

Industrial Land Use GOV1: Although industrial property owners and site operators may have engaged with public agencies on reducing flooding and other risks through existing regulatory programs, planning for sea level rise will require additional, non-regulatory collaboration and partnerships between the public and private sector to ensure that multi-benefit shoreline solutions are advanced that balance economic, environmental and social equity goals.

- Conduct a region-wide campaign to build support from public and private sector leaders to participate in local, regional and state-wide efforts to collaboratively plan for sea level rise
- Identify and target outreach efforts at businesses that may be disproportionately impacted by sea level rise, either due to their physical location, type of operations, or the services and supply chains they rely on
- Create and implement a framework that public agencies, private entities, nonprofit organizations and community partners can use to engage in open, transparent, and well publicized planning and decision making processes to address sea level rise impacts

Industrial Land Use PHYS3: Many industrial land uses generate or store hazardous substances that could have public health or environmental impacts if released into groundwater or surface waters.

- Require industrial facilities that generate and/or store hazardous materials to conduct site and operational assessments to determine their potential vulnerability and risk from sea level rise, including increased flooding, rising groundwater and salinity levels, and increased liquefaction susceptibility
- Require an adaptive management plan that includes current and future prevention and protection measures to address the increasing risk of a hazardous materials release due to sea level rise
- Require consideration of sea level rise impacts including flooding, increased groundwater levels, salinity intrusion, and increased liquefaction susceptibility risk in all hazardous materials regulatory programs, and specifically in the Hazardous Business Plan Program

Industrial Land Use FUNC2: Industrial land uses rely on roads, rail lines, pipelines, airports, seaports and marine terminals to ensure materials and supplies are imported, goods produced are exported, and employees can get to/from work. Many of these transportation systems are vulnerable to flooding and their disruption could impact operations at industrial facilities of all types.

- Conduct a "hot spot" assessment to identify and evaluate vulnerable local and regional routes and nodes that are critical to maintaining industrial supply chains and ensuring employees can access industrial job sites
- Implement an annual King Tide site monitoring and inspection program to document local and regional routes and nodes at early risk from flooding
- Expand or form broad public-private partnerships to guide the planning and implementation of multi-objective transportation and goods movement improvements to ensure existing infrastructure and new investments are resilient to sea level rise impacts

Industrial Land Use FUNC4: Many industrial processes are continually operating and would need adequate warning time to fully or partially shut down in advance of storm-related flooding.

- Review existing operations, emergency management and contingency plans to determine where preparation is inadequate for sea level rise impacts
- Make sure plans and procedures for the shutdown of sensitive processes consider future flooding and how to restore operations afterwards
- Develop a decision-making framework for determining if new industrial uses that are continually operating should be protected from sea level and groundwater rise, or if they should be located/relocated in an area not at risk from sea level rise and storm events

Hazardous Materials Sites GOV3: Current emergency planning and response for many hazardous material sites does not require consideration of future flood risk. For CalARP and ISO stationary sources, there is a requirement to look at external events as part of a Hazard Review or Process Hazard Analysis, including flooding. As past flooding that was very improbable becomes a possibility, stationary sources will need to consider the risk of flooding, the safeguards that are in place, and how to reduce the risk to an acceptable level.

- Require facilities that generate and/or store hazardous materials to conduct site and operational assessments to determine their potential vulnerability and risk from sea level rise, including increased flooding, rising groundwater and salinity levels, and increased liquefaction susceptibility
- Require an adaptive management plan that includes current and future prevention and protection measures to address the increasing risk of sea level rise impacts in capital improvement, site operations, emergency management and contingency plans

Hazardous Materials Sites PHYS1: Industrial facilities containing hazardous materials are not generally designed to withstand flooding, and are difficult and costly to relocate.

- Develop and distribute guidelines for landowners and site operators of industrial facilities with best practices for reducing damages from sea level rise through re-design or retrofit of facilities to accommodate saltwater exposure and periodic low levels of flooding
- Provide incentives or require industrial facilities that generate and/or store hazardous materials to have temporary flood protection practices in place, i.e., waterproof shutters, shields or doors, inflatable barriers, etc., to reduce flood damage during storm events
- Provide incentives or require industrial facilities that generate and/or store hazardous materials to retrofit facilities to provide permanent flood protection, i.e., elevate entrances, windows and foundations above future flood elevations

Hazardous Materials PHYS3: Facilities with hazardous materials stored below ground could be vulnerable to rising groundwater.

