

Public Draft

SANTA BARBARA AIRPORT

Climate Adaptation Plan

Prepared for
City of Santa Barbara

July 2026



Image Source: Santa Barbara Airport, 2010 (<https://flysba.santabarbaraca.gov/projects/airport-and-goleta-slough-climate-adaptation-plan>)

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EXECUTIVE SUMMARY

Santa Barbara Airport is an important gateway for the South Coast and a key part of the region's transportation system, economy, and emergency response network. It also sits in a low-lying area that includes Goleta Slough and several creeks that drain toward the ocean. This location makes the Airport especially vulnerable to flooding during large storms, and that risk is expected to increase with climate change as heavy rainfall events become more intense and sea levels rise.

The City of Santa Barbara prepared this Climate Adaptation Plan (CAP) to ensure the continued safe operation of aviation transportation at SBA and the protection of coastal resources in the Airport area, by proactively preparing for and adapting to increased hazards from climate change, including sea level rise and flooding, while supporting community resilience and environmental stewardship. The objective of this CAP is to identify and describe adaptation measures that could be implemented to improve the airport's resilience to existing and future flood hazards and, where feasible, advance multi-benefit solutions that protect and enhance natural and coastal resources, including the valuable wetland and coastal habitats of the Goleta Slough Ecological Reserve.

Flooding at the Airport can come from several directions. During storms, nearby creeks can overflow onto Airport property. The frequency of heavy rainfall events and flooding appears to be increasing over time. Water can also back up from Goleta Slough, especially during high tide events or when the Slough mouth is closed or partly blocked by sand at Goleta Beach. Sea level rise will make high water levels more common over time. Groundwater, which is already shallow in parts of the Airport, may also rise closer to the surface and affect pavement, utilities, and drainage systems.

Flooding is not a distant concern. The Airport has flooded many times since commercial air service began at the site, including several recent events that caused closures or operational disruptions. Under current conditions, there is already about a one-in-five chance in any given year that flooding could close the Airport for at least one day. Without adaptation, that risk is projected to increase. By around 2076, with about 2.5 feet of sea level rise, the chance of a flood-related Airport closure could rise to about 60 percent in any given year. In the longer term, if sea level rise continues without major action, tidal flooding could become frequent enough to make portions of the Airport difficult or impossible to operate.

This CAP uses a phased approach. It identifies actions that can be pursued now, actions that may be needed as flooding worsens, and larger long-term decisions that will need to be made if earlier measures are no longer effective. The CAP's first priority is to reduce the kinds of

flooding that are already affecting the Airport. Therefore, near-term measures are described in more detail, and measures with longer implementation timelines are included as mid- to long-term measures. Over time, the City will need to monitor flood events, groundwater, sea level rise, and the performance of completed projects to decide when the next round of improvements is needed.

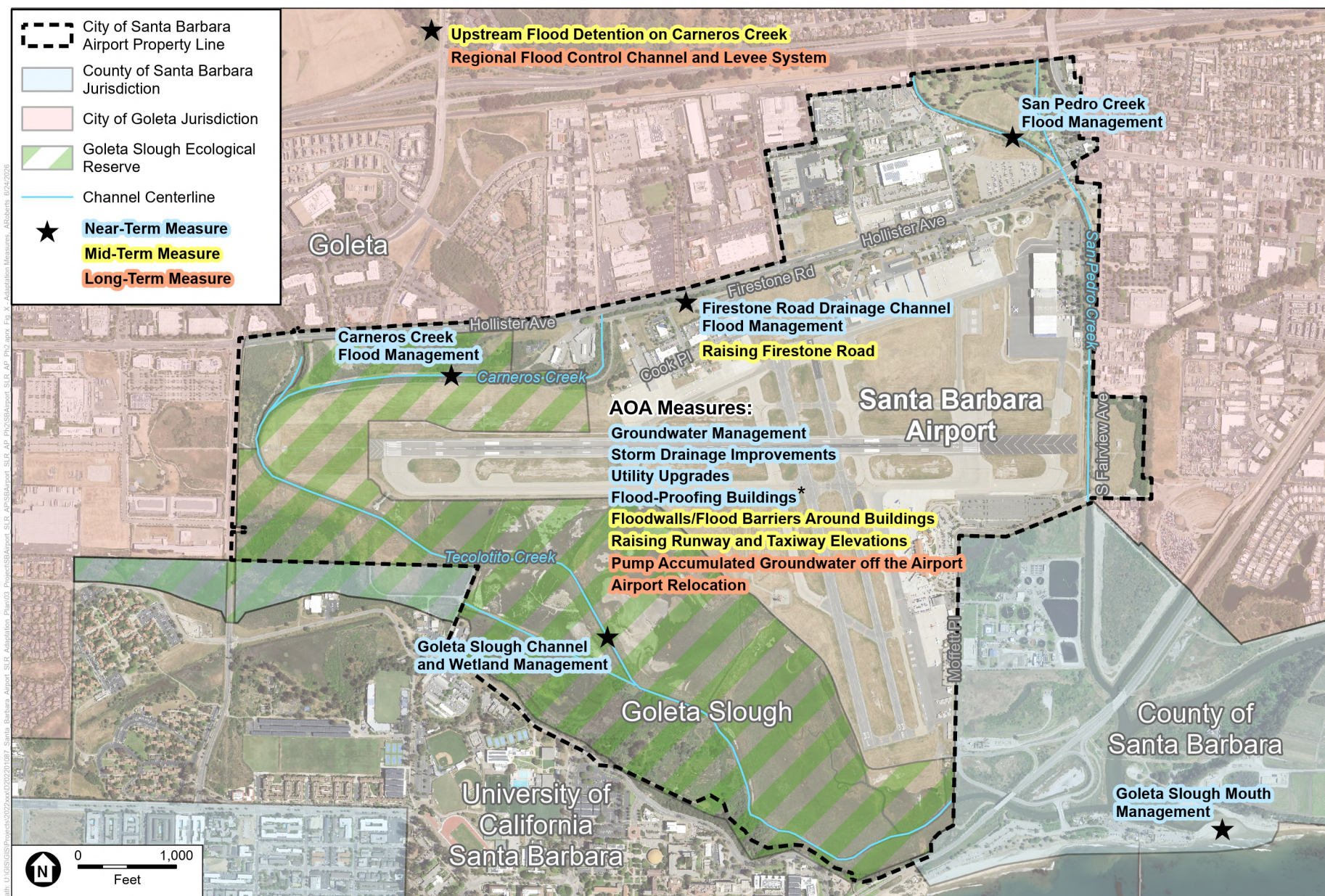
WORK ALREADY UNDERWAY

The Airport, the County, and regional partners are already taking steps to reduce flood risk. These include sediment management of creeks, temporary flood barriers along Firestone Road and Carneros Creek, Carneros Creek maintenance dredging, maintenance of the Firestone Drainage Channel, and additional planned efforts such as storm drain improvements from the Airport Drainage Master Plan Update. These efforts will not fully alleviate increasing flood risks. This plan therefore recommends building on these efforts with a coordinated set of future measures, organized by timeframe and location.

POTENTIAL ADAPTATION MEASURES

The CAP organizes potential future adaptation measures into three timeframes: near-term, mid-term, and long-term, with the most detailed focus on near-term measures. Adaptation measures are categorized based on both the timeline at which they may be necessary as well as the expected implementation timeline. In general, measures with longer implementation timelines are included as mid- to long-term measures. The timeframes are tied to expected sea level rise conditions, but the exact timing may change as new science becomes available and as actual conditions are monitored. “Offsite” measures would occur in Goleta Slough and surrounding creeks. “AOA” measures would occur inside the Airport Operations Area, where aircraft, runways, taxiways, drainage systems, utilities, and support facilities are located. While near-term nature-based, hybrid, and traditional creek flood management measures were considered, particular focus was given to nature-based solutions, including habitat restoration project concepts that build from the Goleta Slough Management Plan and benefit Goleta Slough. The locations of potential near-term, mid-term, and long-term adaptation measures are shown in **Figure ES-1**.

The timeframes identified in this CAP generally represent when adaptation measures may need to be in place to mitigate flood risk within the identified adaptation thresholds. Since high creek flows from rainfall runoff (rather than sea level rise alone) were identified as the primary flooding driver, creek channel and floodplain hydraulic modeling was identified as a next step following this CAP to more accurately determine the level of flood reduction that each adaptation measure would provide. Many measures will require feasibility studies, environmental review, permitting, funding, design, and coordination before implementation. As a result, mid-term adaptation measures would generally need to be studied, planned, and advanced starting in the near-term, while long-term adaptation measures would generally need to be studied and planned during the mid-term (or near-term) to inform future adaptation decisions as sea level rise, flood risk, and adaptation performance are assessed over time. **Figure ES-2** illustrates the adaptation pathway, showing how adaptation measures are planned, evaluated, and implemented over time in response to changing conditions.

