

San Francisco Bay Conservation and Development Commission

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TO: All Engineering Criteria Review Board Members

FROM: Lawrence J. Goldzband, Executive Director (415/352-3653; larry.goldzband@bcdc.ca.gov)
Rafael Montes, Senior Staff Engineer (415/352-3670; rafael.montes@bcdc.ca.gov)

SUBJECT: Approved Minutes of August 8, 2017, BCDC Engineering Criteria Review Board Meeting

1. **Call to Order.** The meeting was called to order by Acting Chair Frank Rollo at approximately 1:00 p.m., in the Monterey Room at the Milton Mark Conference Center, 455 Golden Gate Avenue, San Francisco, California.

The following Board Members were present: Robert “Bob” Battalio, PE, Professor Mary Catherine Comerio, Richard B. Dornhelm, PE, James French, PE, GE, Lou Gilpin, PhD, CEG, and Frank Rollo, PE, GE.

The following Board Members were not present: Board Chair, Roger Borchardt, PhD, William Holmes, SE, and Professors Jack Moehle and Martin Fischer.

BCDC Staff Members present were: Ms. Jaime Michaels, Chief of Permits, and Rafael Montes, Senior Staff Engineer and Board Secretary.

The audience included the following: Todd Bradford (ENGEO), Scott Cataffa (CMG Landscape Architecture), James Conlan (City of Richmond), Jeff Fippin (ENGEO), Cleve Livingston (Laconia Development LLC) Lina Velasco (City of Richmond), Jason White (BKF Engineers), and Sam Yao (Simpson Gumpertz & Heger - SGH)

Mr. Montes reviewed the safety protocols, meeting protocols, and meeting agenda.

2. **Approval of Draft Minutes for May 24, 2017, Engineering Criteria Review Board (ECRB) Meeting.**

MOTION: The Draft Minutes for the May 24, 2017, Engineering Criteria Review Board Meeting were moved and seconded.

VOTE: The motion carried unanimously.

Acting Chair Rollo referred to the list of questions and comments raised by Board Members at the May 24th meeting together with the responses from the project proponent, which were attached to the minutes. He asked if the questions and responses were part of the minutes.

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ECRB MINUTES
August 8, 2017

Mr. Montes stated the questions are referenced in the minutes but the responses will be given today.

Acting Chair Rollo reminded staff that the proponent responses should be read into the record.

3. **Board Discussion: Latitude Project (Pre-Application)**

a. **Laconia Development, LLC.** Cleve Livingston, Project Manager, Laconia Development, LLC, introduced the project team. He provided an overview, accompanied by a slide presentation, of the 13-acre project site, including five multistory, multifamily condominium buildings, and the five components of the public access and open space waterfront park element:

- (1) The entry plaza located in the northwest corner
- (2) The extension of the Shoreline Roadway loop around the Bayside perimeter of the site
- (3) The extension of the Bay Trail that wraps around the site
- (4) The north-south pedestrian promenade that connects the north and south ends of the site, provides a view corridor, and integrates the private components of the development with the public components of the project
- (5) The repurposing of the wharf - the subject of most of the discussion today.

Mr. Livingston stated time and resources have been invested in planning the landscape program, ensuring shoreline protection, and completing the structural assessment of the wharf, which will determine the safety of the public and the ability to reuse these features as part of the public access program. He stated all resident, guest, and employee parking will be in two underground parking podiums. Visitor on-street parking is available on the east and west sides of the park and along Brickyard Cove Road, leaving the Bay side of the project free of as much automobile traffic as possible. The project has planned for more parking spaces than the peak parking analysis concluded was necessary. He stated there is not a more extraordinary site in the Bay that is ready for reuse than this site.

b. **CMG Landscape Architecture.** Scott Cataffa, Principal, CMG Landscape Architecture, provided an overview, accompanied by a slide presentation, of the program and landscape design features of the approximately one-acre wharf. He described the intent behind the design:

- (1) Trace the outline of the historic shed
- (2) Reuse historic shed materials
 - Recycle truss work, beams, and crane elements

(3) Subdivide the long linear space into a series of outdoor program spaces

- Picnic/gathering space, flexible lawn with play theatre, and sculpture garden with undulating grassland and lookout deck

Following the presentation, the Board asked a question:

Board Member Battalio referred to Slide 10, a cross-section of the picnic deck and promenade areas of the wharf. He stated it looks like the waves would go under the pier and hit the bottom of the deck with sea level rise. He suggested considering that trapped air and water hitting the underside of the deck may make a noise or squirt water through the decking. Waves may try to exceed the deck elevation and impinge on the bottom of the deck and/or the back of the slope.

