San Francisco Bay Conservation and Development Commission
455 Golden Gate Avenue, Suite 10600, San Francisco, California 94102 tel 415 352 3600 fax 415 352 3606

January 10, 2019

TO: Engineering Criteria Review Board (ECRB) Members

FROM: Lawrence J. Goldzband, Executive Director (415/352-3653; larry.goldzband@bcdc.ca.gov)
Rafael Montes, Staff Engineer (415/352-3670; rafael.montes@bcdc.ca.gov)
Sam Stewart, Coastal Program Analyst (415/352-3612; sam.stewart@bcdc.ca.gov)

SUBJECT: **Encinal Terminals Project, City of Alameda, Alameda County (5% design)**
(For Board consideration on January 24, 2019)

Project Summary

Project Name. Encinal Terminals Project, City of Alameda.

Project Proponent. North Waterfront Cove LLC c/o Tim Lewis Communities.

Project Representatives. Mike O'Hara (North Waterfront Cove, LLC).

Project Geotechnical Engineer. Uri Eliahu, Jeff Fippin and Pedro Espinosa, (ENGEO).

Project Marine Structural and Coastal Engineer. Sam Tooley, Marc Percher, Brad Porter and Dilip Trivedi (Moffatt & Nichol).

Project Civil Engineer. Angelo Obertello (Carlson, Barbee & Gibson).

Project Description. Historically, Encinal Terminals had maritime industrial uses. The Terminal is a trapezoidal-shaped peninsula located along the Oakland Estuary on the north waterfront of the City of Alameda, Alameda Island. To the west of the site is Alaska Basin and to the east, Fortman Basin and Marina. The project is located on property owned by the permittee, split into two areas, due to a Tidelands property intersecting the peninsula.

Previous iterations of the Encinal Terminals development plan (Master Plan, July 7, 2017) planned to develop the entire peninsula. The former master plan included mixed use development and public access areas also. This plan relied upon the exchange of tidelands property within approximately the lower middle section of the peninsula, the boundaries of which are a simple pentagonal shape. Plans changed when the developer was not able to obtain the exchange of the 6.4-acre Tidelands property. This Tidelands property remains an area subject to the public trust.

The proposed project is a mixed-use residential development with up to 589 residential units, 50,000 square feet of commercial space, at least three acres of public access, and a commercial marina for up to 160 slips in Alaska Basin including landings for water taxi and shuttle ferry service. The plans include a combination of townhouses, wood-podium multi-family residential structures, associated streets, underground utilities, and landscaping.

The proposed master plan divides the approximately 23-acre site into four districts: The Gateway District, the Tidelands District, the Estuary District, and the Waterfront District. The project sponsor proposes to repurpose two wharf structures to public access.

Three wharves were previously constructed along the western and northern boundaries of the site through three generations in the 1920s and 1960s. One is a timber structure built in the 1920s in the northwest and two are concrete structures along the west constructed in 1924 and 1960. The timber structure will be removed as part of the Project. Therefore, only the two concrete wharves are subject to this review. The remaining portions of the wharf would be used for public access. Along the Northwestern waterfront, the proposal includes 0.17 acres of bay fill for public access. Deep soil mixing would be used to strengthen soils behind the western, northwestern wharf structures and south Alaska Basin to prevent liquefaction of the inland soil in the event of seismic activity.

The existing wharves consist of a 1924 concrete wharf (C1), 1,500-foot-long, 8-inch concrete slab over 18-inch diameter timber piles with concrete pile jackets; its width varies from 30 to 200 feet. The 1960 wharf (C2) is an 800-foot-long by 35-foot-wide, 24-inch concrete deck over 18-inch octagonal precast piles with cast-in-place pile caps.

Prior Reviews. The project's engineering criteria were first reviewed by the ECRB on November 1, 2017. During this event, the Board had the opportunity to review an early approach design concept and criteria.

Project Description Changes since 2017. The project has changed in that the developable area for mixed-use housing development has decreased, and the project has been increased for an additional area of public access in the south region of the Alaska Basin. Such area comprises an approximately 230-foot-long bulkhead wall made up of driven steel sheetpiles with tiebacks. The wall was constructed in the mid-1950's and a portion of it was reconstructed in 1973. A small watercraft launch will be built off the bulkhead wall.