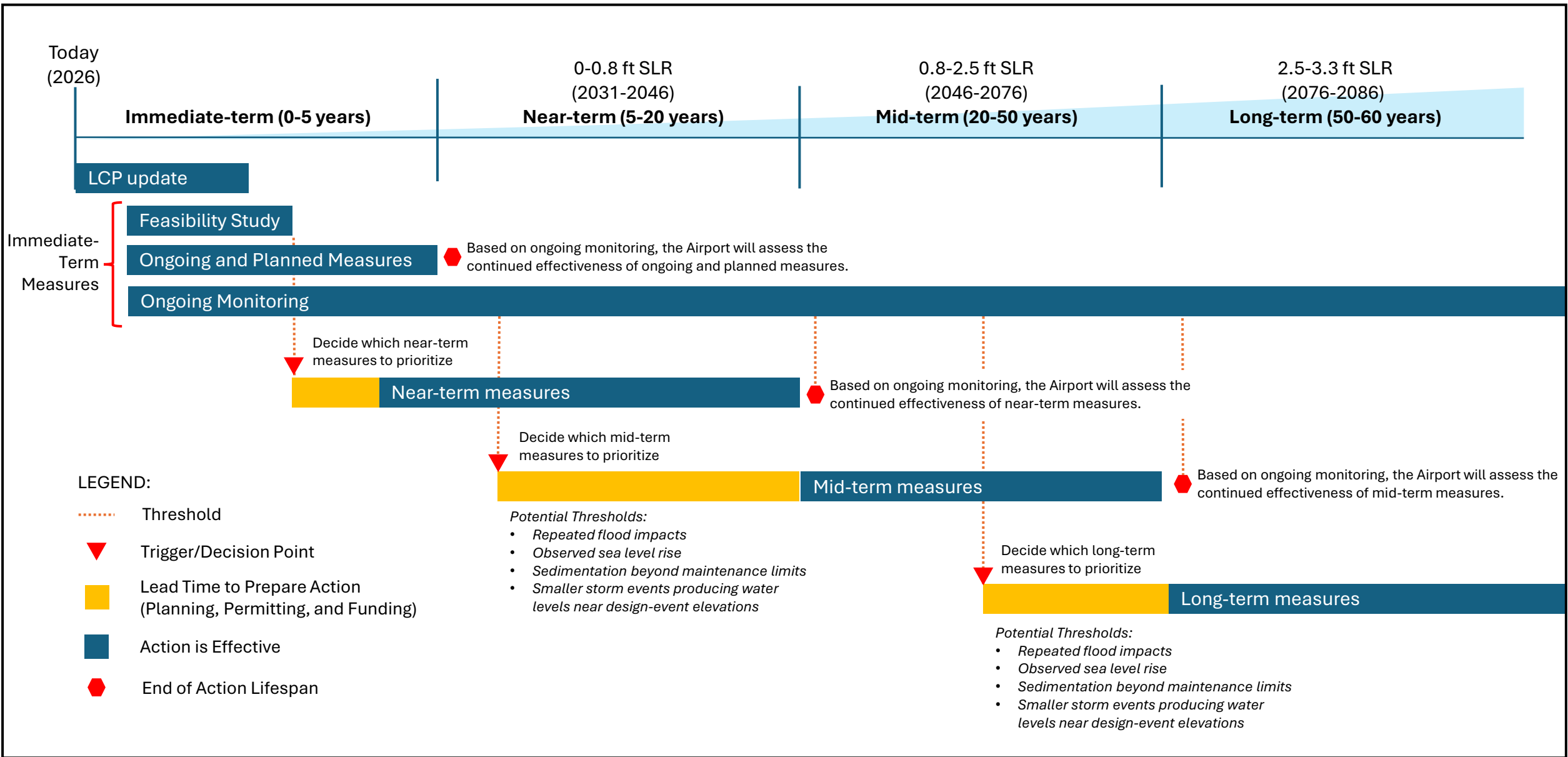


SOURCE: NOAA, 2020; ESA, SBA 2025

*also applicable outside AOA

Santa Barbara Airport Sea Level Rise Adaptation Plan

Figure ES-1
Adaptation Measures



Potential Immediate-Term Measures (0-5 Years)

The CAP identifies four immediate next steps. First, the City will use this CAP to help update the Airport and Goleta Slough Coastal Land Use Plan as part of the City's Local Coastal Program update for the Airport Segment. Second, the City should conduct a feasibility and effectiveness study of adaptation measures identified in this CAP. This study should include hydrologic modeling of the proposed adaptation measures under current and future sea level rise and storm conditions to quantify flood reduction benefits, evaluate potential impacts to neighboring properties and regional flood conditions, and assess the feasibility and effectiveness of each measure. The study should also refine project concepts, update cost estimates, support selection of priority near-term projects, and evaluate whether the identified adaptation measures can maintain airport flooding and closure risk below the CAP's 20% annual chance adaptation threshold over time (as described in further detail in Section 4.2). Third, the City should continue implementing ongoing and planned measures, including the Drainage Master Plan Update improvements, creek and drainage maintenance, temporary flood protection, and coordination with related Goleta Slough projects. Fourth, the City should keep monitoring flood events, sea level rise, groundwater, and project performance. Adaptation should be treated as an ongoing process, not a one-time decision. By acting now, testing solutions carefully, and adjusting over time, the City can reduce flood risk at the Airport while protecting the natural and cultural resources that surround it.

Potential Near-Term Measures: 0 to 0.8 feet SLR (5 to 20 Years)

Near-term measures are intended to address flooding that is already occurring or expected to worsen in the next two decades. These are the most immediate priorities.

Offsite: Goleta Slough and Creeks

Carneros Creek Flood Management

A near-term focus is Carneros Creek, which has recently overtopped onto the airfield. The CAP identifies a preferred concept, subject to further study, which combines a permanent berm along the south side of Carneros Creek with floodplain restoration on the north side of the creek. The berm would replace the temporary K-rail barrier and provide more reliable flood protection. Restoring floodplain areas would give floodwater more room to spread out, slow down, and settle sediment, thereby reducing potential flooding of the Airport. As part of this strategy, the existing vehicle service road on the south side of the creek would be relocated to the south bank berm, and the existing berm and access road on the north side of the creek would likely be removed and replaced with a setback berm and access road along Hollister Ave.

Additional Carneros Creek options include restoring wetland floodplain areas near the confluence of Carneros and Tecolotito Creeks and expanding restoration through relocation of the Airport maintenance yard. An alternative option to wetland floodplain restoration is to enhance the area north of Carneros Creek as a flood detention basin. These options could reduce flood risk while also improving wetland or riparian habitat, although they would require careful design, environmental review, and agency coordination.

Goleta Slough Channel and Wetland Management

Downstream in Goleta Slough, the CAP considers removing remnant levees, reconnecting tidal wetland areas, and managing sediment in ways that improve both flood flow and wetland health. Some Slough areas have been cut off from natural water movement by past berms, roads, and flood control work. Reconnecting these areas could help floodwater move and drain more effectively while also restoring wetland habitat. The CAP also considers using suitable dredged sediment to raise portions of the marsh gradually, helping wetlands keep pace with sea level rise.

Goleta Slough Mouth Management

The CAP also evaluates management of the Goleta Slough mouth. When the sand berm at Goleta Beach blocks the Slough mouth, water can build up behind it. Potential approaches include lowering the beach berm before it naturally opens, breaching it when water levels reach a set threshold, or using a siphon pipe to move water from the Slough to the ocean during closed-mouth conditions. These options could reduce water levels and improve habitat conditions in some circumstances, but they would require permits, careful timing, and protections for fish and other wildlife.

San Pedro Creek Flood Management

For San Pedro Creek, the CAP identifies a possible stormwater detention basin upstream of Hollister Avenue and possible raised banks, berms, temporary barriers, or riparian floodplain restoration downstream of Hollister Avenue. Additionally, the CAP considers floodplain restoration in the northeastern corner of the airport near the historic hangars. These measures are intended to reduce flooding in the northeastern part of the Airport, but their benefits would need to be confirmed through detailed modeling.

AOA: Airport Operations Area

Around the Airport Operations Area, near-term measures focus on known flood pathways and drainage problems.

Firestone Road Drainage Channel Flood Management

At Firestone Road and the Firestone Drainage Channel, the CAP identifies several options:

- More channel maintenance to improve flow
- A localized floodwall near the Carneros Creek bridge
- Extending or strengthening K-rail near Carneros Creek and Firestone Road
- Creating an overflow storage basin to hold water that might otherwise spill over Firestone Road and onto the airfield

These measures would need to be designed so they do not create new flooding problems elsewhere or conflict with Federal Aviation Administration safety requirements.

Groundwater Management

The CAP also recommends a site-wide groundwater monitoring study. Groundwater is already shallow in parts of the Airport, and sea level rise could push it higher. Better groundwater data will help the City decide where future drainage, pavement, building, and utility projects can be built safely.

Storm Drainage Improvements, Utility Upgrades, Flood-Proofing Buildings

Other near-term AOA measures include raising ground elevations in low areas where feasible, converting some storm drain systems to pumped systems, and evaluating stormwater detention systems. Pumping may become necessary where storm drains cannot empty by gravity because receiving waters in the Slough are too high. The CAP also recommends studies of the wastewater, water, and sewer systems to identify where floodwater or groundwater could enter pipes and where pipe materials may be at greater risk of corrosion. Finally, buildings can be flood-proofed by raising sensitive equipment, such as electrical and mechanical systems, where feasible.

Potential Mid-Term Measures: 0.8 to 2.5 feet SLR (20 to 50 Years)

Mid-term measures should be refined after the City has more information about the performance of near-term projects. By this period, sea level rise and storm conditions are expected to place more pressure on the Airport and surrounding drainage systems.

Offsite: Goleta Slough and Creeks

Upstream Flood Detention on Carneros Creek

The main mid-term offsite option is upstream flood detention on Carneros Creek. This would involve working with other jurisdictions and landowners upstream of Highway 101 to temporarily store stormwater before it reaches the Airport. If feasible, this could reduce peak flood flows downstream and may also provide opportunities for habitat restoration and better sediment management. Because this option would likely require landowner participation, land acquisition or agreements, and major permitting, it is a longer-term planning effort rather than an immediate project.

AOA: Airport Operations Area

Mid-term measures around the Airport Operations Area include floodwalls or temporary flood barriers around buildings, raising runway and taxiway elevations, and raising Firestone Road.

Floodwalls/Flood Barriers Around Buildings

Flood barriers around buildings could protect individual facilities where raising the ground surface is not practical. These barriers would need to be designed carefully so they do not trap stormwater around buildings or conflict with airfield safety rules.

Raising Runway and Taxiway Elevations

Raising runways and taxiways could reduce flooding of critical airfield surfaces, but it would be expensive, complicated, and disruptive. Raising pavement may require changes to shoulders, safety areas, lighting, electrical systems, navigation equipment, taxiways, aprons, and connections to the terminal and other facilities. Because the Airport must continue to operate safely, this type of work would require careful phasing and long lead times.

Raising Firestone Road

Raising Firestone Road could reduce the chance that water from the Firestone Drainage Channel and Carneros Creek enters the airfield through nearby roadways. However, bridge elevations, road connections, drainage, nearby habitat, and permitting would all need to be addressed.

