

17. PORT OF REDWOOD CITY

Port of Redwood City

VULNERABILITY SUMMARY

The Port of Redwood City (Port) is **moderately vulnerable** to sea level rise. Low-lying infrastructure is already exposed to flooding from king tides and could experience long-term inundation with sea level rise. If inundated, port functions could be maintained with backup power for 2-3 days and ships could still reach the wharves. The Port functions could be moved to other facilities, but at a significant cost in lost revenue, giving it moderate adaptive capacity. The most vulnerable component of the port is Seaport Boulevard, which facilitates truck and rail access to the Port.

SENSITIVITY Moderate	EXPOSURE High	ADAPTIVE CAPACITY Moderate	CONSEQUENCES High
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ASSET CHARACTERISTICS

675 Seaport Blvd | Redwood City

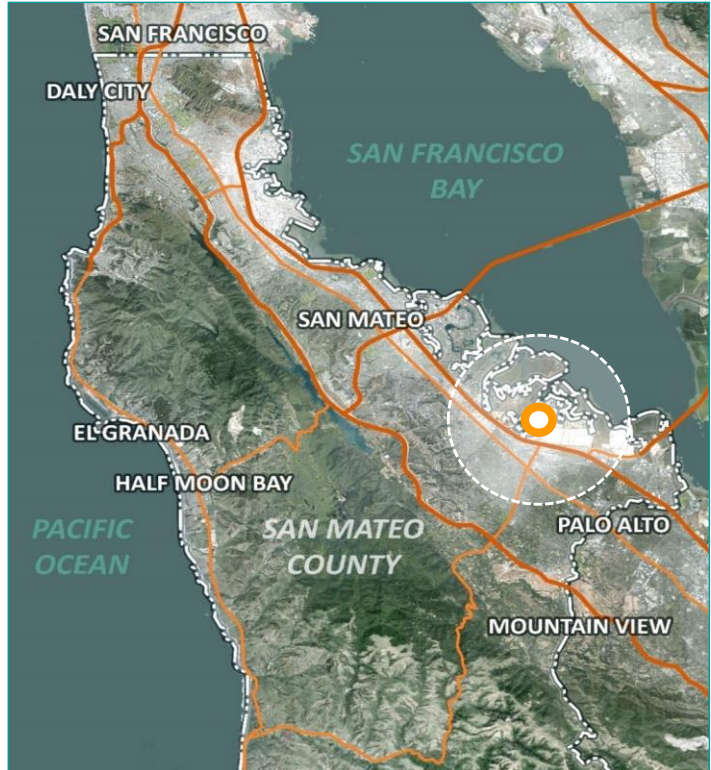
Asset Description and Function:
 The Port of Redwood City is one of four public ports on the San Francisco Bay. The Port consists of wharves, roads, rail infrastructure, buildings for tenants (e.g., Univar USA--chemical distributors, Cemex) and administration, and a seawall. Seaport Boulevard and the rail line provide essential access to the Port, by means of which trucks and rail cars deliver and transport thousands of tons of goods. Wharves 1 and 2 are newly built and elevated. Wharves 3, 4, and 5 are older.



Asset Type	Port
Asset Risk Class	4
Size	120 acres
Year of Construction	1960
Elevation	14 feet, MLLW
Level of Use	2M tons; \$6.9M annually
Annual O&M Cost	Less than \$120,000
Special Flood Hazard Area	Asset is in SFHA
Physical Condition	Varies: Fair to Poor
Landowner	City of Redwood City and three private owners

Underground Facilities
 There are electrical (power source), water, sewer, and natural gas facilities underground.

Environmental Considerations
 Special status plants, animals, and natural communities may be present in the project area; a more detailed analysis will be needed before implementing adaptation strategies.