Mr. Cataffa stated Mr. Sam Yao will address this issue in his presentation.

c. **BKF Engineers.** Jason White, Civil Engineer, BKF Engineers, provided an overview, accompanied by a slide presentation, of the assessment of sea level rise and base flood elevations, rising sea levels and incorporated flood risk mitigation strategies, design elevations and features, and an Adaptive Flood Risk Management Plan that outlines implementation and financing of future design features related to flood risk management. All portions of the site are designed to accommodate 16 inches of sea level rise. He stated the features of the project site have been updated per Board recommendation to address 36 inches of sea level rise based on recent data to the potential sea levels between years 2070 and 2100 with a 60 percent chance that it would fall within that range in the time period. He presented a chart on Slide 13 that covered all the shoreline design features of the wharf deck and program areas, Bay Trail, Shoreline Drive, Promenade Buildings (lowest elevation in garage) and Rails-to-Trails Pathway. He noted that the Rails-to-Trails Pathway at 8 feet is considered temporary because it will become unusable as the sea level rises.

Following the presentation, the Board asked a series of questions:

Board Member Rollo referred to Slide 7 and asked about access from the Bayside park to the development. Mr. White pointed out an elevated crosswalk over Shoreline Drive for public access to the shore.

Acting Chair Rollo asked about emergency vehicle access to the shoreline park area over the 2-foot-high hump. Mr. White stated, although Shoreline Drive is at a 12^{1/2} to 14-foot elevation, there will be a gradual slope increase in the roadway that will allow access to emergency vehicles.

Board Member Battalio asked about the finished floor elevations for the living spaces. Mr. White stated the residential units are at 16 feet. The lowest garage elevation is 14.1 feet but the entrance to the garage on Brickyard Cove Road is much higher.

Board Member French asked about the amount of settlement that is accounted for in the new fill needed to make the site up to this grade. Jeff Fippin, Principal at ENGEO, stated the surcharge plan is a work in progress but the goal is to have nominal settlement within the streets and other improvement areas. There may be three to four inches of settlement in some of the inland open spaces.

Board Member Rollo asked if fill will be used on Shoreline Drive. Mr. Fippin stated there are fill areas within Shoreline Drive. Mr. White stated the fill on Shoreline Drive may be as high as one foot in some areas. The lowest existing elevation on Shoreline Drive is approximately 9 to 10 feet.

Acting Chair Rollo stated there will be 5 feet of fill in the lowest elevations of Shoreline Drive to bring it up to the 14.5 feet elevation as designed in some areas. Mr. White stated that is true if the 14.5 coincides with the lowest point.

Acting Chair Rollo stated 5 feet of fill and 60 feet of Bay mud would be approximately one foot of settlement. Mr. White agreed and stated a surcharge with wicks to reduce post-mitigation settlement down to tenths of inches of post-construction zone is recommended, but the surcharge program has not yet been fully designed.

Board Member Dornhelm stated the Federal Emergency Management Agency (FEMA) Flood Insurance Rate Map (FIRM) for Dornan Drive indicates that the base flood elevation is 12 - a foot higher than the project zone. The western access to the project might be compromised sooner than the rest of the project. Mr. White stated the design team will look into that.

Acting Chair Rollo asked Board Members Battalio and Dornhelm if the applicant satisfactorily addressed their comments from the May meeting. Board Member Battalio stated they were satisfied. He stated the rock-size calculation on the shore east of the wharf is light for the 2 to 1 slope. He confirmed with the applicant the intent to put the rock at the top, which would be appropriate for those calculations.

Board Member Comerio stated her appreciation for the clear, well-done drawings. She stated the proponent added the extra connection and egress from the center, but she questioned if the area would support individuals jumping onto the green space in the event of an earthquake. Mr. White stated that area is level with the Bay Trail.

