Contaminated Lands

Contaminated lands are sites with materials that pose a hazard to people and/or the environment. In general, the threat posed depends on the potential for the hazardous substances to be released, the characteristics of the waste (e.g., toxicity and quantity), and the sensitivity of the people or other receptors potentially affected. The release of hazardous substances typically occurs through four pathways: groundwater migration, surface water flow, soil exposure, and release to the air. These pathways can contaminate drinking water and food chains, as well as direct exposure to human populations and sensitive ecosystems.

Contaminated lands are vulnerable to sea level rise and storm events that could cause flooding or groundwater intrusion. Temporary or permanent surface flooding, erosive tidal or wave energy, and elevated groundwater levels could cause the release of hazardous substances with potentially significant consequences on public health, the environment, and the local economy. Most contaminated sites are remediated in place due to the technical challenges and environmental risks of hazardous substance removal. While there has been many advances in the field of remediation, most clean up practices used have not been designed for sea level rise or changing groundwater conditions. While remediation of contaminated lands offers opportunities for economic growth and redevelopment, or improved community services, for example through the creation of a new park or open space, designing cleanups with the future in mind will help ensure public and environmental health is protected as sea levels rise.

In the Contra Costa project area two types of contaminated lands were evaluated, landfills and Brownfields. This includes open and closed landfills located in Richmond and Martinez, and Brownfields sites located throughout the project area that are active, inactive and cleaned up (certified). The assessment that follows describes the vulnerabilities of contaminated lands to sea level rise and storm events, as well as the consequences that could occur from flooding and changing groundwater levels.

Landfills

Landfills are solid waste management facilities where waste is or once was disposed. California law requires that open and closed landfills be maintained in a manner that protects public health, safety, and the environment. The California Department of Resources Recycling and Recovery (CalRecycle) is responsible for reviewing local permits for active solid waste facilities and for ensuring that operators demonstrate adequate financial assurances for closure and post-closure maintenance, corrective action, and operating liability. The Regional Water Quality Control Board (RWQCB) regulates both active and closed landfills to ensure that non-hazardous wastes do not enter surface waters or groundwater. RWQCB regulations include design standards for protective features (e.g., liners, covers), requirements for environmental monitoring and cleanup when necessary. Some of CalRecycle and the RWQCB regulatory duties

overlap (e.g., margin of safety), while others are split (e.g., the RWQCB's focus on water and leachate and CalRecycle's focus on landfill gas). The California Department of Toxic Substances Control (DTSC) regulates the disposal of wastes classified as hazardous, and other local, state, or federal agencies also issue permits or approvals for solid waste facilities.

Since 2009, RWQCB has required that landfills located adjacent to the Bay, rivers or the ocean submit a long-term flood protection plan when updating existing Waste Discharge Requirements (WDRs). WDR's are most commonly updated every 10-15 years, or with a proposed expansion, significant changes in monitoring parameters or well locations, when ownership changes, or if new regulations are promulgated. Long-term flood protection plans must consider feasible options for achieving protection from the 100-year flood in the face of rising sea levels and increasing flood frequency and intensity. Once in place these plans must be updated every 5 years throughout the operational life and post-closure maintenance period of the landfill. In addition, the RWQCB can require consideration of long-term flood protection and sea level rise in actions requiring landfill implementation of site cleanup and other corrective actions.

KEY ISSUE STATEMENT

Increased flooding, groundwater levels, or tidal, wind and wave energy could have significant consequences on landfill waste containment systems, potentially impacting public health and nearby ecosystems if contaminants are released. Current RWQCB long-term flood protection requirements are one opportunity for landfills to identify and address increased flood risks due to sea level rise. However, this approach is geared towards site-specific actions, and may not suffice in locations where landscape-scale responses are warranted.

EXPOSURE TO CURRENT AND FUTURE FLOODING

All landfill parcels in the project area, except the East Parcel of the Acme Landfill, are located within the 100-year floodplain. The West Contra Costa Sanitary Landfill is at risk from 6 feet of sea level rise, although adjacent wetlands on the parcel could be inundated with 2 feet of sea level rise. Low-lying wetland areas on the Acme and IT Vine Hill Complex landfill parcels could be inundated with 1 foot of sea level rise.