PORT OF REDWOOD CITY

ASSET SENSITIVITY

The Port operations are moderately sensitive to temporary near-term flooding, as the Port could withstand a short-term disruption (up to 2-3 days) without any major issue. Powerlines run underground and were designed for waterlogged conditions and are not very sensitive to inundation. Even with a power outage, ships could still come in and out (as many have their own power source). However, the distribution of goods would experience delays if Seaport Boulevard or the railway were flooded because trucks and trains would not be able to deliver and pick up cargo. The gasoline on site has secondary containment and is elevated; it is therefore not presently sensitive to temporary flooding.

Long-term (permanent) and widespread inundation that affects Seaport Boulevard or the railway, on the other hand, would permanently affect distribution of goods and shut down Port operations. In the future, the Port may provide docking and terminal facilities for ferry boats on Seaport Boulevard. While water transit is adaptable to an increase in sea level, the landside facilities serving the ferry boats would be affected by sea level rise.

New seawall at the Port with tenant facilities and new wharf (left).



SHORELINE VULNERABILITY

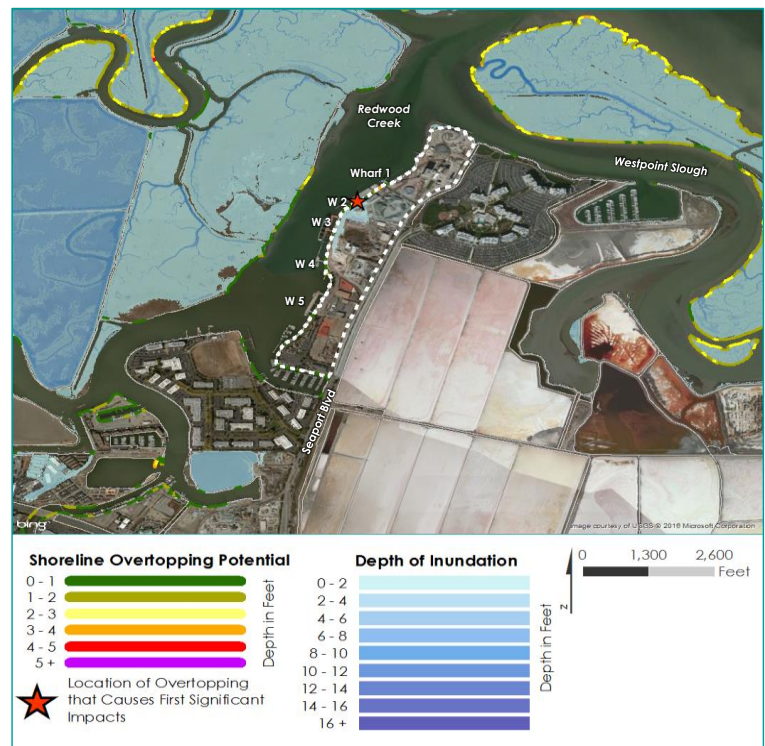
Shoreline Overtopping Analysis

Redwood Creek is a likely source of coastal flooding at the Port. Water 0-12 inches above the current mean higher high water (MHHW), could overtop Redwood Creek along the northwest edge of the site (red star on map), creating a potential flow path to port assets. With water 12-24 inches above MHHW, there is additional inundation at the Port entrance due to overtopping of the berm to the east of Seaport Boulevard, affecting truck and rail access to the Port.

Cross-Cutting Vulnerabilities

Loss of the Port function would increase cargo loads on other regional ports as access roads and railway are essential to port function. Increased loads on other ports, along with increased truck traffic to other ports, could affect local air pollution.

First Significant Impacts: 12 inches above MHHW.



PORT OF REDWOOD CITY

SEA LEVEL RISE EXPOSURE ANALYSIS

Exposure Discussion

The Port is currently subject to regular nuisance flooding from Redwood Creek during king tides. This occurs at the two low spots in the southwestern recreational end where the marina is located and the northeastern end by the Cemex property, north of Wharves 1 and 2. Port properties also experience occasional flooding from storm drain backup when the tide is high and the flapper gates do not allow stormwater to flow out through the gates. Water generally drains or evaporates from the site due to the elevation and grade of the land.

