

# 16. SAN CARLOS AIRPORT

Managed by San Mateo County

## VULNERABILITY SUMMARY

San Carlos Airport (Airport) is **moderately vulnerable** to sea level rise. All airport components are very sensitive to salt water, and even minor inundation would halt airport operations; flooding would require the replacement of many pieces of saltwater-exposed equipment. Asset exposure is low, though a low section of levee required for takeoff and landing provides a pathway for inundation. Adaptive capacity is moderate, as levees could be raised outside the takeoff and landing zones in the long run. Planes could land and refuel at other nearby airports if the asset were flooded in the near term. Economic losses would be very high, and loss of the asset could have regional implications.

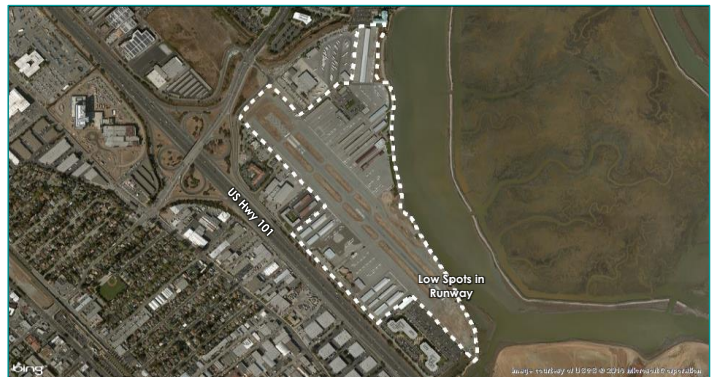
<b>SENSITIVITY</b> High	<b>EXPOSURE</b> Low	<b>ADAPTIVE CAPACITY</b> Moderate	<b>CONSEQUENCES</b> High
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## ASSET CHARACTERISTICS

620 Airport Way | San Carlos

### Asset Description and Function:

San Carlos Airport is a reliever airport for the nearby San Francisco International Airport (SFO) and it supports roughly 350 flights per day, hosting private aircraft from several large companies in the County. The asset hosts over 400 aircraft, one airstrip, and an aviation museum that offers special programs for children. The Sheriff's Air Squadron on site stores equipment for the Office of Emergency Services (OES), and manages and fuels airplanes and helicopters during emergency situations.



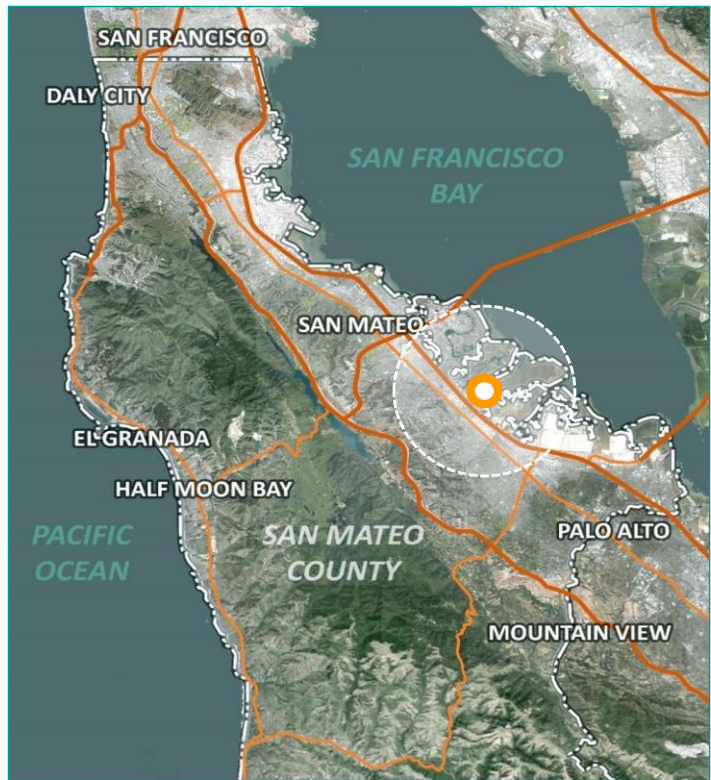
<b>Asset Type</b>	Airport
<b>Asset Risk Class</b>	4
<b>Size</b>	70 acres
<b>Year of Construction</b>	1954
<b>Elevation</b>	4 feet above MSL
<b>Level of Use</b>	135,000 annual flights
<b>Annual O&amp;M cost</b>	\$1.5 million
<b>Special Flood Hazard Area</b>	Asset is in SFHA
<b>Physical Condition</b>	Good
<b>Landowner</b>	County of San Mateo

### Underground Facilities

The electrical network for runway lighting is underneath the runway; storm drains are also 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.



