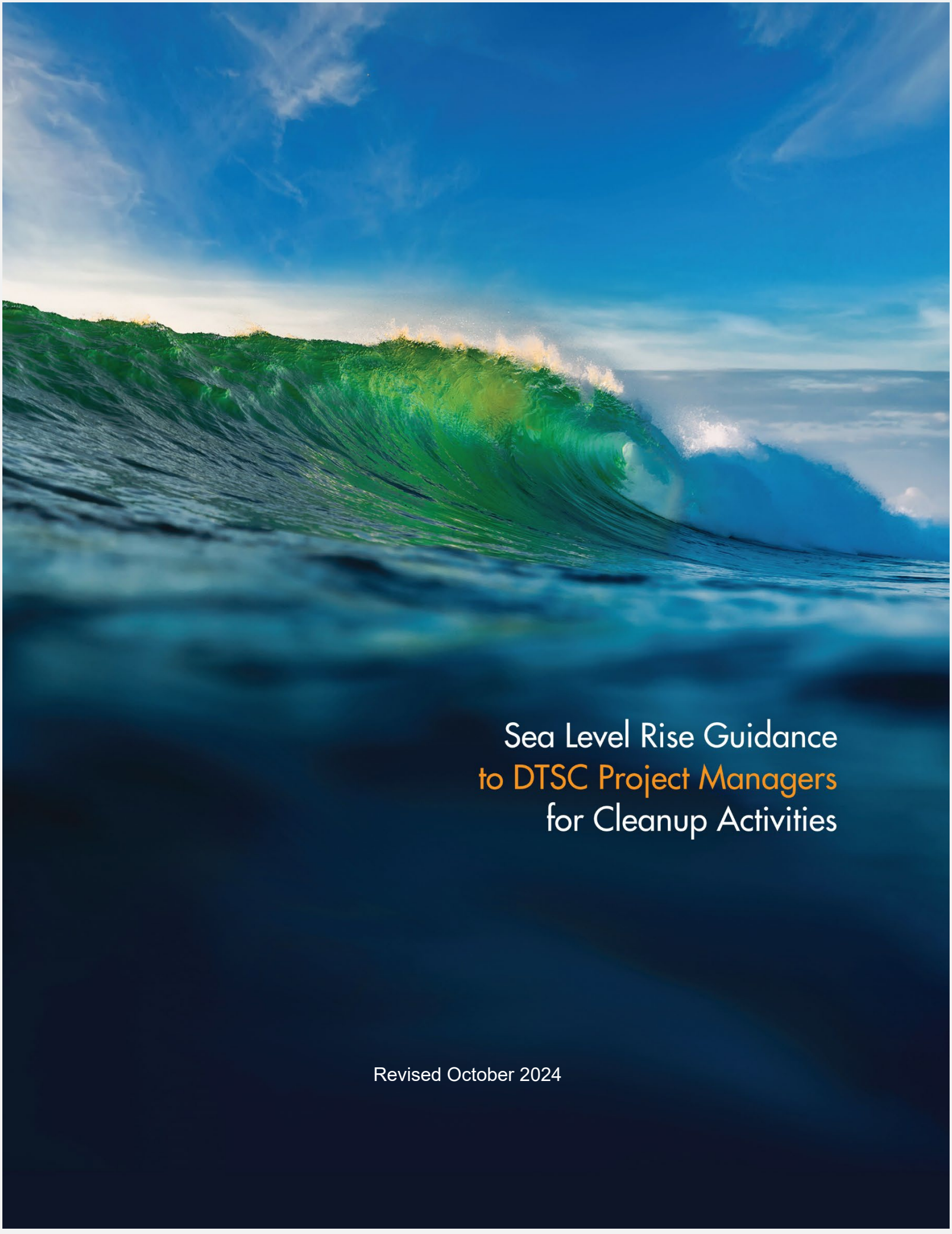

Sea Level Rise Guidance to DTSC Project Managers for Cleanup Activities

Revised October 2024

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PURPOSE

This document establishes guidance for the Department of Toxic Substances Control's (DTSC) Site Mitigation and Restoration Program (SMRP) Project Managers to evaluate sea level rise (SLR) during the hazardous substance and hazardous waste cleanup process pursuant to existing authority. This Guidance aims to help project managers as they oversee a variety of sites, most notably active sites, including Land Use Covenant (LUC)-only sites, and sites with ongoing operation and maintenance activities due to waste being left in place. This Guidance covers historical sites where determinations had already been made and new sites.
This guidance: 1) provides information on sea level rise and related phenomena which can result in damage to remedies; 2) identifies DTSC's authority to address SLR during cleanup; and 3) mandates that project managers consider SLR and related phenomena in the remediation process. (List of Key Terms/Definitions is at the end of the Guidance.)