ASSET DESCRIPTIONS

There are three landfill complexes in the ART project area: the West Contra Costa Sanitary Landfill in Richmond, and the IT Vine Hill Complex (IT Vine Hill and IT Baker) and Acme Landfill in Martinez.

West Contra Costa Sanitary Landfill

The West Contra Costa Sanitary Landfill (also known as the West County Sanitary Landfill) is a closed and capped facility that straddles the City of Richmond and unincorporated North Richmond. The landfill includes a 28-acre Class I landfill that is a Hazardous Waste Management Facility located within the footprint of the 160-acre Class II landfill. Both landfill components are surrounded by slurry walls and have a leachate extraction system and monitoring wells. Leachate is conveyed to the nearby West County Wastewater Treatment Plant for treatment and discharge. Access to the landfill is from Parr Boulevard, which could be disrupted with 2-3 feet of sea level rise.

Low-lying portions of the landfill are within the 100-year floodplain and are at risk from sea level rise. The permanent containment of non-hazardous and municipal wastes at the landfill is vulnerable to flooding because of the proximity to the Bay, limited access via Parr Road, the type of onsite facilities and uses, and the potential that flooding could be long duration or result in permanent inundation. The direct disruption of the closed landfill, particularly the Class I landfill component, could have significant consequences for public health and nearby ecosystems if contaminants were released into the environment. The current leachate collection system may or may not be sufficient to collect and treat additional water volumes that might result from sea level rise.

IT Vine Hill Complex

The IT Vine Hill Complex is located in a heavily industrial area of Martinez near the Acme Landfill. The complex consists of two non-contiguous landfills: the 41-acre IT Vine Hill and 26-acre IT Baker Landfill. Both are former municipal and hazardous waste disposal facilities that are now closed and covered with a system of low permeability soils and geosynthetic layers. The landfills are surrounded by slurry walls and have a groundwater collection system. Groundwater from the IT Baker site is transferred via pipelines to the IT Vine Hill site, which has a groundwater treatment plant and two evaporation basins. Surface water is diverted from the IT Vine Hill site to Pacheco Creek via drainage ditches.

While the majority of the landfill parcels would not be flooded due to their elevation, low-lying areas between the landfills are potentially at risk. Access to the IT Vine Hill Landfill is from Waterbird Way and Waterfront Road, a portion of which floods temporarily during current extreme high tides and which could be further compromised in a flood event as sea level rises. As a portion of the IT Vine Hill Landfill is located within the Lower Walnut Creek Watershed along Pacheco Creek, and the IT Baker Landfill is located between Pacheco Creek and Walnut Creek, protection from flooding will require ongoing coordination with the Contra Costa Flood Control District as well as nearby landowners and managers.

The Acme Landfill

The 516-acre Acme Landfill is located in a heavily industrial area of Martinez near the IT Vine Hill Complex. The landfill consist of three separate waste disposal sites: the North Parcel, a closed 135-acre Class I (hazardous waste) landfill; the South Parcel, a closed 22-acre closed Class III landfill; and the East Parcel, an active 87-acre Class II landfill. Onsite facilities include a weigh station, pay booth, maintenance shop, two office buildings, recycling areas, and storage yards for vehicles and equipment. There is a groundwater and leachate monitoring system in place, a leachate barrier around the perimeter, a leachate treatment plant, and a landfill gas collection and treatment system, including gas turbines.

All three parcels where the landfills are located are within the existing 100-year floodplain and have low-lying portions that could be exposed to sea level rise. Although the majority of the landfill parcels will not be flooded due to their elevation, the low-lying portions of the landfill parcels and any facilities located in low-lying portions of the site could be at risk. Access to the landfill is from Waterbird Way and Waterfront Road, a portion of which floods temporarily during current extreme high tides and which could be further compromised in a flood event as sea level rises, potentially impacting active landfill operations at the East Parcel. The landfills are within the Lower Walnut Creek Watershed, and protection from flooding will require ongoing coordination with the Contra Costa Flood Control District as well as nearby landowners and managers.

VULNERABILITIES

GOV1: The IT Vine Hill Complex and Acme Landfills are located in the Lower Walnut Creek Watershed, and protection from flooding will require ongoing coordination with Contra Costa Flood Control District as well as with other landowners and managers.

