San Francisco Bay Conservation and Development Commission
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Transmitted via electronic mail only

June 5, 2025

ATTN: Javier Mendivil
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SUBJECT: Caltrans State Route 37 Project, Sears Point to Mare Island Tolay Creek Bridge Replacement - Summary of May 21, 2025 ECRB Meeting Comments (BCDC Pre-Application)

Dear Javier,

This letter summarizes the comments from the Engineering Criteria Review Board (ECRB) on design criteria for the Tolay Creek Bridge Replacement Project, presented to the ECRB by Caltrans on May 21, 2025. The ECRB requested that Caltrans come back for a second meeting to present and discuss these additional issues and materials requested. This second meeting is expected to occur in September of this year.

Some general statements from the ECRB meeting are the following (please correct me if any are incorrect):

- Caltrans classifies the bridge as Ordinary, which means it could be out of service and possibly not usable or repairable following a Safety Evaluation Earthquake (SSE). An SEE is an earthquake with a 975-year return interval.
- The bridge is also classified as Nonstandard due to the fault offsets that need to be accommodated. Per the Caltrans Seismic Design Criteria 2.0 (SDC), Nonstandard bridges require Project a Specific Seismic Design criteria (PSDC).
- For the predicted 1.7 feet (ft) of offset in an earthquake of the fault under the bridge, the superstructure is designed to be continuous between the abutments and slide on top of the piers with 1.8 ft extra width on each side of the pile caps at each pier. Shear keys will be provided at each end of the bridge to stop the ends of the bridge from sliding off the abutments.
- Vertical offset of 0.9 ft could cause hinging of the superstructure. It will have a high ductility value.
- The bridge is designed to be as high as it can be considering the elevation of the railroad tracks on the west end of the bridge. The soffit (underside) of the bridge has a low point elevation of 12.6 ft NAVD88 and will be a foot higher on the east end.

- With the 100-year tide level at about 9.9 feet NAVD88, the soffit of the bridge (at 12.6 feet NAVD88) can accommodate sea level rise to 2050 of 0.8 feet with room available for waves, anticipated to typically be about 1 foot high. Creek flood levels were modeled to be less than the 100-year tide level.
- Caltrans hopes to replace the bridge with a causeway in 2050 but the actual timeline for this is unknown.
- Should the bridge end up in place longer than the 2050 design life and begin to flood due to sea level rise then Caltrans is prepared to close the road and set up a temporary detour.

Please provide a response to the following Required Comments with the materials for presentation at least 30 days prior to the next ECRB meeting. The exception is comment 2a, the request for additional bridge design information. Please submit this information (and any other information requested that is readily available) at your earliest convenience, ideally by the end of June, so that the ECRB structural engineers can review them and determine if their comments would change in any way. This will allow Caltrans more certainty that the next meeting will be the final meeting.

<u>Required Comments</u>

1) Geotechnical
   a) Please provide the results for the geotechnical laboratory testing of soil samples.
   b) Please provide design criteria for the expanded polystyrene or other proposed light weight backfill, including the maximum water elevation to be used for the design.
   c) Provide design criteria and results (if available) for a liquefaction analysis, presumably following the guidelines in the Caltrans Memo to Designers MTD 20-14 (*Quantifying the Impacts of Soil Liquefaction and Lateral Spreading on Project Delivery*). Utilize the LOTB and CPT data collected for the project; we suggest using a software such as CLIQ or similar for CPT analysis, which can evaluate liquefaction potential at each thin soil increment.
   d) Provide design criteria and results (if available) for a lateral pile analysis (i.e., for LPILE or other method).
   e) Provide design criteria and results (if available) for pile depth calculations using SHAFT or other method.
   f) Provide design criteria and results (if available) for a slope stability evaluation on slopes adjacent to the bridge and its landings.
   g) Clarify the uncertainty of the location of the fault under the bridge.
   h) Discuss if the seismic design of the bridge accommodates the uncertainty in the fault trace location and orientation (angle).

i) Provide a copy of the Project Specific Seismic Design criteria (PSDC) required by the SDC due to the classification of the bridge as Nonstandard.

j) Provide any updated or recently completed geotechnical reports if available.