Senate Bill 1, the Sea Level Rise Mitigation and Adaptation Act of 2021, directed state "agencies to identify, assess, and, to the extent feasible and consistent with their statutory authorities, avoid, minimize and mitigate the impacts of sea level rise."[1] As such, DTSC has is the state lead agency for several key actions to prepare for and mitigate climate change impacts including SLR on contaminated sites.

SLR is an increase in the ocean's elevation, resulting from the thermal expansion of ocean water and melting of land ice. SLR can significantly alter hydraulic, geologic, hydrologic, hydrogeologic, and chemical conditions, exacerbate releases of hazardous substances and wastes, and affect the protectiveness of cleanup remedies. These changes, in turn, lead to more frequent flooding, more expansive negative flood events, increased shoreline erosion, and elevated groundwater levels. Impacts from SLR can increase exposure to contaminants which can adversely impact human health and the environment, and further increase the burden on Environmental Justice (EJ) communities. Therefore, to protect human health and the environment, project managers must consider SLR for coastal sites with remediation projects and must be re-evaluated over the lifetime of the remedy, as needed.

Without proper protections and remedy resilience, SLR may adversely affect public health and degrade the environment through an increased presence or release of uncontrolled hazardous substances in surface water, groundwater, air, soil, and sediment. This protection is at the core of DTSC's mission to protect California's people, communities, and environment from toxic substances, to enhance economic vitality by restoring contaminated land, and to compel manufacturers to make safer consumer products.

[1] Sen. Bill No. 1 (2021-2022 Reg. Sess.) § 1, California Legislative Information, Senate Bill Number 1 webpage.

RECENT CALIFORNIA ACTIONS RELATED TO SEA LEVEL RISE

The *California Sea Level Rise Mitigation and Adaptation Act of 2021* (Act) requires state and regional agencies to identify, assess, and, to the extent feasible and consistent with their statutory authorities, avoid, minimize, and mitigate impacts of sea level rise. The Act created the *California Sea Level Rise State and Regional Support Collaborative* within the Ocean Protection Council (OPC).

The OPC is implementing the Act through the Statewide Sea Level Rise Leadership Team (SLR Team), comprised of 17 state agencies, including DTSC. The SLR Team, led by OPC, developed the February 2022 *State Agency Sea-Level Rise Action Plan for California* (California SLR Action Plan)[2]. OPC released the California SLR Action Plan for public review on February 22, 2022, finalized it on August 18, 2022, and updated it in February 2024. The 2024 California SLR Action Plan indicates:

> "Best available science, such as the State Sea Level Rise Guidance, should be consulted to determine which scientifically based sea level rise scenarios are most appropriate. Different targets will likely be needed for vulnerability assessments and adaptation strategies associated with coastal ecosystems in order to assess how these areas and associated nature-based solutions might keep pace with rising sea levels. Critical infrastructure (highways, bridges, water treatment plants, etc.) should consider higher SLR scenarios, as appropriate, based on State Guidance. New and re-development in the coastal zone should utilize these targets as consistent minimum criteria for planning for the impacts of SLR. For clarification, the Delta is not considered part of the coastal zone because it is inland, and the Delta's hydrology is extremely complex. SLR projections and planning targets have been updated in the 2024 State Sea Level Rise Guidance."

In addition to the California SLR Action Plan, the OPC has prepared the State of California Sea Level Rise Guidance: 2024 Science and Policy Update (State Sea Level Rise Guidance or OPC Guidance) which identifies that SLR in California can generally be categorized into 5 Sea Level Rise Scenarios: Low, Intermediate-Low, Intermediate, Intermediate-High and High. Each scenario describes the amount of potential SLR associated with each, projected out by decade to the year 2150. The OPC is the state-recognized authority providing a science-based methodology for state and local governments to analyze and assess the risks associated with sea-level rise, and to incorporate sea-level rise into state decisions; DTSC relies on the guidance provided by OPC.

[2] State Agency Sea Level Rise Action Plan for California

AUTHORITY TO ADDRESS SEA LEVEL RISE DURING CLEANUP PROCESS

DTSC has full authority under existing federal and state law to require that SLR be addressed on cleanup projects. This section describes DTSC's authority to require consideration of SLR in the cleanup process, including during the five-year review (FYR). Consult with the DTSC Office of Legal Counsel for support in responding to any questions regarding authority.

