San Francisco Bay Conservation and Development Commission
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January 10, 2019

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)
Rebecca Coates-Maldoon, Principal Permit Analyst (415/352-3634; rebecca.coates-maldoon@bcdc.ca.gov)

SUBJECT: Draft Minutes of November 13, 2018, BCDC Engineering Criteria Review Board Meeting

1. **Call to Order.** The meeting was called to order by the Chair, Dr. Roger Borcherdt, at 1:05 p.m. in the Monterey Conference Room at 455 Golden Gate Avenue, San Francisco, California.

The following ECRB Board Members were present: Dr. Roger Borcherdt, Board Chair; Richard B. Dornhelm, PE; James "Jim" French, PE, GE; Dr. Lou Gilpin; William Homes, SE; Professor Jack Moehle; and Frank Rollo, PE, GE.

The following ECRB Board Members were not present: Robert "Bob" Battalio, PE; Professor Mary Catherine Comerio; and Professor Martin Fischer.

2. **Approval of Draft Minutes for September 26, 2018 Engineering Criteria Review Board (ECRB) Meeting.** Committee Member French had a correction on page 11, second paragraph: "pit tests" should read "PIT tests" as it stands for Pile Integrity Testing.

Committee Member Dornhelm had a correction on page 7, second paragraph: "ground motions for a particular sea level event" should read "ground motions for a particular seismic event."

Chair Borcherdt had a correction on page 2: Mr. French rather than Mr. Dornhelm had seconded the Motion to approve the Minutes.

Committee Member Holmes had a correction on page 3, second paragraph: the phrase "de-aggregation of the piles" should be "deterioration of the piles."

Committee Member Holmes had a correction on page 6, second paragraph: "weight passage" should read "wave passage."

Chair Borcherdt had a correction on page 6, third paragraph: "inertial leads" should read "inertial loads."

MOTION: Mr. Moehle moved approval of the Minutes, seconded by Mr. Holmes. The motion carried with a vote of 7-0-0 with Chair Borcherdt, Mr. Dornhelm, Mr. French, Mr. Gilpin, Mr. Holmes, Mr. Moehle, and Mr. Rollo voting "YES", no "NO" votes, and no abstentions.

Chair Borcherdt invited the audience members and ECRB staff to introduce themselves.

Audience members interested in the Alameda Landing Mixed-Use Development Project included the following: Bill Kennedy, Dave Irving, and Damir Priskich, Catellus Development Corporation; Juan Baez, Ph.D., Advanced Geosolutions, Inc. (AGI); Gayle Johnson, Simpson Gumpertz & Heger (SGH); Haze Rodgers, Langan; and Doug Schwarm, Atlas Geotechnical.

The following BCDC staff members were present: Rafael Montes, Senior Staff Engineer and Board Secretary; Rebecca Coates-Maldoon, Principal Permit Analyst; Morgan Chow, Permit Analyst; Walt Deppe, Coastal Program Analyst; Andrea Gaffney, Bay Development Design Analyst; Todd Hallenbeck, GIS Specialist; and Ethan Lavine, Chief of Bay Resources and Permits.

3. **Public Comments (not addressed).**

4. **Board Discussion: Alameda Landing Mixed-Use Development Project, Alameda County (Pre-Application).** Committee Member Rollo stated for the record that he was recusing himself from any discussions on the Alameda Landing project. Ms. Coates-Maldoon provided a summary of the current stage of the project. During the last review, the ECRB had requested responses to their comments regarding the proposed engineering criteria. Ms. Coates-Maldoon listed the comments.

The project proponents presented their responses and additional information.

Comment #1: Develop estimates of relative displacements induced by wave passage effect using appropriate MCE time histories for Hayward and San Andreas faults. Determine if seismic joint criteria are consistent with anticipated wave-passage displacements.

Mr. Schwarm stated that the letter of October 31 had restated the probabilistic approach taken to time history development. Wave passage effects on wharf performance are addressed beginning on page 2. They felt that the two time histories that they used, one representing a magnitude 7.3 Hayward fault scenario and another slightly larger on the San Andreas fault, had 3.7 – 3.8 inches of differential between the two expansion joints. 4 inches of movement in a work like this is highly redundant – far below the other displacement tolerances that are controlling the design. After rigorous investigation, they determined that this phenomenon did not control stability or safety of the wharf.