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## ASSET SENSITIVITY

The asset, its functions, and its major components are highly sensitive to inundation, particularly salt water. While the runway itself may not be damaged by floodwaters, the site is very flat, so even low levels of flood water would easily cover much of the airport grounds, rendering the facility out of service for over 7 days and requiring the rerouting of 350 flights per day. The airfield lighting system and all other major asset components are very sensitive to salt water. If wheels on any of the more than 400 aircraft stored on site made contact with salt water, they would need to be replaced, and if any part of an aircraft body were submerged, it would be deemed unsafe for flight.

The power system would not function if flooded, and inundation of the runway and other facilities would directly impact (prevent) first responder access during disaster relief efforts, rendering OES personnel unable to respond to disaster situations. While all fuel and hazardous materials are stored above ground, it is assumed that the hazardous materials containment could leak if partially submerged in a flood. If the site were flooded, all education programs that take place at the aviation museum (which include multilingual programs designed for non-native English speakers in the community) would be cancelled.

Aircraft at San Carlos Airport.



## SHORELINE VULNERABILITY

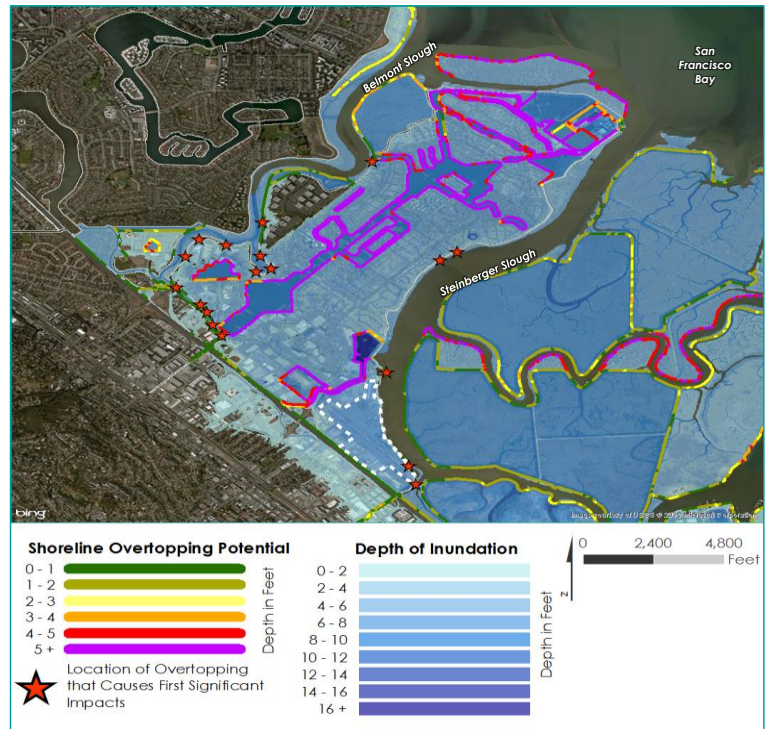
### Shoreline Overtopping Analysis

With 0-12 inches of sea level rise above mean higher high water (MHHW), the asset will be below sea level and dependent on levees for 24 hours/day. The asset will experience no coastal flooding until water from Belmont Slough and Steinberger Slough overtops the levee system along the southeastern shoreline (red stars). This is projected to occur between 36 and 48 inches of sea level rise, at which point widespread flooding is likely.

### Cross-Cutting Vulnerabilities

The Airport provides emergency response services that would be crippled if it were inundated. The facility houses and maintains the Sheriff's Air Squadron and coordinates emergency response and housing and refueling airplanes and helicopters during an emergency. Cross-jurisdictional responsibilities could present a vulnerability because the asset falls within San Carlos and Redwood City jurisdictions; both cities' Public Works departments coordinate information, funding, and decision-making.

First Significant Impacts: 48 inches above MHHW.





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## SEA LEVEL RISE EXPOSURE ANALYSIS

### Exposure Discussion

The Airport has relatively low exposure to flooding and inundation from sea level rise. The asset has not been previously inundated from coastal flooding, as it is protected by the levee system connected to the Redwood Shores neighborhood. The levee is owned by Redwood City and was designed to meet federal standards for a 1% flood.

