Agenda Item No. 9

File Code No. 530.04

CITY OF SANTA BARBARA

COUNCIL AGENDA REPORT

AGENDA DATE: March 17, 2015

TO: Mayor and Councilmembers

FROM: Transportation Planning, Public Works Department

SUBJECT: Status Of Highway 101 High Occupancy Vehicle (HOV) Project, Union Pacific Bridge Replacement And Olive Mill Road Interchange Improvements

RECOMMENDATION:

That Council receive a status report and presentation on the South Coast Highway 101 High Occupancy Vehicle Lane Project and related projects, including the Union Pacific Bridge Replacement at Cabrillo Boulevard and the Olive Mill Interchange Improvements.

DISCUSSION:

Caltrans and the Santa Barbara County Association of Governments (SBCAG) continue their efforts to add a High Occupancy Vehicle lane in each direction on Highway 101 extending from Carpinteria Creek in the City of Carpinteria, to Cabrillo Boulevard in the City of Santa Barbara. The portion of the South Coast Highway 101 High Occupancy Vehicle Project (HOV Project) within the City of Santa Barbara's jurisdiction is between the Cabrillo Boulevard Bridge and Olive Mill Road Bridge.

At its meeting on January 16, 2014, the SBCAG Board created three parallel projects in addition to the HOV Project, including: the Union Pacific Bridge Replacement at Cabrillo Boulevard and Improvements to the Olive Mill and San Ysidro Road Interchanges. Additionally, the SBCAG Board directed that a consultant be hired to advise on the design and construction of the HOV Project. The Final Environmental Impact Report (EIR) for the HOV Project was certified by the Caltrans District 5 Director on August 28, 2014. Two legal challenges to the EIR Certification were filed, and the challenges will be heard in Santa Barbara County Superior Court. SBCAG has provided staff with the attached update as a supplement to this report (Attachment 1).

SBCAG Consultant

SBCAG has retained Tony Harris of Point C Consulting as SBCAG's 101 Corridor Advisor. In December 2014, Tony Harris provided initial recommendations to the SBCAG Board for continued progress into the design phase of the HOV Project. The recommendations, accepted by the SBCAG Board, outlined a strategy to advance the project design to better define it for communicating with local agencies when it came to permitting the construction segments, to make the project more competitive for funding, and to assess alternative delivery methods. Mr. Harris indicated that advancing the project design to the 35 percent completion point would occur over the next 12 to 18 months, and that SBCAG and Caltrans should share their work efforts. SBCAG is expected to hire consultants to design the north end of the HOV Project, and Caltrans would prepare the design for the south end of the HOV Project. Mr. Harris' team is developing the scope of services that will be used by SBCAG staff to prepare Requests for Proposals to hire design consultants and provide support services related to public outreach, coastal permitting, and hydraulic analysis for the various creeks. SBCAG staff anticipates bringing the various Requests for Proposals to the SBCAG Board in March 2015.

Union Pacific Bridge Replacement

The Highway 101 Operational Improvements (Milpas to Hot Springs) Project (completed 2012) included construction of a new multipurpose beachway, extending to either side of the Union Pacific Bridge, and a new tunnel to provide a pedestrian and bicycle connection from Coast Village Road to the existing beachway along Cabrillo Boulevard. The beachway extension and tunnel were incorporated into the project to be consistent with SBCAG's project Purpose and Need Statement, and they support policies requiring improvement of public coastal access across Highway 101. Despite SBCAG's efforts, Union Pacific was ultimately unwilling to allow the tunnel due to structural concerns.

The pending HOV Project overlaps the Milpas to Hot Springs Project at the Cabrillo Boulevard interchange and would result in full reconstruction and reconfiguration of the interchange in a tight diamond configuration, superseding the Milpas to Hot Springs approval at the interchange. The HOV Project does not address the missing multimodal linkage along Cabrillo Boulevard or propose any changes to the Union Pacific Bridge. Replacement of the Union Pacific Bridge would provide required pedestrian and cyclist access through the interchange to the coastal area, and allow for a superior intersection design for motorists by providing a dedicated right turn lane to the new southbound Highway 101 on-ramp. The additional turn lane is needed to significantly improve traffic flow to the on-ramp, preventing long traffic backups on Cabrillo Boulevard to the Andree Clark Bird Refuge.

With the attached Memorandum of Understanding (Attachment 2 - Reading File), SBCAG agreed to provide funding to the City for preliminary engineering design for a replacement Union Pacific Bridge, recognizing that the best long-term improvement to

Cabrillo Boulevard includes bridge replacement. On May 6, 2013, the City retained HDR Engineering, Inc. (HDR), for the preliminary engineering design for the bridge replacement. In coordination with Caltrans staff, and in anticipation of a tight diamond configuration for the Cabrillo Boulevard interchange with the HOV Project, the replacement bridge was designed to accommodate two 12-foot-wide travel lanes, a 12-foot-wide right turn lane for the southbound freeway on-ramp, a 12-foot-wide multipurpose trail, two five-foot-wide bike lanes on Cabrillo Boulevard, and two tracks for Union Pacific.

The City submitted the concept design to Union Pacific in March 2014, and received a response in November 2014. The City had requested design exceptions to have a 15.5-foot vertical clearance under the bridge rather than the standard 16.5-foot clearance, and to use a shoofly to the north as a permanent track alignment. Union Pacific denied those two design exception requests. SBCAG and Caltrans also provided comments on the bridge replacement design. The HDR Engineering Final Summary Report from December 2014 is attached (Attachment 3 – Reading File).

Staff will return to the Planning Commission for a concept review of the bridge replacement after addressing comments from the agencies and receiving written approval on the design from Union Pacific. Extra services will be required from HDR to address the comments and revise the report. Approval for the extra services will be requested once a funding source has been identified. Staff anticipates that the concept review will be held about a year from now. SBCAG staff identified $2.6 million of funding available, which can be used for the next phase of environmental and engineering for the bridge replacement.

Olive Mill Interchange

The City retained Kittelson & Associates, Inc. (KAI), to evaluate intersection alternatives and operations at the Coast Village Road/Olive Mill Road/North Jameson Road/101 Northbound off-ramp/101 Southbound on-ramp intersection. The KAI evaluation (Attachment 4 – Reading File) finds that queue lengths with the existing stop control on the 101 Northbound off-ramp would exceed available storage and spill back onto the freeway mainline in 2022, following the completion of the HOV Project (estimated to occur in 2020 for traffic calculation purposes). The KAI evaluation concluded that a roundabout at this interchange would provide superior operations and safety improvement over stop-controlled or signal-controlled alternatives, and they provided a concept roundabout design, which would not require any right of way acquisition.

Olive Mill Road defines the eastern boundary of the City and the majority of the proposed roundabout design is in the County's jurisdiction. Staff anticipates holding a joint City Planning Commission/Montecito Planning Commission concept review hearing of the roundabout project in coming months, after all comments from the County and Caltrans are received and the report is finalized.

ATTACHMENT(S):

1. SBCAG status report dated February 24, 2015
2. Memorandum of Understanding Between SBCAG and the City
3. Project Final Summary Report, Cabrillo Boulevard Railroad Bridge Replacement Project
4. Intersection Control Evaluation Report, Olive Mill Road/ Coast Village Road/US101 Interchange

PREPARED BY: Browning Allen, Transportation Manager/RD/mj

SUBMITTED BY: Rebecca J. Bjork, Public Works Director

APPROVED BY: City Administrator's Office

SBCAG
santa barbara county association of governments

Project Memorandum

REPORT DATE:	February 25, 2015
AGENDA DATE:	March 5, 2015
SUBJECT:	Status Report on South Coast 101 HOV Lanes Project & Parallel Projects
TO:	City of Santa Barbara Planning Commission
FROM:	SBCAG Staff 805-961-8900 Steve VanDenburgh, Deputy Director svandenburgh@sbcag.org Fred Luna, Transportation Engineer fluna@sbcag.org

Attached, please find an overview and summary of the status of the US 101 High Occupancy Vehicle (HOV) lane widening project and associated "parallel" projects in south Santa Barbara County. SBCAG staff looks forward to the opportunity of presenting the information in Powerpoint format at the Planning Commission meeting and answering questions from commissioners. We expect to be joined at the meeting to aid us in making the presentation and answering questions by SBCAG's US 101 corridor advisor, Mr. Tony Harris of PointC Consulting, as well as representatives from Caltrans.

Please feel free to contact SBCAG staff leading up to the meeting if you have any questions about the attached summary or our presentation to the commission.

US 101 HOV Widening Project Status Report

Congestion on the US 101 is a daily problem for the region's residents, workers and visitors. Widening the 101 freeway south of Santa Barbara is critical to the long term health of the local economy. Traffic volume is overwhelming the existing capacity of the US 101 during weekday and weekend peak periods. US 101 within the project limits typically operates with congested flow (Level of Service F) conditions during weekday and weekend peak periods. These conditions typically occur for two to four hours daily in each direction and result in significant travel delay. Without improvements congested conditions are expected to increase to ten hours a day by 2040.

Nearly 15,000 commuters drive from their homes in Ventura County to their jobs in south Santa Barbara County. The high cost of housing in south Santa Barbara County has forced lower and middle class families to move to Ventura County and north Santa Barbara County and created thousands of commuters on the freeway. If US 101 congestion continues to increase local businesses will lose the employees they need to keep operating. The local economy will suffer if local businesses close because they can't retain and recruit employees. The local and regional economy will suffer if tourists choose not to visit the Central Coast, and agricultural and high tech products can't get to markets on time and local residents are stuck in traffic.

Seven years ago, 79% of Santa Barbara County voters made widening US 101 from 4 to 6 lanes the number one regional transportation priority and taxed themselves to pay for it. Every local government in Santa Barbara has made widening US 101 the highest regional transportation priority.

The widening is being implemented in four phases, as described below.

Phase I – Milpas St. to Hot Springs/Cabrillo

In 1993, when Caltrans originally proposed widening US 101 to three lanes from Santa Barbara to the Ventura County line, the plan was met with significant community opposition. At that time, traffic congestion on US 101 was largely confined to Sunday evenings when Southern Californians returned home from vacations on the Central Coast. Local residents were very concerned about the aesthetic impact of Caltrans' proposed design and wanted SBCAG to consider alternatives to widening the freeway. Consequently, during 1993, the SBCAG Board voted to request Caltrans stop work on its plan to widen the 101 freeway.

Traffic congestion gradually continued to increase. In 1996 the SBCAG Board appointed a citizen-led "101 Task Force" to consider smaller scale transportation improvements that could, in combination, possibly prevent the need for future freeway widening. Working with the transportation consulting firm, Parsons Brinkerhoff, the "101 Task Force" identified 11 operational improvement projects on or near US 101, to address the growing traffic congestion problem on the 101. The largest of these projects was the Milpas-to-Hot Springs Operational Improvements. Thus, the first phase of what is now the US 101 HOV widening project was originally conceived as part of the suite of operational improvements to the 101 corridor that were intended to avoid the need to widen the freeway.

The Milpas-to-Hot Springs Operational Improvements Project included widening the Milpas Street US 101 Bridge in the southbound direction to accommodate a new continuous lane over the bridge to Hot Springs/Cabrillo. In the northbound direction, the project included two new auxiliary lanes from Hot Springs to Salinas and from Salinas to Milpas. The original project did not include widening the Milpas Street Bridge in the northbound direction to accommodate a new lane. When the Environmental Impact Report for the project was open for public comment, the City of Santa

Barbara requested the project include a new lane over the Milpas Street Bridge, but the auxiliary lanes from Hot Springs to Salinas remained part of the final EIR for the project. Once construction began on the project in 2008, members of the Montecito Association requested the auxiliary lane be converted to a continuous northbound through lane. A supplemental environmental impact report was prepared and the coastal development permit from the City of Santa Barbara was modified to include this new element of the project.

In addition to the new US 101 lanes, the Milpas-to-Hot Springs project provided a significant number of local circulation improvements including:

- Third southbound US 101 lane added between Milpas Street and .5 miles past Cabrillo Boulevard
- Third northbound US 101 lane added between Cabrillo Boulevard and Milpas Street
- US 101 bridge replacement and widening at Milpas Street
- Sycamore Creek Bridge replacement and widening
- Cacique Street connected under US 101 between Milpas Street and Alisos Street
- Roundabout added at the intersection of Cabrillo Boulevard, Hot Springs Road, Coast Village Road, and Old Coast Highway for local circulation improvements
- Improved pedestrian and bicycle access under US 101 and along Old Coast Highway

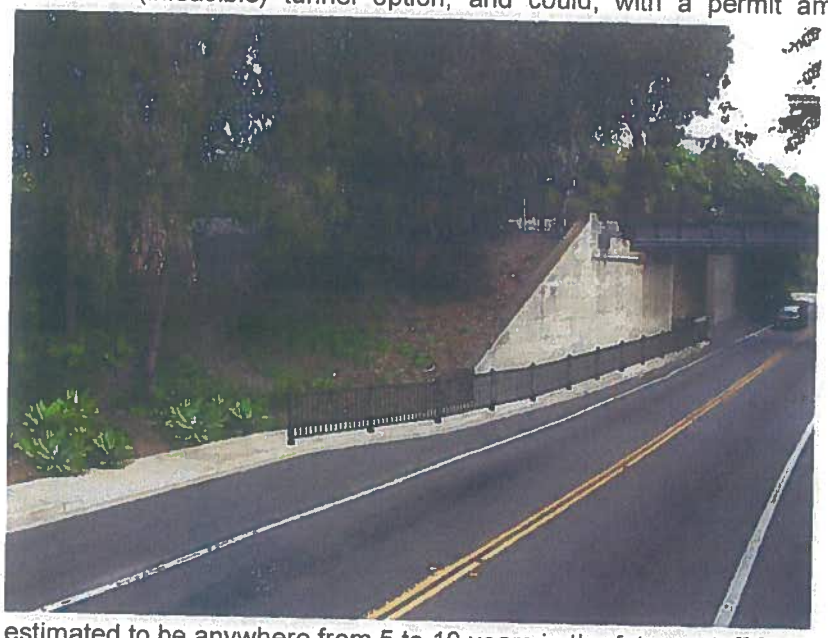
The $57 million construction and landscaping project was funded by Proposition 1B, and with $13 million Measure D dollars, and state and federal gas taxes. Construction began in July 2008 and was completed in April 2012

The project issued a coastal development permit by the City of Santa Barbara included the construction by Caltrans of a multipurpose pedestrian and bicycle path along Cabrillo Boulevard between Los Patos Drive and Coast Village Road, via a tunnel, such as that in the illustration below. The pedestrian and bicycle tunnel was estimated by SBCAG to cost between $3-5 million. SBCAG took the lead on hiring a consultant to design the pedestrian and bicycle tunnel and sought approval from Union Pacific Railroad (UPRR) while Caltrans focused on completing the Milpas-to-Hot Springs improvements described above.

SBCAG spent nearly 5 years and over $300,000 working with UPRR to find a tunnel design that was acceptable to the railroad. Unfortunately, UPRR ultimately decided it could not support

construction of a tunnel under the tracks because of concern about its proximity to the foundation of the railroad's more than 100 year old bridge. UPRR expressed concern that construction of the tunnel might weaken the foundation of the bridge or cause the tracks to subside. UPRR instead suggested it could potentially support a new project that would replace the existing bridge with a longer structure to better accommodate pedestrians and bicycles. SBCAG worked on a number of bridge replacement options with its consultant team and presented those to UPRR. The estimated project cost had grown from $3 million to $5 million for a pedestrian tunnel to over $10 million to $15 million for construction of a new railroad bridge. SBCAG had accumulated approximately $2.6 million in funding for the tunnel.

As the cost to replace the UPRR bridge far exceeded the original cost of the pedestrian tunnel and was out of scale to the original $57 million cost of the entire Milpas-to-Hot Springs project, SBCAG also began to work with the City of Santa Barbara in 2011 on an alternative design that would create a separated and elevated multi-purpose pathway adjacent to the existing road under the existing bridge avoiding impacting UPRR's right of way (see picture below). A project of this scale could be funded with the $2.6 million that had been accumulated to date for the tunnel. The pathway would be presented to the Planning Commission as the best near term solution aside from the (infeasible) tunnel option, and could, with a permit amendment by the Planning Commission, and a finding of Caltrans of being in substantial conformance, be a substitute to the tunnel for the Milpas-to-Hot Springs project. The separated pathway project would be considered temporary because the City made it known that it desired a replacement of the UPRR bridge as part of the US 101 HOV project to include bicycle and pedestrian facilities under the bridge built to modern design standards. Since the start of work on the HOV project in the Santa Barbara area was estimated to be anywhere from 5 to 10 years in the future, staff from both agencies believed that a temporary project implemented in the near term would have years of value and benefit to the community. The staffs from both agencies believed that the funding for the tunnel should be redirected to an elevated sidewalk, with the concurrence of their respective policy bodies.



The City of Santa Barbara Planning Commission made a site visit to the project area to consider this alternative. Commissioners expressed support for the design in concept and supported the idea of doing something in the interim to improve the bicycle\pedestrian situation until the HOV project came along. The City staff proposed to take over the design and construction of the elevated sidewalk using the tunnel funds.

The South Coast Subregional Planning Committee of the SBCAG Board discussed the proposed interim improvement and the transfer to the City of lead agency responsibilities and tunnel funding in July 2012. Concerns were expressed by SBCAG members on the committee and City staff present that the elevated sidewalk and reduced roadway lane widths were not consistent with modern design standards. The committee questioned the value of such an investment and expressed concerns about SBCAG's liability. The matter was not voted on by the committee.

The City of Santa Barbara continued to urge Caltrans and SBCAG to include reconstruction of the UPRR Cabrillo Bridge as part of the 101 HOV Widening Project to address pedestrian and bicycle access at this narrow point on Cabrillo. Development of Caltrans' draft Environmental Impact Report for the 101 HOV Project was well underway and stopping progress on the EIR to include this local circulation improvement was beyond the scope of the project and would have resulted in significant project delays. As an alternative, the SBCAG Board voted in January 2014 to urge Caltrans to continue forward with the draft EIR for the 101 HOV Project without including the UPRR Bridge, the Olive Mill Road Roundabout or Improvements to the San Ysidro Interchange as part of the EIR but to move those projects forward on separate but parallel tracks.

In 2014, the City of Santa Barbara and SBCAG signed an MOU whereby SBCAG agreed to provide part of the $2.6 M in tunnel funding to the City for development of a feasibility study for reconstruction of the UPRR Bridge. The purpose of the (on-going) study is to fully vet a bridge replacement project before the coastal permitting stage for the HOV project, so as to determine if project alternatives can be identified that could receive the approval of UPRR and the support of the Planning Commission. It would also give the community an opportunity to fully appreciate the scope and scale of the reconstruction of Cabrillo Boulevard that would be needed to achieve bicycle and pedestrian facilities to modern design standards. The two agencies agreed that the City was in the best position to hire consultants to develop a bridge reconstruction plan and present it to UPRR and the Planning Commission. The railroad has responded to the City's proposal and the City will be submitting a revised design to the railroad in the near future. The most recent estimated cost of constructing the new railroad bridge is $28-$30 million.

Phase II – Carpinteria to Mussel Shoals in Ventura County

Caltrans and its SBCAG and Ventura County partners are currently constructing a six-mile carpool lane in each direction for vehicles with two or more passengers during peak weekday congestion periods, along US 101 from Mobil Pier Road in Ventura County to Casitas Pass Road in Santa Barbara County. Additional improvements include: a pedestrian undercrossing in La Conchita, concrete barriers, a new southbound class I bike lane, median landscaping, reconstruction of existing drainage, closing existing median openings and installing Intelligent Transportation System elements such as underground vehicle detectors and Close Circuit TV cameras.

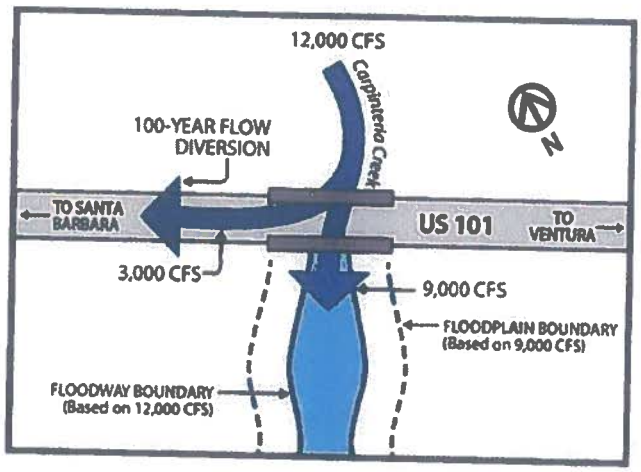
The $102 million project will alleviate congestion, encourage carpooling and improve air quality. The project began construction in the spring of 2012. The new southbound lane was opened in the Fall of 2014 and the entire project is estimated to be completed later this month in March 2015.