DTSC responds to and corrects releases or threatened releases of hazardous substances, hazardous wastes, and hazardous waste constituents to the environment in accordance with both state and federal law. DTSC typically addresses releases under two frameworks: 1) corrective action pursuant to the Hazardous Waste Control Act (HWCA, HSC 25100, *et seq*, also referred to as 'Chapter 6.5'); and 2) response action pursuant to the Hazardous Substance Account Recodification Act (HSARA; HSC 78000, *et seq,* also referred to as Division 45, Part 2; formerly codified at HSC 25300, *et seq.* and referred to as 'Chapter 6.8'). DTSC has authority under both frameworks to require corrective, remedial, or removal actions if there is a release and/or threatened release.

Federal law requires that corrective actions under the HWCA be no less protective than those under the federal Resource Conservation and Recovery Act (RCRA, 42 USC 6901, *et seq.*).

State law expressly requires that response actions under HSARA be based upon, and no less stringent than, those under the federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and National Oil and Hazardous Substances Pollution Contingency Plan (NCP, 40 USC 300.400 *et seq.*), among other areas of law.

Federal guidance notes that corrective or response action "substantively satisfy the requirements of both" CERCLA and hazardous waste frameworks.[3]

Regarding screening, the NCP explicitly describes criteria for use in screening of alternatives in Section 40 CFR 300.430 (e) (7). This paragraph states that "As appropriate, and to the extent sufficient information is available, the short- and long-term aspects of the following three criteria shall be used to guide the development and screening of remedial alternatives: (i) Effectiveness, (ii) Implementability, and (iii) Cost."

Regarding selection of remedies, in 40 CFR 300.430 (e)(9), the NCP provides the nine criteria (e.g., permanence, protectiveness) for fully evaluating remedies.

[3] US EPA memorandum regarding Coordination between RCRA Corrective Action and Closure and CERCLA Site Activities (#EC-G-2002-008), page 2.

Note that these statutes, regulations, and guidance provide the context, basis, and authority for determinations that each remedial decision is protective under both current and anticipated future site conditions.[4] This includes the consideration of future site conditions due to SLR.

The NCP requires FYR's per 40 CFR 300.430(f)(4)(ii). The FYR's apply to sites for which a remedy has already been selected. The FYR needs to assess the impacts of SLR on remedy resiliency to determine whether the remedy remains protective based on impacts due to SLR.

US EPA presents a similar analysis of the applicability of the statutory authorities in its memorandum dated June 30, 2021, *Consideration of Climate Resilience in the Superfund Cleanup Process for Non- Federal National Priorities List Sites*. US EPA concludes "Consideration of climate resilience should not be treated as a new criterion under 40 CFR 300.430(e)(9)(iii))." It is clear that DTSC has the authority to require SLR be addressed as part of the cleanup process.

CONSIDERING SEA-LEVEL RISE DURING CLEANUP PROJECT LIFECYCLE

SLR has the potential to significantly impact waste at a site by causing groundwater levels to rise, by inundation, and by the subsequent deterioration of the remedy and mobilization of contaminants. SLR can also impede stormwater drainage, damage critical infrastructure, and exacerbate erosion, all of which could negatively impact cleanup efforts while increasing the cleanup complexity at the site.

During the Cleanup Project Lifecycle, critical stages for SLR evaluation and decision making are the feasibility study stage, as part of remedial alternatives evaluation, and the Five-Year Review stage. However, it is also important to ensure SLR is integrated into the Conceptual Site Model during site characterization and investigation efforts.

SLR Vulnerability Assessment

A SLR vulnerability assessment (SLRVA) should be conducted to specifically evaluate the resilience of the remedy and wastes at the site to future SLR impacts. A decision tree flowchart is provided at the end of this guidance (Attachment 1) to assist the DTSC Project Manager in evaluating / proceeding with a SLRVA at their site. The SLRVA may be a standalone document or be incorporated into other submittals, as determined by the DTSC Project Manager. The degree of complexity of the SLRVA can vary, depending on the circumstances. For example, a simple and focused analysis would be performed for a site where it is unclear whether SLR is an impact. Progressively more robust analyses may be required based on the results of the evaluation.

[4] Future site conditions include those conditions anticipated due to sea level rise.

The SLRVA may include consideration of community resilience infrastructure and plans. DTSC plans to develop a template for SLRVA's which will be made available on DTSC's climate change webpage once prepared.

Adaptation Plan

If a site is determined to be vulnerable to SLR, an adaptation plan (AP) will be required to increase remedy resilience. For purposes of adaptation planning, the remedy or action should be evaluated to determine adaptive capacity.

While DTSC prefers full action taken now to address future impacts, DTSC will consider a phased adaptation approach on a case-by-case basis.[5] Any phased construction of a remedy must include 30 years of protection prior to the onset of SLR impacts to account for Financial Assurance (see below).