Potential Long-Term Measures: 2.5 to 3.3 feet SLR (50 to 60 Years)

Long-term measures are the most complex and costly options. These measures could possibly be entirely avoided if the recommended near- and mid-term actions are successfully implemented, but they must remain part of the conversation as a contingency if those earlier steps are not taken or if they do not fully mitigate flood risk. Decision-making on these measures will be needed in the mid-term, and the measures would require significant additional study.

Offsite: Goleta Slough and Creeks

Regional Flood Control Channel and Levee System

The major long-term offsite option is a regional flood control channel and levee system. This would be much larger than a project built only around the Airport. Because the Airport sits within the larger Goleta Slough floodplain, simply enclosing the Airport with a levee could push water onto neighboring areas. A regional system would need to address Carneros Creek, San Pedro Creek, and other flood pathways in a coordinated way.

This type of project could potentially reduce larger flood risks, including risks from more extreme events, but it would be very difficult to implement. It would require land acquisition, major changes to creek corridors, significant habitat impacts, extensive permitting, and close coordination with aviation safety requirements. For these reasons, it should be considered only after other measures are studied and implemented and as part of a broader regional flood strategy.

AOA: Airport Operations Area

Long-term AOA measures include pumping accumulated groundwater and, at the highest level of long-term risk, evaluating Airport relocation.

Pump Accumulated Groundwater off the Airport

Pumping groundwater could help lower near-surface water levels in key areas, but it would require ongoing power, controls, maintenance, discharge locations, and careful study of possible effects on soils and water movement.

Airport Relocation

Any decision regarding relocating the airport or replacing regional services at another airport will require significant study and consideration of costs, environmental impacts, and social and economic effects.

KEY CHALLENGES

The Airport's setting makes adaptation challenging. Almost the entirety of the Airport is in a mapped floodplain, so projects must be designed to avoid making flooding worse for others. Many potential projects are near wetlands, creeks, sensitive species habitat, and areas with cultural importance. Projects must also meet aviation safety requirements. These factors do not prevent action, but they mean that adaptation projects will require careful design, public engagement, environmental review, permits, funding, and coordination among multiple agencies and partners.

The CAP also makes clear that adaptation will reduce risk but will not eliminate all flooding. Extreme storms may still flood parts of the Airport even after improvements are built. The practical goal is to reduce the frequency and severity of disruptive flooding and keep the Airport operating safely as often as possible.

Section 1

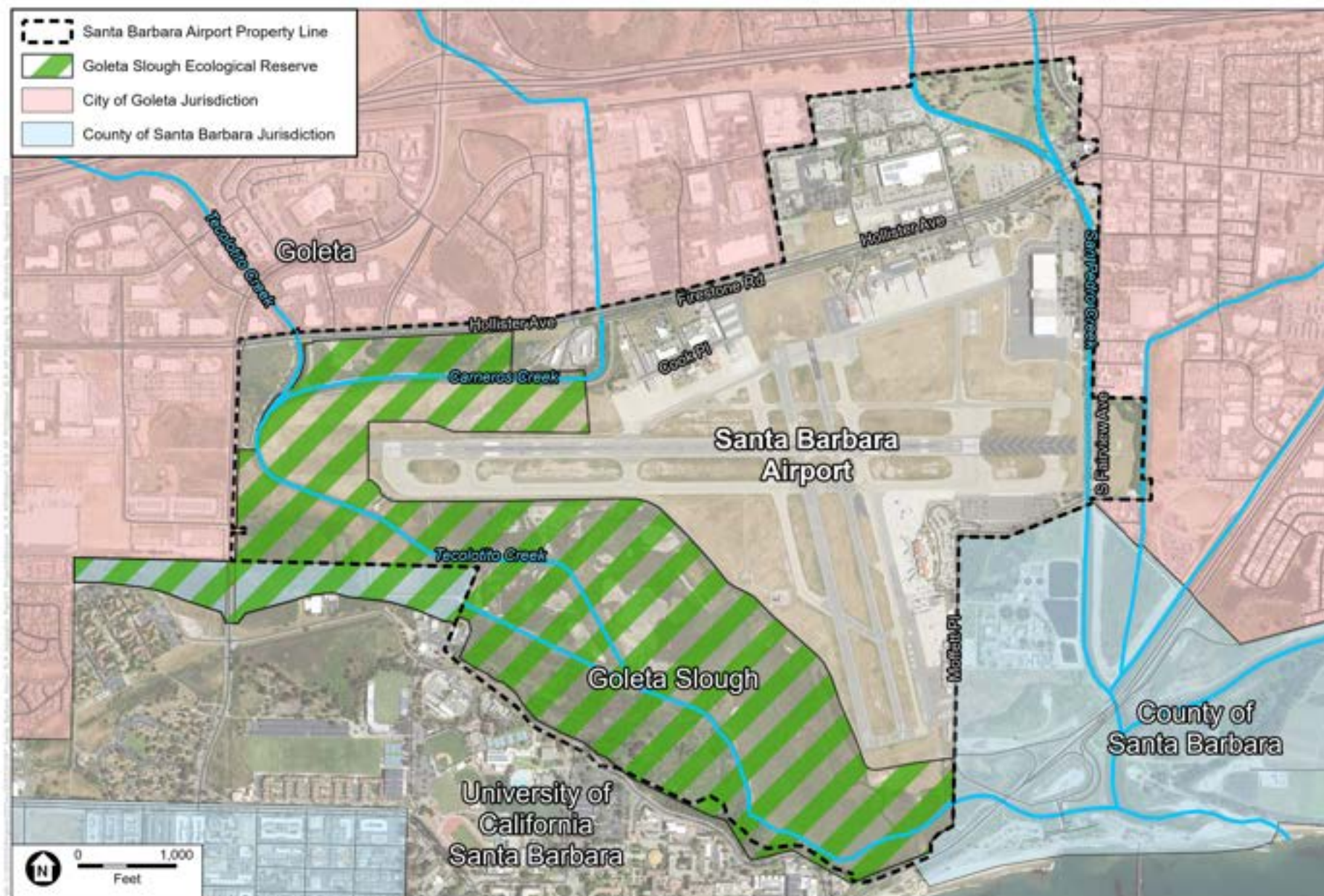
INTRODUCTION

1.1 PURPOSE AND OBJECTIVE

The City of Santa Barbara (City) has prepared this Climate Adaptation Plan (CAP) for the Santa Barbara Airport (SBA) to improve the airport's resilience to existing and future flood hazards while maintaining airport operations and, where feasible, advancing multi-benefit solutions that protect and enhance natural and coastal resources, including the valuable wetland and coastal habitats of the Goleta Slough Ecological Reserve (**Figure 1**). The CAP identifies and evaluates potential adaptation measures to address vulnerabilities and risks to airport assets and operations from flooding under future projected sea level rise and increased precipitation associated with climate change, as identified in the City's SBA Climate Vulnerability Assessment and Risk Evaluation (CVARE). The adaptation measures span near-term, mid-term, and long-term timeframes with the most detailed focus on near-term measures. Since the CVARE identified high creek flows from rainfall runoff (rather than sea level rise alone) were identified as the primary flooding driver, creek channel and floodplain hydraulic modeling was identified as a next step following this CAP to more accurately determine the level of flood reduction that each adaptation measure would provide. Following completion of the CAP, the City will develop new climate change and sea level rise policies based on the CAP and incorporate them into an update of the Airport and Goleta Slough Coastal Land Use Plan (LUP), as part of the Local Coastal Program (LCP) update for the Airport Segment. The City will also pursue funding for a feasibility study and public engagement process to further analyze adaptation options and select preferred near-term projects to advance to environmental review, design, and implementation. Note that this CAP focuses on flooding due to increased precipitation and sea level rise as primary climate stressors for the airport and does not consider other potential climate stressors. Appendix A includes preliminary cost estimates for adaptation measures; Appendix B includes disclaimer and use restrictions; and Appendix C summarizes relevant plans, projects, and guidelines.

This CAP provides near-term nature-based, hybrid, and traditional creek flood management measures with a particular focus on nature-based solutions. Project concepts providing habitat restoration build upon Goleta Slough Management Plan and benefit Goleta Slough habitat. The CAP also identifies mid-term options, including upstream detention basins, raising runways and roads, and long-term measures, including regional flood management, groundwater pumping, and airport relocation. Near-term, mid-term, and long-term adaptation measures are categorized based on both the timeline at which they may be necessary as well as the expected

implementation timeline. In general, measures with longer implementation timelines are included as mid- to long-term measures.



SOURCE: NOAA, 2020; ESA, SBA, GSER, City of Goleta, SB County 2025

Santa Barbara Airport Sea Level Rise Adaptation Plan

Figure 1
Santa Barbara Airport Vicinity Map

1.2 HISTORY OVERVIEW – GOLETA SLOUGH AND SANTA BARBARA AIRPORT

Prior to European settlement, Goleta Slough was a deep-water embayment spanning approximately 18 square miles (ESA 2015). The existing form and function of Goleta Slough have developed over time through a combination of natural geologic processes and human activities. The broader Chumash region, including the Santa Barbara Channel area, was first settled by ancestral Native peoples approximately 13,000 years ago (NPS 2023). Four large Chumash villages were located around the slough, including a village on Mescaltitlan Island that served as a regional harbor and major trading center (Modugno 2021). This likely made the area the most densely populated region in California (Kettmann 2021).

The first known European contact with the Chumash occurred in 1542 when Juan Rodríguez Cabrillo's Spanish expedition arrived along the Santa Barbara coast. In 1786, the Spanish founded Mission Santa Barbara as part of the Alta California mission system. The mission sought to convert local Chumash people to Christianity and incorporate them into Spanish colonial society and the mission economy, including agricultural and livestock-grazing activities.