Phase III – U.S. 101 HOV Project (Linden Ave/Casitas Pass Interchanges)

This $100 million project to reconstruct both the Linden Avenue/101 and Casitas Pass/101 bridges is fully funded. Replacement of the two low vertical clearance bridges and widening of the 101 bridge over Carpinteria Creek will prepare for the widening of the 101 freeway.

The major elements of the Linden Avenue/Casitas Pass Interchange project include:

- Reconstruction of the U.S. 101 overcrossing and ramps at Casitas Pass (see Figure 1)
- Reconstruction of the U.S. 101 overcrossing and ramps at Linden Avenue
- Reconstruction of the U.S. 101 bridges over Carpinteria Creek
- Extension of Via Real frontage road between Bailard Avenue and Casitas Pass Road, and between Casitas Pass Road and Linden Avenue (see Figure 1)
- Class I bikeway improvements along Carpinteria Creek
- Sound walls in various locations



Environmental studies for the project were completed by Caltrans in 2010. Caltrans has completed detailed design and significant progress has also been made on the required coastal development permit. Project partners and Coastal Commission staff have met regularly to work through the needed Local Coastal Plan amendments permit issues. The project is currently scheduled for construction in 2016 and the work would take four years to complete. This timeline has been delayed by approximately one year. The primary reason for this delay is related to resolving an issue with the Federal Emergency Management Agency (FEMA) regarding the hydraulic analysis for Carpinteria Creek. Based on previous guidance from FEMA, at the outset of detailed design, Caltrans designed the US 101 bridges over Carpinteria Creek to restore the historic "100 year" storm event creek flows and eliminate any diversion of flows to the west (see graphic showing diversion of flows). This bridge design allowed for construction of the new HOV lane over Carpinteria Creek and also would remove hundreds of homes from the floodplain north of US 101. Unfortunately, FEMA indicated in late October 2013 to both City of Carpinteria and Caltrans that it had changed its perspective regarding the restoration of the historic flood pattern on Carpinteria Creek and would not support the original design because it would increase flood water downstream of the 101 freeway.

Since January 2014, the project team has been meeting with FEMA representatives in Region IX to investigate possible solutions to meet FEMA's new design requirements. The project team's top priority, is to convince FEMA that current mapping for Carpinteria Creek should be revised to accurately reflect the current risks associated with flooding during the 100-year storm event. There exists a tremendous amount of new technical data to support corrections being made to the floodplain mapping, including new and improved hydraulic modeling methods, updated and improved topography and downstream improvements.

An informal letter has been sent by the City of Carpinteria, as the floodplain manager for Carpinteria Creek, requesting FEMA to update the mapping. Member of Congress Lois Capp's staff have met with FEMA Headquarters staff to discuss the status of the project. This month, FEMA sent a response letter to the City of Carpinteria inviting submission of a formal Letter of Map Revision (LOMR) as proposed by the project team. The Carpinteria City Council will consider this request in the next few months and if they agree to submit the LOMR to FEMA, a response to the application could be received in 2015. The Linden/Casitas Project team will continue to move ahead with the permitting process at the City of Carpinteria to try to keep the project on schedule to begin construction in 2016.

Phase IV – Hot Springs/Cabrillo to Carpinteria
This phase of the HOV project would add one high occupancy vehicle (HOV) lane in each direction on US 101 from 0.44 mile south of Carpinteria Creek in the City of Carpinteria to Sycamore Creek in the City of Santa Barbara. The project is 10.9 miles in length.

Caltrans District 5 is the lead agency for the environmental phase of the project. SBCAG is the primary project sponsor. Project partners include the City of Santa Barbara, County of Santa Barbara, City of Carpinteria, SBCAG and Caltrans. The estimated $425 million cost of the project is proposed to be funded from three primary sources; $140 million in Measure A regional sales tax funds, $135 million from SBCAG's share of state gas tax funds, and $150 million from other state and federal funding sources.

A no-build alternative and three build alternatives were evaluated in the environmental document. Like the carpool lanes in Phase II, the added lanes are expected to be designated as part-time HOV lanes, meaning they will operate as general-purpose lanes during off-peak periods of weekdays and on weekends. Project improvements for all build alternatives are anticipated to be confined primarily to the existing State Highway right-of-way.

The project's Draft Environmental Impact Report was closed to public comment in July 2012. The document was originally scheduled for Caltrans certification in late 2012 and was finally released and certified in September 2014. The design and permitting work is expected to extend through 2017. The project is planned for construction from 2017 to 2027. The 11 mile project will probably be divided into 4-5 phases and will require Coastal Development Permits from the City of Carpinteria, the City of Santa Barbara and the County of Santa Barbara.

Two lawsuits were subsequently filed contesting the adequacy of the environmental document. SBCAG and Caltrans are continuing to move forward on design of the project, but the petitioners in the lawsuits could ask for an injunction to stop additional work. If an injunction is granted or the EIR lawsuit challenges are successful, the HOV project could be significantly delayed. Every month of delay costs an estimated $500,000 to $1,000,000 in inflated construction costs. The project is now two years behind the original schedule.

SBCAG has hired a consultant, Mr. Tony Harris of PointC consulting, as an advisor to the SBCAG board and its executive staff. Among the tasks in Mr. Harris' scope of work are identifying additional funding sources to deliver the project, and investigating design efficiencies to lower project costs, reduce construction impacts and speed delivery of the improvements. Mr. Harris has been meeting with local elected officials and community organizations to develop a series of recommendations to the SBCAG Board for consideration. Mr. Harris has already made a presentation on his first set of design-related recommendations to the SBCAG Board in January and will be making his second set of more specific design-related recommendations at the March SBCAG Board meeting. Mr. Harris is scheduled to attend the Planning Commission meeting and share his recommendations and strategy for the design of Phase IV.

Parallel Local Projects in 101 Corridor

In addition to the four phases of the US 101 Widening Project, there are a number of parallel local transportation improvement projects also under development in the 101 corridor. Local permitting agencies and the California Coastal Commission have indicated these projects will be considered as conditions of approval for the various phases of the 101 widening project's coastal development permits. The projects are being developed separately, but in coordination with the 101 widening project.

Rincon Bike Trail

The Rincon Bike Trail project will eliminate a gap in the California Coastal Trail by constructing a 10-foot wide and 4,500-foot long shared-use trail from Carpinteria Avenue to Rincon Beach County Park in Santa Barbara County near the Ventura County line. The trail begins in the City of Carpinteria, extends into Caltrans right of way, requires a bridge crossing over the Union Pacific RR tracks and ultimately ends at the Rincon Beach County Park.

The trail is proposed along the ocean side of US 101. A non-motorized link to beaches and surfing destinations would be created by the project. This project has been identified as one of the coastal access enhancement projects that will be implemented to "balance" the impacts to wetlands and agriculture in the coastal zone caused by Phase III of the US 101 HOV project, the Linden Avenue\Casitas Pass Road interchanges project, in the City of Carpinteria. This project is estimated to cost up to $8 million (capital and support) over and above the Phase III project costs. The City of Carpinteria is currently the lead agency for environmental studies of the Rincon project using state grants and Measure A Bicycle, Pedestrian and Safe Routes to School funding. The project is nearing completion of a CEQA document and SBCAG applied for construction grant funding from the State of California's Active Transportation Program (ATP) but was not awarded funding. SBCAG is currently discussing submitting a joint Cycle II ATP application with the Ventura County Transportation Commission for this project.

Santa Claus Lane Bike path

The Santa Claus Lane Class I bike path project will eliminate a gap in the California Coastal Trail and connect Santa Claus Lane in the unincorporated area to Carpinteria Avenue in the City of Carpinteria on the southbound side of U.S. 101. This project also has been identified as one of the coastal access enhancement projects that will be implemented to "balance" the impacts to wetlands and agriculture in the coastal zone caused by the Linden Avenue\Casitas Pass Road interchange project in the City of Carpinteria. Currently, approximately $300,000 has been programmed to fund the environmental studies and preliminary engineering that is underway. The funding comes from Measure A South Coast Bicycle and Pedestrian grant funds, sponsored by the City of Carpinteria and County, and unspent Regional Surface Transportation Program funds allocated to the project about 6 years ago. The project is estimated to cost $5 to $7 million (capital

and support). SBCAG is currently the lead agency for this project in developing the environmental document and preliminary engineering. SBCAG submitted an application to fund construction the project from the state's Active Transportation Program (ATP) during the first cycle of funding but was not awarded a state grant.

Cabrillo Pedestrian Improvements
As described above, this project would replace the UPRR bridge at Cabrillo Blvd. in Santa Barbara to provide standard width shoulders and sidewalks for bicycles and pedestrians traveling from the inland side of US 101 to the ocean side of US 101 under the bridge. A feasibility study is currently being conducted by the city of Santa Barbara to replace the bridge. The study has been submitted to UPRR for review and acceptance of the bridge replacement strategy. The pedestrian and bicycle features of this project are estimated to cost around $5 million. Funding of over $2.6 million in Highway Safety Improvement Program (HSIP) and Transportation Enhancement funding has been accumulated by SBCAG for this project. SBCAG submitted an application for state Active Transportation Program grant funds for the $5 million of bike/pedestrian eligible improvements but was not awarded funding.

Olive Mill Road Roundabout
The City of Santa Barbara has hired a consultant to evaluate roundabout alternatives at the intersection of the northbound and southbound US 101 off and on-ramps, Olive Mill Road, Coast Village Road and North Jameson Road.

San Ysidro Interchange
The County of Santa Barbara hired a consultant (the same one working on the Olive Mill Roundabout) to develop preliminary roundabout designs to relieve traffic congestion and improve operations at the San Ysidro Interchange. Four options were presented to the Montecito Planning Commission in the fall of 2014. A number of the proposed designs would require right of way from the proposed Miramar Hotel. The Montecito Planning Commission approved the Miramar Hotel project in January of this year without including any requirement to accommodate construction of the proposed roundabouts. SBCAG and County staff will be meeting to discuss next steps for this project in the near future.

MEMORANDUM OF UNDERSTANDING
Between the Santa Barbara County Association of Governments and the City of Santa Barbara

This memorandum of understanding between the Santa Barbara County Association of Governments (SBCAG) and the City of Santa Barbara (CITY) is entered into with the authorization of the Board of Directors of the SBCAG and the City Council of CITY and herein referred to collectively as PARTIES.

WHEREAS, SBCAG and CITY desire to make cost effective improvements along Cabrillo Boulevard under U.S. 101 and the Union Pacific Railroad (UPRR) bridge to safely connect bicycle and pedestrian paths at Los Patos Drive and Coast Village Road\Old Coast Highway (PROJECT); and

WHEREAS, an engineering study by SBCAG in conjunction with the U.S. 101 Milpas\Cabrillo-Hot Springs project was unsuccessful in securing the approval of UPRR for a bike\pedestrian tunnel PROJECT under their tracks; and

WHEREAS, subsequent efforts by SBCAG and CITY to design an interim PROJECT of raised sidewalk improvements on the shoulder of Cabrillo Boulevard raised safety and cost\benefit concerns and did not garner policy support at SBCAG; and

WHEREAS, SBCAG and CITY have concluded that the best long term PROJECT is a replacement of the UPRR bridge over Cabrillo Boulevard to provide improved roadway and shoulder width for vehicles and to accommodate bicycle and pedestrian facilities; and

WHEREAS, the CITY had previously provided funding for SBCAG's engineering efforts for the tunnel and interim sidewalk iterations of PROJECT; and

WHEREAS, a balance of unspent funds remains on account with SBCAG; and

WHEREAS, SBCAG and CITY believe that the CITY is best equipped to conduct preliminary engineering of the PROJECT specifically to include UPRR bridge replacement alternatives; and

WHEREAS, CITY has negotiated a scope of services with an engineering consultant to perform preliminary engineering for PROJECT with alternatives to replace the UPRR bridge;

NOW THEREFORE, the PARTIES do mutually agree as follows:

1. The purposes of conducting preliminary engineering are (1) to complete preliminary design and cost estimates for feasible alternatives for PROJECT, (2) for CITY to gain acceptance in writing from UPRR of a bridge replacement PROJECT prior to Coastal Development Permit application being submitted by Caltrans to CITY for the U.S. 101 HOV project and (3) to inform SBCAG, Caltrans and CITY of the extent to which PROJECT can be coordinated with the U.S 101 HOV project.

2. SBCAG will return to the CITY funds in the amount of $99,105 which represents the full extent of the unspent funds remaining from CITY'S contribution to prior iterations of PROJECT.

3. CITY shall retain the services of a qualified consulting firm to conduct the preliminary engineering work necessary for the PROJECT, develop cost estimates for the alternatives, and present the PROJECT alternatives to UPRR and Caltrans for input, review and acceptance.

4. CITY shall assemble a project development team and conduct meetings of the team for the duration of preliminary engineering that shall include at a minimum, representatives of CITY, SBCAG and Caltrans.

5. CITY shall present results from the preliminary engineering of PROJECT to the CITY Planning Commission for concept review on the environmental and coastal resource impacts of PROJECT, the feasibility of PROJECT's preliminary design, comments or acceptance by UPRR and Caltrans; and the PROJECT's applicability to fulfill the related Coastal Development Permit condition placed on the Milpas to Hot Springs project.

6. CITY and SBCAG agree to the provisions outlined in Exhibit A.

Amendments to this memorandum of understanding shall require approval by the SBCAG Board of Directors and the Santa Barbara City Council.

Made and entered into on this 29th, April 2013.

CITY OF SANTA BARBARA
a Municipal Corporation

Paul Ly for JLA

Mr. James Armstrong
City Administrator

ATTEST:

Gwen Peirce

Gwen Peirce, CMC
Santa Barbara City Clerk

APPROVED AS TO FORM:
Stephen P. Wiley
Santa Barbara City Attorney

T. O Strenger

SANTA BARBARA COUNTY ASSOCIATION OF GOVERNMENTS

Mr. Roger Aceves
Chair

ATTEST:

Jim Kemp, Executive Officer
Clerk of the Board

APPROVED AS TO FORM:
Dennis Marshall
County Counsel

William M. Dillon

William M. Dillon,
Senior Deputy County Counsel

Exhibit A
INDEMNIFICATION AND NON-PARTNERSHIP

MUTUAL INDEMNIFICATION

CITY shall defend, indemnify and save harmless the SBCAG, its officers, agents and employees from any and all claims, demands, damages, costs, expenses (including attorney's fees), judgments or liabilities arising out of this Agreement or occasioned by the performance or attempted performance of the provisions hereof; including, but not limited to, any act or omission to act on the part of the CITY or his agents or employees or other independent contractors directly responsible to him; except those claims, demands, damages, costs, expenses (including attorney's fees), judgments or liabilities resulting from the sole negligence or willful misconduct of the SBCAG.

CITY shall notify the SBCAG immediately in the event of any accident or injury arising out of or in connection with this MOU.

SBCAG shall defend, indemnify and save harmless the CITY, its officers, agents and employees from any and all claims, demands, damages, costs, expenses (including attorney's fees), judgments or liabilities arising out of this Agreement or occasioned by the performance or attempted performance of the provisions hereof; including, but not limited to, any act or omission to act on the part of the SBCAG or his agents or employees or other independent contractors directly responsible to him; except those claims, demands, damages, costs, expenses (including attorney's fees), judgments or liabilities resulting from the sole negligence or willful misconduct of the CITY.

SBCAG shall notify the CITY immediately in the event of any accident or injury arising out of or in connection with this MOU.

NON-PARTNERSHIP

This MOU is not intended by the PARTIES to constitute or create a joint venture, pooling arrangement, or formal business organization of any kind. The rights and obligations of the PARTIES shall be only those expressly set forth herein.

CITY OF SANTA BARBARA
PUBLIC WORKS DEPARTMENT

CABRILLO BOULEVARD RAILROAD BRIDGE REPLACEMENT PROJECT

Santa Barbara, California

DRAFT

PROJECT FINAL SUMMARY REPORT

December 2014

Prepared for:

City of Santa Barbara
Public Works Department
630 Garden Street
Santa Barbara, CA 93102

Prepared by:

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SUMMARY

This document provides a final summary report for the proposed replacement of the Union Pacific Railroad (UPRR) Bridge over Cabrillo Boulevard in the City of Santa Barbara to accommodate the widening of Cabrillo Boulevard.

INTRODUCTION

The Santa Barbara County Association of Government (SBCAG), Caltrans, and the City of Santa Barbara are partners in implementing the Highway 101 Operational Improvements Project that extends from Milpas Street to Cabrillo Boulevard-Hot Springs Road. In addition to the planned improvements to Highway 101 - which include new structures, improved interchanges, and added lanes - the original project description included improved pedestrian and bicycle traffic access on Cabrillo Boulevard beneath the UPRR Bridge. The pedestrian and bicycle features were included in the permitted improvements under the City of Santa Barbara's Coastal Development Permit process, namely to provide improvement along Cabrillo Boulevard to connect the waterfront to Coast Village Road. However, this part of the project is not yet complete since the UPRR did not approve plans to provide for these facilities. Due to scheduling issues, it was necessary that the Highway 101 Operational Improvements Project be moved forward before the issues with UPRR could be resolved.

HDR Engineering, Inc. (HDR) was hired by the City to complete preliminary engineering designs and cost estimates for the completion of the originally proposed pedestrian and bicycle facilities, the required replacement of the UPRR Bridge, and other related infrastructure improvements. The ultimate goal of the work was to design cost effective improvements along Cabrillo Boulevard under U.S. 101 and the UPRR Bridge, which would safely connect bicycle and pedestrian paths between Los Patos Drive and Coast Village Road/Old Coast Highway.

PROJECT AND WORK DESCRIPTIONS

Engineering work included the development of a preferred shoofly track alignment that would allow the UPRR to maintain rail traffic while the existing bridge was replaced and lengthened. A new roadway cross section was also designed which would widen Cabrillo Boulevard to accommodate two 12-ft wide traffic lanes, two 5-ft wide bike lanes, a 12-ft wide multiple purpose trail, a 12-ft wide right hand turn lane, and 2-ft buffers.

Additionally, a new roadway profile design was developed to lower the road and improve vertical clearances at the bridge. Without the lowering improvements, HDR concluded a design exception from UPRR would be needed, as only 15'-6" could be achieved versus the 16'-6" standard. Since the clearance produced by the new Highway 101 HOV Project was also less than the 16'-6" requirement, HDR believed it was worth the extra time an effort to approach the UPRR about approving a design variance, especially since underground utility and ground water infiltration challenges could be avoided.

City of Santa Barbara staff planned to meet with the UPRR representative to secure their concurrence of initial project concept, as well as approval of vertical clearance and other design criteria exceptions. Afterwards the City planned to move forward with the submission of a General Order 88-B application to the California Public Utilities Commission for approval and order.

EXISTING RAILROAD BRIDGE

The existing Union Pacific Railroad Bridge is located over Cabrillo Boulevard in the City of Santa Barbara, at MP 369.66 on the UPRR Santa Barbara Subdivision, DOT# 745616H. It is a single 45-ft span structure originally constructed in 1917. The bridge has approximately a 40 degree skew angle to accommodate the alignment of Cabrillo Boulevard.

The vertical clearance under the existing bridge structure is posted at 14'-11". No evidence was observed of trucks hitting the structure. This structure is located next to the Cabrillo Boulevard/Highway 101 Interchange and the geometry of the railroad track and the Cabrillo Boulevard cannot be significantly changed without impacts to both right-of-way and the interchange itself. UPRR's Grade Separation Guidelines specify skew angles no greater than 30 degrees depending on the type of the structure. The abutments currently support only a single track but were built to accommodate two tracks on 13'-6" track centers.

The UPRR right-of-way is 100-ft wide at Cabrillo Boulevard but narrows to 60-ft approximately 200-ft geographically south of the existing bridge. The existing single track is located in the center of the UPRR right-of-way.

INITIAL PROJECT SCOPE AND STATUS

HDR was retained by the City to provide conceptual design level analysis of the railroad bridge replacement and to develop two alternative shoofly track alignments needed to facilitate replacement of the bridge structure. The construction of the shoofly track would be required by UPRR due to the need to continue rail services without interruption. The two shoofly alternative designs and study have since been completed by HDR. The two alternatives, known as the North Shoofly Track Alignment and South Shoofly Track Alignment, are described below. Engineering plans for both shoofly alignment alternatives were submitted to the UPRR for their review and comments.