Chair Borcherdt asked for further explanation of "non-vertical waves" pertaining to spatial incoherence of the seismic motions. Mr. Schwarm answered that they exclude vertical waves because their entire analysis is one-dimensional; they rotate the wave orientation to be the least favorable relative to the wharf. The group continued to discuss wave effects. Mr. Schwarm said that in the analysis the design team had borrowed from the bridge analysis industry and performed a simplified analysis of the worst-case reasonable conditions they could find, showing about an order of magnitude below the displacements that would be troublesome for the wharf.

Chair Borcherdt felt that the wave propagation phenomenon differences in the three suggested cases were fairly significant. Rayleigh waves (basin waves) can be predominant on strong motion records; their amplitude should be accounted for in the design. Mr. Schwarm expressed confidence that the design team had addressed the issue adequately from a Life/Safety perspective. They have met the standard of care for these types of analyses; at 875 feet the team does not have any concern about a failure mode developing out of this mechanism.

Committee Member French asked if they had done the displacement time history on top of old bay clay rather than the ground surface. Mr. Schwarm answered that their 1-D analysis developing ground motions for other members of the design team had a number of outlet points. Discussion ensued. Mr. Schwarm stated that their analysis focused on the ASCE 61 approach.

Committee Member Holmes commented that the team seemed to be comparing these displacements to the inertial displacements. Is it possible that the differential displacement could put the wharf in tension or compression? Mr. Schwarm answered that it would only be for the relatively short distance of 875 feet between the expansion joints, and then only to the extent that the piles are capable of transmitting the tension up to the deck. The relative differential for these types of waves is not abrupt – it is related to the wave length.

Mr. Kennedy noted that they were solving for ASCE 61; what was the goal? Mr. Schwarm said that you choose your goals as you work your way through ASCE 61. Here the choice was Life/Safety performance. Mr. Kennedy stated that for the design team, the goal had always been to define failure; in every scenario they ran, failure was displacement of 4–12 inches. They were trying to demonstrate that they have safe egress in the case of a seismic event.

Committee Member French commented that wave passage effects mean that displacement from one end to the other is different at different times, but it is not having any significance relative to how far any given pile is going to be displaced, stressed, or bent. However, it will mean that one end is going to displace differently from another. This impacts whether the wharf diaphragm is getting racked in a horizontal plane. Joints along the wave will displace or strain a little, and this horizontal diaphragm is going to attenuate the deformations

and make the pile performance a little better, if anything. Mr. Schwarm agreed and said that the third mechanism is that the individual piles as structural elements are slender and flexible relative to the very stiff horizontal diaphragm, so the piles are not typically strong enough to transmit a load up off the ground into the diaphragm and cause damage.

Mr. Johnson added that they have an industrial use deck design with crane rails and 24-inch deep sections through much of what they are going to leave at 48 inches in places. The design team was finding that the piles were very flexible and moving along with the soil in their kinematic analysis. He felt that any of the differential movement would be taken out in the piles. Given the margins they had, they were putting in 100% kinematic with 100% inertial.

Mr. French summarized that it is a mechanism that potentially adds some demand to the system, but it is a second order type of loading that is covered because of their conservative first order loading.

Chair Borcherdt stated that the overall implication with respect to the design criteria was that the team had given substantial consideration to the potential impact with respect to egress. As long as the wave passage effect is sufficiently taken into account, the design should be acceptable. Chair Borcherdt was still interested in how large the difference from Rayleigh waves could be because they are prominent in seismology.

He noted that the design team had provided a response to comment #3: Introduce new notation to refer to average shear velocities in bedrock, by designating the depth interval as indicated for an interval of 45m to 60m by "Vs45-60." …

Chair Borcherdt referred to comment #4: Provide a DSM plan that explains installation and performance criteria to minimize potential lateral movement of underlying bay mud induced by addition of fill (soil and buildings) and MCE ground motion. Dr. Baez stated that the design team had prepared a memo in response dated October 29. Two questions were being addressed in the same response. They had provided the layout configuration in the Design Submittal under Appendix E, page 171. Panels are created in 7-foot diameter columns that are overlapped by 1 foot in a north-south direction. They are located every 20 feet along the wharf. Replacement is about 30%.