Acting Chair Rollo asked if the potential for liquefaction during an earthquake in the area behind Shoreline Drive will be a safety hazard. Mr. White pointed out areas on a presentation slide with the same elevation as the Bay Trail that would start to drop off, access points, constrained points, and zones where individuals could easily jump onto the Bay Trail. He stated the constrained areas with 30-inch drops could be raised up if it is a concern.

d. **ENGEO.** Jeff Fippin, Principal at ENGEO, the geotechnical firm, provided an overview, accompanied by a slide presentation, of the existing geotechnical condition, site specific ground response, and geotechnical retrofit options. He stated the project site is reclaimed land - the original regional shoreline was near the hillside above Brickyard Cove Drive. Most of the fill placed on marshy areas below was derived from the bedrock above Brickyard Cove Drive.

During and following the presentation, the Board asked a series of questions:

Board Member French asked if the North American Vertical Datum 1988 (NAVD 88) mean low water level on Slide 18 that showed, the existing geotechnical condition had been reconciled with the mean low water level in the geotechnical report. Mr. Fippin stated it has been reconciled based on correcting elevations of as-built plans on the deck elevation.

Board Member French pressed on if there was a difference between the old "as-built" elevation's mean low water and what is used on the presentation slide. Mr. Fippin stated the primary difference is the bottom of the rock dike where a small adjustment was made to match the findings of the drilling tests.

Board Member French asked where the old swale is located. Mr. Fippin stated the swale was first revealed in aerial photos. He pointed out the location and key features of the swale on Slide 22. He stated the fill is five to ten feet thicker within the swale and the alluvium below the swale exhibits liquefaction. Several of the data points indicate that the susceptibility of liquefaction of the swale area is greater than the rest of the site.

Acting Chair Rollo asked if analyses had been done on other sections. Mr. Fippin stated analyses have been completed but other cross-sections are not included in the report.

Acting Chair Rollo suggested at least putting out a publication on the cross-sections. Stability and other analyses may also need to be done. He suggested moving the section to the right or around the corner to the left for potential increased stability. Mr. Fippin stated ENGEO is currently focused on this section and is considering ways to mitigate the issue.

Acting Chair Rollo stated the logs do not appear to be consistent with what is shown in this section. Clayey sand boring 2-EB-1 shows a significant clayey sand layer that extends further than 2-EB-2, and 2-EB-3 has serious liquefaction issues. He asked what the residual strength is in the stability analysis. There is no evaluation of the stability of the slope beyond the wharf; the focus has been on the wharf area. He pointed to another area on Slide 17 and questioned the residual strengths there. Mr. Fippin stated ENGEO has looked at those areas, can follow that up with supplementary documentation, and can take another look to see how it affects the results and modify it as necessary.

Acting Chair Rollo asked ENGEO to provide more detail on the clayey sand layer.

Board Member French remarked that the designation for clayey sands, SC in the log, shown as non-plastic, should have the designation SM for silty sands with 11-blow count of a non-plastic SM at depth of 62 feet, which in turn would be an elevation of 52 feet due to a correction of the elevation datum and should not be a 30-degree material during an earthquake. Mr. Fippin agreed and stated ENGE0 will take another look at it and revise as appropriate.

Acting Chair Rollo stated the same clayey sand in 2-EB-1 is also present in 2-EB-3. 2-EB-3 has clayey sand that is non-plastic that goes from 55 to 72 feet. Mr. Fippin stated the elevation there is approximately 14 feet; 70 minus 14 equals 56 feet.

Acting Chair Rollo stated Slide 18 shows a sand layer. He stated ENGE0 considered it because it is non-plastic and refers to it as a sand for that section, but the logs call it clayey sand. Mr. Fippin stated ENGE0 can take another look at how it affects things and modify it as appropriate.

Board Member French stated Slide 19, site response, looks like ENGE0 did not run their own seismic hazard. He noted that after running a site response, it makes more sense for ENGE0 to run their own seismic hazard. Mr. Fippin stated ENGE0 used a flat-top code spectrum. A large part of that was a decision because of their convolution of the procedure in ASCE 7-10 and the inclusion of the risk of collapse and directivity effects. Because of ASCE's rules, it ends up with a spectrum that looks very similar to the code spectrum at the bedrock. It provides a flat-top spectrum because S-1 and SDS must be adjusted to meet all the ASCE 7 rules.

Acting Chair Rollo stated the sand and clayey sand test results would mean residual strengths that could be significantly less, maybe 300 or 350 psf, which will impact deep soil mixing (DSM). Mr. Fippin stated it will not affect the deep soil mix design because the design goes all the way to bedrock; however, it will potentially affect the performance of the wharf.

