stakeholders and partner agencies involved in transportation planning and a suitable way of framing ecological, transportation, and community data and interests. The overall finding was that the web (TCAPP) and report (CO6) materials themselves may have limited utility, but that they describe an important way of conducting transportation business.

This finding has important implementation implications. Rather than assuming that just passively making materials available on the web will be effective in transforming transportation planning, it may be more effective to actively engage DOT personnel in learning processes. This could occur as academies sponsored by FHWA where invited DOT staff participate in workshops on applying CO6 and other SHRP-2 products. Alternatively, trainers could travel among state DOTs, or regional get-togethers of DOT staff, and provide training using CO6 materials.
Partner Feedback on CO6 and TCAPP Tools

Below are specific comments on the first five CO6 steps. Project partners did not use the TCAPP or CO6 tools as an everyday guide to the planning process. In part, this is because transportation planning jargon is still unfamiliar to many with a role in transportation planning. For example, the differences between corridor planning, visioning, programming, long range transportation planning—all the types of processes that might occur before detailed construction planning—are not clear to us. Transportation partners also did not make frequent use these tools as intended or requested. Partners reported that CO6 provided some useful approaches and tools that were easy to understand and that provided important advances in planning. After repeated requests and inquiries from the project lead, no partner reported success or interest in using TCAPP. This was reported as being because of the relative opacity of the site for most planner-users. Although the information could be found, the lack of apparent connection between the information and the day-to-day planning and project delivery needs of state and local transportation agency staff reduced the motivation to do anything with TCAPP beyond politely experimenting with the site because of TRB’s interest that the project partners do so.

CO6 Steps

**Step 1: Build and Strengthen Collaborative Partnerships, Vision.** Build a vision of what is most needed for natural resources in the region and commit to integrate and utilize transportation and environmental regulatory processes to address these greatest conservation and restoration needs and goals.

Prior to the C21 project, there was no engagement of partner organizations in developing transportation or environmental alternatives for the corridor. Over the last year, the project has contributed to stakeholders voicing their visions of what the future could hold for the corridor. The majority of partners and stakeholders believes that the current condition and habitat value of the marshes is a critical filter through which to view the highway and potential capacity projects associated with the corridor. At the same time, there is a distinct time-frame disconnect between people’s expectations for change along the highway and the rate at which projects are likely to proceed through conventional corridor-regional-project pathways. For example, most stakeholders are concerned that the ability of the surrounding marshes and the highway itself to survive sea level rise would be jeopardized by planning that took longer than the next 10 years. In contrast, transportation agency partners consider a 30 year horizon to be adequate and have state that this corridor is well back in line for funded enhancement compared to other network highways.

Additional feedback on Step 1 is covered in the Technical Memorandum on Stakeholder Engagement.
**Step 2: Characterize Resource Status. Integrate Conservation, Natural Resource, Watershed, and Species Recovery and State Wildlife Action Plans.** Develop an overall conservation/restoration strategy that integrates conservation/restoration priorities, data, and plans, with input from and adoption by all conservation and natural resource stakeholders identified in Step 1, addressing all species, all habitats, and all relevant environmental issues.

The corridor location, at the edge of San Francisco Bay, an estuary of national significance, benefits from a wealth of credible, detailed plans for conservation and recovery of species, habitats, and ecosystem functions in the corridor vicinity. These plans include clear goals and prioritized action steps to achieve those goals and the plans and associated data are readily available. These plans are listed in the Ecological Conservation and Enhancement section of this Technical Memorandum. There are also detailed regional and county-level plans for increasing recreational access to the Baylands, although the scope of these plans appears to vary greatly depending on the funding environment that existed when they were most recently approved. We used this process to educate stakeholders about the content and availability of plans and data, but did not need to generate new information. The most significant data gaps are related to uncertainty around the predicted rate of sea level rise and the lack of accurate and detailed levee and berm topographic and location data. Recently-available LiDar data may be helpful in identifying areas of vulnerability to sea level rise. We found an additional data gap in the area of plans for sustaining local agriculture, for sustaining local economies, or for meeting the needs of the corridor’s low-income users exist, if these plans exist we are not aware of them and while the stakeholder process included good representation from the local agricultural community, it did not capture other users, such as low-income and commuter populations. It was beyond the budget of the project and the expertise of the project team to locate or produce such plans and/or reach out to the under-represented communities. The conservation strategy for regional ecosystem processes sand attributes was folded into the scenario development for the corridor, the corridor context description, and the regulatory-process foundation. In the case of the last, Caltrans staff developed a report describing the various environmental issues that would require permitting under the different capacity-building scenarios.