Dr. Baez continued with the design submittal. The design team had looked at the impact of the worst case scenario for loading, which is essentially the aggregate of the placed additional fill – the building loads as well as the earthquake loading. Within that context is the information they provided to SGH in terms of lateral deformations, in both the bay mud and the piles. The response memorandum includes a table of four loading cases, taken apart a little more. Dr. Baez explained the analysis of the loading cases.

Committee Member French asked if it was a track crane they drove on the top. Dr. Baez answered that it is a specialized drill rig on tracks. They are going to have a wharf platform to work on, which is essentially regarded as a load transfer platform made of cement-treated material three feet thick. Where the deep soil mixing panels are going to be constructed, the deck will be cut off; the piles will be cut off about one foot below existing grade; above that grade is where they will build the load transfer platform. The rig will be sitting on the load transfer platform, which is supported on the existing piles; therefore, there would be plenty of redundancy on the effects.

Chair Borcherdt asked about the 12-inch movement in the bay mud; was that going to have any effect on the DSM? Dr. Baez responded that it would not. The movement tends to happen in front of the DSM. Working with SGH, the team provided displacements not only at the interface between the deep soil mixing and the first row of piles, but also midway into the deck, first on the water side and also at the far end. There are at least three places where those displacements have been considered.

Chair Borcherdt commented that the design team had done a nice job of modeling these various effects and taking them into consideration.

Chair Borcherdt stated that comment #5, Provide criteria for minimization of potential environmental impacts of DSM and fill emplacement on additional material moving into the Bay, had been addressed.

Chair Borcherdt inquired about the revised plan for the instrumentation. Mr. Johnson responded that they were incorporating additional instruments as the ECRB had suggested.

Chair Borcherdt referred to comment #6, Identify sea level inundation zone and associated criteria for the wharf. Determine if Coastal Zone A is appropriate. Mr. Kennedy referred to the memo prepared by Christopher Mills, PE, of BKF. When the project began, everyone had been using sea level rise of 36 inches for midcentury and 66 inches for end of century. Table 1, attached to the memo, referenced the 2018 update with a midcentury level of 1.9 feet with medium to high risk aversion. With low risk aversion, 1.9 feet is reached in 2070. With the medium to high risk aversion figures, the performance result is 9.75 feet on a deck that is at 13 – a very good performance level.

Mr. Kennedy continued that the end of century scenario is based on the same table: 0.5% probability that sea level rise will meet or exceed 5.7 feet. Mr. Kennedy pointed out that no structures are being built on this promenade; the structures are all behind this zone, still within BCDC jurisdiction. The report states that existing grades today are as low as eight feet. In the future, on the developed project there might be eight foot grades at the bottom of some of the fire retention or landscaped areas. For the end of century scenario they feel pretty well covered.

Mr. Kennedy continued that they have recommended some adaptive measures to get above the 13 feet for king tide events. Those might occur up to 12 times a year. By raising the sidewalk about a foot between the back side of the park and the residential properties, there is one more foot of freeboard to allow maximum feasible public access during those extreme events.

Mr. Johnson explained that they had looked at vertical wave loads underneath the deck. They compared the wave load from wind-generated waves with vessels passing through the estuary; wave heights of the latter were less. The loads on the bottom of the deck were not even large enough to overcome the weight of the deck itself – it was not a design issue.

Committee Member Dornhelm stated that Coastal Zone AE would be the correct designation, shown as such on the FEMA map. The soffit of the deck had seen very little damage because it is so far above the high tide. As the sea level creeps up, there will be increasing splash and the soffit will be part of someone's future maintenance. Mr. Johnson noted that they are repairing the soffit in the initial repair.