Acting Chair Rollo stated the chart shows the test DSM going into the old alluvium layer. Mr. Fippin stated the test went five feet into the old alluvium, which is five to ten feet thick.

Acting Chair Rollo stated the test DSM did not go into the bedrock. Mr. Fippin agreed.

Board Member French stated a shear strength of 3100 psf was used for the old alluvium. He asked where that number came from. Todd Bradford, ENGE0, stated it came from triaxial shear testing.

Acting Chair Rollo asked if it was increased to 20 percent and if it was measured shear strengths. Mr. Bradford stated it was measured shear strengths at a 10 to 15 percent reduction. He stated he needed to confirm that figure.

Board Member French suggested including a narrative describing the processes and time histories used in developing the ground response analysis. He asked if the spectra was disaggregated and how time/history records were chosen. He noted that most hazard in this area is Strike Slip, but the chart in Slide 19, site response, includes one Reverse and one Normal fault type, which is surprising, but does not include the San Andreas fault. He suggested taking the average from at least seven sources instead of the five shown on the slide. Mr. Fippin stated he will give these questions to the seismologist and put together a memo describing the process.

Acting Chair Rollo stated the site in the Boring Log that is liquefiable is labeled as Site Classification E. He questioned why, with liquefaction, the Boring Log does not list the pier Site Classification as F. Mr. Fippin stated it was because the swale is a relatively small portion of the site.

Board Member French stated, when liquefaction is involved, it can still have an Se (site class E) classification.

Board Member French stated it is also described in the text as “young Bay mud with organic content, high- plasticity clay,” which may or may not turn it into a Site Classification F. He suggested providing a narrative describing the process and reasoning behind it. He stated this area is a strong candidate for Site Classification F. Mr. Fippin stated the ground response analysis shows behavior similar to a Site Classification F. For Site Classification F, the ASCE 7 recommends checking against 80 percent of Site Class E and ensuring it does not fall below it.

Board Member French suggested calling it a Site Class F, since it looks like an F-like spectrum.

Acting Chair Rollo stated the text says the site is classified as Site Class E per Chapter 20 of ASCE 7-10. Mr. Fippin agreed it should be modified because Chapter 20 was not used for this analysis.

Board Member French noted that there were no velocities listed, such as seismic cones. He stated seismic cone penetration testing is standard. He suggested turning one of the recent cones into a seismic cone. Mr. Fippin stated this spectrum is driven by the soil offshore. Young Bay mud is significantly stiffer on land than it is over water, so Shear Wave Velocity Profile measurements from onland would have been misleading and overwater seismic cones would have been complicated if not impossible.

Board Member French asked if the Shear Wave Velocity Profile used is included in the report. Mr. Bradford stated it was not included in the report but can be provided.

Acting Chair Rollo stated concerns over the potentially liquefiable soil layer carries over into the p-y curves. He asked if the numbers are balanced in light of residual strengths. Mr. Fippin stated ENGEO’s approach to dealing with liquefiable soil on a p-y analysis is consistent with a centrifuge testing publication by U.C. Davis that recommends using a sand p-y curve with a.15 multiplier.

Board Member French referred to Slide 22, DSM buttress, and asked about the number of inches of lateral movement on the outward piles that was provided to SGH to do their analysis in addition to the deformation that occurs. Mr. Fippin stated, once the driving force with the DSM is removed and the pinning forces are included, the estimate of displacement under seismic event is two to four inches.

Board Member French asked if that is true when running the clayey sand layer all the way back. Mr. Fippin stated they need to review that to see how it affects the results.

Board Member French stated the need to change the dimensions of the buttress. Mr. Fippin stated, if there is a liquefiable layer through there, the cell orientation may need to be modified. He stated, if the soil is liquefiable, the residual strength may be lower than originally assigned to the strength of the young Bay mud.

Board Member Gilpin stated there is over 1,200 feet of shoreline but there is only one cross-sectional area covered with subsurface investigation. He questioned if there was enough subsurface information gathered for the western side of the wharf, considering the added challenge of the heterogeneity of the DSM buttress, the swale area, and the rock dike fill feature. Mr. Fippin stated ENGEO is confident the site is well-constrained with the data gathered.

Board Member Gilpin encouraged the applicant to look at that area and do more cone penetrometer tests (CPTs) before the final design.