Most of the levee is 12.5 feet above mean sea level, and even during a king tide the crest is several feet above the water. However, there is one 460-foot-wide gap in the southeastern part of the levee to allow planes to take off and land safely without obstructions. Though this section could provide a pathway for overtopping, a temporary barrier is installed during high water events. Under future conditions with higher water levels in the San Francisco Bay, the levee system surrounding the airport would no longer be able to accommodate the same design (1%) flood, and water could overtop the levees, either by wave action or due to water levels exceeding the crest elevation. If the temporary barrier were not installed in time or if there were a failure where it joins the rest of the levee system, this flood could happen quickly and damage large areas of the airport grounds because the site is so flat (see maps on the right). In the baseline scenario, water could flood the site up to 10 feet deep. Under the high-end scenario, water could flood the asset up to 16 feet deep.

**Baseline Scenario:** Asset not inundated in 1% flood.



**Mid-Level Scenario:** Flood depths up to 12 feet.



**High-End Scenario:** Asset under 4-16 feet of water.



### Exposure Analysis Results

Potential Inundation Depth (feet)		
Scenario	Minimum	Maximum
First Significant Impacts (48 inches)	0	13
Baseline 1% Flood	0	0
Mid-Level 1% + 3.3 feet	1	12
High-End 1% + 6.6 feet	4	16

# SAN CARLOS AIRPORT

## ADAPTIVE CAPACITY, CONSEQUENCES, AND POTENTIAL ADAPTATION

### Adaptive Capacity

Adaptive capacity of the asset is moderate. Under high-water conditions, a temporary barrier will be erected to close the 460-foot gap in the levee to prevent coastal flooding. Four stormwater pumps can also reduce the extent of rain flooding on site. However, these pumps are only able to pump freshwater, making them ineffective in removing any salt water that overtops the levee. If the airport were inundated and the pumps were ineffective, 350 flights per day would have to be rerouted to other airports around San Francisco Bay. Provided the generator and power distribution remain dry, generators can power the stormwater pumps and airfield lighting for up to 3-4 days in the event of a power failure.

### Consequences

Consequences from a loss of this asset would be extremely high. Airfield lighting and structures like hangars would corrode with saltwater exposure and would need to be replaced. Inundated fuel tanks could leak jet fuel or leaded aviation fuel, releasing hazardous materials into Steinberger Slough. If out of service, the Airport could lose approximately \$5,000 per day. Over 400 aircraft owners would lose access to their vehicles and more than 40 businesses based at or dependent upon the Airport would be closed until the facility was rehabilitated. Full replacement of the airport and aviation museum is estimated at \$75-\$100 million; if all airplanes needed replacement, it could add an additional \$100 million in repair costs. Because the asset serves as a reliever airport for SFO, SFO would be required to find another facility to support its overflow. The more than 300 people at the airport during the day, including staff, aircraft pilots and owners, and visitors to the aviation museum would have to be evacuated. This could cause injuries, especially if a levee breach occurred or if people were exposed to hazardous materials like leaded aviation fuel. Employees would also be without work until the airport could be rehabilitated. Lastly, the loss of the aviation museum would result in lost educational opportunities for community members, including non-native English speakers who benefitted from the multi-lingual programming.

### Additional Important Information

By 2022, the Airport will begin a process to replace its aging hangars and the old office building. There are also plans to realign the levee due to concerns raised by the Federal Aviation Administration that the current alignment obstructs takeoff and landing operations. It is unclear whether plans consider sea level rise. Adaptation of the facility will require considerable coordination because of jurisdictional issues where Redwood City owns the levee that protects the airport; meanwhile the Airport is in San Carlos and operated by San Mateo County. SFO also has an interest in San Carlos Airport's adaptation because its own assets (flights) also depend on the San Carlos Airport in order to maintain its level of service.

### Asset-Specific Adaptation

Five years ago, Redwood City (who owns the levee system) raised the Airport levee to meet FEMA standards. This provides flood protection to the airport but may be insufficient with sea level rise in the mid- to long-term. To protect against sea level rise, the levee may need to be raised in the future. The Airport has four storm pumps (two each at the south and east pump stations), which can assist with pumping saltwater from the runway. Floodproofing of critical assets or components on site may also be needed. The Airport could also benefit from improvements to nearby wetland habitat, which could limit wave and surge height.

### Vulnerable Airports

This is the only Asset Vulnerability Profile on vulnerable airports. However, there is one other vulnerable airport in the project area: San Francisco International Airport (see Appendix M).

Levee system that reduces flooding at San Carlos Airport.