NORTH SHOOFLY TRACK ALIGNMENT ALTERNATIVE

The North Shoofly Track Alignment Alternative would provide a shoofly alignment along the outside curve north of the existing main line track. This alternative would require the construction of the north half of the proposed bridge structure first. The mainline track would then be moved onto the northern structure to be utilized as a shoofly track while the existing bridge is removed and the southerly half of the bridge is then constructed. It is the City's desire, subject to UPRR's approval, to leave the shoofly track in place as the final mainline track alignment after the completion of the proposed bridge. This would provide the advantage of avoiding the costs for the relocation of the mainline back to the original alignment, and the subsequent removal of the shoofly track. The proposed south half of the bridge would then be used to support a future second track alignment. The new shoofly will stop short of the Los Patos Bridge. It will also require the re-grading of a drainage swale, however most if not all skyline tress between the existing track and the freeway will be left intact.

In order to provide 15'-6" vertical clearance, Cabrillo Boulevard will have to be lowered by approximately 1-ft and potential groundwater issues addressed. Surface storm water runoff may be diverted into the existing storm drain system to the south of the structure.

Initial survey conducted revealed that there are 5 existing fiber cables along the corridor that will require relocation. An easement from Caltrans will be needed along the freeway right-of-way approximately 200-ft east of Cabrillo Boulevard. This will allow for the placement of the shoofly track as this portion of UPRR's right-of-way begins to narrow to 60 feet.

SOUTH SHOOFLY TRACK ALIGNMENT ALTERNATIVE

This South Shoofly Track Alignment Alternative would provide a shoofly alignment along the inside curve south of the existing main line track. This alternative would introduce an additional reversing curve on the west side of the shoofly alignment which does not currently exist. The South Alignment will require an additional 1,900-ft of track compared to the North Alignment, which also requires widening/reconstruction of the Los Patos UPRR Bridge. This is due to the constraint of

designing the track alignment along the inside of the existing main line curve. This alternative will construct the south half of the proposed bridge structure first. The mainline track would then be moved onto the southerly structure to be utilized as a shoofly track while the existing bridge is removed and the northerly half of the bridge is then constructed.

In order to provide the required 15'-6" vertical clearance, Cabrillo Boulevard will have to be lowered by approximately 1-ft without encountered possible ground water. Drainage may be diverted into the existing storm drain system to the south of the structure.

The initial field survey limits did not extend beyond Los Patos Way; therefore, this alternative did not include existing top-of-rail shots or identify existing utilities. Based on the information received from the City, removal of trees will be required along the entire length of the south shoofly track. Retaining walls will be required due to the increased elevation differences along the southerly UPRR right-of-way. In addition, sound mitigation may be required due to increased noise generated along the southerly right-of-way as there are multiple adjacent residential and commercial buildings. The railroad bridge at Los Patos Way and the drainage structure at Milepost 369.21 will need to be widened to accommodate the shoofly track. There are 5 existing fiber cables along the corridor that will need to be relocated.

Proposed Railroad Bridge

The proposed structure type for the replacement of the existing railroad bridge is a rolled beam structure. This is a preferred standard type of structure that UPRR will accept, while reducing overall construction costs. In order to accommodate the additional multi-purpose lane and right hand turn lane located on the east side of the roadway, the east span must be longer than the west span. Per the direction of the City, this level of design did not include structural plans.

While a rolled beam structure may not be as aesthetically pleasing as other types of structures, concrete fascia beams (with patterns) can be added to the structure at additional cost, to improve the overall appearance of the completed project.

Realignment of Cabrillo Boulevard

Cabrillo Boulevard is being widening to accommodate the additional 12-foot multi-purpose trail, a 12-foot right hand turn lane and two 5-foot bike lanes with the existing 1 through lane, in each direction, remaining. The improvements are primary concentrated along the east side of the existing roadway. The roadway will be lowered by at least 1-foot in order to provide 15'-6" vertical clearance under the bridge. Additional lowering may be required if the aforementioned vertical clearance design criteria variance is not approved by the UPRR. Drainage potentially can be diverted into the storm drain system currently located to the south of the structure, although a

pump system may need to be investigated during subsequent phases of the project design.

PROJECT UPDATE – DECEMBER 2014

The City has finally received concurrence from the UPRR to use the North Shoofly Track Alignment Alternative to temporarily support rail operations and traffic during construction. The UPRR has also provided the following comments which need to be addressed and incorporated into the future design submittal packages:

- UPRR has approved a proposed bridge skew angle of 50-degrees.
- UPRR has approved a proposed bridge width of 50-ft, which is less than the overall railroad right-of-way at this location. (The bridge will have to be widened to 60-ft however, to accommodate the additionally requested permanent shifting of the mainline track, as further discussed below.)
- UPRR **did not approve** the shoofly becoming the permanent mainline track alignment. The mainline track (and any future track) will need to be centered within the right-of-way. More specifically, the existing main track should be relocated 10-ft north of the right-of-way centerline, and any future second track 10-ft south of the right-of-way centerline.
- UPRR **did not approve** an underpass vertical clearance of 15'-6", which is less than 16'-6" required in the Railroad Guidelines for Grade Separation for the proposed structure type.

PROJECT FINAL DESIGN SELECTION: NORTH SHOOFLY TRACK ALIGNMENT

The temporary shoofly track will be constructed along the outside curve north of the existing mainline track as illustrated in attached Exhibits 1, 2, and 3. Prior to installing this shoofly, temporary shoring will be placed and construction of the north half of the proposed bridge completed. Once the north half is finished, the mainline track will then be moved onto the completed northern portion of the structure, and be used as a shoofly track while the existing bridge is removed and the southerly half of the new bridge constructed.

Upon completion of the southerly half of the structure, track roadbed will be re-graded and track will be re-profiled on both sides approaching the structure to meet current UPRR design criteria. The permanent mainline track will then be constructed 10-ft north of the centerline of the railroad right-of-way as requested by UPRR, and the shoofly track on the northerly structure removed. (It is important to note that the exhibits as prepared earlier in March, 2014 do not show the main track at 10-ft offset from the centerline of the right-of-way, as recently requested. This change will need to be addressed during the next design phase.)

PROJECT FINAL DESIGN SELECTION: STRUCTURE TYPE AND VERTICAL CLEARANCES

The originally recommended rolled beam superstructure bridge will be advanced into final design. The profile of Cabrillo Boulevard will also be lowered as illustrated in attached Exhibit 4. In order to accommodate a future track at a 10-ft offset south of the centerline of right-of-way, the width of the bridge will be increased from 50-ft to 60-ft.

The minimum vertical clearance between the bottom of the new bridge and the finished roadway surface will be 16'-6", to comply with the request made by UPRR. To meet this required vertical distance of 16'-6", the roadway will be lowered by approximately 2-ft beneath the rail bridge. Drainage will likely be diverted into the existing storm drain system currently located to the south of the structure. However, an in-depth survey should be conducted during the next level of design to ensure the connection can be made and positive drainage achieved. If positive drainage cannot be achieved, a pumping system could be used as an alternative drainage solution.

FASCIA GIRDER OPTION

Concrete fascia girders with patterns can be added to the new bridge superstructure as an option to hide the rolled steel beams and enhance the overall appearance of the structure. This approach has been used successfully by HDR on several past rail bridge projects. For example, attached Exhibit 5 shows the recently completed Magnolia Boulevard grade separation project in the City of Riverside, CA, where this method was used to hide the standard steel rolled beams. Alternatively, attached Exhibit 6 shows what the final structure can look like without the installation of the aesthetic fascia girders. There is an additional cost of approximately $225,000 for the bridge with fascia girders, versus a bridge without them.

CALTRANS' LATEST PLANS

[redacted] the design will need to be modified at the next design level. [redacted]

PRELIMINARY PROJECT COST ESTIMATE

The baseline preliminary engineering estimate for the overall project is **$28,500,000** as shown in the attached Exhibit 7. The baseline estimate includes the North Shoofly Alignment Alternative, along with the removal of the shoofly at the conclusion of

construction, the lowering of Cabrillo Boulevard to achieve required vertical clearances, and the construction of a new 2-track wide rail bridge. The estimate however does not include concrete fascia girders or other aesthetic enhancements, and does not fully address the currently unknown utility relocation costs or potential pump station needs. And, the baseline does not account for the potentially significant cost savings if the right-hand turn lane is removed from the scope of the project. Although a 30% contingency has been included in the baseline to offset some of the still unknown costs, the City should still consider increasing this contingency value when submitting project funding requests.

ATTACHMENTS

ENGINEERING PLANS AND EXHIBITS

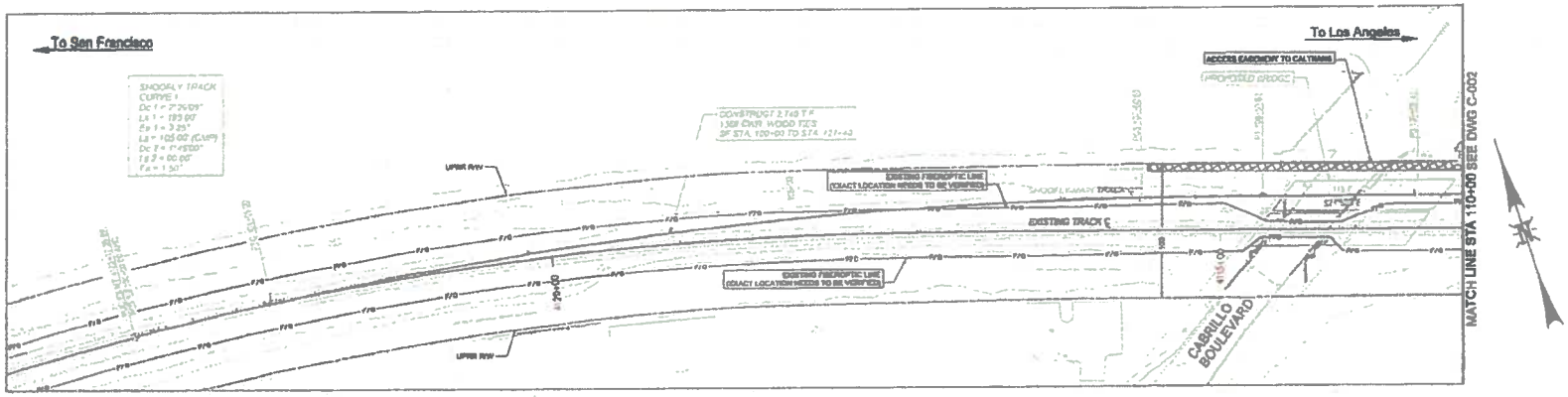
Exhibits 1 thru 3 - North Shoofly Track Alignment and Profile

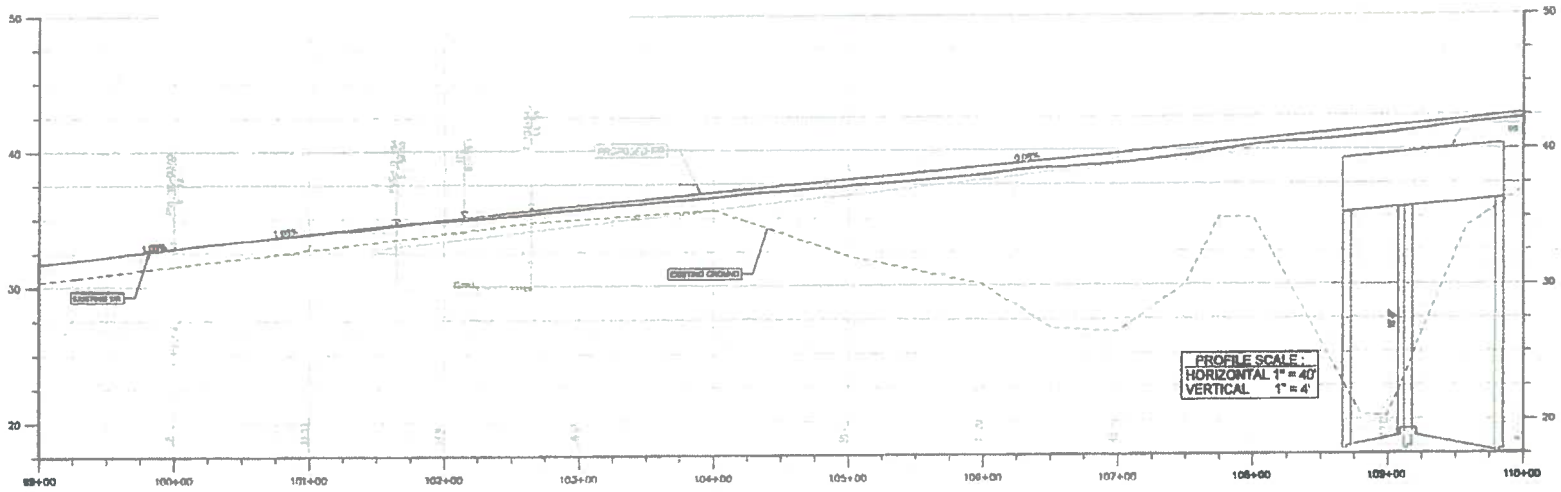
Exhibit 4 - Cabrillo Blvd Realignment and Profile Lowering