Since the applicant proposes to repurpose the entirety of the remaining C1 and C2 wharves for public access, structural upgrades may be made to some portions of the wharves, while other portions will not be upgraded. The applicant is reviewing the feasibility of the overall seismic upgrade program for the wharves, and the agenda package includes revised engineering strategies for the public access wharves that include the structural upgrade of sections of the wharves. It can be assumed that the potentially feasible structural upgrade opportunities are the C2 wharf and the southern portions of the C1 wharf, and that no structural upgrade would occur at the northern portion of the C1 wharf.

As described in the design review documents, a 41-foot-wide strip of public access is provided around the entire site perimeter, inland of the wharves. In addition, the portion of the wharves that are anticipated to be economically feasible to improve (i.e. C2 and the southern portions of C1) will be included in the public access plan and structurally upgraded to meet similar seismic criteria to that of a new structure. The additional existing wharf area (i.e., the northern portion of C1) is intended to be utilized until it is no longer feasible, potentially after a large seismic event, but it will not be structurally upgraded in advance or replaced afterwards. Further description of the criteria follows.

Seismic Design. The design represents the 2nd revision of the engineering criteria as of December 13, 2018. Moffatt & Nichol's **(**M&N) basis of design, as previously developed, evaluates two design approaches for the wharf project: Performance Based Design and Code Based Design, per the California Existing Building Code.

1. The *performance-based design* consists of the evaluation/design typically based on displacement methods, which examine how far a structure can move for associated (earthquake events) damage levels. According to the report, for existing structures, the approach was to determine the displacement capacity for the entirety of the wharves with no retrofit, followed by the displacement demand at a specified earthquake event. If the displacement demand exceeds the capacity, a retrofit of the structure is necessary.

   Change from last November 2017 ECRB meeting. M&N's evaluation assumes that there are two regions/zones of the wharves: the northwestern section with no planned upgrades and southwestern section upgraded with seismic retrofit. For the zone that assumes a structural upgrade, a standard for the reuse of existing wharf structures for public access occupancy (Occupancy Level II) was the CEBC 2016 for seismic evaluation criteria with reference ASCE 41-13. The structural performance objectives for two level earthquakes (BSE-1N and BSE-2N) were Life Safety (BSE-1N) and Collapse Prevention (BSE-2N). BSE-1N and -2N stand for Basic Safety Earthquake, and levels 1 and 2 and "N" stand for level earthquakes 1 and 2 for new buildings. The occupancy level II refers to a structural performance level no more stringent beyond life-safety goal.

   The Life Safety aspect of the criteria per ASCE 61-14 (Seismic Design of Piers and Wharves) requires that, following an earthquake: (1) post-earthquake structure would continue to support gravity loads after damage, (2) damage would not preclude egress, and (3) there is no loss of containment of materials in a manner that would pose a public hazard. As ASCE 61-14 is intended for new design, where existing structural performance does not meet prescriptive requirements of new design, evaluation using Chapter 31F (MOTEMS) criteria may be utilized.

2. The *code-based design* approach consists in the evaluation performed per the 2016 California Existing Building Code. The structure was considered and designated as Risk Category II[1]. For the evaluation of seismic loads, ASCE 41 demands were considered as referenced from the CBC and ASCE 7 "Minimum Design Loads for Buildings and Other Structures."

[1] The basic underlying principle in assigning Risk Category is to recognize the impact of a structural failure. There are four Risk Categories (RC) under the building code, ranging from lowest hazard to human life (RC I) to highest hazard to human life (RC IV).

Geotechnical Design Criteria. The Geotechnical Report prepared by ENGEO as revised on November 15, 2018, expanded on the original October 2017 seismic criteria. Two levels of earthquakes per ASCE 41-13 were evaluated: BSE-1 (Basic Safety Earthquake-1) corresponding to the Design Earthquake, which is 2/3 of MCEr (Risk-targeted Maximum Considered Earthquake), and BSE-2, the MCEr per the 2016 California Building Code (CBC).

ENGEO performed a seismic site response analysis to evaluate potential ground shaking of the soft site soil as well as evaluated potential ground displacement under the wharf using numerical analyses in Plaxis; the ground response in the numerical model matches the site response analysis. The ENGEO report anticipated 4 wharf sections or zones of seismic performance, A through D. It was assumed that Zones A and B at the northern and northwestern sides of the project would not be cited for structural upgrades while zones C and D at the western and southwestern side would be structurally upgraded. The zones were assessed under the BSE-1 and -2 design criteria as noted above. In addition, sections of the wharf area of the project had been evaluated under Caltrans design criteria (Caltrans, 2013) as if the structures were vehicular bridges. Only zones C and D targeted for retrofit were evaluated using the Caltrans design criteria, however, because the project proposal does not now propose any roadways on the wharves, this Caltrans analysis is no longer applicable. Further, the site-specific spectral response used was Site Class D for stiff soils based on soil borings and depth of bedrock at the site.