**Step 3: Create Regional Ecosystem Framework (Conservation Strategy + Transportation Plan)**

Integrate the conservation and restoration strategy (data and plans) prepared in Step 2 with transportation and land use data and plans (LRTP, STIP, and TIP) to create the Regional Ecosystem Framework (REF).

The project team adopted the term “Corridor Context” instead of “Regional Ecological Framework” to broaden the types of information and values we included. The corridor context includes parallel recognition of community, transportation, environmental, and economic systems and values in decision-making about highways. Using these parallel categories for collecting and organizing information, then seeking feedback from stakeholders and the community about how well
transportation plans support their values in these categories, reinforces the broad context in eventual project prioritization. We echo the Technical Memorandum on stakeholder/regulatory engagement in saying that the CO6 steps focus too narrowly on traditional approaches to recognizing and protecting environmental values in transportation planning. We recommend that planning outcomes will be better if more values are included such as local economy, community identity, environmental justice, climate adaptation, carbon budget, and possibly greenhouse gas emissions, and/or life cycle analysis. Some of these important values are difficult to map. For Highway 37, for example, the issue of sustaining agriculture in the North Bay has emerged as a critical issue for stakeholders, but this issue falls outside the CO6 framework. The TCAPP Decision Guide is more complete in this respect.

Step 4: Assess Land Use and Transportation Effects on resource conservation objectives identified in the REF. Identify preferred alternatives that meet both transportation and conservation goals by analyzing transportation and/or other land use scenarios in relation to resource conservation objectives and priorities utilizing the REF developed in Step 3 and models of priority resources.

We have spent a great deal of time on this step, working over many options with an array of stakeholders. Based on their knowledge of environmental conditions, conservation objectives, and the connection between these and transportation infrastructure and plans, stakeholders and partners identified future scenarios for the corridor that supported these objectives. In addition, environmental regulatory agencies were asked explicitly to consider different possible management scenarios for the corridor and speculate on the permissibility of the scenarios and the mitigation that might be required under each scenario. This conversation was very important for transportation partners to witness at this stage because responding to this feedback is more likely to result in development of planned projects that provide the stewardship benefits sought under one interpretation of the Eco-Logical rubric. As stated in the Tech Memo on stakeholder/regulatory engagement, it may be wise to include the development of draft scenarios earlier in the decision-making process than is currently prescribed by either CO6 or TFC. For this project, some stakeholders had a hard time focusing solely on values and goals, in the absence of tangible scenarios for the highway. Discussions on values and goals were too abstract, and came to a halt in a short time, whereas discussions that included possible scenarios were vigorous and creative. It was relatively easy to draw out values and goals from the discussions about scenarios. It was difficult for the regulatory stakeholders to provide more than speculative comments on various scenarios because of the lack of detailed information about the impacts on resources and the long planning time frame. Most regulatory staff stated that they had little ability to provide specific and formal input unless it is related to a regulatory action, such as a permit of environmental review. While the discussions were useful and generated comments (reflected in the meeting summaries) we did not solicit or receive detailed comments on various alternatives or mitigation strategies.

Step 5: Establish and Prioritize Ecological Actions Establish mitigation and conservation priorities and rank action opportunities using assessment results from Steps 3 and 4.
After 6-9 months of explicit discussion of particular strategies and future scenarios for the corridor, there did appear to be some consensus that raising the highway onto elevated causeway was environmentally-preferable, but many questions remained and key stakeholders were not present. In the absence of a clearly defined preferred alternative and specific recommendations from regulators, it is difficult to identify and establish mitigation priorities. What we do know is that the conservation and restoration strategy for the corridor is well articulated in regional plans and these plans are being implemented by local, state and federal organizations. It seems likely that these plans can serve as the blueprint for understanding transportation project impacts on wetlands and potentially how those impacts could be mitigated (avoided or reduced). There will be additional project impacts on agricultural lands and these were not addressed in much detail during the process.

**Step 6: Develop Crediting Strategy.** Develop a consistent strategy and metrics to measure ecological impacts, restoration benefits, and long-term performance, with goal of having analyses throughout the life of the project be in the same units.

