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To: Coastal Commission staff, local planners, and interested parties
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Statewide Planning Unit, Sea Level Rise Team
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Re: **Sea Level Rise and Sub-surface Development (Basements)**

Introduction

This document provides information for CCC staff and local governments to consider when developing permit analysis and conditions for proposed subsurface development (basements, subterranean parking, etc.) in light of sea level rise. Broadly, analyses should consider the resource implications over the lifetime of the proposed development, including how the development might impact coastal resources both now and in the future under sea level rise conditions. While basement development raises many Coastal Act issues (e.g., cultural resource impacts, structural stability, etc.), this memo addresses issues raised by basement development related to sea level rise specifically. The memo describes analyses to consider when reviewing permits and possible permit condition options and examples. Each permit review involving a basement is fact- and site-specific. Please work with your supervisor and reach out to the Statewide Planning Unit to develop appropriate permit conditions.

Basements and Sea Level Rise: The Main Issues

Depending on the location, basement development can cause severe impacts to coastal resources. Future sea level rise and its associated hazards (e.g., erosion, flooding, inundation, rise in groundwater table, etc.) may also exacerbate these impacts. The following are the primary issues associated with sea level rise hazards and basement impacts on coastal resources.

Basements can complicate the removal of the associated structure: In cases where sea level rise may impact development in the future, the Commission has in the past sometimes imposed conditions requiring removal, relocation, or elevation of structures at a specified future time. This ensures that the development will appropriately minimize risks to life and property pursuant to Coastal Act Section 30253 and protect coastal resources consistent with other Coastal Act provisions. However, basements could make compliance with such conditions more difficult and/or result in greater impacts to coastal resources. The impacts associated with removing substantial subsurface development could be inconsistent with the Section 30253 requirement that new development “shall not contribute to erosion, geologic instability, or the destruction of the site or surrounding area,” and that projects should be sited and designed to avoid those impacts.

Basements could eventually function as shoreline protective devices: Erosion and shoreline change will likely accelerate with sea level rise, which could cause basements on both blufftop and low-lying shoreline lots to daylight and potentially start functioning as shoreline protective devices. In cases where the development is considered new development or redevelopment, approval of a basement could conflict with Section 30253, which states that “new development shall not . . . require a protective device that alters landforms along bluffs and cliffs.” Since new development and redevelopment must not require protective devices that have resource impacts, the initial siting and design decisions should consider a basement’s ability to eventually function as a protective device and avoid that outcome. Additionally, just like a seawall, a basement that becomes exposed could also cause whatever coastal resources that lie between the basement and the sea—such as the beach or other coastal habitats—to disappear as rising seas flood the area and increase erosion rates by reflecting wave energy. These coastal processes could potentially adversely affect public access, beach width, shoreline sand supply, visual resources, or environmentally sensitive habitat areas. In this respect, basements could contradict the requirement in section 30253 that new development “shall not contribute to erosion, geologic instability, or the destruction of the site or surrounding area,” as well as other resource protection policies of Chapter 3.

Basements may house electrical and mechanical components and/or household chemical storage that could compromise human safety and coastal resources: Storage of hazardous materials and common household products in basements could present coastal resource and public safety issues if flooding occurs. For example, a flooded basement containing paints, bleach, cleaning materials, etc., may release harmful toxins into the water and/or impact water quality, surrounding coastal habitats and species, as well as human health. In addition, locating critical mechanical and electrical equipment in basements could also present important human health and safety concerns (e.g., electrocution, interruption in public infrastructure services) if flooded. See below for condition considerations related to the location of critical mechanical & electrical systems (e.g., electrical panels, HVAC units, elevator systems, etc.) as well as hazardous materials and household products.

Basements can displace groundwater: Though this issue is not likely to be relevant in most of the coastal zone, basements can displace ground water if they extend beyond the depth of the water table in *confined* aquifers (as in, for example, Balboa Island), causing the surrounding groundwater to rise. If installed in many homes throughout a region, their cumulative impact could result in a localized rise in groundwater and flooding.

Analyses to Consider When Permitting

There are a number of analyses and regulatory factors associated with basement siting and permitting that should be undertaken and considered during the permit application stage, including, but not limited to, technical studies, LCP policy application, and FEMA requirements.