Board Member French agreed and suggested including a wrapped longitudinal section along the rock dike area and the contours of the bottom of granular materials or the top of the old alluvium layer where the swale cuts through.

Board Member French asked about the integrity of piles below grade and if pile integrity tests were completed. Sam Yao, SGH, stated although some pile-supported wharves in other projects exhibit damages in piles below grade, they are not common. The most common pile damages occur in the tidal zone due to concrete deterioration and steel corrosion. He stated he has not done testing on piles below grade in this project, and testing pile below grade is not common practice for this type of projects. He has observed that the majority of the damages to the piles in the Latitude wharf is in the tidal zone. He stated SGH's focus on the structural assessment perspective is looking at the piles and the damage in the tidal zone - the disintegration and damage due to several issues, such as corrosion in the reinforcing steel.

Board Member French suggested doing a soil structure interaction (SSI) analysis. Mr. Yao stated SSI was conducted using 3-dimensional finite element analysis of the wharf supported on soil p-y springs, and SGH's approach to seismic kinematic loading and slope stability is interacting between the 3D finite element analysis and giving the results (pile pinning forces) to ENGEO to do a slope stability analysis.

Acting Chair Rollo summarized the Board comments and suggestions, as follows:

(1) Look at the amount of information gathered on the western part of the site to see if additional work and exploration is warranted to better characterize the materials below the Bay mud.

(2) Questions were raised regarding the strength parameters used in evaluating the stability of the sand and clayey sand using Phi (friction angle) of 31 and a undrained strength of 780 psf.

(3) Reexamine the deflections for the piles during an event and the configuration and depth of the DSM buttress.

(4) Justify why the site is classified as E and not F.

(5) Mr. Fippin agreed that it should be Site Classification F. It was erroneously marked E due to an oversight.

(6) Provide information gathered regarding subsurface profiles in other parts of the site, including longitudinally.

(7) Reexamine the results and provide a narrative of the seismic hazard staging.

e. **Simpson Gumpertz & Heger.** Sam Yao, Senior Principal, Simpson Gumpertz & Heger (SGH), provided an overview, accompanied by a slide presentation, of the existing condition of the wharf and concrete testing of the piles, dead weight and 3D finite element analysis for gravity loads, benefits of the pile encasement repair method, structural design of the wharf, seismic load evaluation and retrofit, and wave slamming analysis and summary.

Mr. Yao stated twenty eight piles have severe deterioration. Almost 95 percent of the piles have exposed shotcrete with a thickness of 4 to 7 inches. He maintained that the Knowledge Factor of the concrete piles is 1.0 in accordance with California Building Code (CBC), but reduced the Knowledge Factor of the timber piles to zero. He stated, in the seismic inertial load evaluation, the torsional effect was accounted for in a 3D Finite Element model, pushing the seismic inertial load in two directions simultaneously. He stated the effect of the 20-30 feet of rock/gravel fill beneath the wharf on seismic response is included in the 3D Finite Element model. It increases the shear force on the piles but those increases are still below the capacity of the pile.

Mr. Yao stated the seismic structural design is at 35 percent design level. He summarized that the seismic retrofit scheme works structurally.

During and following the presentation, the Board asked a series of questions:

Acting Chair Rollo stated 126 piles were classified as major damage and 30 piles classified as severe damage. He asked if the intent is to repair 156 piles. Mr. Yao stated he will get to that later in his presentation.

Board Member Dornhelm asked if chloride ion penetration tests were completed on the core samples. Mr. Yao stated he performed these tests. He concluded that the chloride has

penetrated through the concrete and initiated the corrosion of the rebar; however, the sign of corrosion is limited due to the benefit of the shotcrete.

Board Member French asked when the shotcrete was placed. Mr. Yao stated there is no specific record of this but estimated it was from the '70s.

Board Member French asked how far down the shotcrete goes. Mr. Yao stated it goes from the deck beams to the low water. He stated the structural assessment did not account for the 4- to 7-inch-thick shotcrete. A severe deterioration rating shows a spall on the concrete; a major deterioration rating shows a spall on the shotcrete rather than the concrete pile itself.