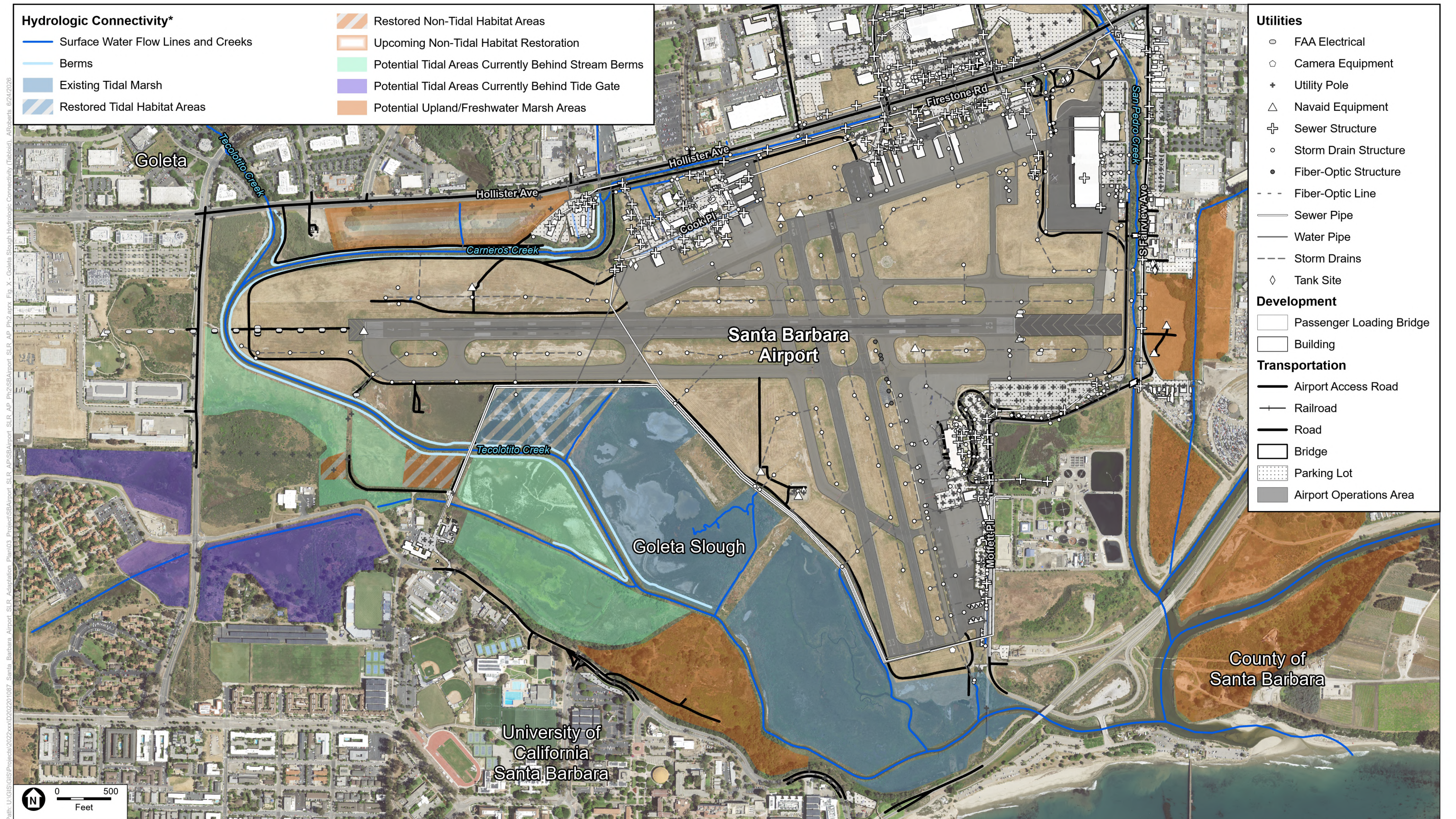
In the nineteenth century, the slough experienced increasing human-caused changes. Overgrazing and fires in the watershed contributed to severe sedimentation and conversion of open water to marsh following intense storm events in 1861-1862. By 1903, construction of railroads, roads, and expanding settlements around the slough had caused fragmentation of the estuary.

Development of the airport began with the creation of an airfield at the present-day Santa Barbara Airport site in 1938. Construction of Santa Barbara Municipal Airport followed, beginning in 1941. Construction of Marine Corps Air Station Santa Barbara began in 1942 before being decommissioned in 1946 and converted back to Santa Barbara Municipal Airport.

Substantial hydrologic modifications occurred during the second half of the twentieth century. In 1961, flood control channels were excavated to manage flows in Tecolotito and Carneros Creeks, airport development expanded, and U.S. Highway 101 was constructed. Berms built along creek and slough channels during flood control channel construction effectively separated channels from Goleta Slough wetlands, reducing hydrologic connectivity. South of the airport, the slough is now largely composed of basins divided by berms and a network of service roads. While some areas of the slough remained tidally influenced, others became isolated from tidal exchange. Additional wetland loss occurred in 1967 when wetland areas were filled following construction of Ward Memorial Drive.

Airport expansion continued in subsequent decades. In 1975, Tecolotito and Carneros Creeks were rerouted to accommodate a 1,000-foot extension of Runway 7/25, resulting in the creek alignment forming nearly right-angle turns around the airport area. In 2008, Runway 7/25 was relocated approximately 800 feet to the west to accommodate Runway Safety Areas (RSAs), requiring another rerouting of both creeks. This realignment created a more curved channel alignment and eliminated the previously sharp channel bends (ESA 2015a). Prior to this relocation, Carneros Creek flowed southwest through Goleta Slough. At the same time, sedimentation basins along the creeks were expanded and the Airport restored approximately 80 acres of habitat at twelve locations throughout the slough, including Basins E and F, areas

along Tecolotito Creek, and the confluence of Tecolotito and Carneros Creeks. A map of the current creek alignment, basins, and Goleta Slough's hydrologic connectivity is shown in **Figure 2**.



Santa Barbara Airport Sea Level Rise Adaptation Plan . D202201087.00

Figure 2
Goleta Slough Hydrologic Connectivity

1.3 SANTA BARBARA AIRPORT FLOOD HISTORY

SBA has been subject to flooding during major storm events since commercial air service began at the site in 1936. Its geographic location in a coastal wetland system at the convergence of five major creeks makes SBA especially susceptible to flooding. Historical records indicate that SBA flooded in 1935, 1941, 1969, 1995 (two flood events), 1998, 2005, 2008, 2010, 2017, 2023, 2024 (two flood events), 2025, and 2026. Observational data is relatively sparse in the early period of airport operations from the 1930s through the 2000s. Therefore, there is an incomplete record of the Goleta Slough mouth conditions, precipitation, and creek flow during the flood events prior to 2000. A review of historical and recent records provides a timeline of notable flooding events at SBA:

- 1935: Historical records show that flooding occurred at the General Western Aero Hangars however the magnitude of the event and extent of flooding are unclear.
- 1941: Again, historical records show that flooding occurred at the General Western Aero Hangars however the magnitude of the event and extent of flooding are unclear.
- 1969: The highest water level observed in Goleta Slough in historical record, submerging nearly the entire airport runway, access roads, and parking lots. Water completely surrounded the main terminal (ESA 2025).
- 1995: Two major flooding events occurred in January and March. Both events caused ponding on low-lying runway areas and flooded the airport for multiple days (ESA 2025).
- 1998: All three runways were flooded, closing the airport for several days (ESA 2025).
- 2005: Rainfall led to major flooding in Santa Barbara. The airport flooded but did not close during this event (ESA 2025).
- 2017: In February 2017, the airport closed for one day due to flooding of the last 1,000 feet of Runway 7/25 (ESA 2025).
- 2023: On January 9, rainfall caused flooding that closed the airport, submerged Runway 7/25, and damaged multiple hangars and airport buildings (ESA 2025).
- 2024: Two early February storms caused repeated airport flooding, including flooding from Carneros Creek and Firestone Ditch. The airport closed for one day (ESA 2025).
- 2025: On December 25, SBA closed due to airfield flooding; nearby street and highway flooding occurred, but no major damage was reported (Cruz 2025).
- 2026: On January 3, SBA closed after rapid rainfall caused major flooding on the airfield and main runway, coinciding with king tides and regional flooding; on February 16, SBA remained open during a smaller storm, though some flight delays and a brief power outage occurred (Ghiglini 2026, SBA 2026a).

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Section 2

SEA LEVEL RISE AND THE VULNERABILITY OF COASTAL RESOURCES

In the 2025 CVARE, ESA identified four sources of flooding vulnerability to SBA and its assets:

- Fluvial flooding;
- Lagoon flooding from Goleta Slough;
- Tidal inundation; and
- Groundwater inundation.

For the purposes of the CVARE, three airport flood thresholds were defined to assess vulnerability. In order of increasing severity of flooding, the flood vulnerability thresholds are:

- Flooding of the NW Quadrant near Carneros Creek, including open space areas adjacent to the runways, but that does not extend to the runways. Associated with a water elevation of approximately 11 feet NAVD;
- Flooding of the runways that causes airport closure, primarily influenced by the inundation of Runway 7/25 (SBA staff, pers. comm.). Associated with a water elevation of approximately 12.5 feet NAVD; and
- Flooding of the entire airport property, based on the 100-year FEMA flood map extent. Associated with a water elevation of approximately 14 feet NAVD.

The NW Quadrant and airport closure flood vulnerability thresholds developed for the CVARE are also used as adaptation thresholds, which are described in Section 4 and used to guide adaptation planning and implementation. Flooding of the entire airport property was used as a vulnerability threshold for the CVARE but is not used as an adaptation threshold because adaptation planning is focused on reducing more frequently occurring flooding.

This is because the Airport is located within the floodplain and while adaptation measures may reduce the risk of more frequently occurring flooding, it is likely that adaptation will not eliminate the risk of infrequent extreme flooding. For example, adaptation is not likely to reduce flooding

during extreme flood events, such as the “100-year” flood event defined by the FEMA National Flood Insurance Program.

2.1 FLUVIAL FLOODING

SBA is located adjacent to several creeks, including Carneros Creek, Tecolotito Creek, and San Pedro Creek. The confluence of Carneros and Tecolotito Creeks is located near the west end of Runway 7/25. San Pedro Creek flows north to south and is located directly to the east of SBA.

Historically, fluvial flooding has been the primary driver of flooding at SBA. Fluvial flooding occurs when intense rainfall generates runoff that exceeds the capacity of creek channels, causing water levels to rise and overtop the banks of Carneros, Tecolotito, or San Pedro Creek. Floodwaters can then spread into low-lying areas of the airport and surrounding areas.

In the CVARE, ESA used historical data on airport flooding, FEMA flood profiles for the creeks, and a global climate model to quantify predicted increases in the frequency of extreme precipitation and fluvial flooding with climate change (ESA 2025).