Exhibit 5 - Example of a Rail Bridge with Aesthetic Fascia Girders

Exhibit 6 - Example of a Rail Bridge without Aesthetic Fascia Girders

Exhibit 7 - Preliminary Cost Estimate





CONCEPTUAL
NOT FOR CONSTRUCTON

HDR

CITY OF SANTA BARBARA PUBLIC WORKS

SCALE IN FEET

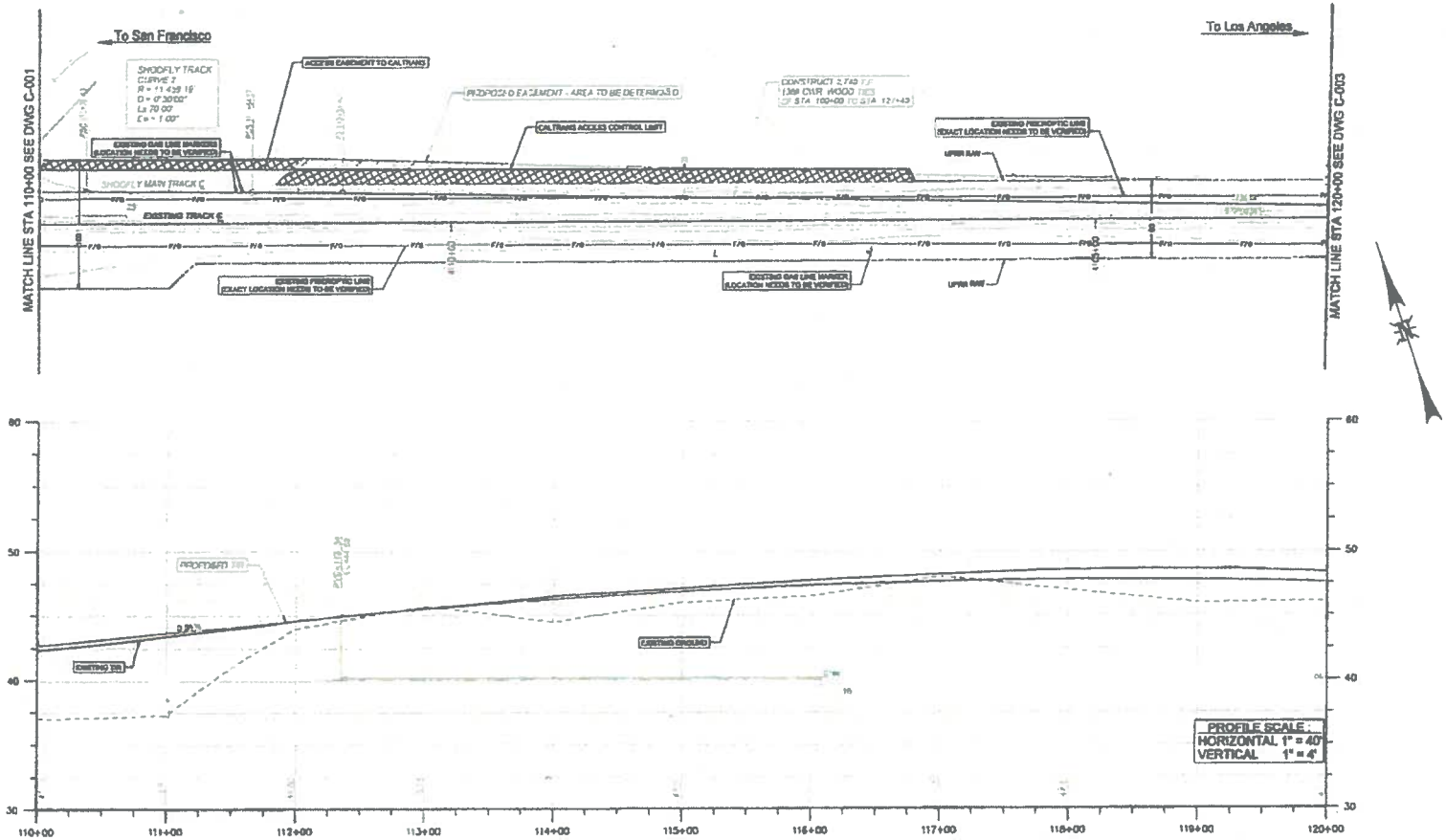
UNION PACIFIC RAILROAD

Office of Assistant Vice President Engineering Design/Construction

CABRILLO BRIDGE REPLACEMENT
SANTA BARBARA, CALIFORNIA
SANTA BARBARA SUBDIVISION, MP 372.95

SHOOFLY TRACK PLAN & PROFILE - NORTH ALIGNMENT

C-001



CONCEPTUAL
NOT FOR CONSTRUCTON

HDR

CITY OF SANTA BARBARA
PUBLIC WORKS

SCALE IN FEET

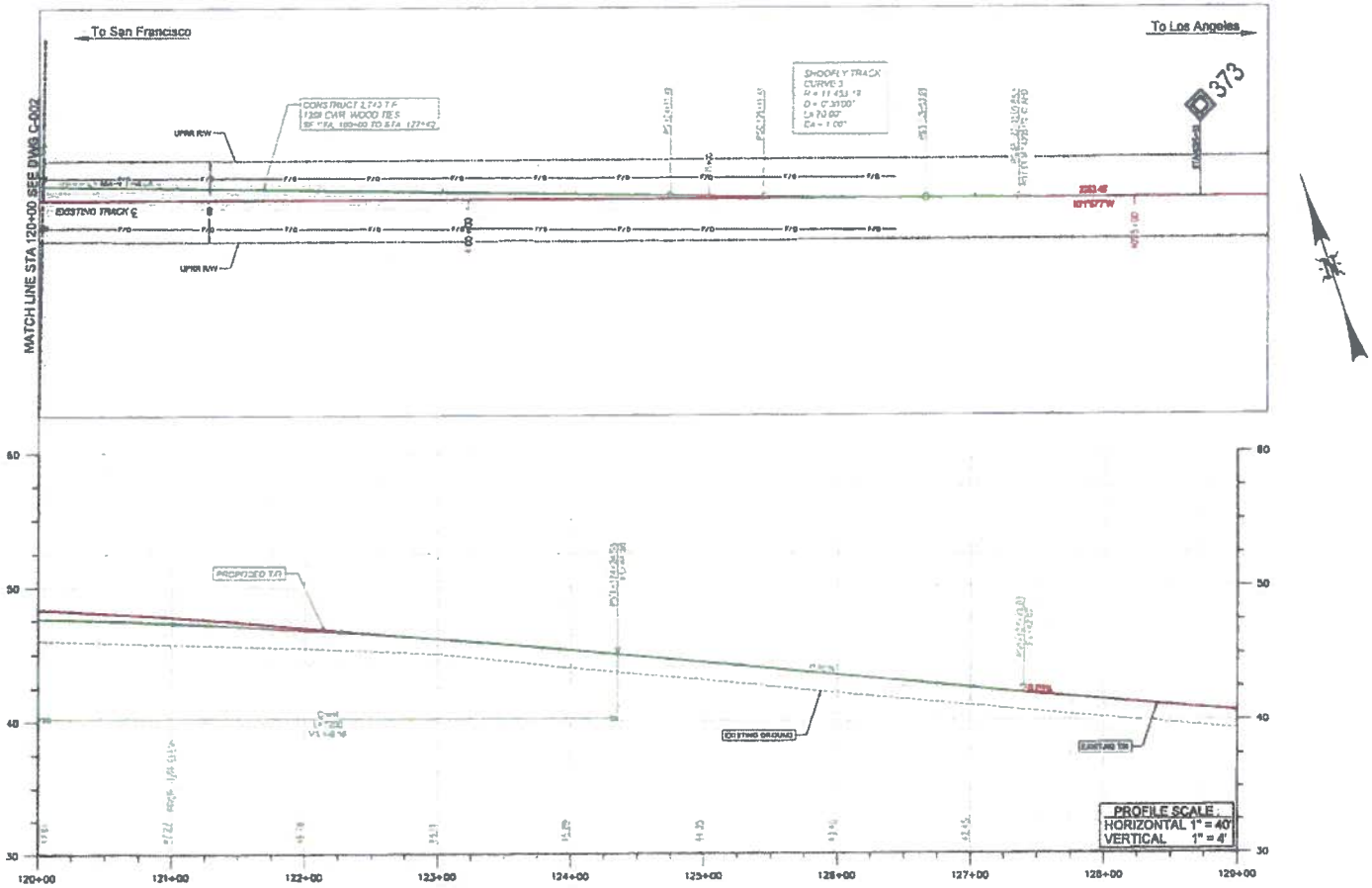
UNION PACIFIC RAILROAD

Office of Assistant Vice President
Engineering Design/Construction

LOCATION & DESCRIPTION: CARRILLO BRIDGE REPLACEMENT
SANTA BARBARA, CALIFORNIA
SANTA BARBARA SUBDIVISION, MP 372.96

SHEET TITLE: SHOOFLY TRACK PLAN & PROFILE - NORTH ALIGNMENT

SHEET NUMBER: C-002



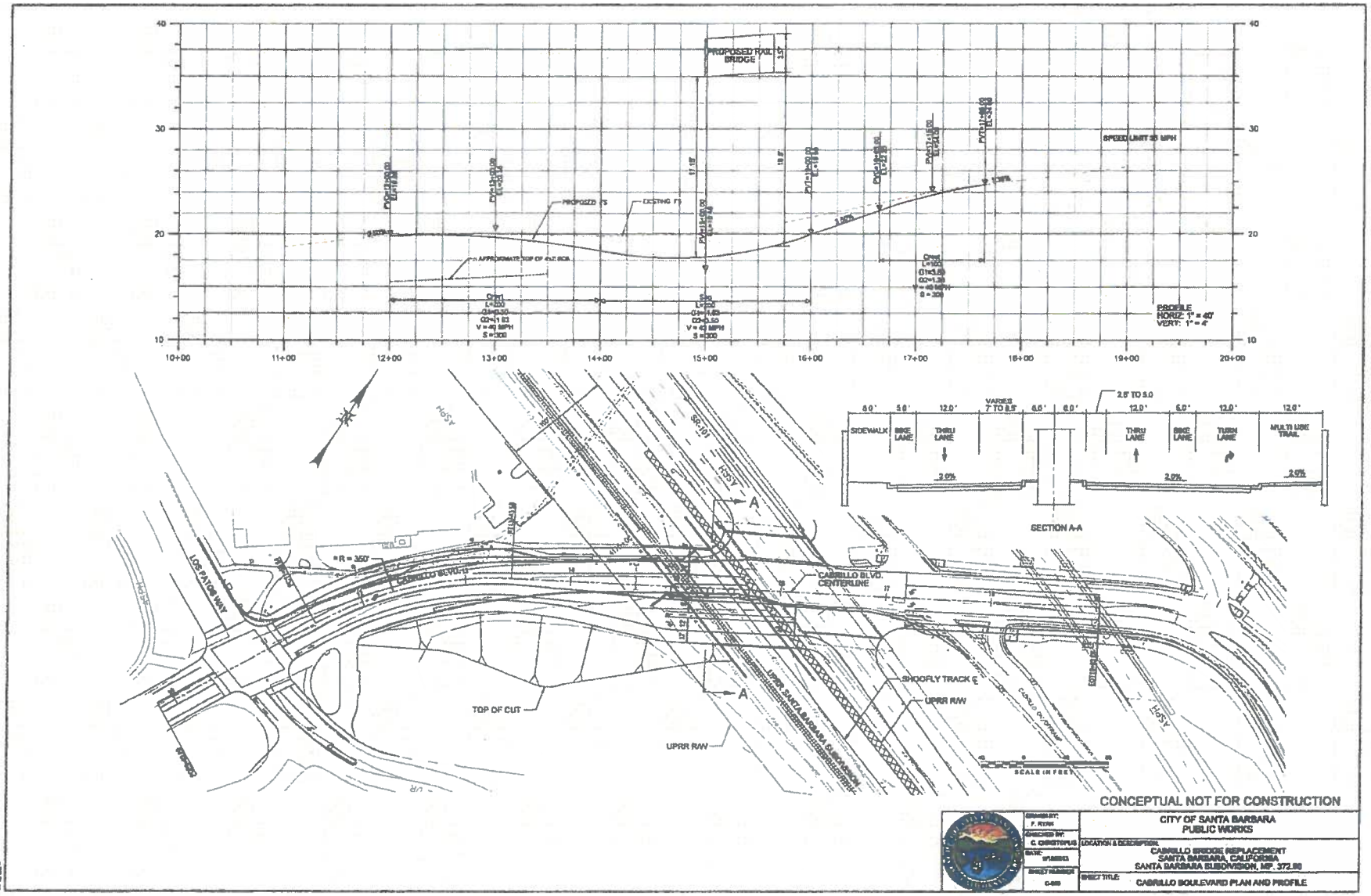
CONCEPTUAL
NOT FOR CONSTRUCTON

HDR

CITY OF SANTA BARBARA
PUBLIC WORKS

SCALE IN FEET

DRAWN BY: F. RYAN	UNION PACIFIC RAILROAD — Office of Assistant Vice President Engineering Design/Construction
CHECKED BY: G. REMMINGER	LOCATION & DESCRIPTION: CABRILLO BRIDGE REPLACEMENT SANTA BARBARA, CALIFORNIA SANTA BARBARA SUBDIVISION, MP 372.98
DATE: 10/09/13	
SHEET NUMBER: C-003	SHEET TITLE: SHOOFLY TRACK PLAN & PROFILE


PROPOSED RAIL BRIDGE
PROPOSED TS
EXISTING TS
APPROXIMATE TOP OF ROCK
SPEED LIMIT 35 MPH
PROFILE
HORIZ: 1" = 40'
VERT: 1" = 4'
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
SIDEWALK
BIKE LANE
THRU LANE
TURN LANE
MULTI USE TRAIL
SECTION A-A
LOS PATOS WAY
CABRILLO BLVD.
CABRILLO BLVD. CENTERLINE
SR-101
TOP OF CUT
UPRR R/W
SHOOFLY TRACK ℄
UPRR SANTA BARBARA SUBDIVISION
SCALE IN FEET
CONCEPTUAL NOT FOR CONSTRUCTION
CITY OF SANTA BARBARA
PUBLIC WORKS
CABRILLO BRIDGE REPLACEMENT
SANTA BARBARA, CALIFORNIA
SANTA BARBARA SUBDIVISION, MP. 372.88
CABRILLO BOULEVARD PLAN AND PROFILE

City of Santa Barbara - Cabrillo Blvd Railroad Bridge Replacement Project

- Engineer's Opinion of Probable Conceptual Project Cost -
10% Submittal - Alternative Shoofly North
December 5, 2014

EXHIBIT 7

Item No.	Description	Unit	Quantity	Unit Cost	Total Cost
	DESIGN				
	Agency Design Admin. (City of Santa Barbara)	%	3.00	CCE	$602,500
	Alternative Analysis & Environmental (3% to 5%)	%	4.00	CCE	$803,400
	Design - Preliminary to 30% (1% to 3%)	%	2.00	CCE	$401,700
	Design - 30% to 60% and Permits (2% to 3%)	%	3.00	CCE	$602,500
	Design - 60% to Final PS&E (2% to 4%)	%	3.00	CCE	$602,500
				Subtotal	***$3,012,600***
	GENERAL				
	Mobilization	LS	1	$700,000	$700,000
	Clearing and Grubbing	LS	1	$200,000	$200,000
	Prepare Storm Water Pollution Prevention Plan	LS	1	$125,000	$125,000
	Implement Storm Water Pollution Prevention Plan	LS	1	$100,000	$100,000
	Storm Water Annual Report	EA	2	$2,000	$4,000
	Air Pollution Control	LS	1	$25,000	$25,000
	Project Schedule	LS	1	$20,000	$20,000
				Subtotal	***$1,174,000***
	CIVIL				
	AC Pavement (6" thick)	TON	1,513	$110	$166,430
	Aggregate Base (6" thick)	CY	773	$60	$46,380
	Hardscape	SF	785	$10	$7,850
	Decomposed Granite (3" thick)	CY	59	$60	$3,540
	Curb and Gutter	LF	1,536	$25	$38,400
	Handicap Ramps	EA	8	$1,500	$12,000
	Crash attenuators	LS	1	$35,000	$35,000
	Street Lighting	LS	1	$50,000	$50,000
	Signing and Striping	LS	1	$10,000	$10,000
	Landscape	LS	1	$100,000	$100,000
	Storm Drain (64" RCP)	LF	300	$150	$45,000
	Catch Basin	EA	3	$7,500	$22,500
	Earthwork	CY	10,000	$15	$150,000
	Remove 8" Water Line	LF	300	$25	$7,500
	Construct 8" Water Line	LF	300	$150	$45,000
	Power Line Relocation	LS	1	$100,000	$100,000
	Modify Traffic Signals	LS	1	$200,000	$200,000
	Remove AC Pavement	SF	33,318	$2	$66,636
	Remove PCC Pavement	SF	1,387	$5	$6,935
	Remove Retaining Wal	LF	329	$50	$16,450
	Remove Existing Bridge	LS	1	$250,000	$250,000
	Remove Storm Drain System (Pipe, Catch Basin, Manholes)	LS	1	$20,000	$20,000
	Remove Street Lighting	EA	3	$10,000	$30,000
				Subtotal	***$1,429,621***
	STRUCTURAL				
	Railroad Bridge (Cabrillo), Including Temporary Shoring	LS	1	$5,200,000	$5,200,000
	Retaining Walls	LS	1	$800,000	$800,000
				Subtotal	***$6,000,000***
	UTILITIES				
	Relocate Fiber Optic Lines (MCI, Sprints, AT&T, Level 3 & Quest)	EA	5	$750,000	$3,750,000
	Encase High Pressure Gas Line	EA	1	$50,000	$50,000
				Subtotal	**$3,800,000**
	RAILROAD TRACKWORK - SHOOFLY				
	FURNISH AND INSTALL TRACK, 136# RE, WOOD TIES INCLUDING BALLAST & OTM	TF	1,600	$350	$560,000
	SHIFT TRACK (WOOD TIES)	TF	1,140	$75	$85,500
	TRACK SUBALLAST	CY	1,725	$40	$69,000
	EMBANKMENTS AND OTHER FILLS	CY	4,800	$20	$96,000
	EXCAVATION	CY	9,900	$20	$198,000
	REMOVE AND SALVAGE WOOD TIES, 136# TRACK	TF	1,600	$40	$64,000
				Subtotal	***$ 1,072,500***
	RAILROAD TRACKWORK - RESTORE TO ORIGINAL ALIGNMENT				
	FURNISH AND INSTALL TRACK, 136# RE, WOOD TIES INCLUDING BALLAST & OTM	TF	1,600	$350	$560,000
	SHIFT TRACK (WOOD TIES)	TF	1,140	$75	$85,500
	TRACK SUBALLAST	CY	1,725	$40	$69,000
	EMBANKMENTS AND OTHER FILLS	CY	1,200	$20	$24,000
	EXCAVATION	CY	4,500	$20	$90,000
	REMOVE AND SALVAGE WOOD TIES, 136# TRACK	TF	1,600	$40	$64,000
				Subtotal	***$ 892,500***
	RAILROAD SIGNAL WORK - Shoofly				
	MISCELLANEOUS SIGNAL WORK (REMOVAL, RECONNECTIONS AND MODIFICATION)	LS	1	$50,000	$50,000
				Subtotal	***$50,000***
	RAILROAD SIGNAL WORK - RESTORE TO ORIGINAL ALIGNMENT	LS	1	$50,000	$50,000
	MISCELLANEOUS SIGNAL WORK (REMOVAL, RECONNECTIONS AND MODIFICATION)			***Subtotal***	***$50,000***

Item No.	Description	Unit	Quantity	Unit Cost	Total Cost
	RAILROAD FLAGGING				
	RAILROAD FLAGMAN	MAN-DAY	400	$1,200	$480,000
				Subtotal	*$480,000*
	SUBTOTAL, RAILROAD WORK PERFORMED =				$2,545,000
	OTHER PROJECT COSTS				
	PERMANENT EASEMENT FROM CALTRANS	SF	2,020	$20	$40,400
	RIGHT OF WAY	SF	18,482	$25	$462,050
				Subtotal	*$502,450*
	ENGINEER'S ESTIMATE OF PROBABLE TOTAL PROJECT COST, WITHOUT CONTINGENCY =				$15,451,071
	30% COST CONTINGENCY =				$4,635,321
	Total Construction Cost =				$20,086,392
	ANCILLARY CONSTRUCTION COSTS				
	Agency Construction Admin.	%	2	CCE	$401,700
	Design Support During Constr. (3% to 4%)	%	3	CCE	$602,500
	Construction Management & Testing	%	10	CCE	$2,008,600
				Subtotal	*$3,012,800*
	Total Project Cost (not escalated) =				$26,111,792
	ESCALATION				
	Escalation to Midpoint of Construction (June 2015) @	3%	1.00	YEAR	$784,000
	Escalation to Midpoint of Construction (June 2016) @	3%	2.00	YEARS	$1,591,000
	Escalation to Midpoint of Construction (June 2017) @	3%	3.00	YEARS	$2,422,000
	Escalation to Midpoint of Construction (June 2018) @	3%	4.00	YEARS	$3,278,000
	Escalation to Midpoint of Construction (June 2019) @	3%	5.00	YEARS	$4,159,000
	Total Project Cost (Escalated to 2017) =				$28,500,000

- Estimated costs shown does not includes the cost to lowering the utility lines underneath the railroad bridge
- Estimate assumes no hazardous materials, either in structures or underground.

Intersection Control Evaluation (ICE) Screening Evaluation

Olive Mill Road / Coast Village Road / US 101 Interchange

Santa Barbara, California

Draft

January 2015

KITTELSON & ASSOCIATES, INC.
TRANSPORTATION ENGINEERING/PLANNING

This Intersection Control Evaluation has been prepared under the direction of the following registered civil engineer. The registered civil engineer attests to the technical information contained herein and the engineering data upon which recommendations, conclusions, and decisions are based.

REGISTERED PROFESSIONAL ENGINEER
SEAN T. HOUCK
No. C59500
CIVIL
STATE OF CALIFORNIA

SEAN T. HOUCK, P.E., Registered Civil Engineer *DATE*

Intersection Control Evaluation (ICE) Screening Evaluation

Olive Mill Road / Coast Village Road / US 101 Interchange

Santa Barbara, California

Prepared For:
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Project No. 17493

January 2015

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Olive Mill Road / Coast Village Road / US 101 Interchange

INTERSECTION CONTROL EVALUATION: SCREENING SUMMARY

Kittelson & Associates, Inc. (KAI) conducted an Intersection Control Evaluation (ICE) to objectively evaluate and screen intersection control and access alternatives at the following intersection(s):

US 101 Northbound Off-Ramp Terminal / US 101 Southbound On-Ramp Terminal / Olive Mill Road / Coast Village Road / North Jameson Road

The control options include:

- Traffic signal control
- Roundabouts
- Stop control (existing)

The City of Santa Barbara, County of Santa Barbara, and Caltrans jointly own and operate the intersection. Operationally, the roundabout configuration is the most likely, viable alternative to serve forecast traffic. The existing stop-control or, no project alternative, is a feasible traffic control alternative for the near term but will degrade over time with queues exceeding available storage capacity of the existing northbound off-ramp. Signal control is not a viable alternative considering the project constraints given for this evaluation. There may be other considerations, constraints, and project factors identified in future design evaluations that could affect the prioritization of a specific configuration.

The intersection evaluation considered year 2040 "build" condition traffic operations, geometrics, constraints, and other design considerations.

KEY FINDINGS INCLUDE:

- The Caltrans District 5 ICE coordinator has reviewed the initial roundabout concept and agrees the project is viable to move forward into further analysis. No fatal flaws have been identified in this phase.
- Roundabout control type would provide superior AM/PM peak hour operations over either the stop controlled or the signal controlled alternatives.
- The roundabout alternative preserves the existing US 101 overpass bridge.
- The roundabout alternative would simplify the existing intersection and reduce the number of decision points.
- Traffic signal operations would not be acceptable for the existing nor 2040 design year. Stop control operations would not be acceptable for the 2040 design year.
- With stop control, queues lengths on the US-101 northbound off ramp will exceed the available storage in year 2022, and spillback would affect mainline operations.
- The roundabout alternative would not require right of way acquisition. The signal alternative is fatally flawed given the project constraints.

Figure 1. Site Vicinity Map

The roundabouts will provide speed control and the required sight distance, as well as accommodate traffic movements for the California Truck, Bus 45, and emergency response design vehicles. The roundabout alternative allows for less complex guide signing through the intersection. Additionally, the roundabout alternative has better expected safety performance than the traffic signal and stop control alternatives.

KAI recommends the roundabout alternative be advanced as viable intersection control and access strategies for the Olive Mill Road / Coast Village Road / US 101 Intersection.

Table 1 provides a summary of the operations comparison and Figure 2 displays the roundabout alternative concept design.

Table 1. Year 2040 Operations Comparison

Year 2040 Existing Stop Control	Year 2040 Signal Control	Year 2040 Roundabout Control
• **Over capacity** • **LOS F in the a.m. peak hour with average delay of 71 seconds** • **LOS F in the p.m. peak hour with average delay of 57 seconds** • **Inadequate queue storage**	• **Over capacity** • **LOS F in the a.m. peak hour with average delay of 124 seconds** • **LOS F in the p.m. peak hour with average delay of 209 seconds** • **Inadequate queue storage**	• Under capacity • LOS B in the a.m. peak hour with average delay of 10 seconds • LOS B in the p.m. peak hour with average delay of 14 seconds • Adequate queue storage

Bold indicates unacceptable operations

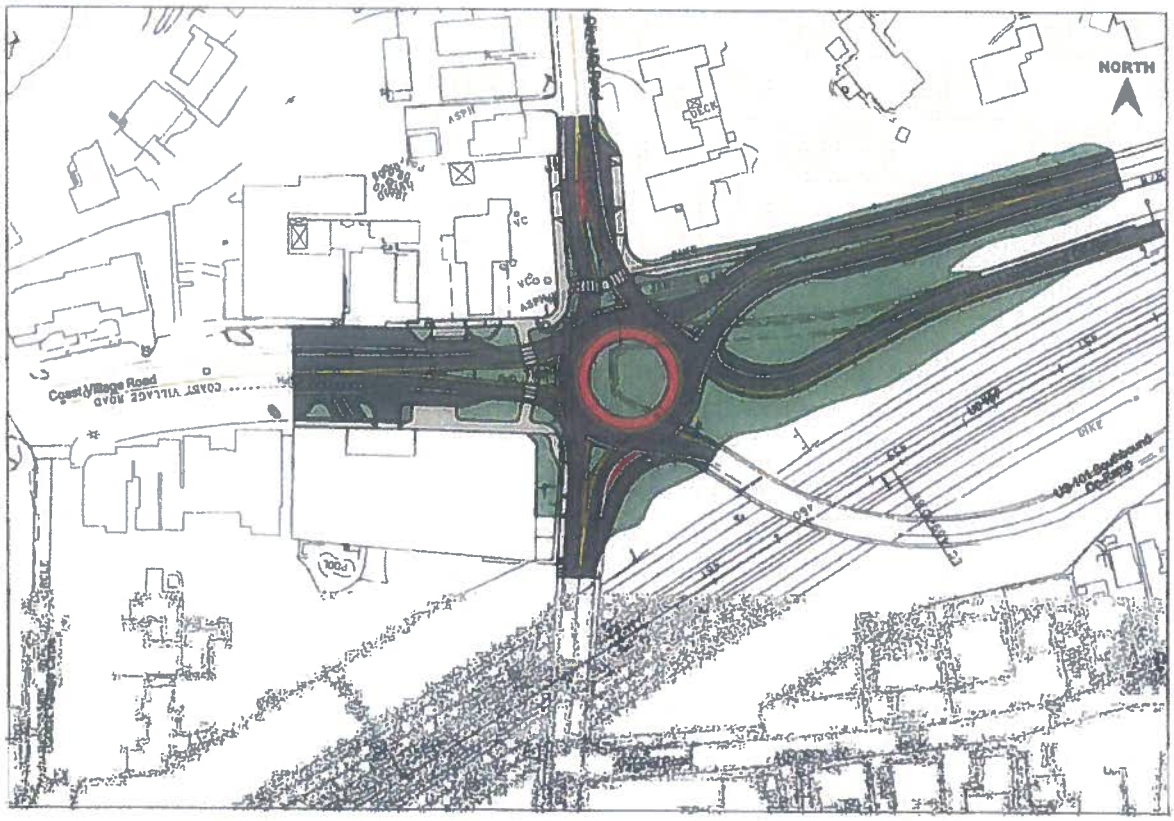

Figure 2. Roundabout Alternative Concept Design

INTRODUCTION

PROJECT OVERVIEW

This Intersection Control Evaluation (ICE) objectively evaluates alternatives for the intersection control form at the Olive Mill Road / Coast Village Road / US 101 interchange.