Caltrans had previously contracted with UC Davis, Road Ecology Center, to develop a valuation protocol to use in project, corridor, and regional planning. This approach was adapted in collaboration with a visiting scholar from the French Ministry of Transportation. This approach was used as the basis for using measures of ecological impacts

**TCAPP Steps**

This section contains feedback and comments from the project on the decision-making guidance provided by the Corridor Planning portion of the Decision Guide for TCAPP (Transportation for Communities—Advancing Projects through Partnership). The guidance describes 9 key decisions, numbered COR-1 through COR-9.

In general, TCAPP lists only public agencies as “partners.” In our process, however, non-agency entities such as non-governmental organizations and local agencies such as Resource Conservation Districts have represented natural system issues more consistently than most agencies have. These entities have attended all stakeholder meetings, and have been the main communicator of environmental issues, values, and datasets to Caltrans. However, these entities were only able to take this role because the SHRP-2 grant paid for their time to participate. It appears that, if these entities were not consistently at the table, important land use issues might not have seen the light of day, such as the issue of supporting and sustaining local agricultural livelihoods. It also appears that, because normally Caltrans consults only with the regulatory side of natural resource agencies, not the conservation side, without the non-agency participants, Caltrans might not have seen the
magnitude of the opportunities for ecological restoration that improvement of the corridor provides.

**COR-1. Approve Scope of Corridor Planning Process**

We did not pursue a formal approval of scope. From the beginning, the entire length of the Highway 37 corridor was the focus. In addition, networked routes were also included in the scope of the study, because they would experience increased traffic if Highway 37 was abandoned or flooded. We spent time identifying relevant datasets and information sources associated with any actions on the corridor.

**COR-2 Approve Problem Statements and Opportunities**

Much feedback on planning and infrastructural deficiencies and opportunities arose from our stakeholder meetings. Caltrans provided traffic data that highlighted transportation deficiencies, and Sonoma Land Trust and Southern Sonoma County RCD took the lead on describing the deficiencies in terms of marsh restoration and agricultural operations, respectively. Opportunities were represented primarily by existing large-scale restoration plans described in previous sections of this memo.

**COR-3 Approve Goals for the Corridor**

This project focused on eliciting values, not goals, and they seem similar enough for the project’s purposes. We obtained a great deal of input on goals and values, from the public, business community, NGOs, RCDs, and a lesser degree from local transportation agencies. The World Café format worked well for eliciting goals and values. For example, it became clear that Napa and Sonoma Counties are firmly committed to not increasing capacity or traffic on the alternative routes 12/121/116. Similarly, most agency/stakeholder identified marsh restoration and adaptation to sea level rise as critical conservation goals, which was reflected in the community survey.

Part of the TCAPP guidance is that natural resource agencies’ role is to “Provide input on the most important environmental needs in the planning area and where partners may be able to work together to make a difference across multiple resources of concern.” However, it often appeared that the opportunity to make a difference was seen as secondary to complying with regulations. This orientation was apparent both within the resource agencies and within Caltrans.

**COR-4 Reach Consensus on Scope of Environmental Review and Analysis**

We did not carry out this step.

**COR-5 Approve Evaluation Criteria, Methods and Measures**

There was no formal adoption of criteria, methods, or measures primarily because most transportation partners saw this as an early stage in planning, in contrast to conservation concerns, which were looking for shorter-term action.
**COR-6  Approve Range of Solution Sets**

We found that describing a range of possible future scenarios for the highway was necessary, to get stakeholders to engage mentally in such a long-term planning process. Therefore, early in the project, simultaneously with COR-3, we began publicly discussing 5 scenarios, at least 2 of which are quite unlikely (i.e., tunnel and “doing nothing”). It was easier for people to identify their goals and values when considering specific scenarios than when considering the corridor as it already exists. See below for more detail on the scenarios, which also appear elsewhere in this report.

**COR-7  Adopt Preferred Solution Set**

This step has not been taken formally by Caltrans, but the project team did see consensus emerge on a preferred construction scenario – a causeway across the marshes, (c) below. This consensus construction scenario is not enshrined in Caltrans planning in any way, and there is no assurance that the agreement among stakeholders will survive the next planning or fundraising phases.
Appendix 1  Highway 37 Corridor Study Stakeholder List  
Appendix 2:  Technical Memorandum: Stakeholder Process  
Appendix 3:  World Café Discussion of Stakeholder Values and Future Corridor Scenarios  
Appendix 4:  Technical Memorandum: Corridor Context  
Appendix 5:  Technical Memorandum: Environmental Permitting issues  
Appendix 6:  Technical Memorandum: Valuation Approach
APPENDIX 1: HIGHWAY 37 CORRIDOR STUDY STAKEHOLDER LIST