Mr. Kennedy noted that the Catellus offices in Jack London Square are opposite the project, so they observe the Coast Guard cutters going through creating very little wake compared to recreational boats. He also noted that in light of the extreme scenarios the group had discussed, the one area in Alameda that still had no overtopping is the frontage of this wharf.

Committee Member Dornhelm felt that they had done a good job in raising the finished floor in the building to 15'5". The elevation 13' which corresponds to the low risk aversion is appropriate for the wharf deck, but probably not for new building structures with floors. He also noted that they have an area for an adaptive management flood wall should one ever be needed.

Committee Member Dornhelm commented on the tail water for the drainage system, for which they set a mean higher high water (MHHW) for today's conditions. He suggested that the design team make some provision to accommodate the impact of rising sea level on the tail water – either pumping or some sort of accumulator basin. Mr. Kennedy responded that they have an existing bubble-up system with an oversize basin to which they intend to tie in the entire Alameda Landing project.

Chair Borcherdt addressed comment #7: Provide criteria for characteristics of fill to be added landward of the wharf, including that of cellular concrete and its buoyancy potential if inundated by water. Mr. Rodgers stated that the design team had provided a response in the letter from October 24 essentially recommending that any lightweight fill placed behind this wharf runnage be pervious to prevent buildup of hydrostatic pressure, to allow for any surface

that does infiltrate in to drain freely, and to assist with reducing the additional load added to the soil. There should be minimal pressures due to buoyancy associated with this – it is pervious so it will allow free transfer of water through it. Committee Member French stated that this was the solution he was wanting to see. Mr. Rodgers confirmed that they will not wrap the pervious material in an HDPE liner to keep the water out.

Chair Borcherdt stated that this response from the applicant was excellent.

Mr. Montes stated that BCDC had been looking to ensure that the questions raised by the Board last time were satisfactorily addressed.

Chair Borcherdt had understood that there were two reasons for which the ECRB had met again today: to provide their expertise in evaluating the applicant's response, and to satisfy the requirements of the Bagley-Keene Open Meeting Act.

MOTION: Mr. Moehle moved to accept the responses as presented; seconded by Mr. Holmes. The motion carried with a vote of 6-0-0 with Chair Borcherdt, Mr. Dornhelm, Mr. French, Dr. Gilpin, Mr. Holmes, and Mr. Moehle voting "YES", no "NO" votes, and no abstentions.

Ms. Gaffney, Secretary for the Design Review Board, stated that she and Erik Buehmann, one of the Chiefs of Permits, would present at the upcoming Commission meeting that Thursday a briefing on the Ocean Protection Council's updated Sea Level Rise Guidance and how it is being applied in the regulatory unit.

Ms. Gaffney also announced that a staff report workshop was being held at the Commission.

5. **Demonstration of the Adapting to Rising Tides Bay Shoreline Flood Explorer.** Mr. Montes stated that the presentation would be posted and that he would send the ECRB a PDF copy.

Mr. Hallenbeck stated that he would be speaking about the development of the underlying data and MAP_SET that are available with this tool, and that he would provide a demonstration.

He stated that adapting to Rising Tides (ART) is a program within the BCDC Planning Division primarily focused on supporting local jurisdictions in developing adaptation measures for vulnerable areas along the shoreline.

ART relies on highly accurate spatial data related to sea level rise and storm surge flood risk.

The mapping effort began in 2015. They now have a uniform data set reflecting sea level rise and storm flooding for all nine Bay Area counties. Several months ago they launched this website to help make the data, which had existed in geodatabases and PDFs, more accessible to a wider range of audiences.

The sea level rise maps rely on two primary inputs. One is the water surface that was created through the FEMA Bay Coastal Study. In 2016 the tidal datum was updated: it modeled water levels and tidal datums at 900 distinct points throughout the San Francisco Bay. A hydrodynamic MIKE21 modeled daily tide and extreme tide events and calculated them for the 900 points. Understanding the spatial variability of the water level was important in being able to understand flood risk.

The key topographic data was collected in 2010 in a 1-meter digital elevation model.

The ART maps were developed to fill a niche to support planning:

a. Stakeholder Review

b. One Map, Many Futures

c. Shoreline Overtopping

Committee Member French asked if the DEM is available. Mr. Hallenbeck answered that it is available at a county-by-county level. It can be requested through the program staff.