2.2 LAGOON FLOODING

Goleta Slough is a coastal wetland system located immediately southwest of SBA. The mouth of Goleta Slough at Goleta Beach is intermittently closed due to ocean waves building up a sand berm that blocks the Slough mouth. The Slough mouth can stay closed as creek flows into the Slough, which fills and raises the water level throughout the Slough behind the sand berm. Ocean waves overtopping the beach berm can also further fill the Slough. The berm may not breach until Slough water levels overtop the beach berm during rainfall runoff storm events. Once the Slough water levels overtop the beach berm, flows out of the Slough typically scour a channel that opens the Slough mouth and allows the Slough to drain to the ocean and ocean water to flow into the Slough during higher tides. The Slough mouth can stay open until ocean waves deposit sand that blocks the Slough mouth and the cycle repeats.

Lagoon flooding is possible under certain conditions when the Slough mouth is closed or significantly blocked by sand. Water levels in the Slough while the mouth is closed could rise to a point that causes overflow flooding at the Airport, even during “sunny day” non-storm conditions.

In the 2015 study of Goleta Slough, ESA developed the Quantified Conceptual Model (QCM) which uses empirical data and parameterizations to quantify lagoon hydrology, coastal influences, and lagoon mouth hydraulics (ESA 2015, Behrens et al. 2015). In the CVARE, ESA adapted the QCM to simulate lagoon conditions under sea level rise and increased extreme precipitation conditions. Note that the study assumed no emergency lagoon mouth breaching would take place. An extreme value analysis was performed on the results to project the recurrence interval of the three airport flooding thresholds described above with future sea level rise (ESA 2025).

2.3 TIDAL INUNDATION

SBA is located in a coastal area, meaning there is potential for it to be exposed to tidal flooding with future sea level rise. The USGS Coastal Modeling System (CoSMoS 3.0) provides projections of tidal inundation with sea level rise in the Santa Barbara region, represented by the typical monthly spring tide condition with no storm (USGS 2018). In the CVARE, ESA used these CoSMoS results to quantify the airport's risk of flooding caused by tidal inundation¹ (ESA 2025).

2.4 COMBINED FLOODING PROBABILITIES

The individual probabilities of fluvial, lagoon, and tidal flooding were combined to estimate the overall likelihood of airport flooding in a given year under different precipitation and sea level rise scenarios. **Table 1** shows the probability that flooding could occur from any of these sources (ESA 2025). The Baseline row shows current flooding probabilities. The Near Term (0 feet sea level rise) row shows future flooding probabilities based on projected precipitation changes only, without sea level rise. The remaining rows show the flooding probabilities under future precipitation combined with different amounts of sea level rise. The same future precipitation projections were used for all sea level rise scenarios.

¹ Note that all sea level rise dates provided in this section are based on the OPC 2024 sea level rise guidance timing associated with the Intermediate-High sea level rise scenario.

TABLE 1
COMBINED FLOODING PROBABILITY SUMMARY

Time	Sea Level Rise and Precipitation Scenario ^a	Primary Cause of Flooding ^b	NW Quadrant and Edge of Runway Flooded (11 ft WSE ^c)	Runways Flooded, Airport Closed (12.5 ft WSE)	Entire Airport Flooded (14 ft WSE)
Baseline	0 ft, Past Precipitation	Fluvial	12%	7%	1%
Near Term	0 ft, Future Precipitation (2024–2100)	Fluvial	28%	21%	3%
	0.8 ft ^d (2048)	Fluvial	29%	21%	4%
Near-Mid Term	1.3 ft (2058)	Fluvial	32%	21%	4%
Mid Term	2.5 ft (2076)	Tidal	100%	61%	4%
Long Term	6.6 ft (2130)	Tidal	100%	100%	100%

SOURCE: ESA 2025

Annual chance is the probability of flooding occurring in any given year

NOTES:

- a. Timing based on 2024 OPC guidance Intermediate-High sea level rise scenario
- b. Defined by the source of flooding that contributes most to the combined flooding probability. Other types of flooding are possible.
- c. WSE = water surface elevation (ft NAVD)
- d. All scenarios above 0 ft SLR assume future precipitation

2.5 GROUNDWATER EMERGENCE

Groundwater emergence poses a risk in low-lying areas where rises in water tables associated with sea level rise can lead to flooding and infrastructure damage. CoSMoS 3.0 provides projections of groundwater rise with sea level rise (USGS 2018). In the CVARE, ESA examined these projections with the conclusions that “groundwater depths may be shallow for much of the SBA property under existing conditions and will become increasingly shallow, which may impact buried infrastructure” and that the extents of ponding caused by groundwater emergence are predicted to increase slightly with sea level rise. Groundwater emergence is not included in the combined flooding probabilities in Table 1 above.

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Section 3

OPPORTUNITIES, CONSTRAINTS, AND CONSIDERATIONS

Opportunities, constraints and considerations for airport adaptation are driven by the airport's physical setting in a flood-susceptible area, the Goleta Slough area's valuable and sensitive ecology and cultural resources, environmental permitting, FAA requirements, and community and equity impacts. Opportunities, constraints and considerations associated with each of these factors must be considered when planning for adaptation.

3.1 FLOOD MANAGEMENT

3.1.1 Flood Conveyance and Storage

Due to the reduced flood storage capacity of Goleta Slough resulting from berming and segregating flood control channels from wetland floodplains (as described in Section 1.3), an important adaptation strategy is to expand flood conveyance capacity and increase opportunities for flood storage. Past channelization and construction of berms and levees along the creek channels have reduced connectivity between the creeks and adjacent floodplain areas, limiting flood storage capacity. The presence of disconnected, historic floodplain areas provides an opportunity to reintroduce flood detention and storage through floodplain reconnection and the development of flood detention features.

Increasing conveyance in upstream creek reaches can provide localized reduction in flood risk. However, upstream improvements may not change or may increase flood impacts downstream if the downstream reach remains channelized. As a result, an ideal adaptation strategy is to increase flood conveyance along a continuous corridor extending downstream to the Highway 217 bridge.

As an alternative or complement to increasing creek conveyance, flood storage can be increased through the creation of flood detention basins. These facilities would temporarily divert and store floodwaters during peak storm events, then release water gradually once peak conditions have subsided. To be effective, detention basins must be appropriately sized relative to expected flood volumes.

The adaptation measures described in this CAP were all determined to be conceptually feasible and likely to reduce flooding impacts.

Note that the adaptation measures included in the CAP are not likely to reduce flooding during extreme flood events, such as the “100-year” flood event defined by the FEMA National Flood Insurance Program (see section below). The Airport is located within the floodplain and while adaptation measures may reduce the risk of more frequently occurring flooding, it is likely that adaptation will not eliminate the risk of infrequent extreme flooding. There will therefore continue to be a residual flood risk even with adaptation.

3.1.2 FEMA National Flood Insurance Program

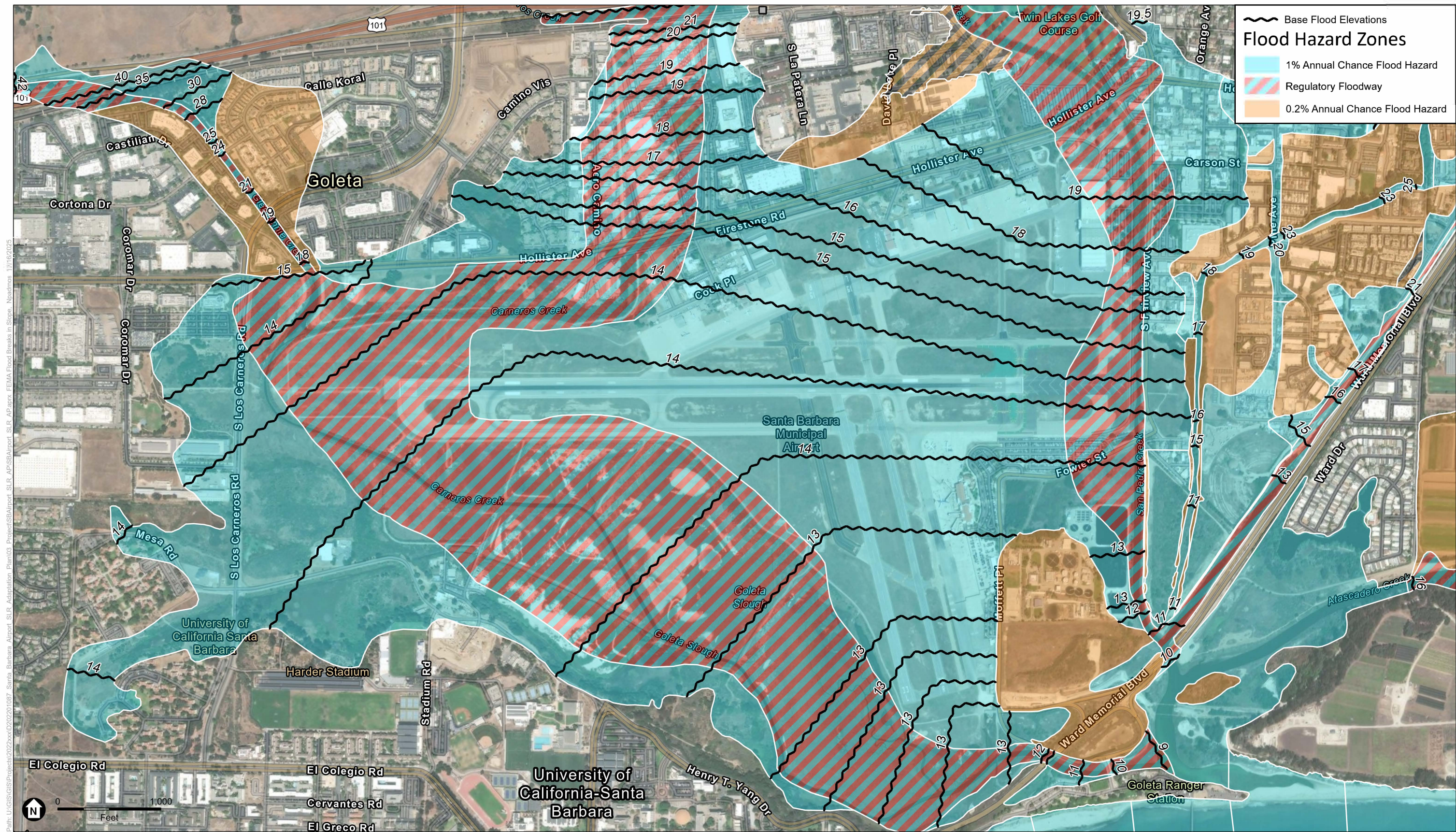
Almost the entire airport footprint is located in the FEMA floodplain (**Figure 3**). Therefore, isolating the airport (i.e., building a levee around the airport) is not likely feasible because doing so would reduce floodplain storage and likely increase flooding elsewhere. (See Section 6.3.1.1 for discussion of the potential for a regional flood control channel and levee system and associated constraints.)