The adaptation plan may be a standalone document or be incorporated into other submittals, as determined by the DTSC Project Manager. DTSC plans to develop a template for Adaptation Plans which will be made available on DTSC's climate change webpage once prepared

SLR Evaluation Through the Remedial Process

For all projects, SLR should be addressed.[6] Addressing SLR impacts early on at a contaminated site increases awareness of the situation in relation to SLR, saves costs by addressing SLR before it becomes a broader, more widespread issue, and provides an opportunity to strengthen site resilience and community commitment.

The SLR evaluation for each remedy phase includes, but is not limited to:

- Preliminary Endangerment Assessment (PEA): Integrate current and projected SLR and groundwater rise impacts to determine if there may have been a release of a hazardous substance due to SLR that presents a risk to human health or the environment.
- Post-PEA and up through Remedial Investigation: Integrate current and projected SLR and groundwater rise impacts to prepare risk assessments and the conceptual site model (for example, SLR causes groundwater level rise, which can affect exposure pathways in the risk assessment, and change the groundwater level in the conceptual site model).
- Feasibility Study (FS): Identify and analyze resilience for each remedial alternative based on current and projected SLR impacts. Note that alternatives which include land use restrictions should ensure the restrictions take into consideration SLR impacts.

[5] Any future phased work requires financial assurance as described later in this document.
[6] For projects that are clearly not affected by SLR, the applicability and impact of SLR can be a statement to that effect in the salient document submitted for DTSC review.

- Remedy Selection/Decision: The remedy should be protective under current conditions and future conditions including impacts due to SLR. DTSC cannot sign off on any remedial decision unless SLR is accounted for.
- Remedial Design: Incorporate engineered resilience measures into the remedy design. The design should incorporate the latest science and reflect the salient information regarding SLR at the site.
- Remedial Action: Ensure the remedial action implementation incorporates design elements to address SLR.
- Cost Estimate: For each step of the remedial process which includes a cost estimate (i.e., the FS, RS, Operation, Maintenance & Monitoring Agreement, and Five-Year Reviews, at a minimum), SLR should be considered as part of the estimated cost of the proposed remedial actions.
- Determination that Remedy is Operational and Functional: Prior to determining that the remedy is Operational and Functional, evaluate the remedy performance under current and future SLR conditions. In some cases, this may require evaluation to ensure modifications are identified and implemented at sites before determining whether the remedy is Operational and Functional.
- Operation, Maintenance & Monitoring (OM&M): SLR should be addressed when establishing the requirements for remedy OM&M, and within any OM&M agreement (#EO-93-036-MM).[7] During OM&M, evaluate remedy performance and monitoring systems under current and future SLR conditions, and any necessary modifications.
- Five-Year Review (FYR): If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above those levels required for unlimited use and unrestricted exposure, DTSC reviews the remedial action no less often than every five years after initiation of the selected remedial action. This will include a review of updates to SLR modeling and projections provided in OPC Guidance in a 5-year cycle to evaluate the potential impact to project design.
- Other Protectiveness Determination: When new information arises that appears to affect the protectiveness of the remedy due to SLR, regardless of whether five years have elapsed since remediation began or since the prior FYR, a Protectiveness Determination should be initiated which includes an updated SLRVA. The Protectiveness Determination is equivalent to a FYR.

Note that FYR's and other protectiveness determinations should include updates to the SLRVA, where needed.

Should a remedy be determined to no longer be protective given the current or future SLR scenarios, DTSC should take necessary action to protect public health and the environment

[7] DTSC Management Memo #EO-93-036-MM, *Operation and Maintenance Enforceable Agreement* (DTSC, 1993).

(e.g., Remedial Action Plan Amendment, Removal Action Workplan Amendment, Explanation of Significant Differences, OM&M plan modification, minor changes documented appropriately, etc.). If a project manager becomes aware of new risks to public health or the environment due to SLR at a specific site/project, they should work with their management and technical services staff to immediately assess whether risks at the site/project have (or may have) changed, what those potential effects are, and whether the current SLRVA needs updating.

Financial Assurance

Financial assurance needs to reflect the net present value of the full scope of the remedy, including anticipated changes in remedy infrastructure and changes in remedy operations and maintenance.[8] Pursuant to State law[9] and federal guidance, financial assurance is calculated for a minimum of 30 years. SLR may result in significant expenses well beyond 30 years; when calculating costs, sites should use a time horizon for remedy implementation through the date that remedial goals are met, and revise these cost estimates at the time of each FYR.