Committee Member French asked how far inland it goes. Mr. Hallenbeck answered that it is set by the flooding extent of the highest water level. The bathymetry does not go below mean low water.

Mr. Hallenbeck explained Stakeholder Review as an effort to ground truth the digital elevation model and the resulting flood maps to identify areas that had not ever seen flooding.

Committee Member Dornhelm asked if FEMA recognized some of these corrections and accordingly revised their flood maps. Mr. Hallenbeck was not certain. Staff has a list of where all the corrections were made.

Mr. Hallenbeck continued that another unique aspect of the dataset is a layer called shoreline overtopping. The staff leveraged a dataset created by the San Francisco Estuary Institute which mapped shoreline segments around the Bay and characterized the type of shoreline; they then overlaid their elevation data and flood data to identify low points along the shoreline that would lead to inland flooding. It is valuable in the planning process for identifying and prioritizing areas along the shoreline for focusing adaption efforts.

Committee Member French asked if they were using hydraulics in their analysis. Mr. Hallenbeck answered that they were assuming water becomes level – the bathtub approach.

Mr. Hallenbeck explained the third unique characteristic of the dataset: the "One Map, Many Futures" approach. This concept was developed to communicate sea level rise and flood risk – temporary flooding from storm surge events and long-term impacts of permanent inundation from sea level rise. With today's high tide line, at MHHW a single total water level can occur due to a variety of scenarios. A flooding level may be seen temporarily during storm surge events or permanently from sea level rise.

The maps are intended for a wide range of stakeholders: planning partners, public agencies, elected officials, and the general public. Educational materials within the website explain the concepts; a major goal is to make the information accessible. Mr. Hallenbeck listed additional goals:

- Have people be able to explore parts of the shoreline
- Understand appropriate uses of the data
- For technical users, download the data for further analysis
- Highlight where the adaptation efforts are
- Build a shoreline and see resulting flood risk
- Pick a geography and get a report back on what might be exposed

Mr. Hallenbeck displayed the home page of the Bay Shoreline Flood Explorer. He pointed out that this tool and the maps attempt to reflect the flooding due to sea level rise and coastal storm surge. They do not try to reflect all the types of flooding that may be occurring from the watershed of riverine flooding.

Committee Member Dornhelm asked if the shoreline is all BCDC's jurisdiction. Mr. Hallenbeck answered that for the ART program, they often go outside of their regulatory jurisdiction because many times that information is valuable to the local partners. The inland extent of the flooding that they are mapping goes outside of the shoreline map. They do not go up to Sacramento, but a project they are currently working on is to map the remaining portions of eastern Contra Costa and Solano Counties as well as some portions of the Delta.

Mr. Hallenbeck gave a demonstration of the website.

He selected Learn from the Home page.

He explained the Introduction, Flood Concepts, and Disclaimer pages.

He selected Explore from the Home page.

Staff had recently worked with the City of San Leandro to explore the flood risk of their water treatment facility. Mr. Hallenbeck used this example to demonstrate screen features.

Chair Borcherdt suggested including data for a tsunami. Mr. Hallenbeck agreed with the idea.

Because much of the information can be fairly overwhelming, the ART staff tries to connect people to where adaptation projects are happening; that will change the flood risk in the future.

Because the website is intended to enable people to zoom in on a place, look at the flood risk, and make a map of an asset, an Upload icon lets them look at and see other related vulnerabilities.

People can customize their base maps to look at particular streets and so on. They can print the maps and share them with colleagues or stakeholders. People can provide feedback on accuracy of the maps and functionality of the tool itself.

Mr. Hallenbeck selected Download from the Home page. It shows largely Depth of Flooding, Shoreline Overtopping Depth, and Disconnected Low-Lying Areas.

He selected About from the Home page. It shows how the maps should be used, and includes the state guidance on water levels. It has become apparent that especially for the H++ (the extreme risk-aversion scenario), ART does not have a water level that corresponds to their highest estimate.