Board Member French stated Slide 23, concrete testing, shows the major classification extending through the concrete. Mr. Yao stated most of the wharves on the West Coast have a chloride level above the threshold for corrosion. The rate of deterioration is difficult to assess. He recommended that the property owner repair what is needed to meet safety requirements and create a long-term plan for monitoring inspections and maintaining the wharf, including the piles, as per CBC 31F.

Board Member French stated he has a problem with that because this project will become the property of the city of Richmond. Cities never have enough funds for maintenance. A project representative agreed but stated the homeowners will maintain the facility through a Community Facilities District (CFD) maintenance agreement.

A project representative stated the Land Disposition Agreement with the city is also a development agreement with obligations the city agrees to incur to extend beyond the purchase of the property. A financing mechanism will be created to support the maintenance of the public land including the wharf.

Board Member French asked if the applicant will repair only the severe-category piles. Mr. Yao stated he will answer that question during his presentation.

Board Member French referred to Slide 28, the demand-to-capacity ratio, and asked if the red areas in the graph will be holes in the deck if the demand exceeds the capacity. Mr. Yao stated the rebar will yield in a ductile failure mode, the concrete will crack, and, if not repaired, there will eventually be a hole in the deck. Board Member French asked whether Mr. Yao is alluding to the potential of a non-catastrophic, non-life threatening but structural failure. Mr. Yao said it would be a ductile failure instead.

Acting Chair Rollo asked if the whole deck will be red-tagged and closed down if the beam failures occur, which are marked in red on the slide. Mr. Yao stated he did not wish to get into such speculation as the structural engineer of record. He stated he would not let this happen. He will encourage the developer to repair piles as they become classified as severe and fall below the safety requirement in the CBC.

Acting Chair Rollo stated Mr. Yao's recommendation is that Phase 1 will include repair of all of the piles that have been rated Severe, watch the piles that have been rated Major, and repair them as they deteriorate to a Severe classification. Mr. Yao agreed.

Mr. Montes referred to Slide 31 and asked if the shotcrete will be removed prior to the pile encasement repair method. Mr. Yao stated that will be considered in the detailed design. He stated the shotcrete would be awkward to remove in the encasement procedure.

Acting Chair Rollo referred to Slides 32 and 33, structural basis of design, and asked if this portion of the presentation was discussed with the structural Board Members at the May 24th meeting. Mr. Yao stated it was. He stated Board Members asked two questions that he will respond to during his presentation.

Acting Chair Rollo referred to Slide 34, seismic retrofit, and asked if the diameter of the piles is 6 feet. Mr. Yao stated the new 14x117 HP piles are spaced at 10 feet. The total weight of the wharf including the new park above the wharf deck is only a little over 16,000 kips.

Board Member French stated the most critical seismic direction is transverse to the deck towards the water. Mr. Yao agreed. He reminded Board Members that the timber piles have been assigned a Knowledge Factor of zero.

Acting Chair Rollo asked if the steel pile will be coated. Mr. Yao stated the top 40 to 50 feet of the steel pile will be coated; below that there is no oxygen so there is no little corrosion.

Mr. Yao addressed the comments of Board Member Bill Holmes in absentia regarding lateral-torsional load effects included in the analysis model. Slide 35 showed a schematic of the lateral load resistance of the piles (100% transverse and 30% longitudinal) with most of the load/energy dissipated and torsional effects happening at the piles closest to the shoreline. There were 4 levels of earthquake resistance described in the slide ranging from Yield, Level 1 seismic performance (little damage), Level 2 seismic performance (life safety) and Failure. He said that the design target is the Level 2 seismic performance or life safety criteria. He explained the demand capacity(D/C) ratios based on the inertial loads combinations of 100% transverse and 30% longitudinal for the upper and lower bound cases based on the site spectra. He compared the above ratios to the D/C of the new steel and existing concrete piles that seem to show a reservoir of capacity for the piles. Some discussion about the capacities of the proposed H-piles ensued.

Board Member French referred to Slide 36, nonlinear pushover analysis, and asked if the spectrum will stretch out as it gets ductile, if the period will get longer as it degrades, and if it will make it climb up the spectrum. Mr. Yao stated all the analysis results on the slide account for upper bound and lower bound of the soil response. The reason the numbers are low is the pile is in an approximately 30-foot stack of gravel and rock. The last comment Mr. Yao addressed in response to the structural engineering questions from the last meeting was regarding a check on the corbel reinforcement under the deck in relation to any effects on the

seismic response. He said that this effect response is addressed on its 3-D finite element model where it shows that the plastic hinge happens below the corbel with a plastic hinge on the pile. It increases the shear force on the pile but the increase is still below the capacity of the piles. The comment's response was addressed in Slide 37 of the presentation.