DTSC Review of SLRVA's and AP's

Upon receipt of a SLRVA, the PM submits work requests to Engineering Services (ES), Geological Services Branch (GSB) and the Human and Ecological Risk Office (HERO). Initially, the SLRVA is anticipated to be a high-level review of site components to determine vulnerabilities and a screening of possible SLR scenarios using publicly available tools to identify specific SLR threats. The initial SLRVA should be based on the California SLR Action Plan recommendation to use "Best available science," i.e., the OPC Guidance, to determine which scientifically based sea level rise scenario is the most appropriate for a particular site or project.

Technical services staff advise whether a more robust SLRVA is warranted. If so, the PM should inform the Responsible Party (RP), project proponent, or contractor (for orphan sites) that a more robust SLRVA is required. SLRVA's should be signed and stamped by the appropriately registered licensed professional.

The SLRVA includes a detailed review of site components and site-level SLR impacts, including SLR modeling when appropriate. Variations from the intermediate-high risk scenario are appropriate in cases where more intense (higher) or less intense (lower) SLR may occur during the period when waste or contamination remains at the site (See Attachment 1).
Other circumstances may also warrant variation from the stated risk scenario. The SLRVA should consider current or planned site and community infrastructure, the extent to which site and

[8] Note that there is a preference for full action to address SLR at the time of initial remedy implementation, rather than adaptation plans that accommodate future significant actions.

[9] HSC 25187.3, 25246.1-25246.2, 79180-79190, 79310-79330, and 22 CCR. 66264.140, *et seq.*, and 66265.140, *et seq.* are the most pertinent citations though other sections may be relevant.

remedy analyses incorporate SLR projection, the type of contamination, the structure of the waste at the site, and the remedy phase.

These same steps above would apply to any Adaptation Plan prepared by an RP, project proponent or contractor to address how a proposed or existing remedy for a site will be adapted to address estimated SLR impacts at the Site now and in the future.

Accepted SLRVA's and Adaptation Plans are to be placed in the site file and made accessible to the public on EnviroStor immediately upon finalization.

Public Engagement and Transparency

Effective planning for SLR involves collaboration among various agencies within coastal city and county governing bodies, special districts, state agencies, federal agencies, climate researchers, non-governmental organizations, business owners and other stakeholders. For DTSC sites identified as vulnerable to SLR, DTSC PM's will work with relevant state and local government agencies and communities to transparently develop pathways of adaptation that will help maintain the protectiveness of contaminated sites in their communities. DTSC will prioritize vulnerable communities for assessing potential SLR-impacts, as well as develop and implement plans and strategies to mitigate site-specific impacts.

Project managers will ensure transparency and public engagement for SLR issues.
Project managers will also work to ensure that SLR is addressed appropriately in all technical reports, remedy selection documents, and Community Updates. All approved SLRVA's and Adaptation Plans will be posted promptly to the EnviroStor database to assure public access to the analysis and underlying information.

Project managers will work collaboratively with Public Participation Specialists (PPS) to ensure stakeholders and all interested parties are promptly informed regarding updates relating to SLR. Anticipated Public Participation Activities include the following: Community Updates, Public Notices, and Community Meetings as needed. The purpose of these activities is to inform communities of critical information, maintain transparency, and encourage collaboration amongst stakeholders.[10]

Equity

DTSC aims to prioritize the allocation of resources to address contaminated sites vulnerable to SLR in communities overburdened with pollution. DTSC will integrate planning requirements, priorities, and standards from tribal and local SLR adaptation and resilience plans within contaminated site-specific cleanup decisions for sites vulnerable to SLR. In addition, DTSC's

[10] For a more detailed understanding of how public engagement and transparency is handled at DTSC, view the Public Participation Manual. The Public Participation policy and procedures manual is based on state and Federal statutes and regulations, and sets DTSC policy for public participation. This manual is designed to address the public participation components of the site mitigation and hazardous waste management processes and ensure compliance with state and federal laws and regulations.

Office of Environmental Equity consistently works to foster communication, collaboration and consultation between DTSC and CA native Tribes. Even though it may not be mentioned, the office of Public Participation ensures outreach to tribes.[11]

SLRVA's and Adaptation Plans are integral to preparing for SLR. Plans should: highlight the vulnerabilities of natural and human resources and the impacts of SLR; adequately consider the priority and phasing of actions and strategies; develop project implementation strategies and ensure active community engagement processes that strive for equity across racial/social lines by implementing appropriate, targeted strategies.[12]

APPLYING BEST AVAILABLE SCIENCE TO SEA LEVEL RISE EVALUATIONS

The OPC is the State's recognized authority for sea level rise projections. Consistent with the California Sea Level Rise Mitigation and Adaptation Act of 2021 (PRC 30970, *et seq.*), DTSC relies on the OPC Guidance and other OPC recommendations and information as they become available. DTSC considers OPC guidance the "best available science" for procedural matters related to SLR evaluation. The decision tree flowchart provided at the end of this guidance (Attachment 1) will aid PM's in navigating the various SLR scenarios to assist them in deciding how to complete SLRVA's.