FUNC1: Landfills require local road access for site management (e.g. monitoring, repairs or upgrades to waste containment systems). The three landfill complexes in the project area are vulnerable to flooding that could affect access roads. For example, at the East Parcel of the Acme Landfill, waste disposal operations rely on access roads that could be compromised in a flood event. Short-term disruption of road access during a storm, or longer-term disruption due to more persistent flooding will interrupt ongoing operations and make site management more difficult.

PHYS1: The volume and type of waste contained makes it extremely challenging and expensive to relocate the function of landfills, therefore they need to be protected in place.

PHYS2: While landfill cover systems are designed to prevent water infiltration, leachate extraction systems may or may not be sufficient, depending on the volume of inundation, to collect and dispose of the additional leachate if flooding occurs.

PHYS3: Waste containment systems designed for existing conditions may not be adequate to withstand permanent flooding or increased storm energy depending on their design and maintenance and the location of the landfill.

PHYS4: Displacement of the ground due to liquefaction during a seismic event could compromise the stability of waste containment facilities, such as landfill caps or liners, caps over remediated sites, and slurry walls constructed to contain contaminants. Damage to the caps, liners, and containment systems could be costly to repair and would make the landfill more vulnerable to flooding.

CONSEQUENCES

Society and Equity: Landfills pose a risk to public health if contaminants currently contained on site are released to surrounding surface or groundwater.

Environment: There could be significant water quality impacts if contaminants are released from landfills into the adjacent natural areas that support a variety of species and habitats. The Walnut Creek Watershed, for example, supports a variety of species, including federally threatened coho salmon, federally threatened steelhead trout, black rails (threatened), and California Ridgway's rails (endangered).

Economy: A release of contaminants from closed or active landfills could strain local emergency resources and could result in high cleanup and recovery costs.

Brownfields

Brownfields are environmentally distressed properties where expansion, redevelopment, or reuse may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant. Regulatory jurisdiction over brownfields and other contaminated sites in Contra Costa County is shared among the U.S. Environmental Protection Agency, the State Water Resources Control Board (Water Board), the Department of Toxic Substances Control (DTSC) and Contra Costa Health Services. To facilitate the coordination and communication on Brownfields issues, the Water Board and DTSC have a Memorandum of Agreement that defines how a lead agency is assigned and specifies that cleanups address the requirements of both agencies (http://www.waterboards.ca.gov/water_issues/programs/brownfields/).

The extent to which Brownfields sites are cleaned up depends on the sites' current land use designation or on its intended reuse use. For example, sites intended for heavy industrial uses have less stringent cleanup standards than those intended for light industrial or commercial uses. In addition, sites are cleaned up to different standards depending on if they are dry (e.g., uplands) or wet (e.g., aquatic). Depending on cleanup costs and the level of remaining risks, some contamination can be allowed to remain on site. In these cases there are often restrictions on the future use of the site, and for activities on site such as digging in certain areas. Long-term monitoring, maintenance

plans and site reviews are required for Brownfields where some contamination remains in place. Additionally, these sites are subject to deed restrictions, covenants, and administrative, institution or engineering controls.[1]

Sites included as Brownfields in this assessment include U.S. Environmental Protection Agency Superfund sites and DTSC State Response, Voluntary Cleanup, and Corrective Action Programs sites. In addition, brownfield sites can be classified based on cleanup status. Classifications include inactive and in need of further action or evaluation; active with investigations or remediation by a responsible party underway; or certified that the cleanup has been completed, although possibly with waste left on site. The challenges of current and future flooding of Brownfields sites are different depending on the status, and therefore these categories provide a useful distinction.

KEY ISSUES

Brownfield cleanups are site-specific and based on the designated land use and/or the proposed site reuse, as well as current standards, which vary by location (e.g., upland or aquatic). Upland sites that become aquatic as sea level rises will not have been remediated to a high enough standard, as allowable aquatic contaminant concentrations are greater than upland concentrations. Opportunities for further cleanup of brownfields to address changing flood or groundwater conditions will vary; remedies are site specific, and there may not be means to compel the further cleanup of certified sites.