Figure 3 displays the site vicinity map.

This document explores intersection control alternatives at the study intersection. Three project alternatives were analyzed as described in this ICE:

- Stop Control Intersection (Existing Condition)
- Signalized Intersection
- Roundabout Intersection

PROJECT CONTEXT

The project context identifies the transportation facilities and geometric characteristics of the roadways within the study area. Table 2 describes the study area roadways.

As seen in Figure 3, the Olive Mill Road / Coast Village Road / US 101 interchange is an interchange controlled by stop signs on all approach legs. The stop limit-lines for the southbound and northbound Olive Mill Road approach are approximately 145 feet apart. The Coast Village Road, US 101 Off-Ramp, US 101 On-Ramp, and the N. Jameson Road approaches all fall within the intersection defined by the Olive Mill Road stop limit-lines.

The Coast Village Road leg is a gateway to the City of Santa Barbara and the Coast Village Business District.

All parcels in the immediate vicinity of the project are developed.

Table 2: Study Area Roadways

Roadway	Corridor Context				Multimodal Transportation		
					Transit Service	Active Transportation Links	
	Cross Section	Functional Classification	Speed Limit	Regional Context		Pedestrian Considerations	Bicycle Routes
Olive Mill Road **(City of Santa Barbara and County of Santa Barbara)**	Undivided two-lane	Local Street	40 mph North of US Hwy 101 30 mph south of US Hwy 101	Serves local communities to the north and south of the study area Serves tourist and recreation destinations to the south and west of the study area	Local transit service is operated by MTD Santa Barbara in the study area. Service is provided via the Line 14 – Montecito north of the study intersection. A bus stop is located just north of N. Jameson Road.	Sidewalks are provided along the west side of Olive Mill Road within the City of Santa Barbara. Consistent with Montecito Association guidelines, sidewalks are not provided within the County of Santa Barbara.	Class II bicycle lanes are provided north of N. Jameson Road

Roadway	Corridor Context				Multimodal Transportation		
					Transit Service	Active Transportation Links	
	Cross Section	Functional Classification	Speed Limit	Regional Context		Pedestrian Considerations	Bicycle Routes
Coast Village Road **(City of Santa Barbara)**	Undivided two-lane On-street angled parking	Commercial, shopping, entertainment. corridor	Not Posted	Serves local communities to the west. Gateway to Santa Barbara. Serves local and tourist shopping, entertainment, professional, and lodging services to the west. Alternate, parallel route to US 101	Local transit service is operated by MTD Santa Barbara in the study area. Service is provided via the Line 14 – Montecito. A bus stop is located just west of Olive Mill Road.	Sidewalks are provided along both sides	Class II bicycle lanes are provided
North Jameson Road **(County of Santa Barbara)**	Undivided two-lane	Local Street	40 mph	Serves local communities to the east. Serves local and tourist shopping, entertainment, professional, and lodging services to the west. Alternate, parallel route to US 101	None	None. Potential pedestrian destination limited to north of N. Jameson Road midblock. Consistent with Montecito Association guidelines, sidewalks are not provided within the County of Santa Barbara.	Class II bicycle lanes are provided
US 101	Four-lane divided highway	Highway		Bisects the City of Santa Barbara to provide north-south service through the City and to regional destinations	None	None	None

Figure 3. Study Area and Existing Study Intersection Lane Configuration

© 2013 Google

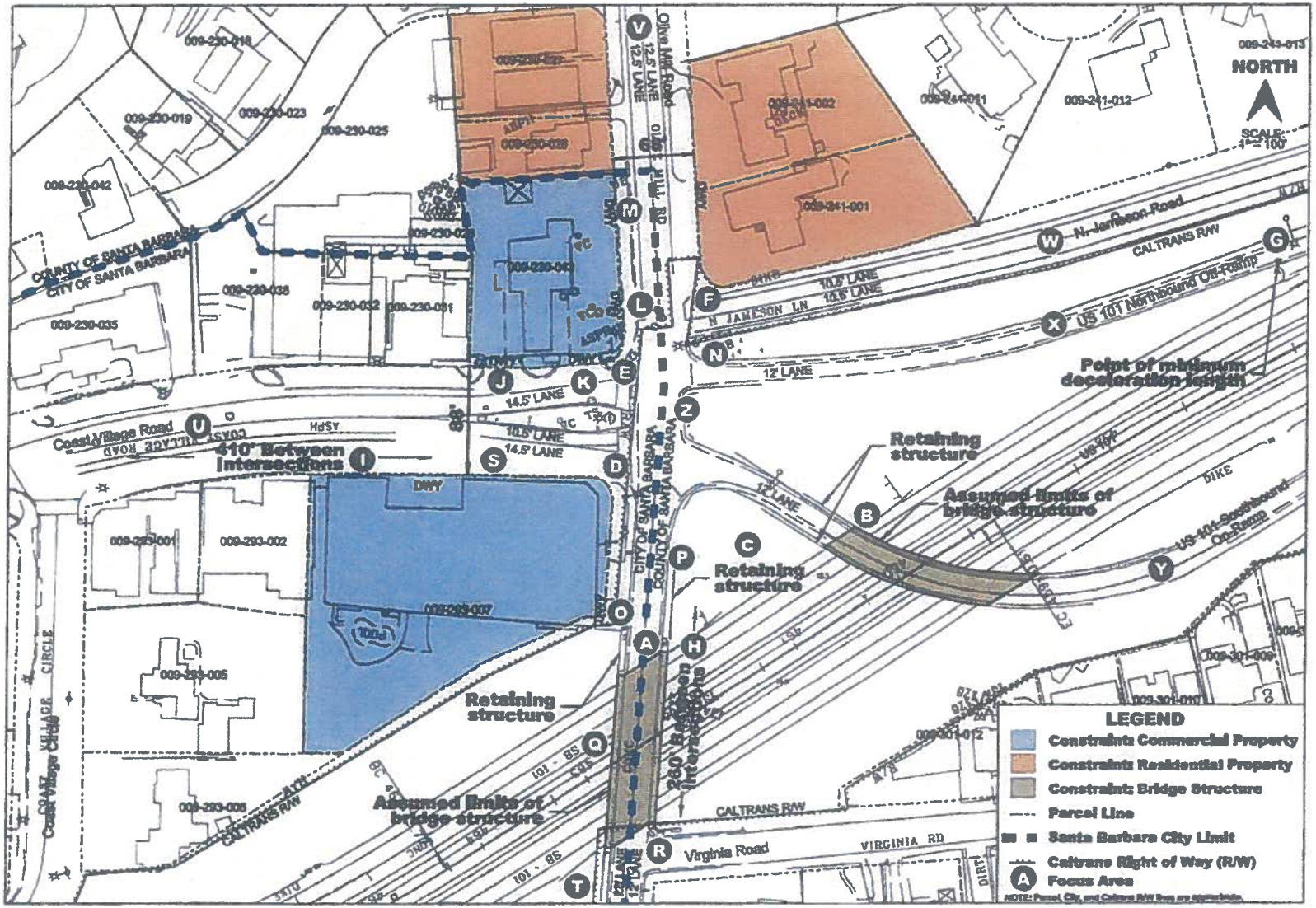

Figure 4: Existing Conditions and Constraints

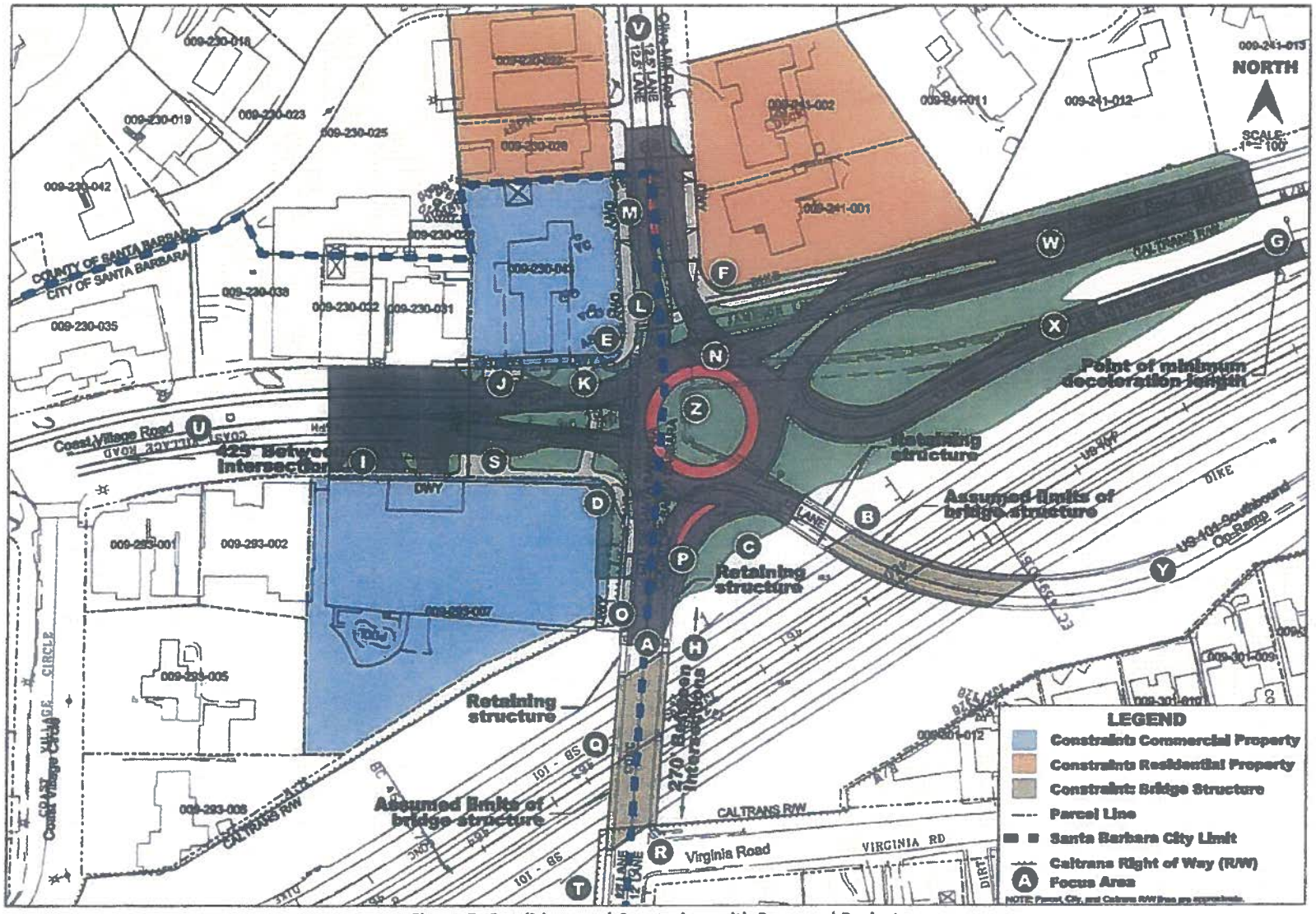

Figure 5: Conditions and Constraints with Proposed Project

PLANNING AND DESIGN FRAMEWORK

EXISTING CONDITIONS AND DESIGN CONSTRAINTS

The following section and Table 3 describe the existing conditions and constraints identified in Figure 4 and Figure 5.

RIGHT OF WAY

The project intersection is bisected by the City of Santa Barbara to the west and the County of Santa Barbara to the east. The centerline of Olive Mill Road is the approximate location of the jurisdictional boundary.

Caltrans right of way generally follows the southerly fence line of N. Jameson Road and the westerly back of sidewalk of Olive Mill Road. Right of extends to a portion of Olive Mill Road north of N. Jameson Road. The existing intersection is largely within Caltrans R/W.

Table 3: Existing Conditions and Design Constraints

BOLD indicates either a fatal flaw identified by the City of Santa Barbara or a deviation from Caltrans Highway Design Manual (HDM) advisory or mandatory design standards effective September 22, 2014.

Focus Area	Description	HDM Design Deviation Alt.1/Alt.2	Alt. 1 Existing (Figure 4)	Alt. 2 Proposed Roundabout (Figure 5)
A	Olive Mill Bridge	No/No	• **Potential Design Constraint / Fatal Flaw if altered** •	• No impact • Preserves existing bridge
B	US 101 Southbound On-Ramp Bridge	No/No	• **Potential Design Constraint / Fatal Flaw if altered** •	• No impact • Preserves existing bridge
C	Retaining Structure Easterly side of Olive Mill Road	No/No	• Cost consideration if modified	• New retaining structure will be required. The cost and magnitude of the structure will be influenced by Focus Area P.
D	Montecito Inn Parcel 009-293-007	No/No	• **Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed**	• No significant impact • Landscape modifications may be needed to accommodate landscaping and sidewalk
E	76 Service Station Parcel 009-230-043	No/No	• **Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed**	• No significant Right of Way impact • **Significant access impact. Access for fuel trucks may be may be significantly impacted. Refer to Focus Areas K and L.** • Landscape modifications may be needed to accommodate landscaping and sidewalk. • Improvements will likely replace existing sidewalk within parcel.
F	Private Residence Parcel 009-241-001	No/No	• **Potential Right of Way Constraint / Fatal Flaw if additional Right of Way needed**	• No impact • Improvements do not encroach

Focus Area	Description	HDM Design Deviation Alt.1/Alt.2	Alt. 1 Existing (Figure 4)	Alt. 2 Proposed Roundabout (Figure 5)
G	**Northbound Off-Ramp Deceleration Length**	**No/Unlikely**	• **First curve radius = 650 feet (approx.)** • Curve is approx. 420 feet from gore	• **Design Deviation Unlikely** • There is sufficient length to accommodate a variety of alignments to approach the roundabout. • As shown, the first curve radius is 500 feet with approx. 420 deceleration length. • Future studies should evaluate horizontal and vertical approach alignments that balance superelevation requirements, retaining structure costs, roundabout geometric guidance, intersection sight line angles, and ramp deceleration length.
H	Distance to Virginia Road from southbound US 101 on-ramp	**Yes/Yes**	• **Existing deviation from Mandatory Design Standard** for HDM Topic 504.3 (3) • Curb return to curb return distance is less than 400 feet	• **Maintains deviation from Mandatory Design Standard** with minor improvement over existing • Distance from ICD to curb return, measured at Olive Mill Road centerline is 270 feet.
I	Distance to Coast Village Circle from Olive Mill Road	**Yes/Yes**	• **Existing deviation from Advisory Design Standard** for HDM Topic 504.3 (3) • Curb return to curb return distance is less than 500 feet but greater than 400 feet.	• **Maintains deviation from Advisory Design Standard** with minor improvement over existing • Distance from ICD to curb return, measured at Coast Village Road centerline is 425 feet.
J	Driveway APN 009-230-043	**Yes/Yes**	• **Existing deviation from Advisory Design Standard** for HDM Topic 504.8 • Curb return to curb return distance is less than 100 feet but greater than 50 feet	• **Maintains deviation from Advisory Design Standard** • Distance from ICD to driveway, measured at Coast Village Road centerline is 80 feet.
K	Driveway APN 009-230-043	**Yes/No**	• **Existing deviation from Mandatory Design Standard** for HDM Topic 504.8 • Curb return to curb return distance is less than 50 feet	• Deviation from Mandatory Design Standard is not needed with this alternative. • Driveway is removed with this concept
L	Driveway APN 009-230-043	**Yes/No**	• **Existing deviation from Mandatory Design Standard** for HDM Topic 504.8 • Curb return to curb return distance is less than 50 feet	• Deviation from Mandatory Design Standard is not needed with this alternative. • Driveway is removed with this concept
M	Driveway APN 009-230-043	**Likely/No**	• May be an **Existing deviation from Advisory Design Standard** for HDM Topic 504.8 • Curb return to curb return distance may be less than 100 feet but is greater than 50 feet	• Either maintains existing deviation or a new deviation from Advisory Design Standard may be needed with this alternative. • Driveway location may be 85 feet from ICD to driveway measured along the proposed Olive Mill Road centerline.
N	Distance to N. Jameson Road	**Yes/No**	• **Existing deviation from Mandatory Design Standard** for HDM Topic 504.3 (3) • Curb return to curb return distance is less than 400 feet	• Deviation from Mandatory Design Standard is not needed with this alternative • N. Jameson Road is realigned to become a part of the ramp terminal intersection

Focus Area	Description	HDM Design Deviation Alt.1/Alt.2	Alt. 1 Existing (Figure 4)	Alt. 2 Proposed Roundabout (Figure 5)
O	Driveway APN 009-293-007	**Yes/Yes**	• **Existing deviation from Advisory Design Standard** for HDM Topic 504.8 • Curb return to curb return distance is less than 100 feet but is greater than 50 feet	• **Maintains deviation from Advisory Design Standard** • Distance from ICD to driveway, measured at Coast Village Road centerline is approximately 90 feet.
P	Pedestrian access though easterly side of intersection	No/No	• Accessible pedestrian facilities are not provided along the easterly side of Olive Mill Road between the bridge and N. Jameson Road.	• No change in pedestrian route • Accessible pedestrian facilities are not proposed, as illustrated. • Accessible pedestrian facilities could be provided through intersection. If provided, cost of retaining structure identified in Focus Area C will likely increase. • Also see Focus Areas Q and R
Q	Pedestrian access on Olive Mill Road bridge	No/No	• Accessible pedestrian facilities exist on both sides of bridge	• No change
R	Pedestrian access at intersection of Virginia Road and Olive Mill Road	No/No	• Curb ramps and crosswalks are not present	• Refer to Focus Area P • Northbound pedestrians should be routed to the westerly side of Olive Mill Road if pedestrian facilities are not provided on the easterly side of the project intersection
S	Bus stop with turnout bay	No/No	• Consideration for all proposed improvements	• Bus stop with turnout bay is improved at existing location
T	Olive Mill Road, South Leg	No/No	• 12 foot lanes • 2 foot shoulders • 5 foot sidewalk along westerly side • No crosswalk at study intersection	• No Change • No Change • No Change • No Change • Right turn lane with mountable channelization added at intersection • Splitter island

U	Coast Village Road, West Leg	No/No	• At intersection
			  o Eastbound 10.5 foot left turn lane
			  o Eastbound 14.5 foot through and right turn lane
			  o Westbound 14.5 foot lane
			  o Crosswalk
			  o Variable width median with pedestrian refuge
			• 12 foot eastbound lane
			• 17 foot westbound lane
			• 6 foot bicycle lanes
			• On-street, angled parking
			• Sidewalks
				• At intersection
				  o Removed
				  o 12 foot eastbound left-through-right lane
				  o Westbound 12 foot lane
				  o No change
				  o No change
				• No change
				• No change
				• No change
				• No change
				• No change

V	Olive Mill Road, North Leg	No/No	• 12.5 foot lanes • 5 foot Class II bicycle lanes • Sidewalk along APN 009-230-043 only • No crosswalk at intersection	• 12 foot lanes • No change • Add 50 feet of sidewalk along easterly side, north of intersection • Add crosswalk • Add splitter island with mountable median at Focus Area M
W	N. Jameson Road, Northeast Leg	No/No	• 10.5 foot lanes • 5 foot Class II bicycle lanes • No sidewalks • No crosswalk at intersection	• 12 foot lanes • No Change • 110 foot sidewalk/path along northerly side, east of intersection • No Change • Splitter island

Focus Area	Description	HDM Design Deviation Alt.1/Alt.2	Alt. 1 Existing (Figure 4)	Alt. 2 Proposed Roundabout (Figure 5)
X	**US 101 Northbound Off-Ramp, East Leg**	Possible*/ No	• 12 foot lane • 8 foot right shoulder • 2 foot left shoulder* * Assumes concurrence for restrictive condition per Note (2), Table 302.1 in HDM	• No change • No change • 4 foot left shoulder
Y	US 101 Southbound On-Ramp, Southeast Leg	Possible*/ Possible*	• 12 foot lane • 8 foot right shoulder • 2 foot left shoulder* * Assumes concurrence for restrictive condition per Note (2), Table 302.1 in HDM	• No change • No change • No change*
Z	Design Vehicle (DV) Refer to Figures in Appendix A	No/No	• DV: CA Truck o Right turns: Limited - DV will encroach into oncoming traffic lane. o Left turns: Possible with 1 Limitation – Left turn from southbound Olive Mill Road to N. Jameson Road, trailer will track into westbound lane. o US 101 Northbound Off-Ramp to N. Jameson Road: Not Possible o Eastbound Olive Mill Road to N. Jameson Road: Limited – DV will track into opposing westbound N. Jameson lane	• DV: CA Truck o Right turns: Possible. o Left turns: Possible. o US 101 Northbound Off-Ramp to N. Jameson Road: Possible if DV circulates through roundabout. o Eastbound Olive Mill Road to N. Jameson Road: Possible.