California SLR Action Plan indicates that different targets will likely be needed for vulnerability assessments and adaptation strategies associated with coastal ecosystems to assess how these areas and associated nature-based solutions might keep pace with rising sea levels.

For sites that appear to be negatively impacted given the target SLR estimates, a more refined analysis may be appropriate. RP's can refine an initial SLRVA to more precisely model the impacts of SLR on their remedy, and the impacts of the remaining contamination on the environment in the predicted SLR conditions.

The OPC Guidance presents median values of sea level rise scenarios, in feet, for each of 13 locations along the coast of California, from San Diego to Crescent City, for each decade from 2020 to 2150, with a baseline of 2000 (see Appendix 2 of the OPC Guidance). All median scenario values incorporate the local estimate of vertical land motion. RP's can refine an initial SLRVA to model the impacts of SLR more precisely on their remedy and the impacts of the remaining contamination on the environment based on the SLR scenarios. For that purpose, DTSC recommends RP's rely on the SLR scenario for the timeframe appropriate to the remedy.

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[11] For more information on DTSC's tribal consultation policy, please visit: DTSC Tribal Consultation Policy.

[12] State Agency Sea-Level Rise Action Plan for California, https://www.opc.ca.gov/webmaster/_media_library/2022/08/SLR-Action-Plan-2022-508.pdf

OPC Guidance can be supplemented by other available site-specific information (e.g., on-site groundwater monitoring well or surface water monitoring data representing current conditions) or regional guidance (e.g., regional inundation models endorsed by local, State, or federal agencies). OPC Guidance provides a decision framework to evaluate SLR risk and decisions. This Guidance recommends that a SLRVA follow this process, or any updated OPC Guidance process, to the extent practicable. The following steps are consistent with OPC Guidance, but restated and organized to more directly apply to DTSC Cleanup sites:

Step 1: Identify the time at which waste will remain in place above unrestricted use levels. Determine whether remediation to unrestricted use will occur by the year 2050 or beyond.

Sites that are remediated to unrestricted use levels by the year 2050 are defined as short-term. Sites that are remediated to unrestricted use levels beyond the year 2050 are defined as long-term.

Step 2: Identify the appropriate Sea Level Scenario.

For short-term projects, use the Intermediate Sea Level Scenario. Multiple lines of evidence identify the Intermediate Sea Level Scenario for being most likely in the near term and OPC recommends using this scenario, regardless of risk, for short-term remediation completed by the year 2050.

For long-term projects, use either the Intermediate-High or High Sea Level Scenario. The majority of DTSC sites impacted by SLR will use the Intermediate-High Sea Level Scenario for adaptation planning. For high consequence (e.g., reactive waste or extremely toxic waste), very long lifespan projects, adaptation planning should be based on the High Sea Level Scenario.

Step 3: Identify the nearest tide gauge to your site.

Appendix 1 of the OPC Guidance depicts the 13 National Oceanic and Atmospheric Administration (NOAA) tide gauge locations along the California coast from Crescent City (northernmost) to San Diego (southernmost). Select the nearest tide gauge to the site. If the site is situated equidistant to multiple tide gauges, use the tide gauge projecting the higher SLR.

Step 4: For the nearest tide gauge, identify the appropriate table of relevant SLR projections.

Appendix 2 of the OPC Guidance identifies Sea Level Scenarios at the 13 NOAA tide gauge locations. Select the appropriate table which corresponds to the closest tide gauge. Using the time at which waste will remain in place above unrestricted use levels, determine the appropriate SLR projections.

Step 5: Evaluate SLR projection based on project life span.

SLR projections presented within the Tables in Appendix 2 of the OPC Guidance are identified by decade. DTSC recommends rounding up to the nearest decade when selecting an SLR projection. For example, waste remaining in place above unrestricted use levels at a site until the year 2038, will use the 2040 SLR projection. Waste remaining in place above unrestricted use levels at a site until the year 2041, will use the 2050 SLR projection.

Step 6: Conduct SLR vulnerability assessment.