If a basement is proposed as a part of a permit application, a technical study may be needed to analyze the amount of flooding, inundation, or groundwater rise that will impact the basement and its function, whether along the shoreline or inland (e.g., when will the development experience temporary v. permanent wetting at the basement level). As a reminder, at this early

screening phase, you should refer to Appendix G of the [CCC Sea Level Rise Policy Guidance](#) to find the tide gauge projections closest to your project. Based on the project's anticipated life and recommended risk aversion scenario (e.g., 75 years under the medium-high risk scenario for a residential structure), review the selected sea level rise projection amount + a 100-year storm event (e.g., 6.6ft. on the [Our Coast Our Future Online Tool](#)) to gain an understanding of the project's vulnerabilities. Based on the level of vulnerability resulting from your initial screening step, you can consider whether a technical study should look at the following issues:

- Effects of sea level rise, if applicable, on bluff edge position, shoreline position, depth of flood waters and groundwater table;
- Typical depth of the basement in relation to the current and future flood waters and groundwater table;
- Whether the basement may cause elevation of the groundwater table or otherwise increase flood risks;
- The amount of sea level rise and erosion that will expose the basement walls or cause them to start functioning as seawalls (for structures along the shoreline), during both sunny-day conditions and 100-year storm conditions;
- Impacts to landforms and other coastal resources that could occur with installation and/or removal;
- Cumulative impacts to coastal resources with or without widespread use of basements; and/or
- Whether a basement on a bluff may become exposed, thereby creating visual impacts or altering natural bluff processes.

If the permit is governed by a certified LCP, or a certified LCP is used as guidance, the permit analysis and findings should also reference the relevant policies and zoning ordinances that guide basement permit approvals and conditions (including blufftop development policies, floodway or floodplain ordinances, etc.) Look for provisions such as:

- Blufftop development policies, including setbacks, factor of safety requirements, and/or prohibition of construction of basements in certain landform or substrate types;
- Floodway or floodplain ordinances impacting basement approval or design limitations (see more below);
- Geographic prohibitions on construction of basements;
- Limits on depth or size of basements;
- Conditions for removal or reassessment of basements;
- Requirements for conditions for removal of single family homes; and/or
- Policies regarding shoreline protective devices.

FEMA requirements implemented through floodplain or floodway ordinances may also apply, and note that as sea level rises, FEMA flood zones are expected to move inland. National Flood Insurance Program regulations speak specifically to the lowest floor elevation requirements (including basements) for different flood zones, and in some cases, result in basements not being allowed in these zones. For example, Federal regulations state:

Require that all new construction and substantial improvements of residential structures within Zones A1-30, AE and AH zones on the community's FIRM have the lowest floor (*including basement*) elevated to or

above the base flood level, unless the community is granted an exception by the Federal Insurance Administrator for the allowance of basements in accordance with § 60.6 (b) or (c). 44 CFR § 60.3(c)(2) (emphasis added; note that the referenced § 60.6 (b) and (c) describe situations where variances or exceptions may allow basements below the base flood level.).

Similar regulations apply to other zones as well. As another example, Federal regulations for utility systems also require local jurisdictions to:

Review all permit applications to determine whether proposed building sites will be reasonably safe from flooding. If a proposed building site is in a flood-prone area, all new construction and substantial improvements shall . . . *(iv) be constructed with electrical, heating, ventilation, plumbing, and air conditioning equipment and other service facilities that are designed and/or located so as to prevent water from entering or accumulating within the components during conditions of flooding.* 44 CFR § 60.3(a)(3) (emphasis added).

While these are just a few examples, permits should be consistent with all the requirements that are implemented through a local jurisdiction's floodplain or floodway ordinance, if applicable. However, importantly, additional more stringent permit conditions may also be required to bring the project into conformance with the Chapter 3 policies of the Coastal Act or LCP policies, and particularly with respect to evaluating safety from sea level rise hazards over the life of the proposed development. Thus, FEMA flood zone requirements should be considered a regulatory minimum because while FEMA flood zones are updated periodically, many are very outdated, and *none of them reflect sea level rise projections into the future.* Instead they only account for existing flood risk (i.e., what would flood in a 100-year storm *today*). Also, note many FIRMs are in the process of being updated and are thus 'provisional' maps that are not yet fully finalized. Make sure you are reviewing the right maps for your project.