Dr. Gilpin noticed that the USGS flooding scenario map is mostly concerned with the California coast. Mr. Hallenbeck confirmed that USGS has a wider focus that they continue to expand. The ART program is not quite at the point of directing people when to go from ART maps to USGS maps depending on their questions.

Mr. Hallenbeck emphasized that the ART staff is interested in updating the actual underlying data itself –incorporating the best available science to remove some of the limitations in the maps, understanding how the maps can be combined with other flood maps to best answer particular questions, and collecting and incorporating the most current topographic data. As the ART program completes the regional Bay Area vulnerability assessment, they hope to use this platform as a way to highlight some of their key findings.

Committee Member Dornhelm asked how it would differ if you chose zero sea level rise and a 100-year flood event, which is basically base flood elevation. Would you get the same extent of flooding as you would expect on a FEMA map? Mr. Hallenbeck responded that from the agency's perspective in developing and releasing these maps, there has always been strong concern about misconceptions between regulatory flood maps versus FEMA maps.

Committee Member French asked if this live demo could be reproduced at home. Mr. Hallenbeck confirmed that it can work on any decent Wi-Fi connection. The URL is explorer.adaptingtorisingtides.org. It is up and running and should work on most browsers.

Chair Borcherdt asked about any interaction between the ART program and Hazus – Hazus is always interested in the risk associated with flooding. Mr. Hallenbeck answered that the ART staff are interested in a coordinated future where they are talking about the same maps with Hazus and USGS. Hazus has a recently released tool that allows reporting of consequence of flooding in given areas. The ART staff would like to utilize some of that information into their own research on vulnerability of the shoreline.

Committee Member Holmes commented that currently the developers and keepers of Hazus are a moving target. It is a FEMA tool. If the flood module is like an earthquake module, while using a FEMA flood map as input you should be able to put in your own map.

Chair Borcherdt noted that with FEMA's tremendous effort on consequences, there may be tools, concepts, and models that ART could take advantage of. FEMA might be very interested in having ART improve the Bay Region aspect of what they do. The big picture answer you want is how sea level rise of various amounts will impact the Bay Area; that will take an assessment of all likely resources. Mr. Hallenbeck agreed that the ART staff want to ensure that people are aware that Hazus is a complementary tool, and to work towards coordination with that.

Committee Member Dornhelm suggested future "what if" possibilities if the model could predict flooding. Mr. Hallenbeck commented on a shifting focus of the ART program: instead of saying something is vulnerable or at risk, it would move more toward adaptation by building functionality within the tool that allows us to answer such questions.

Chair Borcherdt asked what GIS system they use. Mr. Hallenbeck answered that ESRI is used for the desktop analysis that generates these maps. Now they use open source software to do the GIS analysis on the website. ESRI also makes a platform called Story Map used for the educational component. Aecom was a principal partner in developing the original maps; the application development team of the San Francisco Estuary Institute has been a partner in developing the website. BCDC is responsible for all the content and functionality.

Committee Member Holmes asked where the funding comes from. Mr. Hallenbeck answered that the initial funding for the maps – probably the lion's share of the costs – came through the Bay Area Toll Authority and MTC. Funding for the website has largely come from the Greenhouse Gas Reduction Fund. The ART team will need to look toward the next available pot of money to fund the map updates and the next iterations of the website.

Committee Member French asked if a lot of the hazard is related to low-lying roads and rail. Mr. Hallenbeck confirmed – they were very interested having the data to understand transportation vulnerability, particularly bridge touch-downs. He added that the Adapting to Rising Tides Bay Area project is funded by a Caltrans grant.

Mr. Montes noted that it does not include groundwater levels due to sea level rise. That may be information worth knowing. Mr. Hallenbeck responded that some interesting work is coming out of UC Berkeley and East Bay consultants in trying to map groundwater. That is active partnership that the staff is hoping to leverage in future updates of the maps – it is a substantial missing component of the flooding we are showing.

Refresher Presentation on Roles and Duties of the Board. Mr. Montes announced that Item #6 was postponed.

7. **Adjournment.** There being no further old or new business, the meeting was adjourned at 3:33 p.m.