EXPOSURE TO CURRENT AND FUTURE FLOODING

There are 63 Brownfields in the project area: 25 of which are Active, 18 are Certified with Operations and Maintenance, 12 are Certified with land use restrictions, and 7 are Inactive - Action Required. Thirty-eight of these Brownfields are potentially exposed to flooding and one is in a low-lying area adjacent to an area that is exposed to 6 feet of sea level rise.

[1] Brownfields and Contaminated Sites Cleanup Policy in Contra Costa County, Recommendations for Improvement, Contra Costa Hazardous Materials Commission, September 2010

Brownfield Parcels	Current 100-year Flood	100 year Flood plus Sea Level Rise					
		1'	2'	3'	4'	5'	6'
Active	1	11	11	12	12	12	12
Certified / Operation & Maintenance	2	5	5	5	5	5	5
Certified O&M - Land Use Restrictions Only	3	7	7	7	7	7	7
Inactive - Action Required	0	2	2	2	2	4	4
Total	6	25	25	26	26	28	28

Brownfield Parcels	Sea Level Rise not in Flood Zone						Low-lying, adjacent to 6 feet SLR
	1'	2'	3'	4'	5'	6'	
Active	1	1	1	2	3	5	0
Certified / Operation & Maintenance	0	1	1	1	1	2	0
Certified O&M - Land Use Restrictions Only	0	1	1	1	1	3	1
Inactive - Action Required	0	0	0	0	0	0	0
Total	1	3	3	4	5	10	1

ASSET DESCRIPTIONS

While there are brownfields across the entire project area, the highest concentration (over two-thirds) of sites is within the City of Richmond. There are at least 68 different contaminants of concern associated with brownfields in the ART project area, including various metals, corrosive materials, petroleum products, volatile organics, organochlorine pesticides, and other compounds. Nearly all of the brownfield sites have multiple contaminants of concern, and often have more than one contaminant of the same type, for example more than one kind of metal. The most common contaminant of concern is lead, which is found at nearly two-thirds of sites considered in the project area. These contaminants can potentially affect soil, sediments, sediment vapor, groundwater, or surface water.

Brownfields cleanup status can vary from not yet initiated to complete. The four cleanup status categories are described below.[2]

Inactive

Inactive sites have either been screened and require action, following the identification of contamination, or further evaluation is needed, as the site has been identified as a possible problem but contamination has not yet been found. Beyond these sites identified as inactive, other sites may exist which have yet to be identified by any of the state, regional or federal regulatory agencies responsible for overseeing the cleanup of contaminated lands.

Active

Active sites are those either being investigated or undergoing cleanup. For these sites, there is an opportunity to examine how potential changes from sea level rise may impact how cleanup standards are applied, and how future flooding may impact the efficacy of the remediation practice in use.

There are different cleanup remedies, some relatively fast, and others slower and in place for longer periods of time. In most cases, the remediation begins with removal of contaminated soils. Contamination that remains on site can then be capped or covered. Groundwater is treated either through traditional pump and treat systems (which are not as prevalent), with in-situ oxidative/reductive technologies that are relatively fast and ideal for localized contamination, or with permeable reactive barriers, used when the area of contaminated groundwater is large. These treatment practices are sensitive to salinity levels. Because they stay in place for long periods and use passive groundwater flow, permeable reactive barriers will be affected by changes in groundwater. For example, if the rate and direction of groundwater flow is slowed or reversed, which can happen in shallow areas with a rising Bay, the treatment practice will not function as designed. In addition, permeable reactive barriers require maintenance over their lifespan, and if placed in an area that is permanently inundated or flooded for long periods of time, they may not be serviceable for the duration of the expected cleanup.

Certified

Certified sites are those where cleanup has been completed. In many cases contamination remains on site after cleanup, and there are three sub-classes of certified brownfields sites. “Certified with Operations & Maintenance” sites must have an engineered or physical remedy in place that requires ongoing operations and maintenance. These sites may also have some form of land use controls, such as land reuse restrictions or covenants that describe the appropriate and allowable uses of the site. “Certified – Land Use Controls Only” sites do not require ongoing operations or maintenance, but do have land reuse restrictions. Finally, “Unrestricted” sites can be reused for any type of land use.

[2] Cleanup status as used by DTSC in the Envirostor database.