In addition, ENGEO performed an analysis of the bulkhead at the southern end of Alaska Basin. According to the Supplemental Geotechnical Exploration report, dated December 6, 2016, and revised on November 15, 2018, the main geotechnical concerns regarding the existing bulkhead at the Alaska Basin are: (1) liquefaction and lateral spreading potential of fill behind the bulkhead; and (2) potential loads on the bulkhead wall.

Deep Soil Mixing (DSM) Proposal. Since the last ECRB review meeting in 2017, the DSM buttress concept proposal along the western and northern perimeter of the shoreline is essentially unchanged, but the project now includes DSM behind the bulkhead at the southern end of Alaska Basin with the goal of reducing potential lateral slope movement under seismic loading. Specific DSM criteria have been developed for the project by ENGEO.

According to ENGEO, the primary purpose of the DSM is to protect the development from lateral displacement within the soft Young Bay Mud clay, which is why the buildings can be designed as independent foundations that do not rely on the DSM. Liquefaction is not a significant hazard at the site with the exception of the fill behind the bulkhead along Alaska Basin.

Given the above information, the DSM is anticipated to experience some distress at the maximum Credible Earthquake level of shaking (as will all structures designed to the Current Building Code); however, the criteria established in the Request for Qualifications (RFQ) for DSM design/build (included in the review material) outlines a design method (established by the FWHA) that checks for damage to the DSM and widens the improved zone so as to not rely on elements that are crushed or may break in tension. As a result, the DSM would successfully perform to pass the MCE and will remain after the MCE though it may not be in the same condition as before the MCE.

Sea Level Rise (SLR). *All elevations are provided in NAVD88 datum.* Based on the SLR risk assessment, the proposed waterfront and development areas are planned to be constructed at a minimum elevation that provides built-in protection from the projected sea levels at *2100 for a medium-high risk aversion.*

The project's public access areas, streets and building sites will be raised to a minimum elevation of 13.5 feet. The wharves deck will be fitted with a 4-inch topping slab. The report includes a flood risk assessment and adaptive measures to be implemented to provide protection from higher amounts of sea level rise. The adaptive strategies may include implementation of floodwalls, earthen berms, elevated wharves, pump stations and outfalls. The project proposes a public access setback which would be inboard of any adaptive strategies.

The project has updated its evaluation of flood risk under the guidance criteria of the 2018 California Ocean Protection Council.

Commission Findings & Policies

Bay Plan Policies. The applicable BCDC Bay Plan policies in relation to the proposed project include policies on Safety of Fills, Shoreline Protection, Public Access and Climate Change.

Safety of Fills. The policies on the Safety of Fills seek to reduce risk of life and damage to property, special consideration must be given to construction on fill in San Francisco Bay. The following policies apply:

1. **Policy No. 1**. The Commission has appointed and empowered the ECRB to "establish and revise safety criteria for Bay fills and structures thereon."
2. **Policy No. 2**. The BCDC Bay Plan indicates that even if a fill may be permissible, no fill or building should be constructed if hazards cannot be overcome adequately for the intended use in accordance with the criteria prescribed by the ECRB.
3. **Policy No. 3** requires the installation of strong-motion seismographs on all future major landfills with the guidance of and recommendations by the California Geological Survey, for purposes of data comparison and evaluation.
4. **Policy No. 4** requires that adequate measures be provided to prevent damage from sea level rise and storm activity that may occur on fill or near the shoreline over the expected life of the project. New projects should either be:
    a. set back from the edge of the shore so that the project will not be subject to dynamic wave energy,
    b. be built so the bottom floor level of structures will be above a 100-year flood elevation that takes future sea level rise into account for the expected life of the project,
    c. be specifically designed to tolerate periodic flooding, or
    d. employ other effective means of addressing the impacts of future SLR and storm activity.

Policies on Public Access. Public access is required by the Commission as an integral component of development and usually consists of pedestrian and other nonmotorized access to and along the shoreline of San Francisco Bay.

Policy No. 5 requires that public access be sited, designed, managed and maintained to avoid significant adverse impacts from sea level rise and shoreline flooding.