Additionally, while a Letter of Map Revision was completed during the 2006 Runway Extension project, which included a realignment of Carneros Creek, the updated floodway and floodplain have not been published by FEMA. The current FEMA maps do not show the updated floodway after the Carneros Creek realignment and runway extension.

3.2 ECOLOGY

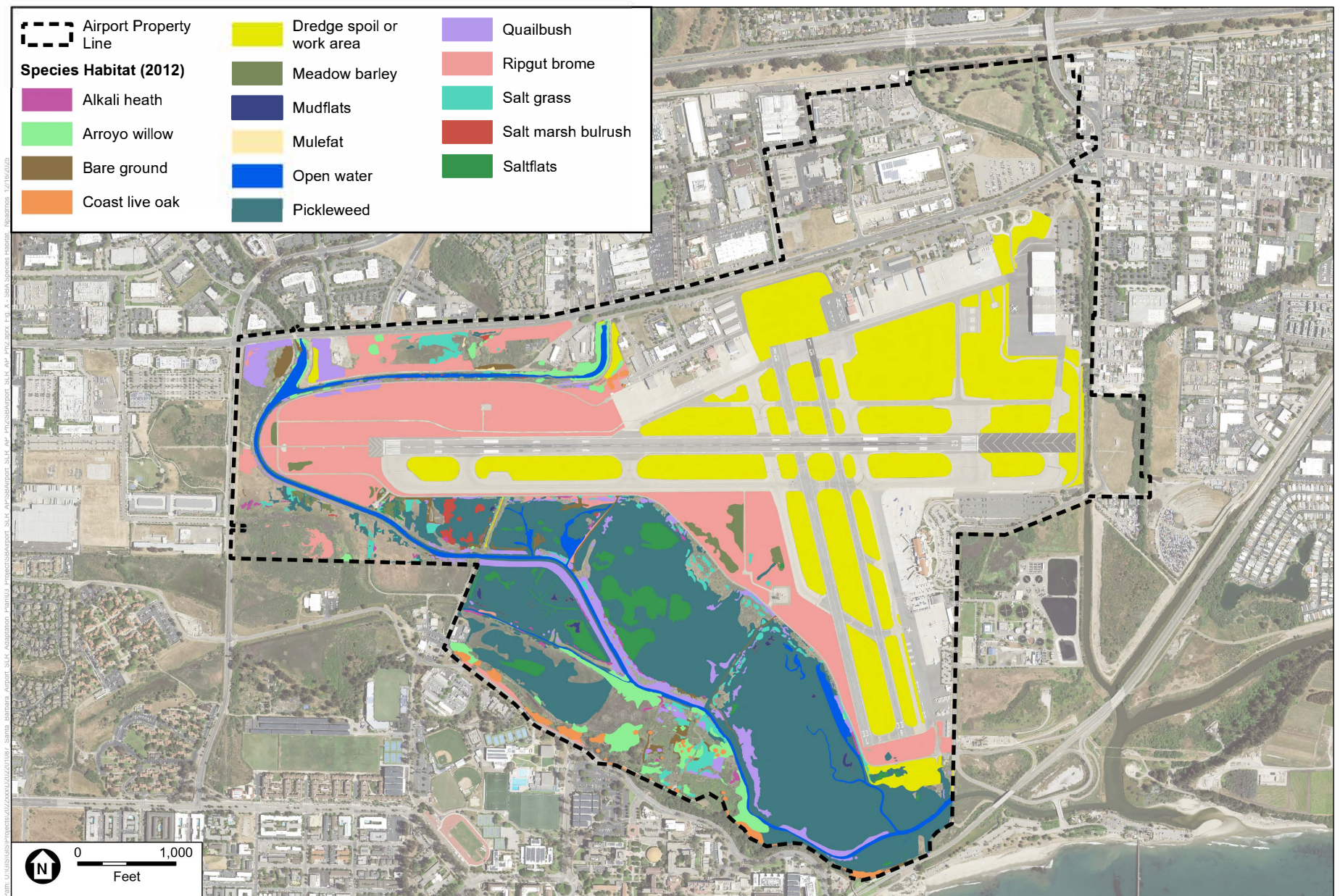
The ecological resources and functions of the Goleta Slough and estuary are described in the Goleta Slough Ecosystem Management Plan (1997) with minor updates in the Goleta Slough Area Sea Level Rise and Management Plan (2015). The 1997 and 2015 Goleta Slough Management Plans describe the slough as a highly modified but ecologically important coastal wetland complex that supports tidal marsh, mudflat, creek, upland transition, and wildlife habitat. The 2015 update further emphasizes that sea level rise, flooding, sedimentation, inlet/slough mouth management, and limited space for habitat migration are major considerations for maintaining and restoring ecological function. Recommendations for management of the ecosystem and adjacent areas include maintenance and improvement of tidal hydrology to support salt marsh species and functions.

In 2008, URS developed a map of existing vegetation within Goleta Slough as part of the Western Goleta Slough Restoration Project. This mapping effort compiled data from several prior studies and data from surveys conducted specifically for that project. Building on this work, the 2017 Santa Barbara Airport Master Plan compiled and updated habitat areas and vegetation data for Goleta Slough. A map of the Santa Barbara Airport species habitat areas is shown in **Figure 4**.



SOURCE: FEMA, ESA, 2023

Figure 3
FEMA Flood Profiles
Breaks in Slope



SOURCE: SBA 2012, NOAA, 2020, ESA 2025

Santa Barbara Airport Sea Level Rise Adaptation Plan

Figure 4
Santa Barbara Airport Species Habitat Areas

3.3 CULTURAL RESOURCES

Adaptation strategies that include ground-disturbing activities (such as grubbing/clearing, excavation, grading, drilling, and trenching) and inundation have the potential to impact archaeological resources that occur both on the surface and subsurface. In particular, both ground-disturbing activities and inundation have the potential to disturb, displace, or destroy the context (the location, original position, and association of individual artifacts and features) of the resource which is crucial for interpreting the age and function of an archaeological resource and evaluating it for listing in local, state, or federal registers. For instance, higher-velocity water, such as in floods or storm surges, can wash away entire resources, erode the soil layers that preserve the archaeological material in its original position, and break, chip, or move artifacts. Coastal flooding or inundation can move sediments, causing archaeological resources to disappear overnight or scatter individual artifacts. Ground-disturbing activities have the potential to cause these same types of impacts to archaeological resources that would harm their context.

Measures that can be implemented to avoid, reduce, or mitigate impacts to archaeological resources from proposed adaptation strategies can include, but are not limited to: deeding archaeological resources into permanent conservation easements, planning adaptation strategies to avoid archaeological resources, archaeological data recovery excavations and follow up laboratory processing and analysis, and/or archaeological and Native American monitoring during the implementation of the adaptation strategy.