Brownfields with ongoing operations and maintenance are inspected annually by DTSC, and those that are subject to land use controls are reviewed by DTSC through inspections and reporting. Additionally, these sites are subject to review every 5 years to confirm that their cleanup remedy remains effective given changing conditions. These periodic reviews are an opportunity to evaluate whether the cleanup remedy will remain effective as sea level rises.

Certified sites that are unrestricted are not, however, subject to review. This can pose some challenges. For example, the amount of cleanup required to allow residential reuse (an unrestricted land use) is based on human health considerations, and may not adequately protect aquatic species.

The potential for flooding of contaminated sites, including those already cleaned up and those with contamination not yet uncovered, could impact sensitive aquatic receptors. As sea levels rise, the release of sequestered contaminants to aquatic environments is likely to be one of the most significant issues faced because:

- For Certified sites, cleaned up to the most appropriate standard at the time of remediation, the responsible party may be unwilling or financially unprepared to take on additional cleanup.
- Remedial actions necessary to cleanup sites to aquatic standards are likely to be much more costly than cleanup to upland standards, not only for private responsible parties but also for governments that might be funding the cleanup.
- It will be challenging to demonstrate that the existing cleanup will or will not suffice under inundation, as this will depend on the type of contaminant present, site specific characteristics, and what the original remedy consisted of.

VULNERABILITIES

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.

GOV2: Agencies may have shared oversight responsibilities over individual brownfield sites, or different agencies may have oversight over sites that are physically close to one another. This could potentially create challenges in coordinating information and action to address sea level rise impacts.

GOV3: There are no effective regulatory or financing mechanisms to prioritize the remediation of brownfields that will be affected by sea level rise. Additionally, these sites may not provide the most appropriate redevelopment opportunities, further diminishing any incentive to conduct cleanup activities. This is especially true for sites such as landfills that once cleaned up are generally reserved for habitat or open space.

FUNC1: Brownfields are typically cleaned up to specific upland standards and for the type of proposed reuse, such as industrial, habitat or open space land uses. Sites that become partially or fully exposed to the tides as sea level rises would need more stringent remediation to meet aquatic standards. Locating the original responsible party and requiring them to fund the further cleanup to protect aquatic resources would be challenging.

FUNC2: Some of the brownfields in the project area are protected from flooding by structures on site. For example, the Shipyard #3 and Union Carbide Brownfield sites are within the Port of Richmond and are protected from flooding by the port's structural shoreline. Other brownfield sites are protected from flooding by shorelines that are owned and managed by others.

PHYS1: Some brownfields can be cleaned up through the removal of contaminated soil. In sites where the removal of all contaminants is infeasible due to technical challenges or funding issues, remaining contamination is typically capped and remediated in place. Remediation practices such as permeable reactive barriers, that need to be in-situ for a long duration and rely on existing groundwater flow rates, directionality and salinity level, may not continue to be effective as sea level rises.

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.

PHYS3: Sediment bound contaminants are vulnerable to erosion, which could transport them into the Bay. Water-soluble contaminants are vulnerable to flooding and rising groundwater. While groundwater in nearshore clay or mud deposits does not move very fast or far, sites that are located further inland may be vulnerable to increasing groundwater levels.

CONSEQUENCES

Society and Equity: Brownfields that have not been fully cleaned up, or have been cleaned up to less stringent upland or reuse standards, may pose a risk to public health if onsite contaminants are released to residential areas or to areas with sensitive receptors (elderly, very young, medically challenged). Many contaminants are harmful to human health, and could cause problems for those who come into contact with them or if they migrate into groundwater. Engineering control methodologies and technologies are available for use at upland sites to protect the occupants of buildings constructed on contaminated sites, in particular where groundwater drives soil vapors up and into occupied spaces. However, these technologies will not be in place in areas newly exposed to contaminants due to sea level rise or changing groundwater levels.

Environment: Many common brownfield contaminants that remain on site post-cleanup are at levels that are not harmful to people. However, contamination levels that remain on sites remediated to upland standards can be harmful to aquatic receptors, and if released to the Bay and shoreline, would have significant adverse impacts on aquatic species.

Economy: Brownfield cleanup can be very costly, and often must be undertaken with public funds, which are extremely limited and difficult to obtain. Brownfields undergoing active cleanup are also typically slated for redevelopment; disruption of these sites and release of contaminants could result in loss of economic investment or potential.