CRASH DATA AND OPERATING SPEEDS

Existing crash data was not reviewed as part of this effort. Vehicle speed data was not collected as part of this effort. If physical and operational constraints assessments presented herein do not inform the ICE process, these factors could be examined at a later time.

SPECIAL EVENTS

The Santa Barbara Triathlon course goes through this intersection from Olive Mill Road (south leg) to Jameson Road.

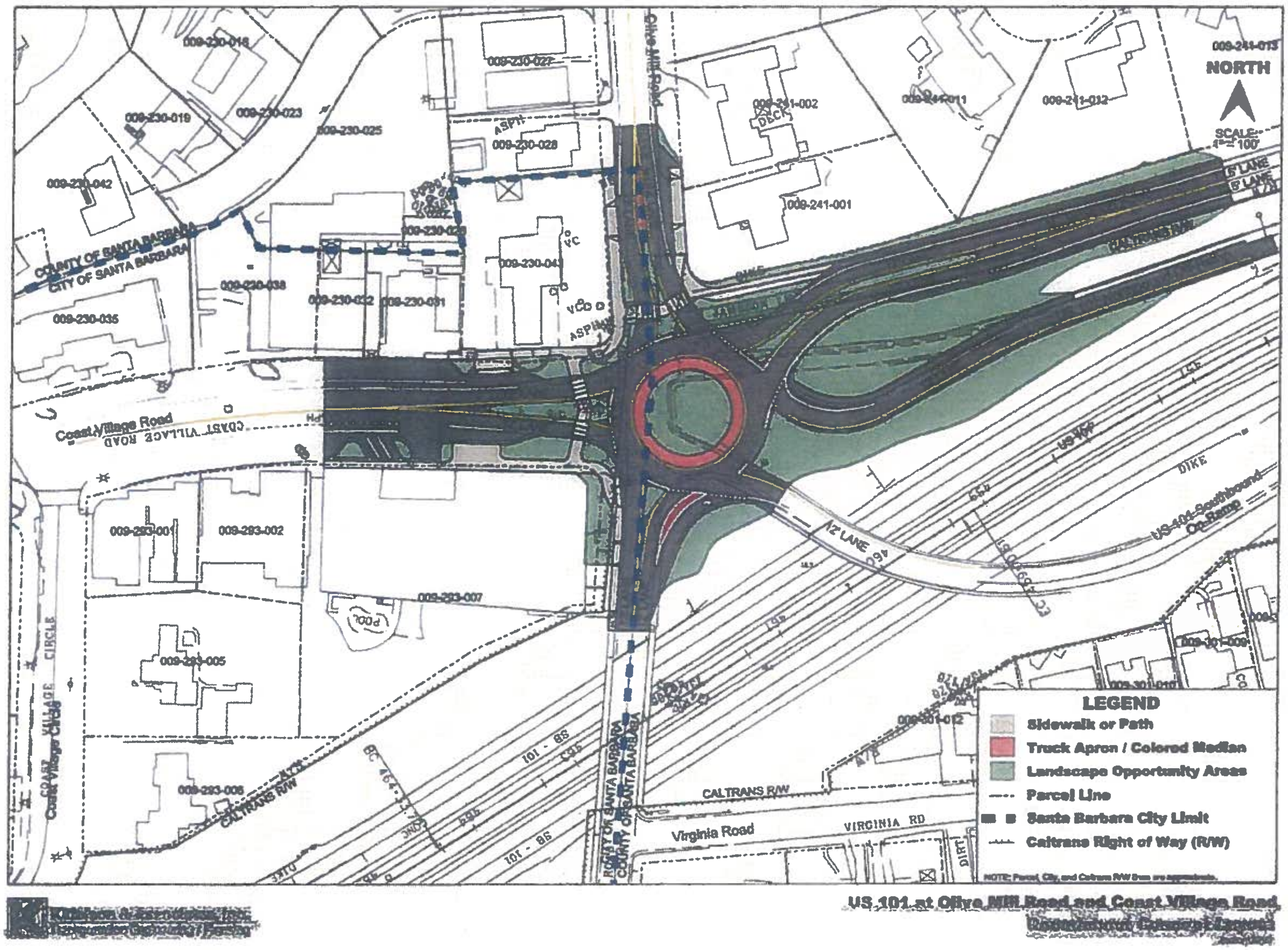

Figure 6: Proposed Roundabout Project

TRAFFIC CONTROL STRATEGIES, CONSIDERATIONS, AND PERFORMANCE ANALYSES

Traffic control alternatives evaluated as part of this ICE include:

- Retaining the existing intersection control and geometry. This alternative would retain all-way stop control (AWSC) at the intersection.
- Converting the intersection to signal control.
- Converting the intersection to a roundabout.

AWSC and signal alternatives with new geometric configurations are not identified in this study. Geometric modifications for AWSC and signal control are not considered feasible due to the operational constraints identified as fatal flaws (i.e., queue spill-back onto the US-101 off-ramp).

Using operations methodologies consistent with the *US 101 HOV PA-ED* (dated December 2011) described in Appendix C, KAI evaluated the traffic control alternatives. The analysis results for each intersection are presented below. Supporting material, including more detailed operations results and the operations analysis worksheets can also be found in Appendix C.

ANALYSES RESULTS

All-Way Stop Control with Existing Geometry

The AWSC with existing geometry alternative assumes the existing lane configuration remains the same under year 2040 conditions. Under year 2040 conditions, the intersection is projected to operate over capacity. Queues on the US 101 Northbound Off-Ramp will exceed available storage during the weekday a.m. and p.m. peak hours.

Given the limitations of existing state-of-the-art operational software combined with the a-typical geometric design of the current interchange, two analysis approaches have been developed to analyze the AWSC conditions of the Olive Mill interchange. A static analysis using SYNCHRO was applied in the US101 HOV PA-ED study (with Modified F Configuration at Cabrillo Hot-Springs) which analyzed the Olive Mill interchange as three distinct and separate TWSC intersections (NB Off-Ramp/Olive Mill Road; North Jameson Lane/Olive Mill Road; and SB On-Ramp/Olive Mill Road). This analysis determined that the NB Off-Ramp and SB On-Ramp portions of the interchange failed (LOS E/F). For this ICE determination, a VISSIM micro-simulation model calibrated to site specific conditions with field measured flow rates and queue lengths was developed which holistically analyzed interchange operations (as one unified intersection). All capacity analysis results presented in this memo for all-way stop control were determined using the microsimulation model. Both approaches yielded similar/consistent results i.e., LOS E/F under 2040 conditions.

Signal Control with Existing Geometry

The signal control alternative with existing geometry alternative assumes the existing lane configuration remains the same under year 2040 conditions. Under year 2040 conditions, the intersection is projected to operate over capacity with significant queuing during the weekday a.m. and p.m. peak hours.

Roundabout Control

A roundabout configuration was evaluated to determine lane configurations needed to support the 2040 design year conditions. The proposed roundabout lane configuration is shown in Figure 7. The proposed roundabout is projected to operate with a volume to capacity (v/c) ratio of 0.77 or less on all approaches for year 2040 build conditions, with the US 101 Northbound Off-Ramp as the critical approach during the p.m. peak hour.

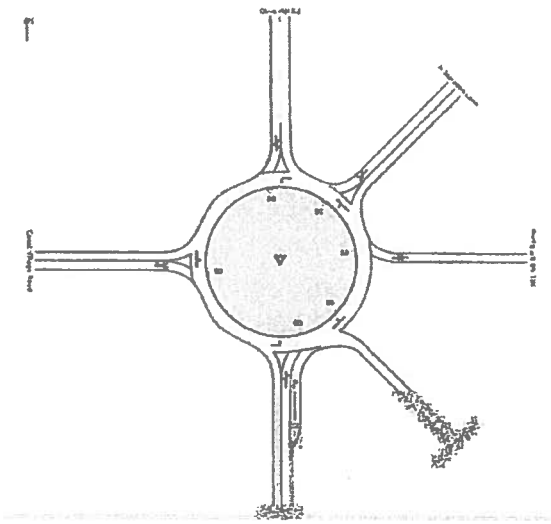

Figure 7. Proposed Roundabout Lane Configuration

Roundabout vs. AWSC and Signal Comparison

Comparing these models to the year 2040 intersection operations shows the roundabout to be the configuration with better predicted operational performance and no identified fatal flaws. Under AWSC and signalized conditions, the intersection is expected to exceed capacity and experience significantly greater delays than under the roundabout alternative. Further, any mitigated geometry alternatives to the AWSC and signal control options would exceed given right of way constraints and would be considered fatally flawed.

Table 4: Existing (2014) Operations

Approach	Movement*	Delay (seconds/vehicle)		95th % Queue (feet)[1]		Storage (feet)[2]	Adequate Storage (Yes/No)
		AM	PM	AM	PM		
Northbound – Olive Mill Road	L/T/R	**29.1 (D)**	**31.2 (D)**	150	225	275	Yes
Westbound – US-101 NB-Off Ramp	L/T/R	**58.9 (F)**	**30.8 (D)**	325	125	750	Yes
Westbound – Jameson Lane	L/T/R	22.4 (C)	14.4 (B)	100	75	710	Yes
Southbound – Olive Mill Road	L/T/R	**29.1 (D)**	**31.2 (D)**	150	225	720	Yes
Eastbound – Coast Village Road	Left	17.4 (C)	**58.6 (F)**	100	1425	410	**No**
	T/R	23.0 (C)	**35.1 (E)**	150	1600	150	**No**

*Movement Key: L=Left turn, T=Through, R=Right turn.
1. Rounded up to the nearest 25 feet
2. Storage = Available storage
Bold and shaded indicates inadequate condition

Table 5. Year 2040 Operations Comparison

	Existing All Way Stop Control*			Signal Control*			Roundabout Control**		
Time Period	Volume to Capacity Ratio	Delay (seconds/ vehicle)	Queue Length (feet)	Volume to Capacity Ratio	Delay (seconds/ vehicle)	Queue Length (feet))	Volume to Capacity Ratio	Delay (seconds/ vehicle)	Queue Length (feet))
AM	0.542	71.6 (LOS F)	> 1000 (E)	>1.00	112.5 (LOS F)	700 (S)	0.421	9.6 (LOS A)	100 (E)
PM	0.676	58.3 (LOS F)	> 1000 (E)	> 1.00	162.3 (LOS F)	775 (S)	0.555	13.7 (LOS B)	250 (W)

*Overall intersection operations shown for the all way stop control and signalized alternatives
**Critical movement volume to capacity ratio and overall intersection average delay shown for each alternative

SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

SUMMARY

Kittelson & Associates, Inc. (KAI) conducted an Intersection Control Evaluation (ICE) to objectively evaluate and screen intersection control and access alternatives at the following intersection(s):

- US 101 Northbound Off-Ramp Terminal / US 101 Southbound On-Ramp Terminal / Olive Mill Road / Coast Village Road / North Jameson Road

The control options include:

- Traffic signal control
- Roundabouts
- Stop control (existing)

The intersection evaluations considered year 2040 traffic operations, geometrics, constraints, and other design considerations.

INTERAGENCY COORDINATION

Review of the project concept geometry and operations were conducted with project stakeholders and KAI. Project stakeholders include City of Santa Barbara, County of Santa Barbara, Santa Barbara County Association of Governments (SBCAG), and Caltrans. The following reviews were conducted:

1. Meeting 1, July 9, 2014. Santa Barbara North County Public Works Conference Room, Orcutt, CA.
2. Meeting 2, November 12, 2014. City of Santa Barbara Public Works Main Conference Room, Santa Barbara, CA.
3. Draft ICE document review, January 2015.

CONCLUSIONS

Key findings include:

- The Caltrans District 5 ICE coordinator has reviewed the initial roundabout concept and agrees the project is viable to move forward into further analysis. No fatal flaws have been identified in this phase.
- Roundabout control type would provide superior AM/PM peak hour operations over either the stop controlled or the signal controlled alternatives.
- The roundabout alternative preserves the existing US 101 overpass bridge.
- The roundabout alternative would simplify the existing intersection and reduce the number of decision points.
- Traffic signal operations would not be acceptable for the existing nor 2040 design year. Stop control operations would not be acceptable for the 2040 design year.
- With stop control, queue lengths on the US-101 northbound off ramp will exceed the available storage in year 2022, and spillback would affect mainline operations. The roundabout alternative would not require right of way acquisition. The signal alternative is fatally flawed given the project constraints.

RECOMMENDATIONS

KAI recommends the roundabout alternatives be advanced as viable intersection control and access strategies for the Olive Mill Road/Coast Village Road/US-101 Interchange intersection.

REFERENCES

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3. Transportation Research Board, Highway Capacity Manual 2010, 2010.
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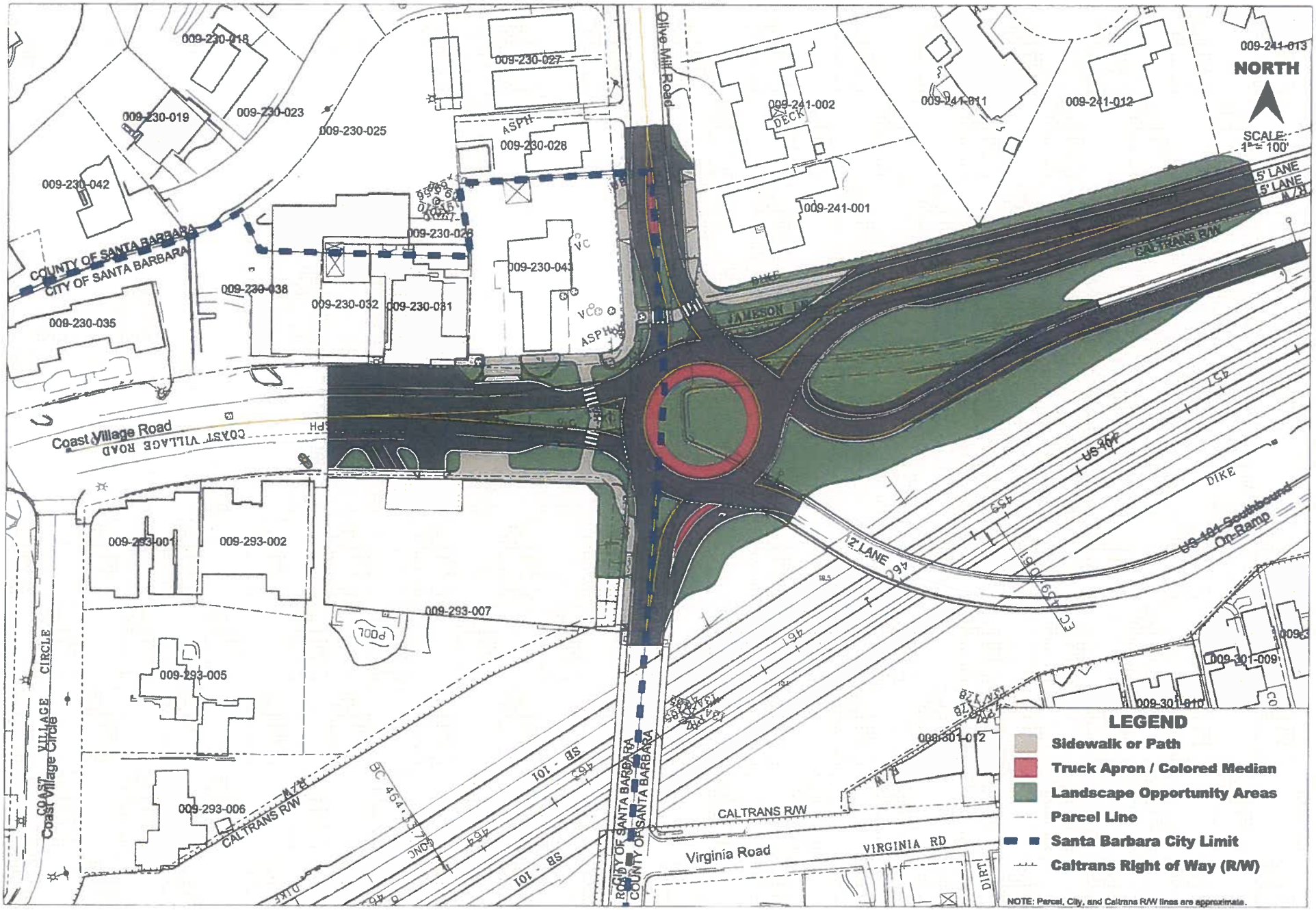
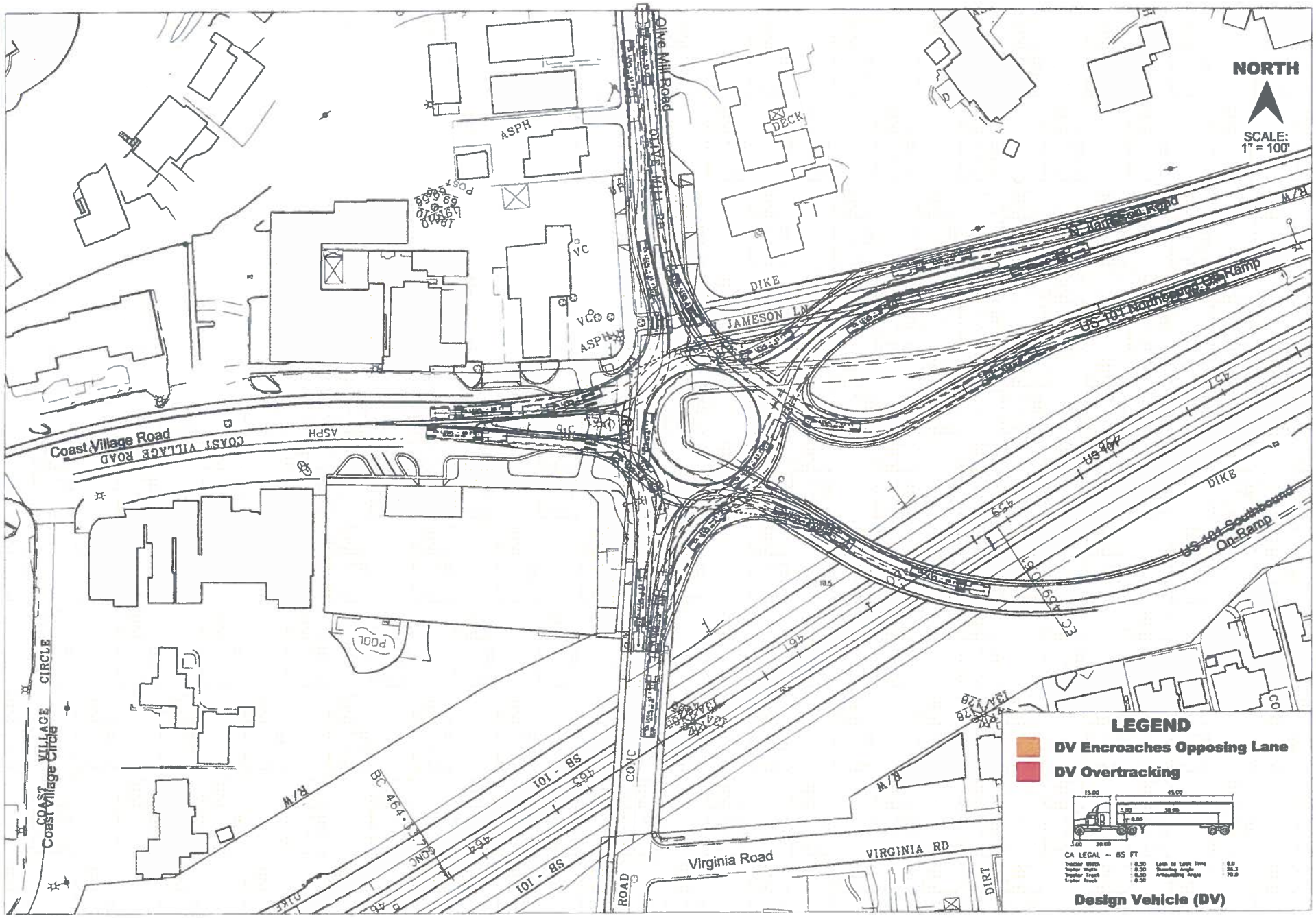
Appendix A
Conceptual Roundabout Layouts