Board Member French referred to Slide 38, kinematic load analysis, and asked if the rock mass was pushed with a spring or with a displacement. Mr. Yao stated it was pushed with a soil displacement on the soil spring by four inches.

Acting Chair Rollo asked what happens if that surface extends down into the old alluvium. Mr. Yao stated it will not get worse unless the displacement is greater but the design is limited to four inches. Based on this analysis, the conclusion is that rock slope is stable under those pinning forces as well as soil resistance.

Board Member French asked how ENGEO searched for the potential slip failure surface for the kinematic load analysis. Mr. Fippin stated ENGEO did a circular and noncircular search each time. The circular was constrained due to the boxes that noncircular surfaces had to go through.

Board Member French asked if ENGEO can include where the search constraints are in their report, such as the entry and exist points.

Board Member French referred to Slide 39, combined inertial and kinematic loads, and questioned the effective structure period of 0.42 seconds with 5 percent damping. Mr. Yao stated that figure is only 25 percent of the total inertial load per CBC because inertial and kinematic loads do not occur at the same location or at the same time.

Board Member Battalio stated he made a comment earlier about possible high water or air pressures where the deck meets the land. He stated there may be a gap where the water will squirt through the decking. Mr. Yao stated the wave entrance is from the southwest side so it comes in at an angle. The 2D slide shows a confined space, but there is space for the air and water to dissipate.

Board Member Battalio asked if air and water pressures influence the fill or landscaping. Mr. Yao pointed to an area on a presentation slide that shows a bulkhead wall that will not allow the water through.

Board Member French stated when the water hits the wall it will reflect backwards, which will double the wave height or wave pressure. Mr. Yao stated waves will pass many piles, which will cause energy dissipation. The slope, depth, and distance was accounted for when the wave particle velocity was calculated.

Board Member Dornhelm asked about waves going over the deck with sea level rise. Mr. Livingston stated that issue will be part of the adaptive analysis. Adaptive measures address not only design features of the site, but also of restrictions on use and the ways to control use of the facilities.

Board Member Battalio stated it seemed like SGH did not rely on the piles for the lateral load analysis. Mr. Yao clarified that the longer piles sticking up through the water and air are flexible. From the inertial analysis, the piles in the front row attract approximately 1 percent of the lateral loads, while the piles in the back, plus the new piles, attract 99 percent of the lateral loads. Repairing the piles from the three rows with a major spall or rebar corrosion is relatively inexpensive because they are above the water level. The section that is 10 to 12 feet under the water will require boats and divers to repair and therefore will be more expensive. Mr. Yao pointed to the piles on the presentation slides that are more important for seismic resistance.

Board Member Battalio asked about including the repair of the piles that are classified as having major damage in the water near the shoreline while repairing the severely damaged piles. Mr. Yao agreed. He pointed out piles that have major deterioration on the presentation slides and stated they should be repaired because of the seismic requirement. He stated a repair and maintenance program will be created working with the developer and the city.

Acting Chair Rollo referred to Slide 24, pile conditions, and pointed out the significant number of piles that are classified as having major damage along Lines J, K, and L on the schematic of the wharf. Mr. Yao agreed but stated they must be considered on a case-by-case basis to determine if the damage is in the structural pile or is weakening, softening and spalled on the shotcrete cover. If the damage is structural, they should be repaired.

Mr. Montes asked if the shotcrete tests included sounding for hollowness. Mr. Yao stated sounding tests were done on selected piles to test for delamination over time. No delamination was found.

f. **Board Discussion.** The Board discussed the following:

Board Member Comerio suggested that, in the same way that the BCDC is thinking about the long-term implications of sea level rise and its issues relative to the Bay and policy, it should also be thinking about long-term resilience and public access to the Bay. Ninety-nine percent of the projects that come before the ECRB are designed to code, which means they will be inaccessible in the event of an earthquake.

Mr. Montes asked the Board for advice on three questions listed on page 10 of the staff summary, which was included in the meeting packet, as follows:

- (1) Whether the seismic, structural, and geotechnical criteria is appropriate.
- (2) Whether resilience over the long-term is appropriate.

