STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
SAN FRANCISCO BAY REGION

STAFF SUMMARY REPORT: Alyx Karpowicz, Rachelle Lim, and Jacob Henry
MEETING DATE: October 9, 2024

ITEM: **6**

Groundwater Rise Impacts at Site Cleanup Program Sites – Informational Item

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DISCUSSION:

This item provides an update on our work to address potential adverse effects that groundwater rise can have on our Region's cleanup sites. This item focuses on our Site Cleanup and Underground Storage Tank programs. We previously updated the Board on our work related to sea level rise and groundwater rise at land disposal facilities and Department of Defense facilities in February 2024.

Predicted Sea Level Rise and Groundwater Rise

Sea levels have been rising along the California coast for the past century and have been increasing more rapidly since the 1990s due to glacier melting and warming of the oceans causing expansion. According to the Ocean Protection Council's current Sea Level Rise Guidance, the San Francisco Bay area is likely to experience 3.1 feet of sea level rise by 2100. With rising seas comes rising shallow groundwater. Groundwater is expected to rise as much as sea level rises within about a half mile of the San Francisco Bay margin and low-lying coastal areas with shallow aquifers. The United States Geological Survey's Coastal Storm Modeling System shows how groundwater levels are expected to rise with sea levels, using the current sea level rise ranges across California.

Potential Adverse Effects at Cleanup Sites

The potential adverse effects associated with sea level and groundwater rise that are of most concern at cleanup sites include:

- Emergence of contaminated groundwater into utility corridors, basements, and crawlspaces
- Increased leaching and mobilization of residual contaminants from soil and/or groundwater
- Increased vapor intrusion potential by shortening the transport distance from contaminated groundwater
- Surface inundation and erosion leading to remedy failure and exposure of contamination

Approach to Addressing Potential Adverse Effects

The potential for adverse effects largely depends on site-specific factors including the site location, type and extent of residual pollution, and the proximity of the site to the shoreline, homes, or other sensitive receptors. As stated in our Strategic Workplan, staff in the two groundwater cleanup divisions have been evaluating and prioritizing cleanup sites for vulnerabilities to sea level rise and groundwater rise where the potential for mobilization of

contamination is present. Our approach to addressing the potential adverse effects at cleanup sites involves three steps:

1) The first step is to identify if the cleanup site is within a location considered vulnerable to future sea level inundation and/or significant groundwater rise. For sea level inundation we use the Ocean Protection Council's intermediate to intermediate-high projections, which range from 0.8 to 1 foot by 2050, and 3.1 to 4.9 feet by 2100. For groundwater rise we consider sites where groundwater is 6 feet deep or less, based on the Pathways Climate Institute and San Francisco Estuary Institute's study that developed local groundwater rise models for Marin, Alameda, San Mateo, and San Francisco counties. These models provide the most accurate groundwater rise estimates we have for these counties. For sites in other counties, we rely on the Coastal Storm Modeling System projections.

2) The second step is to evaluate the potential for adverse effects considering the nature and extent of residual pollution at the site. For sites near the Bay margin, where significant post-remediation residual pollution remains, we will request the responsible party conduct a vulnerability assessment to evaluate the mobility and degradability of the residual pollution, its depth and distribution in the subsurface, and the likely effects if the pollution were to contact rising groundwater or become submerged.

3) The third step is to determine if additional actions are needed in response to the vulnerability assessment. This step is challenging due to the various uncertainties. However, monitoring at cleanup sites that experience tidal and seasonal groundwater level fluctuations similar to predicted groundwater rise can reduce the uncertainties and improve our understanding of the potential for increased pollutant mobility and vapor production.

It is important to note that most sites we oversee conduct a high degree of source remediation in accordance with our low-threat case closure criteria. This means that the remaining residual pollution is typically deeper than 6 feet (and in contact with groundwater or fully submerged), and of low solubility and low mobility. Otherwise, it would have been feasible to remediate through standard cleanup methods such as excavation, vapor extraction, air sparging, groundwater extraction, or reagent injections to promote chemical or biological degradation.

Furthermore, the screening levels that we apply to soil contamination conservatively account for leaching to groundwater. This further reduces the potential for future adverse effects related to groundwater rise at sites that have completed source remediation. Prior to our low-threat criteria, cleanup was generally even more conservative. Therefore, most sites that meet our low-threat criteria (including closed sites) will have a low or very low potential for adverse effects related to sea level and groundwater rise. Nonetheless, there have been exceptions due to inaccessibility or impracticability where containment strategies such as caps were necessary. These sites comprise our highest priorities for vulnerability assessment.