3.4 PERMITTING & FAA REQUIREMENTS

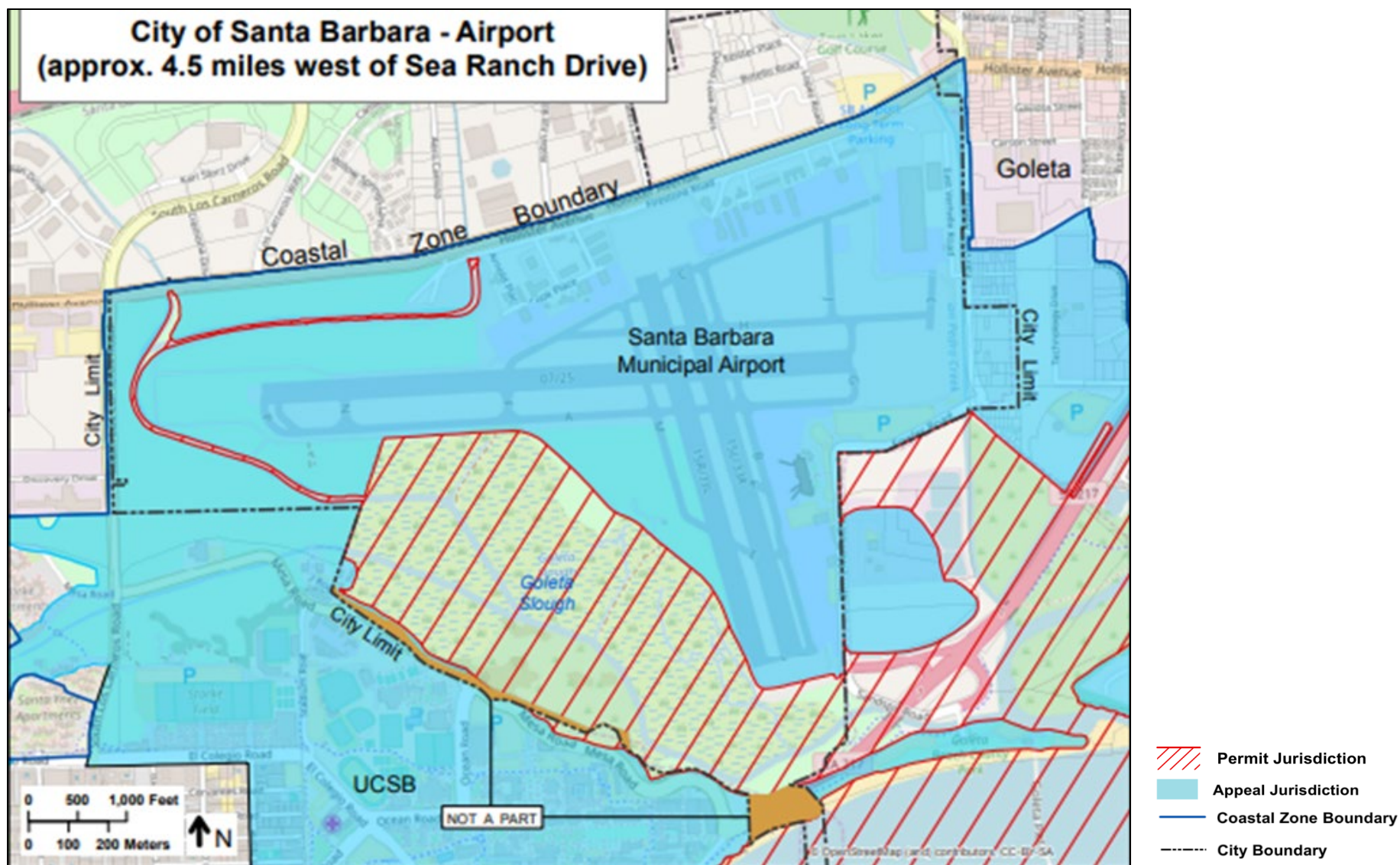
3.4.1 Environmental Permitting

Due to the ecological setting around the Airport, a variety of regulatory agencies take jurisdiction over existing biological or hydrological resources. This includes State agencies like California Department of Fish and Wildlife (CDFW), Regional Water Quality Control Board (RWQCB), and the CCC, as well as Federal agencies that may include the United States Army Corps of Engineers (USACE), United States Fish and Wildlife Service (USFWS) and NMFS. The involvement of these agencies is contingent on the proposed actions and proposed location of those actions for the proposed project. Existing wetlands, waters, and other jurisdictional features occur throughout portions of the Airport and surrounding Goleta Slough, including areas documented in the *Delineation of Waters of the United States and State of California report* prepared for the Taxiway B (formally H) Extension Project (KMA 2024). Impacts to Jurisdictional Wetlands, work in or adjacent to creek, streams or floodplains, activities in proximity to special status plant and animal species, or other activities that require notification or consultation with these agencies.

The permitting program will need to be uniquely tailored for each of the proposed adaptation measures and an initial analysis has been provided in the description of each measures in Section 6. The location of the project is a critical aspect. Specifically, at the Airport, the Coastal Zone boundary extends inland to Hollister Avenue (**Figure 5**). The CCC's retained Coastal Development Permit (CDP) jurisdiction includes Goleta Slough and follows Carneros Creek to the west and north to the Coastal Zone boundary (shown in red lines below). The City of Santa

Barbara's LCP jurisdiction covers the remaining portions of the Airport property, all of which is in the appeal jurisdiction of the CCC (shown in blue below). In effect, a project proposed in the red lines below would apply for a CDP from the CCC. A project proposed in the blue areas would apply for a CDP from the City of Santa Barbara. However, the City of Santa Barbara's permit decision would be appealable to the CCC. For a project that was located in both the Commission's retained permit jurisdiction and the City's LCP jurisdiction, the City (or project sponsor) could request permit consolidation, which would allow for submittal of one CDP application to the CCC for the entire project.

Additionally, some project may be in locations that include wetlands that are under the jurisdiction of the USACE and may require permits from the USACE for potential impacts to wetlands. Some projects may also require consultations for impacts to federally endangered species or essential fish habitat. USFWS and NMFS would respectively administer these consultations. Any project in tidally influenced areas outside the City Limits would require State Lands Commission (SLC) leases.



Source: California Coastal Commission Post LCP Certification Permit and Appeal Jurisdiction 2017

Figure 1. Coastal Zone Boundary and Coastal Development Permit Jurisdiction at the Airport

3.4.1.1 Existing Compensatory Mitigation

Another aspect regarding the location of the projects is if they may directly or indirectly affect the performance and/or compliance of existing compensatory mitigation projects (see **Figure 6**). Typically, impacting mitigation sites is not advisable and could be denied by the agency who required the mitigation. The path forward would involve sourcing all of the permits and documents (e.g., Habitat Mitigation and Monitoring Plans) related to the mitigation project. The next step would be to coordinate with the jurisdictional agency(ies) that required the compensatory mitigation and determine if the project is in compliance. If the project is in compliance, then another mitigation site would need to be negotiated. New mitigation ratios may be applied based on temporal loss factors or other variable, and new performance standards may need to be developed specifically for the impacted mitigation site. If the mitigation site is not in compliance, then there may be an issue with the site and perhaps greater flexibility with moving the mitigation or adding an additional location. It is also likely that the original responsible party would need to be involved with this process.

3.4.2 FAA Requirements

The FAA has numerous design standards and safety requirements that must be maintained on the Airport. FAA Advisory Circular 150/5300-13B – Change 1 “Airport Design” specifies these requirements. Of note, the Airport’s Object Free Areas (OFAs) and Runway Safety Areas (RSAs) are of critical importance. Any recommended adaptation measure must be designed in a manner compatible with FAA OFA and RSA specifications. For improvements made within FAA RSA and Taxiway Safety Areas (TSA), grading requirements should be followed.

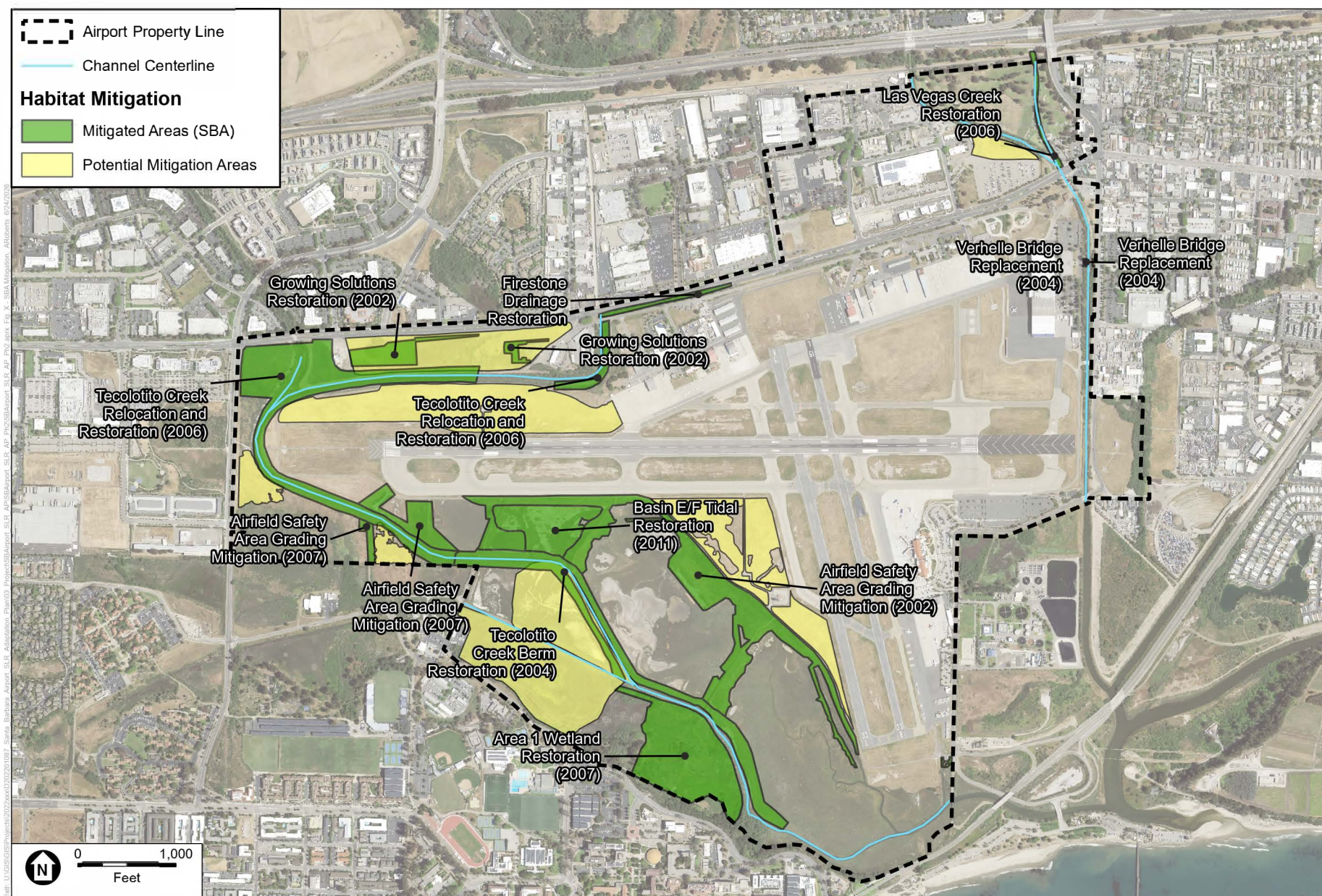
Airspace clearance must be evaluated for potential adaptation measures that are in close proximity to any of the Airport’s runway ends. So long as the proposed adaptation measures physical features are lower than the published runway end elevation, no detailed analysis will be required. If the proposed adaptation measures will have physical features rising above the runway end elevations, an analysis of those proposed features for consistency with the Federal Aviation Regulations (FAR) Part 77 Airspace Surfaces should be performed.

Any recommended adaptation measures selected to be moved forward into design will ultimately need to be shown on SBA’s Airport Layout Plan (ALP) for FAA review and concurrence prior to construction. At their discretion, the FAA may approve the use of a “pen-and-ink” ALP update to accommodate these ALP changes.

Prior to construction on the Airport, an Obstruction Evaluation/Airport Airspace Analysis must occur. The online portal for submission can be found here:

<https://oeaaa.faa.gov/oeaaa/oe3a/main/#/home>

Environmental review as specified in the National Environmental Policy Act (NEPA) will be required for any proposed adaptation measures. FAA NEPA guidance should be followed and closely coordinated with the FAA Environmental Protection Specialist.