Acting Chair Rollo stated these questions reflect why the Board has been discussing issues such as the pile damage categories to repair and whether to conduct a site response analysis. This is a performance-based design. He asked whether this Board should decide the level of performance expected from this structure or let the code govern that. The design should meet the requirements to code and should be in accordance with the standards of practice. He stated he did not know if the Board should request the applicant to go beyond that.

Mr. Montes stated the code is the minimum standard; the Board can require more than that. The ECRB has requested more than what the code requires in previous projects. Staff relies on the Board to set criteria beyond the code.

Board Member Comerio stated this is a difficult question. A performance-based design is the norm in the design community. The research world is past that and is now doing resilience-based design, which takes long-term models into account. She stated the need for a culture change of not accepting the minimum standard code anymore. She stated the engineering community is beginning to discuss it but is a long way from accepting it. She stated she is unsure that the BCDC is ready to go there, much less the rest of the engineering community.

Ms. Michaels stated the policies already allow for resiliency to a certain point and then adaptation depending on the life of the structure. She stated policies also require that public access be resilient and adaptable for the life of the structure.

Board Member Comerio stated she would be comfortable making this decision if there was a serious safety issue. She asked staff to count the percentage of shoreline projects that are built to code that will interfere with access in a major earthquake. It is an important question because policy cannot be shaped without that information.

Acting Chair Rollo suggested considering if the applicant has properly characterized the site so that, going forward, whatever analysis is done, the right input is used to ensure it is safe. The applicant has done good engineering, although there are issues with what is classified as major and severe. He stated he was satisfied with the engineering criteria that was used in evaluating and taking this design to 35 percent.

Board Member Battalio stated the BCDC is contemporary with the guidance over and above the code on the sea level rise component. The applicants have responded to Board input, but there is more work to do since the guidance is fluid and will continue to change. He stated access does not necessarily have to be always accessible. There is the benefit of having access over the next fifty years, even if it is not accessible later in the century. He suggested that the environmental implications can better be covered by the Design Review Board to consider sustainability and adaptation above and beyond the code.

(3) Whether shoreline protection is adequate based on sea level rise projections.

Board Member Comerio stated she has a difficult time answering this question without a better understanding of the amounts of shoreline that are and are not developed and how much was developed within the last 20 years.

Board Member Battalio stated the need for change; thinking about shoreline protection is an old way of looking at things. The shore is going to change. How it will change and how to change with it are the questions. The idea of shoreline protection being maintained in an existing spot is something the Board cannot be stuck on.

Mr. Montes stated the amount of shoreline protection is an issue staff struggles with as well. Inundation and flooding can occur from adjacent properties to a project, even though the shoreline protection on that project may be adequate.

Board Member Battalio stated shoreline protection is not always good, especially from an environmental perspective. He suggested revisiting the idea of shoreline protection.

g. **Conclusion.** Acting Chair Rollo asked if the issues raised and the comments and requests made by the Board warrant that the applicant come back with their responses, or if Board Members were satisfied that the applicant met the proper criteria and that the specific items can be addressed through correspondence.

Board Members were divided between those who were satisfied to receive responses in writing and those who preferred to see the project again at the next meeting.

Mr. Livingston stated, until the BCDC permit approval, the project cannot move forward. He stated he is waiting to put the formal application in until approval of the ECRB. He asked if the Board would allow the applicant to move forward at the same time that his team is responding to the issues raised today.

Ms. Michaels stated the applicant is free to submit their formal application at any time.

Acting Chair Rollo asked for a motion.

MOTION: A motion was moved and seconded that the Board grants a conditional approval and recommends that the BCDC proceed with the application process contingent upon adequate responses to the issues raised at the August 8, 2017, ECRB meeting, including geotechnical and seismic instrumentation concerns, to be provided in writing, evaluated by the Board, and final approval be voted on at the next ECRB meeting.

VOTE: The motion carried unanimously.

h. **Public Comment.** Brian Lewis, Brickyard Cove Alliance for Responsible Development (BCARD), asked for a copy of the applicant response documents so he can have the opportunity to provide feedback.

4. **Adjournment.** There being no further business, the meeting was adjourned at approximately 4:30 p.m.

Respectfully submitted,

RAFAEL MONTES, P.E.
Board Secretary

Approved, as corrected, at the Engineering Criteria
Review Board Meeting November 1, 2017.