Sea level rise will likely increase the frequency and severity of both shoreline overtopping from Redwood Creek and storm drain backup flooding. With sea level rise, water will likely not drain from the site naturally and may require pumping. Sea level rise could also cause more widespread inundation of other Port infrastructure (e.g., road, rail, buildings, marina). With 12-24 inches of sea level increase, it may be possible for the sea walls to be overtopped, but more importantly the Port could be exposed to flooding from the salt ponds abutting Seaport Boulevard. The ponds are presently below high tide, but 12-24 inches of sea level rise could overtop and fill the ponds, which could then overtop Seaport Blvd from the east side, affecting ingress and egress at the Port.

Groundwater is not currently a concern at the Port, but more analysis is needed to understand sea level rise impacts to groundwater.

Baseline Scenario: Inundation up to 10 feet deep.



Mid-Level Scenario: Inundation up to 13 feet deep.



High-End Scenario: Inundation up to 17 feet deep.



Exposure Analysis Results

Potential Inundation Depth (feet)		
Scenario	Minimum	Maximum
First Significant Impacts (12 inches)	0	4
Baseline 1% Flood	0	9
Mid-Level 1% + 3.3 feet	0	13
High-End 1% + 6.6 feet	0	17

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ADAPTIVE CAPACITY, CONSEQUENCES, AND POTENTIAL ADAPTATION

Adaptive Capacity

The Port has high adaptive capacity for short-term flooding and moderate capacity for permanent inundation. The Port employees and some tenants have flood mitigation plans, i.e., portable pumps. One area has a two-pump system, but all others rely on gravity to drain water to San Francisco Bay. There is a generator on site to power port administrative buildings, though it is not sufficient to power tenants or industrial operations. For widespread or permanent inundation causing the port to shut down, there is no alternate truck or rail route to access port industrial facilities or transfer goods. However, most port cargo could be shifted to other regional ports (San Francisco or Oakland) with the exception of cement, which would be sent to Stockton. As the Port of Redwood City is more frequently disrupted due to the impacts of sea level rise, the temporary use of barriers, or the use of other ports may prove too cumbersome or costly and will likely require a decision about mitigation or adaptation.

Consequences

Consequences from the loss of the Port or port functions could be high. Direct damage to the Port's and tenants' infrastructure could occur with temporary or permanent inundation, and recreational access to the marina could be lost as well. Employees or other individuals on site could be injured during a large storm, or while driving cargo trucks across flooded roads. Some tenants store hazardous materials (e.g., chlorine, hydrochloric acid) that could have water quality impacts and pose threats to health and safety if released in a flood. The larger, if less direct, impact would be the business interruption and economic impact of delays from disrupted rail and truck operations. If the port were shut down, lost revenue could reach \$6.9 million per year (\$19K per day) in addition to repair costs of up to \$60 million (excluding tenants' infrastructure). If vessels were rerouted to other regional ports, regional truck traffic and cargo transport costs would increase, along with potential air pollution caused by the traffic.

Additional Important Information

The Port owns 120 acres, 40 of which are leased to tenants. The Port officially manages this property, though it shares some property management decisions with tenants, leading to some complex and negotiated management decisions. Flooding on Seaport Boulevard may also affect any businesses that depend on the road. The Redwood City Inner Harbor Specific Plan projects increased development in the region.

Asset-Specific Adaptation

The third wharf at the Port could be reinforced similar to Wharves 1 and 2, which are less vulnerable following recent reinforcement. Since Seaport Boulevard is an access vulnerability for the Port, it could be raised, and because the road also provides access to neighboring businesses, co-funding is a viable option.

Vulnerable Ports

This is the only Asset Vulnerability Profile on vulnerable ports in the County. There are no other ports in the County, but there are four in the San Francisco Bay Area. These include the ports of Oakland, San Francisco, Stockton, and Richmond. All of them would be vulnerable to sea level rise because they are located on the water.

Rail and truck access at the Port.



Ponding near Cemex Aggregates facilities.