Permit Condition Options and Examples

Depending on the location of the development (shoreline v. bluff-top v. inland), the level of exposure to hazards, and at what time period the exposure may occur, a range of CDP conditions can be considered. In general, bluff-top basements have sometimes been found to be inappropriate due to their ability to possibly serve as shoreline protection that impacts natural landforms, and due to their impacts to sensitive bluff habitat and species during both installation and removal. Visual impacts have also been a consideration in past actions. However, analysts should consider the facts of each particular case when deciding whether to recommend approval or approval with conditions.

In terms of non-blufftop shoreline or inland basements, if technical analyses show high, near-term exposure of the basement to hazards, basements have also raised shoreline protection, human safety, sensitive resources, or groundwater concerns. However, again, analysts should consider the facts of each particular case when deciding whether or with what conditions the Commission could permit them. In any case, if it is determined the basement may be permitted, consider the following:

- If a technical analysis shows lower exposure to hazards, or exposure that may occur towards the end of the project’s development life, depending on the site-specific facts it may be appropriate to recommend that the basement be permitted, but with conditions for future adaptation of the site, including:
 - An assumption of risk condition that speaks specifically to the basement possibly being exposed to hazards and that accommodation (e.g., flood flaps, elevating electrical, etc.) may be required in the future; and,
 - A condition requiring removal of the basement and/or entire structure when monitoring or other analysis shows it is no longer in a stable location. In some cases this will be at or before daylighting due to erosion occurs or once the basement begins to experience either temporary or permanent flooding (noting these as potential precursors to the basement beginning to serve as a shoreline protective device), and incorporate provisions for restoration of the site.

- Also consider some or all of the following for any basement permit, depending on site-specific circumstances:
 - Require the basement be ‘floodproofed’ for the duration of the development life; and/or
 - Require that critical mechanical equipment (e.g., HVAC, elevators, parking lifts, electrical panels, washer/dryers, etc.) be located on upper floors; and/or
 - Require no habitable space on the basement level .

Example: [Winget](#), Action Date 2/12/2014. Permit was for a 1,200 sq. ft., one-story single-family residence on a bluff-top lot. While the permit did not include basement development, it is instructive for considering permit conditions relevant to removal of blufftop development. Specifically, the development was approved with conditions requiring a Bluff Monitoring and Reporting Plan and removal of the development once monitoring indicates the development is no longer in a “stable location.” “Stable location” is defined as inland of the 1.5 factor of safety established by the qualitative bluff stability analysis or a minimum distance of 60 feet between the bluff edge and the authorized development, whichever is greater.

Example: [Lowell/Correll \(Hermosa\) 5-18-1212](#), Action Date 5/8/2019. Permit was for a new 3,543 sq. ft. three-story single-family residence with a 1,474 sq. ft. basement along the Strand in Hermosa Beach. Sea level rise analysis showed the development to be safe from flooding for its entire development life. Nonetheless, the groundwater table was demonstrated to be higher in this location, and thus the basement was designed to be 100% floodproofed to address this. The permit was conditioned with an assumption of risk policy including “that critical mechanical equipment may be required to be relocated above-grade in the future given that the basement is located below the water table and groundwater inundation is expected to increase with sea level rise in the future.” The permit was also conditioned to require removal if “the development would require a shoreline protective device or the basement walls would essentially function as a shoreline protective device . . .”

Example: [Fabian Bever, California Eco Homes De Novo \(Venice\) A-5-VEN-15-0052, -0053, -0054](#), Action Date 8/9/2019. Permit for demo of 2-story 4-unit apartment building and construction of (3) 3-story detached SFRs each with a basement and an attached ADU. Sea level rise analysis showed the development subject to inland flooding hazards toward the end of its development life, close to 2100. The applicant proposed to seal all exterior walls for water proofing up to 3.22 feet above grade and the homes have been designed such that flood gates can be installed at all openings on the first floor, including skylights and openings leading to the basements up to 3.22 ft. above grade. In addition, the permit includes Special Conditions 4 and 5 that require assumption of risk, including that “critical mechanical equipment may be required to be relocated above-grade in the future given that flooding is expected to increase with sea level rise in the future” and removal triggers.

For more information please contact the Statewide Planning Unit staff person assigned to your area of interest:

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