- Create incentives for facility owners or operators to improve below ground storage or to replace with properly designed above ground storage that is resilient to flooding or rising groundwater
- Prohibit facilities from creating new below ground hazardous materials storage in areas that are at risk from sea level rise impacts
- Monitor groundwater and salinity levels near vulnerable hazardous materials sites by leveraging existing data or collecting site-specific data as necessary

Brownfields PHYS2: Past remediation and cleanup standards may not consider impacts of sea level rise, and sites that have been cleaned up to upland standards, or for specific groundwater and salinity levels, could be vulnerable if exposed to increased temporary flooding, permanent inundation, or changes in groundwater or salinity levels. Sites that become partially or fully exposed to the tides as sea level rises would need more stringent remediation to meet aquatic standards.

- Develop new brownfield cleanup standards that consider the impact of sea level and groundwater rise on the efficacy of the remediation practice and cleanup standard selected
- Conduct a study to determine where brownfields sites that have been cleaned up to upland standards may become aquatic as sea levels rise

Brownfields GOV1: Most brownfield sites are privately owned, and cleanup depends in part on being able to locate the responsible party and on these parties having the necessary funds to undertake the cleanup. Where responsible parties cannot be found or do not have sufficient funds, the cleanup process may be delayed or public funds must be used.

- Conduct studies of brownfields to gather critical information needed to assess vulnerability and risk from sea level rise, storm events, and elevated groundwater
- Establish agreements among agencies and organizations that regulate or manage brownfield sites to collect, manage, and share the data necessary to understand brownfield site vulnerability using consistent methods
- Prioritize the remediation of contaminated sites based on the timing of exposure to sea level rise, storm events, and elevated groundwater, degree of vulnerability, and extent of the consequences

Refineries GOV2: Refinery owners and associated industrial facility managers do not have control over the entire shoreline that protects low-lying areas that are at risk of flooding.

- Expand or form partnerships among public and private agencies, organizations and shoreline landowners to facilitate cost-sharing for planning, implementing, and monitoring multi-objective shoreline improvements to protect refineries and associated facilities, vulnerable infrastructure and the populations and facilities they serve
- Improve communication and coordination between those that own and manage the shoreline and those that own and manage refineries and associated facilities that are protected by these shorelines

Refineries PHYS1: Refineries and associated industrial facilities that are located in low-lying areas are unlikely to have been constructed to withstand flooding or higher groundwater levels.

- Follow existing or develop new standards requiring that waterproof materials be used in the construction of new infrastructure and in the repair or protection of existing infrastructure
- Follow existing or develop new standards to ensure existing and new pipelines and cables are adequately weighted and secure and will remain in place even if exposed to scour or flooding
- Consider relocating critical elements that are necessary to continuity of refinery operations and are vulnerable to flooding or higher ground water levels to areas that are not at risk from sea level rise and storm events

Pipelines FUNC1: Pipelines supply liquid fuels and other materials over long distances within the region, and are critical the region's energy and goods movement economy. Damage to pipelines could result in service disruptions as well as threats to public safety and the environment in the event of an explosion or release of hazardous contents.

- Increase inspection and maintenance of pipeline infrastructure that is sensitive to water or salt in areas at risk from sea level rise, storm events, or elevated groundwater levels
- Review existing operations and maintenance plans to determine if preparation is adequate for sea level rise and storm events that could cause widespread disruption of the region's pipeline systems

Pipelines PHYS3: Rising groundwater can increase the risk of liquefaction, which could damage buried pipelines in a seismic event.

- Conduct a study on the impacts of rising sea levels on groundwater elevation and the potential for increased liquefaction susceptibility of pipeline systems
- Assess critical and interconnected infrastructure in areas exposed to sea level rise and liquefaction to identify strategies that can improve resilience to both hazards
- Consider relocating vulnerable pipeline infrastructure to areas that are not at risk from increased seismic susceptibility due to sea level rise and storm events

Household Hazardous Waste PHYS1: The HHW facilities are at grade, and may have hazardous waste stored at grade that could be impacted by a flood event.

- Require that hazardous materials can be elevated above projected flood levels or can be temporarily protected from flooding by manual, remote control, or automatic barriers or waterproof closures
- Increase inspection of hazardous materials sites in areas at risk from sea level rise impacts, in particular in advance of predicted storm events

Household Hazardous Waste PHYS2: The HHW facilities, like most buildings, are not designed to withstand flooding. If the facilities were exposed to floodwaters, they could suffer damage that would require extensive repairs.

- Require HHW facilities to consider vulnerability and risks of sea level rise, storm events, and elevated groundwater in emergency plans, facility operations plans, and capital improvement plans
- Provide incentives or require that HHW facilities are retrofitted using waterproof shutters, shields or doors or materials to reduce flood damage