Board Questions

The Board's advice and recommendations are sought on the following issues regarding the engineering criteria of the proposed project:

Wharf's Safety

1. The project seeks to repurpose the entirety of the historic wharves as public access; however, only the southern wharves would be structurally improved to meet seismic criteria to that of new structures while the northern wharf would be used until no longer feasible, potentially after a large earthquake. As a result, the project proposes a public access setback as an alternative if the wharves were damaged beyond repair after a potential natural hazard. Therefore: (1) Is the design criteria approach adequate to limit the upgrading of the entirety of the wharves (i.e. new public access) to one area? (2) Is there sufficient evidence of thorough engineering analyses and overall safety considerations, including visual inspections, structural investigations and materials testing (ratings), that the wharves would perform as intended? (3) Are there any safety concerns with post-earthquake egress from all public access wharf areas? (4) Could the risk of periodic and future frequent flooding of the structures pose safety hazards? (5) Are these criteria appropriate for these historic structures?
2. The DSM is meant to prevent severe damage to and failure of the public access shoreline areas (in and landside of the existing wharves); yet, the DSM may not be able to save the wharves for reuse post-earthquake. Portions of the wharves may be unsalvageable after a large earthquake.
   As a result, what is the function of the DSM following a large earthquake if or when sections of the public access wharf are no longer feasible?
   Are there any potential groundwater rise concerns of the DSM in relation to future SLR? Could groundwater rise diminish the DSM's lateral displacement effectiveness?
   Two of the three waterfront sides of the relatively small peninsula would be sited with a DSM, would the DSMs continue to perform as designed if lateral seismic displacement happen in the opposite direction of the intended protection, on the non-DSM side?
3. Like previous projects reviewed by the ECRB, a structural monitoring inspection plan and program of the substructure components (wharf underdeck components) and the deck should be recommended.

Sea level Rise. The project's public access areas, streets and building sites will be raised to a minimum elevation of 13.5 feet. From the documentation, it appears the bottom of the wharf deck (soffit) to be approximately at 10 feet. Current FEMA 2016 BFE is at 9.9 feet.

The sea level risk assessment strategy indicates that the project will provide built-in protection from SLR levels at year 2100 for a medium-high risk aversion and high-emissions scenario per the 2018 California Ocean Protection Council SLR guidance criteria. Under such scenario, the 2018 SLR guidance indicates water levels of 1.9 feet for year 2050, 4.5 feet for 2080 and 6.9 feet for 2100. BFEs are projected to increase to 11.9, 14.5 and 16.9 feet by 2050, 2080 and 2100, respectively.

Based on the 2018 OPC figures, by year 2050 the wharf deck would be dry during daily tidal conditions, but it appears the soffit would be 1.9 feet underwater during 100-year (1%-annual-chance or 1%) storms. By year 2080, the deck would be overtopped by 1 foot (and the soffit would be completely underwater) during 1% storms. In addition, the soffit would be 2.5 inches underwater every day at tides above the projected Mean High Water. By year 2100, the deck would be overtopped by 3.4 feet during 1% storms and the soffit would be permanently underwater except at Mean Low Water and below.

Although the project would provide adaptive measures to mitigate flooding of the landside areas including the permanent public access setback, it is not clear from the information whether there could be structural impacts/effects from periodic flooding, permanent inundation or any water loadings as a result. Are there any structural and safety concerns with frequent flooding and/or inundation of the wharf public access surfaces?

Material Enclosed with this Staff Report for November 1, 2017 ECRB Meeting

1. ENGEO, Slope Stability Analysis with Ground Improvement, October 2, 2017 and revised on November 15, 2018.
2. ENGEO, Updated Geotechnical Report/Encinal Terminals/Alameda, California, October 2, 2017.
3. Moffatt & Nichol, Encinal Wharf Schematic Structural Design Engineering Criteria, October 16, 2017 and revised on December 13, 2018.
4. Encinal Terminals Waterfront Open Space, BCDC/City of Alameda, Design Review Plan, December 17, 2018.
5. CBG, Sea Level Risk Assessment and Strategy/Encinal Terminals, Alameda, California, December 5, 2018.
6. ENGEO, Deep Soil Mixing Request for Proposal, November 16, 2018.
7. ENGEO, Supplemental Geotechnical Exploration, December 6, 2016 and revised on November 15, 2018.
8. 2017 Presentation to the ECRB: Encinal Terminals/Alameda, California, November 1, 2017.