SLRVA's must include and address all potential SLR impacts to a remedy. Conducting a SLRVA begins with evaluating exposure maps of sea level rise induced inundation and flooding at the contaminated site, which can also incorporate coastal erosion and groundwater rise. DTSC should request the responsible party (RP) include these maps within the SLRVA, when appropriate. Once the physical extent of exposure is determined, a sensitivity analysis will provide information on the potential impacts of that exposure to the remedy. The final step in a SLRVA is to determine the remedies adaptive capacity to the determined impacts.

Step 7: Additional considerations to evaluate SLR.

Evaluation of "potential impacts" and "adaptive capacity," both before and after remedy selection, should consider, for example, King Tides, storm surge, expected community-wide infrastructure, changes to site hydrology and hydrogeology, implications for administrative controls, and impacts to exposure pathways.

Existing community-wide infrastructure might include a third-party levee, or a community-wide climate adaptation plan that includes future infrastructure investments. Where remedies would rely on existing infrastructure, RP's should demonstrate that this existing infrastructure would be adequately planned, funded, and maintained, indefinitely.

Expected changes to site hydrology and hydrogeology might include impacts such as remobilization of residual contamination based on SLR-induced changes to a site's hydrologic and hydrogeologic regime.

Expected implications for site administrative controls might include the need to amend land use covenants to accommodate future remedial features, land use changes, groundwater use, ownership changes, and OM&M and financial assurance burdens.

Expected impacts to exposure pathways evaluated in human health and ecological risk assessments might include new/future exposure scenarios for human and ecological receptors owing to new environmental media and contaminant behavior. Risk assessors might consider such phenomena as changes to groundwater geochemistry and hydraulics including the likelihood of saltwater intrusion; surface water inundation; groundwater surface expression;

and increased contaminant transport by diffusion and advection; as well as indirect risks, such as exacerbation of vapor intrusion potential.

Step 8: If necessary, develop adaptation pathways that increase resiliency to SLR and include contingency plans if projections are exceeded.

Remedies are intended to remain protective of human health and the environment under all foreseeable conditions including SLR plus episodic events such as King Tide and storm surge. As such, potential sea level rise impacts that influence remedy resiliency should be addressed with an appropriate adaptation plan and implementation.

For sites where the remedy has not yet been selected:

If the SLRVA identifies any potential material threat to the remedy, then the remedy selection, design, and OM&M should include mitigative measures to entirely avoid impacts. It is DTSC's preference for mitigative measures to be incorporated into the remedy. DTSC may consider the option of adaptive management measures (to allow for iterative changes in the face of uncertainty) in limited circumstances.

Mitigative measures might be as simple as installing riprap to protect against erosion or be as intensive as solidification of hazardous substances to reduce their toxicity and mobility or installation of sea walls, levees, or caps. Adaptive measures would need to be consistent with land use designations. The reliance of any contingent remedies on existing infrastructure (e.g., levee, sea wall), should be accounted for in remedy selection, design, OM&M, and financial assurance.

The vulnerability of remedial system components including associated site infrastructure must be assessed to identify whether the long-term integrity of a selected remedy may be impaired by adverse effects of SLR. Based on any potential vulnerability identified, methods should be incorporated to increase the systems resilience to SLR and its associated phenomena and ensure continued protectiveness of human health and environment.

For sites where the remedy has already been selected:

The remedy may require revision upon completion of the FYR or upon introduction of new information that raises significant questions regarding protectiveness. Any changes to remedial decision documents will occur through the post remedy decision document modification process such as outlined in the NCP, which may warrant or require public involvement. Depending on the scale and scope of change needed, the change may be documented by way of a Technical Memorandum of Non-significant Change to File, Explanation of Significant Differences, or Amendment to the remedial decision document.

KEY TERMS/DEFINITIONS:

Adaptation: adjustment or preparation of natural or human systems to a new or changing environment which moderates harm or exploits beneficial opportunities.

Adaptive capacity: the ability of a system to adjust to SLR to moderate potential damages, to take advantage of opportunities, or to cope with the consequences.

Mitigation: an action taken at an environmental site to stop or reduce the chances of receptors being exposed to harmful chemicals. Usually, the term 'mitigation measures' is used by DTSC to describe the controls implemented to limit exposures.