Kittelson & Associates, Inc.
Transportation Engineering / Planning

US 101 at Olive Mill Road and Coast Village Road
Roundabout Concept Layout
January 2015



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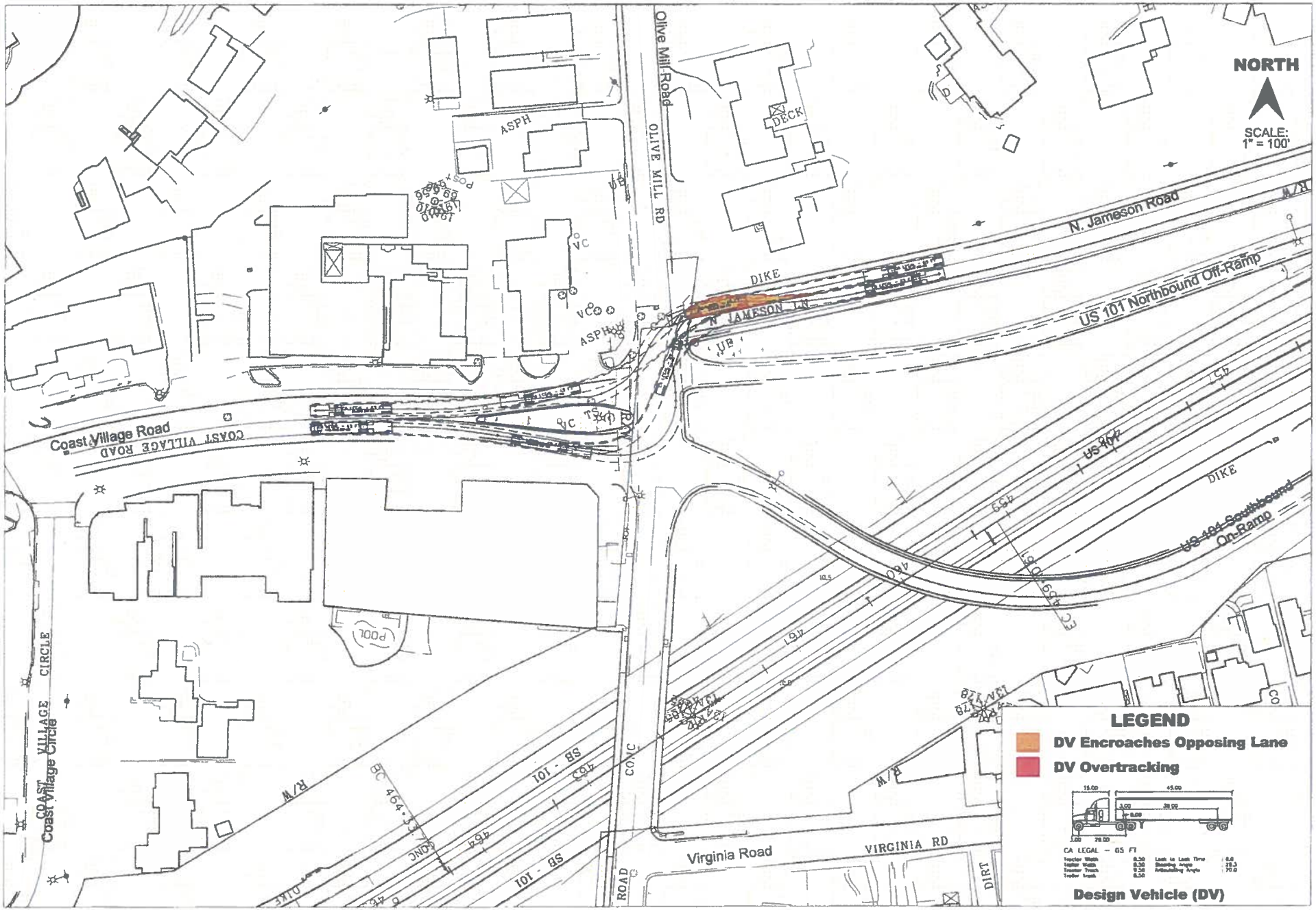
US 101 at Olive Mill Road and Coast Village Road
Design Vehicle Path - Roundabout Concept
January 2015



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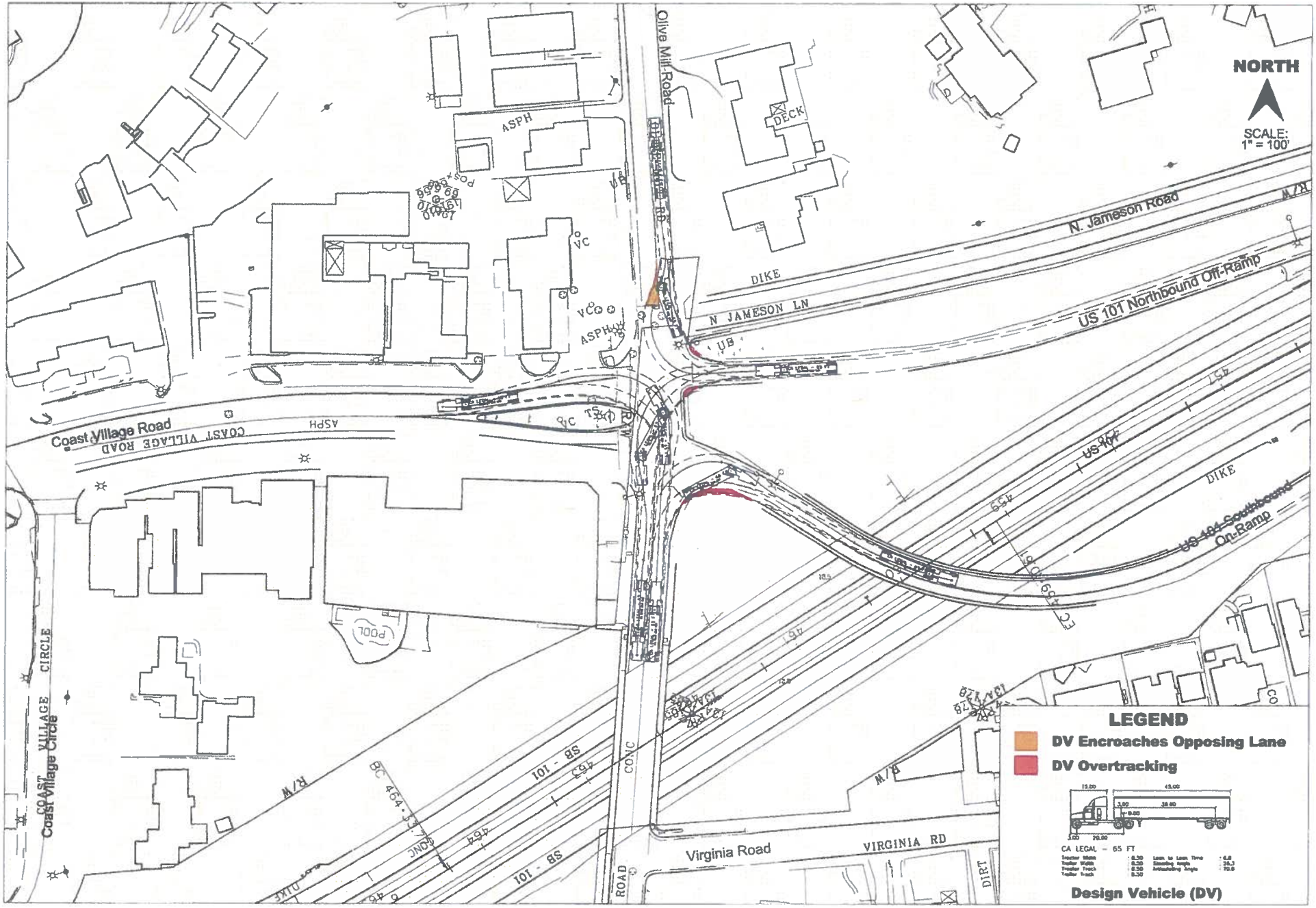
Transportation Engineering / Planning

US 101 at Olive Mill Road and Coast Village Road
Design Vehicle Path - Exsiting East - West
January 2015



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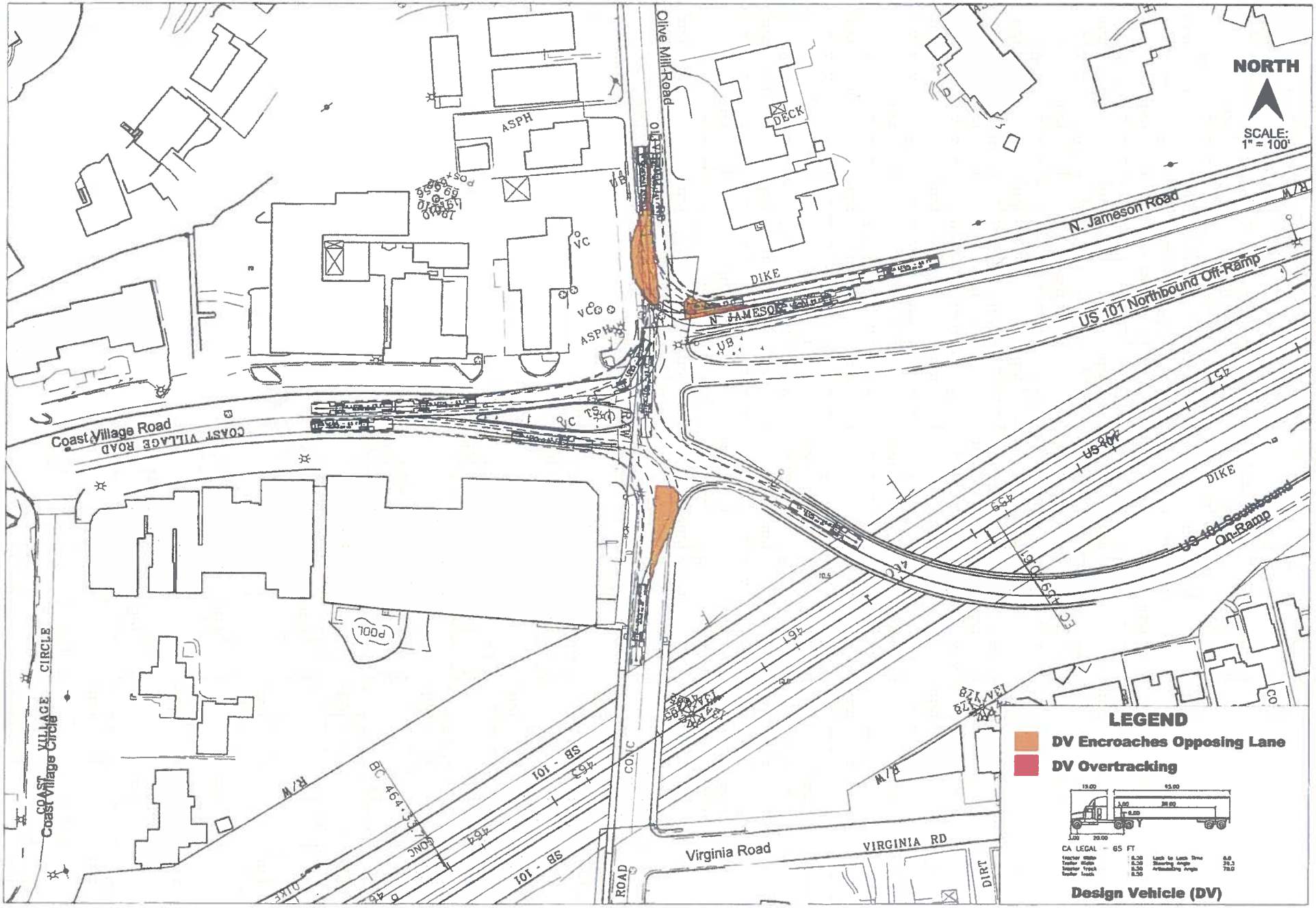
US 101 at Olive Mill Road and Coast Village Road
Design Vehicle Path - Exsiting NB - WB
January 2015



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US 101 at Olive Mill Road and Coast Village Road
Design Vehicle Path - Exsiting NB - WB
January 2015

Appendix B
Level-of-Service Concept

APPENDIX B LEVEL-OF-SERVICE CONCEPT

Level of service (LOS) is a concept developed to quantify the degree of comfort (including such elements as travel time, number of stops, total amount of stopped delay, and impediments caused by other vehicles) afforded to drivers as they travel through an intersection or roadway segment. Six grades are used to denote the various level of service from "A" to "F".

SIGNALIZED INTERSECTIONS

The six level-of-service grades are described qualitatively for signalized intersections in Table B1. Additionally, Table B2 identifies the relationship between level of service and average control delay per vehicle. Control delay is defined to include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. Using this definition, Level of Service "D" is generally considered to represent the minimum acceptable design standard.

Table B-1: Level-of-Service Definitions (Signalized Intersections)

Level of Service	Average Delay per Vehicle
A	Very low average control delay, less than 10 seconds per vehicle. This occurs when progression is extremely favorable, and most vehicles arrive during the green phase. Most vehicles do not stop at all. Short cycle lengths may also contribute to low delay.
B	Average control delay is greater than 10 seconds per vehicle and less than or equal to 20 seconds per vehicle. This generally occurs with good progression and/or short cycle lengths. More vehicles stop than for a level of service A, causing higher levels of average delay.
C	Average control delay is greater than 20 seconds per vehicle and less than or equal to 35 seconds per vehicle. These higher delays may result from fair progression and/or longer cycle lengths. Individual cycle failures may begin to appear at this level. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
D	Average control delay is greater than 35 seconds per vehicle and less than or equal to 55 seconds per vehicle. The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle length, or high volume/capacity ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	Average control delay is greater than 55 seconds per vehicle and less than or equal to 80 seconds per vehicle. This is usually considered to be the limit of acceptable delay. These high delay values generally (but not always) indicate poor progression, long cycle lengths, and high volume/capacity ratios. Individual cycle failures are frequent occurrences.
F	Average control delay is in excess of 80 seconds per vehicle. This is considered to be unacceptable to most drivers. This condition often occurs with oversaturation. It may also occur at high volume/capacity ratios below 1.0 with many individual cycle failures. Poor progression and long cycle lengths may also contribute to such high delay values.

1 Most of the material in this appendix is adapted from the Transportation Research Board, Highway Capacity Manual, (2000).

Table B-2: Level-of-Service Criteria for Signalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10 and ≤20
C	>20 and ≤35
D	>35 and ≤55
E	>55 and ≤80
F	>80

UNSIGNALIZED INTERSECTIONS

Unsignalized intersections include two-way stop-controlled (TWSC) and all-way stop-controlled (AWSC) intersections. The 2000 Highway Capacity Manual (HCM) provides models for estimating control delay at both TWSC and AWSC intersections. A qualitative description of the various service levels associated with an unsignalized intersection is presented in Table B3. A quantitative definition of level of service for unsignalized intersections is presented in Table B4. Using this definition, Level of Service "E" is generally considered to represent the minimum acceptable design standard.

Table B3: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Delay per Vehicle to Minor Street
A	• Nearly all drivers find freedom of operation. • Very seldom is there more than one vehicle in queue.
B	• Some drivers begin to consider the delay an inconvenience. • Occasionally there is more than one vehicle in queue.
C	• Many times there is more than one vehicle in queue. • Most drivers feel restricted, but not objectionably so.
D	• Often there is more than one vehicle in queue. • Drivers feel quite restricted.
E	• Represents a condition in which the demand is near or equal to the probable maximum number of vehicles that can be accommodated by the movement. • There is almost always more than one vehicle in queue. • Drivers find the delays approaching intolerable levels.
F	• Forced flow. • Represents an intersection failure condition that is caused by geometric and/or operational constraints external to the intersection.

Table B-4: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay per Vehicle (Seconds)
A	<10.0
B	>10.0 and ≤ 15.0
C	>15.0 and ≤ 25.0
D	>25.0 and ≤ 35.0
E	>35.0 and ≤ 50.0
F	>50.0

The level-of-service criteria for unsignalized intersections are somewhat different than the criteria used for signalized intersections. The primary reason for this difference is that drivers expect different levels of performance from different kinds of transportation facilities. The expectation is that a signalized intersection is designed to carry higher traffic volumes than an unsignalized intersection. Additionally, there are a number of driver behavior considerations that combine to make delays at signalized intersections less galling than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor street approaches to TWSC intersections must remain attentive to the task of identifying acceptable gaps and vehicle conflicts. Also, there is often much more variability in the amount of delay experienced by individual drivers at unsignalized intersections than signalized intersections. For these reasons, it is considered that the control delay threshold for any given level of service is less for an unsignalized intersection than for a signalized intersection. While overall intersection level of service is calculated for AWSC intersections, level of service is only calculated for the minor approaches and the major street left turn movements at TWSC intersections. No delay is assumed to the major street through movements. For TWSC intersections, the overall intersection level of service remains undefined: level of service is only calculated for each minor street lane.

In the performance evaluation of TWSC intersections, other measures of effectiveness (MOEs) in addition to delay, such as v/c ratios for individual movements, average queue lengths, and 95th-percentile queue lengths should be considered because of their impacts on the operational and safety performance of the intersection. By focusing on a single MOE for the worst movement only, such as delay for the minor-street left turn, users may make inappropriate traffic control decisions. The potential for making such inappropriate decisions is likely to be particularly pronounced when the HCM level-of-service thresholds are adopted as legal standards, as is the case in many public agencies.

ROUNDABOUT INTERSECTIONS

The levels of service (LOS) criteria for automobiles in roundabouts are given in Table B-5. As the table notes, LOS F is assigned if the volume-to-capacity ratio of a lane exceeds 1.0 regardless of the control delay. For assessment of LOS at the approach and intersection levels, LOS is based solely on control delay. The thresholds in Table B-5 are based on the considered judgment of the Transportation Research Board Committee on Highway Capacity and Quality of Service.

Table B-5: Level-of-Service Criteria for Roundabout Intersections

Control Delay (s/veh)	Level of Service by Volume-to-Capacity Ratio*	
	v/c ≤ 1.0	v/c > 1.0
0-10	A	F
>10-15	B	F
>15-25	C	F
>25-35	D	F
>35-50	E	F
>50	F	F

*For approaches and intersection-wide assessment, LOS is defined solely by control delay

Roundabouts share the same basic control delay formulation with two-way and all-way STOP-controlled intersections, adjusting for the effect of YIELD control. However, at the time of publication of 2010 edition of the Highway Capacity Manual (HCM), no research was available on traveler perception of quality of service at roundabouts. In the absence of such research, the service measure and thresholds have been made consistent with those for other unsignalized intersections, primarily on the basis of this similar control delay formulation.

Appendix C
Operations Methodology and Analysis Results

INTRODUCTION

Kittelson & Associates, Inc. (KAI) has completed an evaluation of the performance of existing and proposed intersection control alternatives at the intersection of US 101 and Olive Mill Road. The purpose of this analysis is to summarize the design year operations at this interchange assuming the following intersection control options: 1) stop control; 2) signal control; and, 3) roundabout. This analysis was conducted in support of, and in accordance with, the Caltrans Traffic Operations Policy Directive 13-02 (TOPD 13-02) for Intersection Control Evaluations (ICE) effective August 30, 2013. The purpose of TOPD 13-02 is to apply a performance based assessment to test the full range of intersection control options to identify the most cost-effective solution.

The analysis tools and methodologies described herein were based on and are consistent with those documented in the *SC101 HOV PA-ED Traffic Study (Kittelson & Associates (formally Dowling Associates) December 2011).*

The analysis for the *SC101 HOV PA-ED Traffic Study* reflected a 2008 baseline and a 2040 design year. Hence, this intersection control analysis of the Olive Mill interchange at US 101 was also based on a 2040 design year.

RESULTS SUMMARY

Based on the 2040 design year operations, this intersection control evaluation of the Olive Mill interchange with US 101 in the City of Santa Barbara has determined that a roundabout control type would provide superior AM/PM peak hour operations over either an all way stop controlled or signalized control alternative.