2) Structural

a) In the ECRB meeting, Caltrans verbally described the main features of the bridge to accommodate the seismic forces, namely the continuous bridge deck will have a certain amount of ductility to accommodate vertical offsets, the deck will be allowed to slide on top of the pile caps and abutments, fuse bars will be incorporated to hold the deck in place up to a certain level of force, and additional structures will be installed to constrain the movement of the deck at the abutments. The plans provided of the bridge (attached) do not allow the ECRB to understand these design elements. An understanding of these aspects of the project are required for the ECRB to determine, for the bridge, "the adequacy of their specific safety provisions, and make recommendations concerning these provisions" per Bay Plan Safety of Fills Policy 1b. Please provide design details showing how the vertical and horizontal offsets are being accommodated in the bridge design, including barriers/guardrails, special joints and fuse bars.

b) Please submit additional information that defines the criteria and describes how the joints and fuses will be designed and how the lateral design of the piers and pile caps will be designed to include the effects of the joints and fuses.

c) Please include the design ground movement, it's orientation relative to the bridge axis and the amount of movement that will be assumed in both the transverse and longitudinal bridge directions for design.

d) Please define the continuous fault creep assumed in the design, if any, in addition to the expected fault rupture displacement. Provide representative joint details that show how movement is accommodated in both the longitudinal and transverse directions and how the fuses will work. Provide a description of the nonlinear behavior of the fuses in both directions including the load at yield and residual load after yield over the range of expected displacements.

e) Please describe the mechanism for keeping the bridge deck stable on top of the pier caps after the fuses yield, recognizing that shaking may continue during the main shock after the fuses yield and also during aftershocks.

f) Provide the loading on the piers and pile caps from all types of loading considered in the design, including inertial seismic loads (which are in addition to the ground movement seismic loads), loading from the water current, wind, etc. and show how the various loads, including those from ground movement are combined for design of the piers and caps.

g) Please describe the basis for how lateral loads are distributed between the various piers and the abutments.

h) Please describe where collapse prevention (or similar, more lenient) performance goals are being used in lieu of life safety performance goals and the basis for accepting that lower level of safety. We understand that a request to increase the displacement ductility demand from 5 (maximum permitted for Ordinary bridges, per Caltrans SDC) to 8 (per item 1, page 6 of the Type Selection Report) has been made to the Caltrans Seismic Advisory Board. The loads and details need not represent the 100% final design, but they do need to represent the proposed criteria and the intended approach to implement it so that the ECRB can evaluate what criteria is being used and how it is being employed in the design of the bridge.

i) What proportion of the ductility demand on the piers is coming from the fault rupture from the Rogers Creek fault as opposed to the ground motion from the acceleration response spectra? What is the contribution, via hazard deaggregation, of the Rogers Creek fault to the design acceleration response spectra?

j) Provide information on the category of other bridges in the area, including along SR 37 – are they also Ordinary?

<u>Suggested (But don't need to Respond to) Comments</u>

3) Hydrology and Hydraulics

a) Wave height at 2050 was estimated to be 1 ft high, based on FEMA modeling. This is not a correct approach for determining wave heights for design considerations. It is recommended to use wind speeds to derive wave heights.
b) Provide an analysis of how much vertical land motion (VLM) is expected in the area of the bridge during the design life of the bridge. Govorcin 2024 indicates VLM in the bridge area is about -0.15 in/year.
c) Please add references to the Hydraulic Report by AECOM.

d) Reconsider the use of the term Consolidated Bay Mud when the color of the material was not grey and is probably an older alluvium.

e) Consider use of alternatives to the use of expanded polystyrene as lightweight fill since it is buoyant when submerged and will float in the future due to sea level rise.

f) The Hydrology Report should start with the fact that the elevation of the bridge is constrained by the elevation of the railroad tracks and explain that the bridge is designed to be as high as it can be. Given the soffit elevation of that design, explain the amount of sea level rise that can be accommodated under the soffit.

g) It is recommended to select future modeling scenarios for HEC-RAS that are conservative, for example include a scenario that includes the 100-year tide elevation of 9.9 ft NAVD88 (AECOM Extreme Tides Study 2016). The “100-year” Scenario 11 with no precipitation only goes to 9.12 ft NAVD88 before sea level rise is added.

h) For scenarios 10 and 11, the result for the Maximum Water Surface Elevation is a lower elevation that the highest tide level. This is surprising

i) NOAA Atlas 14 was used for rainfall in the modeling. It is recommended to bump up the precipitation since this rainfall data is not up to date and more recent rainfall data including the effects of climate change on rainfall in the future, would likely be higher.

j) Collecting field data on tide levels and wave heights could help inform the modeling effort.

k) It is possible that sedimentation under the bridge would cause actual velocities at the bridge to be higher; it is recommended to take that into account.

Please do not hesitate to contact Julie Garren with any questions at 415-352-3624 or julie.garren@bcdc.ca.gov.

Sincerely,

JENN HYMAN, PE
Senior Engineer

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Attachment: 65% Bridge plans provided by Caltrans for the May 2025 ECRB meeting