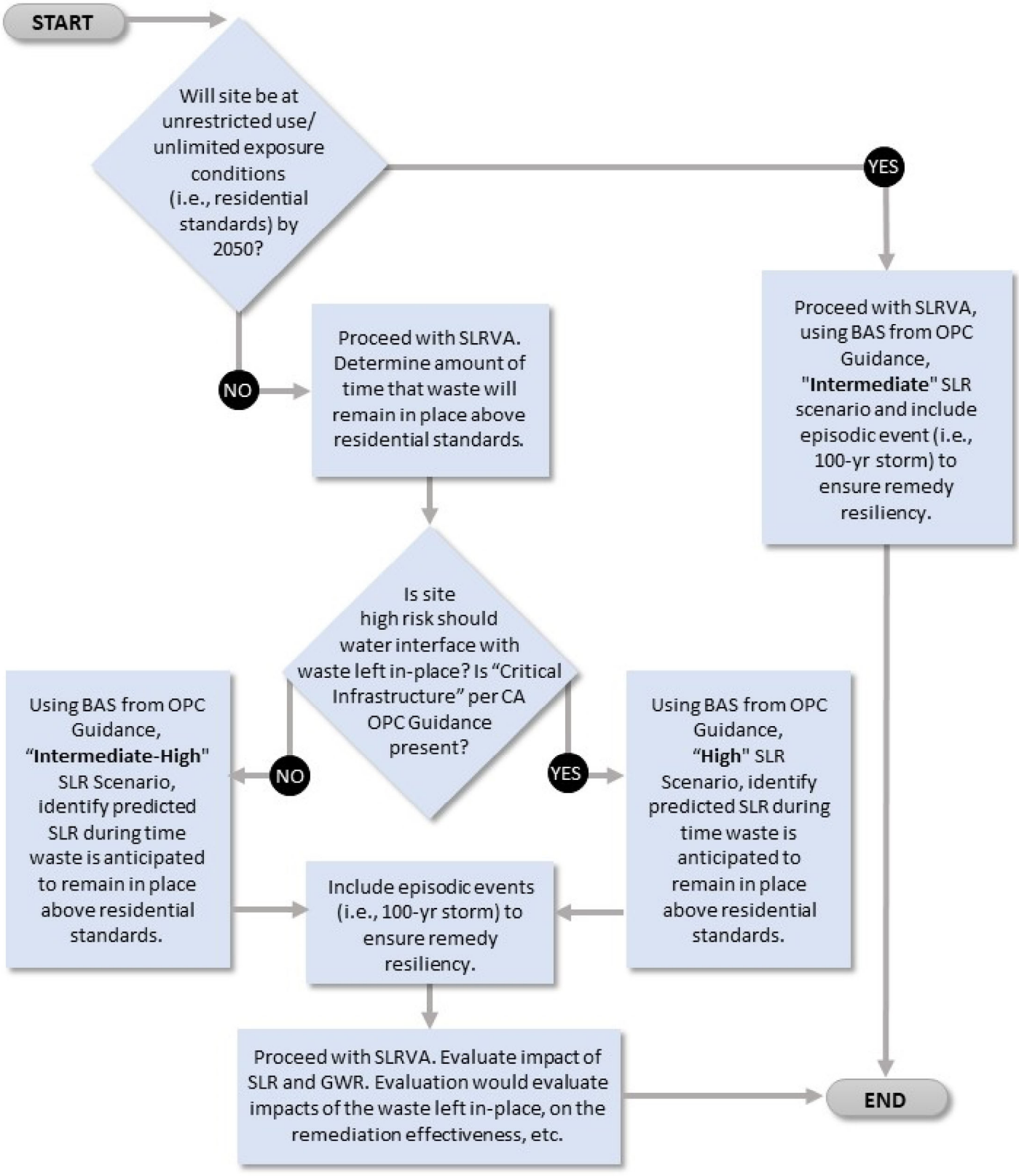
Resilience: a capability to anticipate, prepare for, respond to, and recover from significant multi-hazard threats with minimum damage to human health and the environment.

Vulnerability: the degree to which a system is susceptible to, or unable to cope with, adverse effects of SLR; it is a function of the character, magnitude, and rate of climate variation to which a system is exposed; its sensitivity; and its adaptive capacity.

GUIDANCE UPDATE

The guidance will be updated periodically as the best available science and OPC guidance evolves. For any questions related to DTSC's Sea Level Rise guidance document, please email us at DTSC_SeaLevelRise@dtsc.ca.gov.

ATTACHMENT



Notes:

1) This flowchart applies to projects at the stages of feasibility study, proposed remedial alternatives, remedy selection, and protectiveness determination.
2) DTSC has a preference for removal of contamination for sites in locations likely to be impacted by SLR. Mitigating factors include immobile contaminants, low risk contaminants, lack of completed exposure pathway should SLR inundate or groundwater rise to interface with contamination, etc.

Acronyms:

BAS	Best Available Science
DD	Decision Document
FS	Feasibility Study
GWR	Groundwater Rise
SLR	Sea Level Rise
SLRVA	Sea Level Rise Vulnerability Assessment