A modern roundabout achieves the best level of service (i.e., delay) for the entire intersection, including the US-101 NB off-ramp approach. If the existing all way stop control is maintained through year 2040, the average delay during the AM peak will be 72 seconds (level of service F), and the average delay during the PM peak will be 58 seconds (level of service F). A signalized intersection would result in a - 113 second average delay (level of service F) in the AM peak period and a 162 second average delay (level of service F) in the PM peak period. A roundabout would result in a 9 second average delay (level of service A) in the AM peak period and an 14 second delay in the PM peak period.

For the US-101 NB off-ramp in year 2040, all way stop control will result in XX seconds of delay (level of service X) during the AM peak, and XX seconds of delay (level of service X) during the PM peak. Signalized control would result in 124 seconds of delay (level of service F), and 209 seconds of delay level of service F) during the PM peak. A roundabout would result in 6.9 seconds of delay (level of service A) during the AM peak, and 18.1 seconds of delay (level of service C) during the PM peak.

In addition to superior delay based performance, a roundabout will achieve the shortest 95th percentile queues for the intersection. For the all-way stop alternative, it was determined using VISSIM analysis that the US 101 NB Off-ramp's maximum queue will be over 1000-feet by year 2040, which exceeds the available ramp storage of 750-feet, and will cause spill back onto the US-101 mainline. The off-ramp queue at the existing stop controled intersection is projected to exceed the available storage in the AM

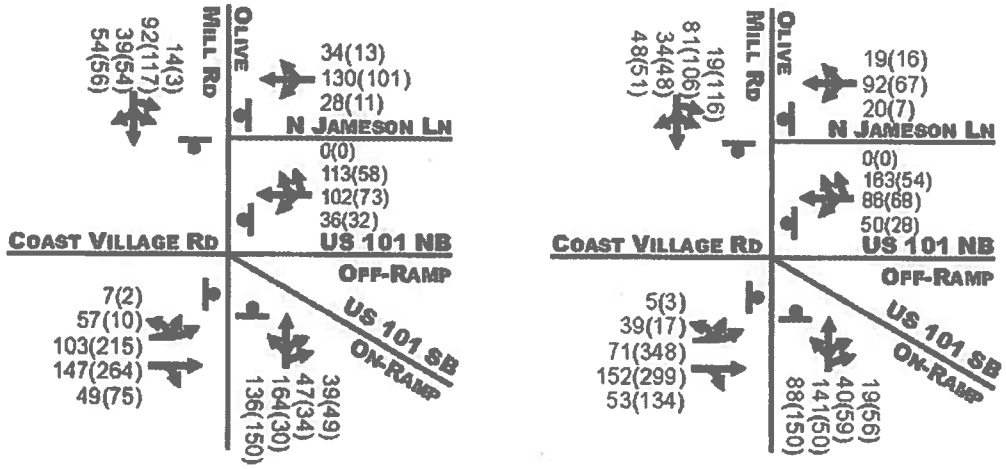
peak period by year 2022 and in the PM peak period by year 2036. For the signalized alternative, queues on the off-ramp will reach 680-feet in the AM peak period and 633 feet in the PM peak period by year 2040. Conversely, the proposed roundabout will result in a 92-foot queue in the AM peak period and a 59-foot queue in the PM peak period under 2040 conditions.

BASELINE CONDITION

Traffic counts performed as part of the *SC101 HOV PA-ED Traffic Study* were examined. These turning movement counts were collected in April 2008. Given that six years had transpired since this count was taken, a more recent 2014 turning movement count was performed for this analysis. Similar to the 2008 traffic count, the 2014 count was performed during the 7:00 AM – 9:00 AM and 4:00 PM – 6:00 PM peak periods. The true AM/PM peak hour volumes were identified from this four hour count.

A graphical comparison between the 2008 and 2014 AM/PM peak hour turning movement counts is provided below in Figure 8.

Figure 8: 2008 Traffic Counts (left) and 2014 Traffic Counts (right)



LEGEND: XX (YY) – AM (PM) Peak Hour

From 2008 to 2014, an overall reduction of 2% was experienced at this interchange in the AM peak hour and 0.69% increase was experienced in the PM peak hour.

Although holistically traffic demand at this interchange has not significantly changed, inspection of specific movements show several significant differences. Of note, in the AM peak period, Olive Mill Road coming from Coast Village Road experienced 18 and 32 reduction in vehicle counts traveling left onto Olive Mill Road and left onto North Jameson Lane respectively. Additionally, in the AM peak period, vehicles traveling northbound right from Olive Mill onto the US-101 SB on-ramp experienced a 20 vehicle count reduction from 2008 volumes. Conversely, in the PM peak period, there were an additional 25 vehicles traveling northbound right from Olive Mill onto North Jameson Lane. Also in the

PM peak period, there were approximately 100 additional vehicles traveling southbound on Olive Mill Road onto Coast Village Road.

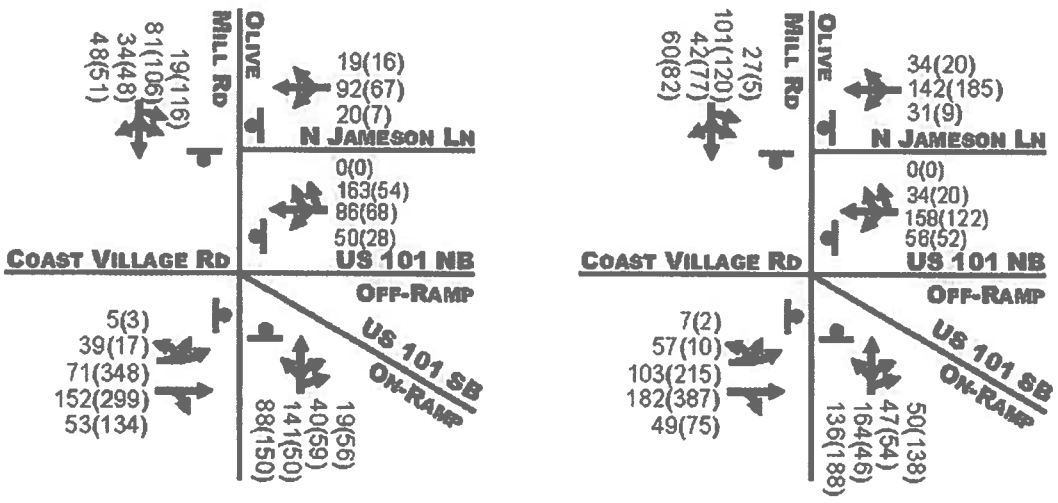
DESIGN YEAR CONDITION

The basis for the design year volume set were the traffic projections developed for the *SC101 HOV PA-ED Traffic Study (December 2011)* which were generated using the Santa Barbara County Association of Governments (SBCAG) travel demand model. The AM/PM peak hour models were used to forecast 2040 year volumes appropriate for peak hour operational analysis as seen in Figure 9.

To ensure reasonable intersection turn movement forecasts, a refinement process called the Furness Method was applied. This post-processing adjustment is needed given that travel models are calibrated to produce more accurate results on road segments than for individual turn movements. The Furness Method iteratively adjusts the 2014 turning movement counts until the directional sum of the movements balance to the adjusted future link volumes. This factoring process produces forecast turn distributions that resemble the count distribution, but turn movement proportions change in response to different growth rates on different legs as produced by the AM/PM peak hour travel demand model. Additional "spot" adjustments were performed to ensure that no future volume for a given turn movement was less than the 2014 traffic count.

Given that the Olive Mill Interchange is be affected by operations at near-by adjacent interchanges, planned modifications to the Cabrillo-Hot Springs interchange are reflected in this analysis. Kittelson & Associates, Inc. (as Dowling and Associates, Inc.) prepared the Cabrillo Boulevard I/C Modified Configurations Analysis (July 19, 2011) included as part of the Cabrillo/Hot Springs Interchange Configuration Analysis Technical Memorandums (December 11, 2011). Based on these technical studies, the "Modified F" configuration has been advanced as the preferred configuration for the Cabrillo-Host Springs interchange. This configuration is assumed as part of this US 101/Olive Mill interchange analysis.

Figure 9: 2014 Traffic Counts (left) and 2040 Forecast Traffic Counts (right)



LEGEND: XX (YY) – AM (PM) Peak Hour

As seen in **Error! Reference source not found.** above, from 2014 to 2040, a 1% compound growth in the AM peak period and 0.65% in the PM peak period is projected. There is an increase in 31 vehicles traveling northbound turning right onto the US-101 SB on-ramp and 72 additional vehicles traveling westbound thru in the AM peak period. In the PM peak period, there are over 100 vehicles traveling westbound right on Jameson movements, 83 additional vehicles traveling westbound right from US-101 NB onto Olive Mill Road, and 82 additional vehicles traveling northbound right from Olive Mill Road onto US-101 SB on-ramp.

TRAFFIC OPERATIONS ANALYSIS

This subsection summarizes operational analysis methodology and results at the study location.

Analysis Methodology

Site visits were performed and aerial imagery was also used to document the physical, geometric and operational characteristics of each of the study area intersections and roadway approach segments. This included observed queue lengths and back of queue distances at each approach.

The adjusted 2040 turn movement forecasts were input into the operational software SYNCHRO 8.0 and Sidra. Further volume balancing adjustments were performed to ensure that conservation of traffic flow was maintained at adjacent intersections. For stop controlled and signalized intersection analysis, SYNCHRO analysis was performed to yield the intersection LOS and queue lengths results. Sidra analysis was performed for the roundabout option.

Given that micro-simulation can better capture the interaction of closely spaced intersections, a simulation analysis using the VISSIM software was developed to better determine queues and delays at the study intersection. The model was developed and calibrated to existing conditions using field measured queue lengths delays to ensure an accurate reflection of this a-typical intersection. Given that queue spill-back onto the freeway mainline is a major safety concern, this check of future queue lengths on the off-ramp is considered a fatal flaw assessment. VISSIM simulation runs were based on a minimum 10 minute seeding time, 60 minute analysis time (divided into four 15 minute intervals), and reflect an average of 5 multiple runs. VISSIM simulation for this analysis was validated for existing queue spillback by the *FHWA Traffic Analysis Toolbox Volume III: Guidelines for Applying Traffic Microsimulation Modeling Software* prepared by Dowling Associates, Inc. (now Kittelson & Associates, Inc.) in July 2004.

Stop Controlled and Signalized Intersections

Roadway operations are typically governed by, and most constrained at, intersections. The measure of effectiveness commonly used to determine the quality or level of service (LOS) experienced by motorists at intersections is average control delay. The methodology used to analyze intersection LOS is outlined in the Transportation Research Board's Highway Capacity Manual, 2010 version (HCM 2010).

LOS is a qualitative measure of driver satisfaction and is quantitatively expressed by the level of delay and congestion experienced by motorists using an intersection. LOS is designated by the letters A through F, with A being the best condition and F being the worst (high delay and congestion). A summary of LOS criteria for signalized and unsignalized intersections can be found in Table 5 below.

Table 6: LOS Criteria for Signalized and Unsignalized Intersections

	Average Delay (sec/veh)		
LOS	**Signalized**	**Unsignalized**	**Description**
A	≤10.0	≤10.0	Very Low Delay: This occurs when progression is extremely favorable and most vehicles arrive during a green phase. Most vehicles do not stop at all.
B	>10.0 & ≤20.0	>10.0 & ≤15.0	Minimal Delays: This generally occurs with good progression, short cycle lengths, or both. More vehicles stop than at LOS A, causing higher levels of average delay.
C	>20.0 & ≤35.0	>15.0 & ≤25.0	Acceptable Delay: Delay increases due to only fair progression, longer cycle lengths, or both. Individual cycle failures (*to service all waiting vehicles*) may begin to appear at this level of service. The number of vehicles stopping is significant, though many still pass through the intersection without stopping.
D	>35.0 & ≤55.0	>25.0 & ≤35.0	Approaching Unstable/Tolerable Delays: The influence of congestion becomes more noticeable. Longer delays may result from some combination of unfavorable progression, long cycle lengths, or high v/c ratios. Many vehicles stop, and the proportion of vehicles not stopping declines. Individual cycle failures are noticeable.
E	>55.0 & ≤80.0	>35.0 & ≤50.0	Unstable Operation/Significant Delays: These high delay values generally indicate poor progression, long cycle lengths, and high v/c ratios. Individual cycle failures are frequent occurrences.
F	>80.0	>50.0	Excessive Delays: This level, considered to be unacceptable to most drivers, often occurs with oversaturation (i.e., when arrival flow rates exceed the capacity of the intersection). It may also occur at high v/c ratios below 1.00 with many individual cycle failures. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.
Source:	*Highway Capacity Manual,* Transportation Research Board, Washington D.C, 2010		

This analysis includes stop control and signal controlled alternatives. For all-way stop intersections, Chapter 20 of the HCM 2010 outlines the operational methodology to analyze this type of control. Signal-controlled intersections were analyzed using the operational methodology outlined in the HCM 2010, Chapter 18. This procedure calculates the average control delay per vehicle at a signalized intersection, and assigns a LOS designation based upon the delay. The SYNCHRO 8.0 software package was used to perform LOS analysis. Intersection geometrics were based on aerial imagery and field observations. Bicycle and pedestrian counts were not used.

Roundabouts

Roundabout operations were evaluated using Sidra Intersection 6 software using the 2010 Highway Capacity Manual (HCM) capacity model. The 2010 HCM capacity model was calibrated to better reflect gap acceptance behavior of California drivers for critical headway and follow-up headway. The calibration factors, or HCM Parameters A and B, used in this analysis are recommended in the Caltrans document "Roundabout Geometric Design Guidance" dated June 2007. The A and B parameters were derived based on field observations to more accurately reflect operational performance of California

roundabouts. The differences among the default parameters used in the 2010 HCM methodology and identified for California roundabouts are shown below in Table 6.

Table 7: Roundabout Model Parameters for Entry Capacity

	Default 2010 HCM Parameters		Modified HCM Parameters based on Caltrans guidance	
	A	B	A	B
Single-lane circulating stream (n_c=1)				
Single-lane entry (n_e=1, n_c=1)	1130	0.00100	1440	0.00100
Multi-lane entry (n_e> 1, n_c=1): apply to all lanes	1130	0.00100	1440	0.0010
Multi-lane circulating stream (n_c>1)				
Single-lane entry (n_e=1, n_c=1)	1130	0.00070		
Multi-lane entry (n_e> 1, n_c=1)				
Dominate lane (right lane)	1130	0.00070	1640	.00090
Subdominate lane (left lane)	1130	0.00075	1640	.00100

LOS criteria specified in the 2010 HCM was used to establish the quality of service for the roundabout from a user's perspective. The 2010 HCM uses the average control delay (s/veh) and volume-to-capacity ratio (v/c) to establish thresholds for intersection LOS. These thresholds are shown in Table 7.

Table 8: Level of Service Criteria

Control Delay (s/veh)	Level of Service by Volume-to-Capacity Ratio*	
	v/c ≤ 1.0	v/c > 1.0
0-10	A	F
>10-15	B	F
>15-25	C	F
>25-35	D	F
>35-50	E	F
>50	F	F

*For approaches and intersection-wide assessment, LOS is defined solely by control delay

For roundabouts, v/c ratios in the range of 0.85 to 0.90 represent an approximate threshold for satisfactory operations. Individual lanes with v/c ratios near this threshold should be evaluated to determine the sensitivity of the lane to varying traffic conditions and/or driver behavior.

DESIGN YEAR ANALYSIS RESULTS

Level of Service (LOS) and 95th percentile queue (feet) results for each control type are provided in this section.

Operations for the roundabout were calculated using the 2010 HCM with California Calibration capacity model (HCM-CA) according to the methodology above. As shown, the proposed roundabout is expected to perform at an acceptable LOS through the 2040 forecast year.

The VISSIM model was run for a number of different years to determine the approximate year when queue lengths for the off-ramp will exceed the available storage length of 750-feet. It was assumed that the project is built by year 2020, as the 2020 "build" traffic volumes from the *SC101 HOV PA-ED Traffic Study (December 2011)* report were used. Traffic volumes were assumed to have straight line growth between 2020 and 2040. As seen in Table 8 below, the queue during AM peak period is projection to exceed the available storage in year 2022, and the PM peak period queue length for the off-ramp will exceed available storage in year 2036.

Table 9: Maximum Queue Results for East (Northbound US-101 Off-Ramp) Approach

Max Queue (ft.)			Simulated	
Year	**Approach Lane**	**Location**	**AM**	**PM**
2014	East	101 NB Off-Ramp	104.05	14.13
2020	East	101 NB Off-Ramp	530.80	134.70
2021	East	101 NB Off-Ramp	634.50	137.40
2022	East	101 NB Off-Ramp	827.70*	101.00
2030	East	101 NB Off-Ramp	1560.20	242.90
2034	East	101 NB Off-Ramp	1664.50	440.20
2036	East	102 NB Off-Ramp	1666.80	784.50*
2040	East	101 NB Off-Ramp	1672.40	1616.20

* Projected queue length exceeds available storage on off-ramp (750-feet)

ANALYSIS RESULTS

Table 10. Year 2040 US 101 at Olive Mill Road All Way Stop Control with Existing Lane Configuration

Approach	Movement	Level of Service (LOS)		Volume to Capacity Ratio		Delay (seconds/vehicle)		95th % Queue (feet)[1]		Storage (feet)[2]	Adequate Storage (Yes/No)
		AM	PM	AM	PM	AM	PM	AM	PM		
Northbound – Olive Mill Road	L/T/R	F	F	0.47	0.45	101.7	97.3	160.4	235.6	275	No
Westbound – US-101 NB-Off Ramp	L/T/R	F	F	1.02	1.03	195.6	228.0	1,672.4	1,616.2	750	Yes
Westbound – Jameson Lane	L/T/R	E	C	0.49	0.50	36.8	19.2	148.9	131.5	710	No
Southbound – Olive Mill Road	L/T/R	F	F	0.50	0.61	101.7	97.3	160.4	235.6	720	No
Eastbound – Coast Village Road	Left	D	F	0.40	0.61	22.0	69.6	112.3	365.9	410	No
	T/R	F	F	0.36	0.86	28.0	95.7	206.9	1,603	150	Yes

1. Rounded up to the nearest 25 feet
2. Storage = Available storage to the nearest local street intersection or distance to ramp gore point
Bold and shaded indicates inadequate condition

Table 11. Year 2040 US 101 at Olive Mill Road Signalized Intersection Control with Existing Lane Configuration

Approach	Movement	Level of Service (LOS)		Volume to Capacity Ratio		Delay (seconds/vehicle)		95th % Queue (feet)[1]		Storage (feet)[2]	Adequate Storage (Yes/No)
		AM	PM	AM	PM	AM	PM	AM	PM		
Northbound – Olive Mill Road	L/T/R	F	F	1.07	1.22	117	169	681	775	275	Yes
Westbound – US-101 NB-Off Ramp	L/T/R	F	F	0.93	1.35	121	228.3	221	633	750	No
Westbound – Jameson Lane	L/T/R	E	F	1.08	1.10	62	111.1	680	286	710	No
Southbound – Olive Mill Road	L/T/R	F	F	1.06	1.16	135	155	448	626	720	No
Eastbound – Coast Village Road	Left	F	E	0.88	0.70	101	68.2	321	330	410	No
	T/R	F	F	1.08	1.41	139	242.2	451	889	150	Yes

1. Rounded up to the nearest 25 feet
2. Storage = Available storage to the nearest local street intersection or distance to ramp gore point

Table 12. Year 2040 US 101 at Olive Mill Road Proposed Roundabout Alternative

Approach	Movement	Level of Service (LOS)		Volume to Capacity Ratio		Delay (seconds/vehicle)		95th % Queue (feet)[1]		Storage (feet)[2]	Adequate Storage (Yes/No)
		AM	PM	AM	PM	AM	PM	AM	PM		
Northbound – Olive Mill Road	L/T	B	C	0.463	0.546	10.5	16.3	68.2	79.1	275	Yes
	R	A	A	0.066	0.259	5.0	9.7	6.7	26.8	85	No
Westbound – US-101 NB-Off Ramp	L/T/R	B	A	0.548	0.425	12.8	9.9	92	59	700	No
Westbound – Jameson Lane	L/T/R	B	A	0.363	0.315	10.9	8.3	43	37	670	No
Southbound – Olive Mill Road	L/T/R	A	B	0.327	0.497	8.6	12.2	38	74	735	No
Coast Village Road	LT/R	A	C	0.411	0.772	7.8	18.9	60	239	425	No

1. Rounded up to the nearest 25 feet
2. Storage = Available storage to the nearest local street intersection or distance to ramp gore point
Italics and shaded represent mitigated lane configuration changes