SOURCE: NOAA, 2020; ESA, SBA 2025

Note: Areas defined by SBA

Santa Barbara Airport Sea Level Rise Adaptation Plan

Figure 6
Santa Barbara Airport Mitigation

Drawdown times for stormwater detention facilities in the vicinity of the Airport Operations Area (AOA) must not exceed 48-hours in accordance with FAA AC 150/5200-38, Protocol for the Conduct and Review of Wildlife Hazard Site Visits, Wildlife Hazard Assessments, and Wildlife Hazard Management Plans. Ponding that may occur in other areas of the Airport must also drain within 48-hours to reduce the potential for wildlife attractants. Stormwater facilities, including storm drainpipes, manholes, inlets, and other drainage infrastructure, must comply with FAA AC 150/5320-D, Airport Drainage Design.

3.5 COMMUNITY AND EQUITY CONSIDERATIONS

Flooding at SBA can affect not only airport operations, but also airport employees, travelers, nearby businesses, residents, and users of surrounding roads and public facilities. These effects may be greater for vulnerable or disadvantaged communities that have fewer resources or transportation alternatives available to respond to flooding and related disruptions. Consideration of these communities is therefore an important component of adaptation planning.

Many of the adaptation measures identified in the CAP are intended primarily to reduce flooding at the Airport, but some could also provide benefits beyond Airport property. Measures that reduce overtopping of creeks and drainage systems or improve regional flood conveyance and storage could potentially reduce flooding of nearby roads, properties, and communities. For example, measures addressing flooding along Firestone Road and Carneros Creek may improve access and connectivity during storm events. Regional measures and possibly offsite measures described in this CAP could provide broader flood risk reduction benefits to the Airport and adjacent communities. Conversely, adaptation measures must be designed to avoid shifting or increasing flood risk in surrounding areas. The feasibility and effectiveness study recommended by this CAP will further evaluate these potential offsite effects.

Implementation of adaptation projects could also result in temporary community impacts, including construction traffic, noise, access restrictions, or disruptions to airport employees and users. These impacts would vary by measure and would be evaluated as projects advance through design and environmental review. Ultimately, reducing the frequency and severity of airport flooding and closures would provide benefits to employees, travelers, businesses, and the broader community by supporting continued airport operations and access during flood events.

Future adaptation planning should continue to incorporate public and stakeholder engagement, including engagement with potentially affected and vulnerable communities, as individual projects are evaluated and refined. The next phase of adaptation planning includes a public engagement process as part of the recommended feasibility and effectiveness study, providing an opportunity to better understand community concerns, identify potential benefits and burdens, and consider whether adaptation measures would disproportionately affect vulnerable or disadvantaged communities.

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Section 4

ADAPTATION TIMEFRAMES AND THRESHOLDS

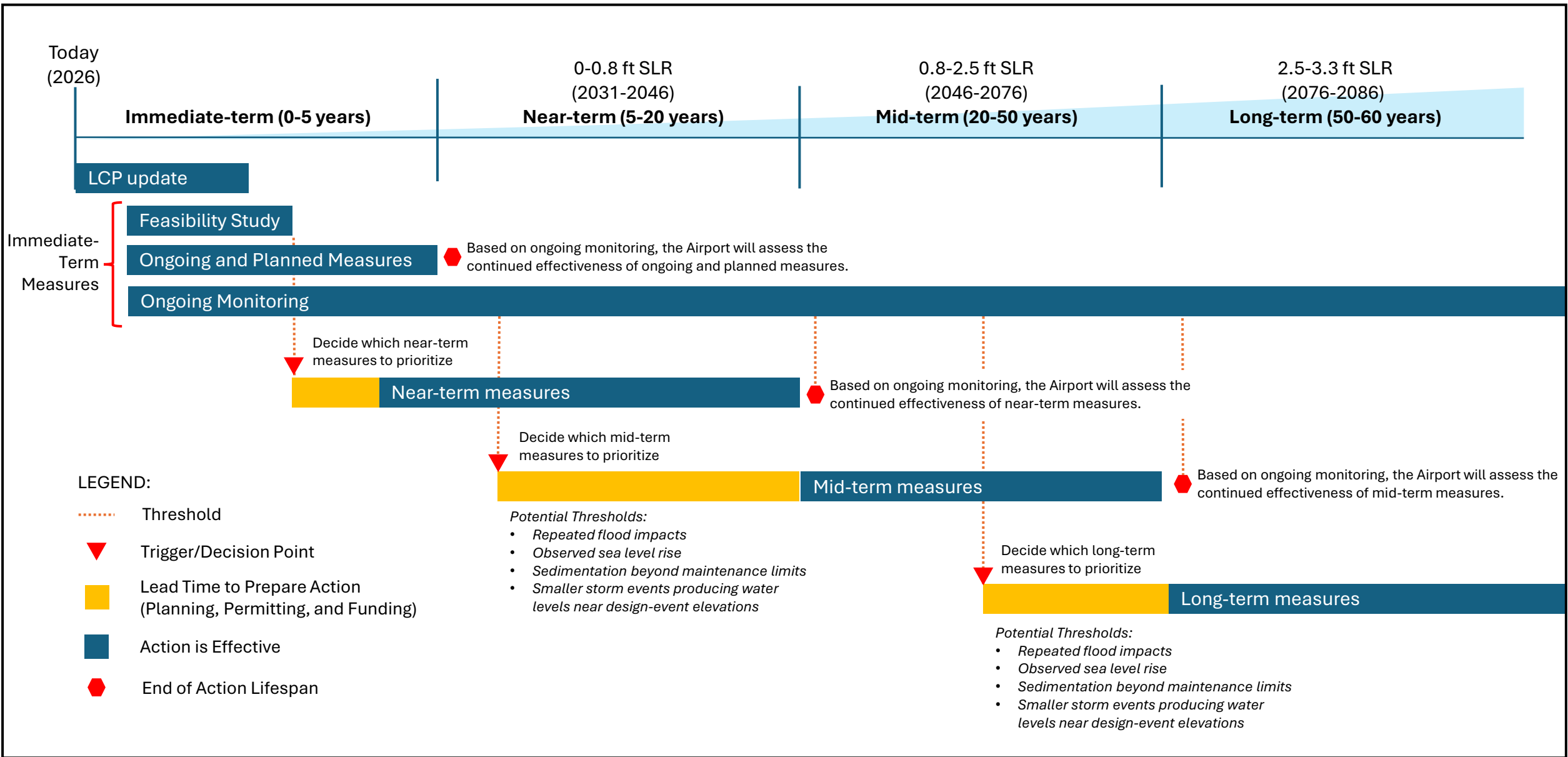
4.1 ADAPTATION TIMEFRAMES

Adaptation measures described in this report are organized by implementation timeframe. SBA has already implemented several measures to reduce flooding risk at the airport, and additional measures are currently planned for implementation. Beyond these ongoing and planned efforts, this report identifies potential future adaptation measures that may be implemented over time in response to increasing sea level rise and flood risk. The implementation timeframes generally correspond to projected sea level rise conditions. The adaptation measures are organized into the following categories:

- Ongoing and Planned Adaptation Measures (Section 5), i.e., measures that are already happening or that are already planned;
- Potential Future Adaptation Measures (Section 6)
 - Near-Term (5–20 Years), i.e., Now to 0.8 feet SLR (2050)
 - Mid-Term (20–50 Years), i.e., 0.8 feet (2050) to 2.5 feet SLR (2080)
 - Long-Term (50–60 Years), i.e., 2.5 feet (2080) to 3.3 feet SLR (2090)

The implementation timeframes presented in this report are intended to represent the general timeframe during which adaptation measures may need to be in place to address projected flood risk under future climate change and sea level rise conditions. A future feasibility and effectiveness study, including hydrologic modeling, should further refine implementation timing and phasing and confirm when planning for adaptation measures would need to be initiated and completed to maintain flood risk within the adaptation thresholds described below. Since fluvial sources are the primary driver of flooding at SBA, hydraulic modeling is required to determine how fluvial flood dynamics will be impacted, including flooding upstream and downstream of the implemented adaptation measure. Figure 7 illustrates the adaptation pathway, showing how adaptation measures are planned, evaluated, and implemented over time in response to changing conditions. Note that Figure 7 shows approximate timeframes to generally illustrate the adaptation pathway. The lead time required for planning, design, environmental review, permitting, funding, and construction and adaptation measure effectiveness have not yet been

evaluated. Lead times and adaptation measure effectiveness will be evaluated and estimated in the future feasibility and effectiveness study.



4.2 ADAPTATION THRESHOLDS

Adaptation thresholds are predefined conditions or trigger points used to guide future adaptation decisions. When a threshold is reached, it triggers a set of planned actions to evaluate, prepare for, or implement sea level rise adaptation measures. Examples of adaptation triggers include the number of flood events over a set period of years, amounts of sea level rise, damage frequencies, tidal inundation moving under elevated structures, etc.

SBA prepared this Climate Adaptation Plan to ensure the continued safe operation of aviation transportation and the protection of coastal resources in the Airport area, by proactively preparing for and adapting to increased hazards from climate change, including sea level rise and flooding, while supporting community resilience and environmental stewardship. Consistent with these objectives, adaptation thresholds help identify when additional measures may be needed to maintain acceptable levels of flood risk over time.

Airport closure adaptation threshold: For SBA, the adaptation threshold is primarily based on the level of flood risk that could close the airport. Under current conditions, there is approximately a 20% chance in any given year that flooding could close the airport for at least one day (see the combined flooding probabilities in Section 2.4). This is commonly referred to as a 5-year event, meaning the event has a 1-in-5 chance of occurring in any given year, or would be expected to occur about five times over a 25-year period, on average.

The goal of adaptation is to maintain or reduce the current level of flood risk over time. Ideally, adaptation measures would reduce the risk of flood-related airport closure to below 20% annually. However, as sea levels rise, flood risk is expected to increase again over time, even with adaptation measures in place, and eventually approach the 20% threshold again. At that point, additional adaptation would be needed. In practice, maintaining the annual risk of flood-related airport closure at or below 20% over the long term may be challenging. As a next step, this CAP recommends hydrologic modeling of the adaptation measures identified in the CAP to evaluate their effectiveness and feasibility in reducing flood risk. The modeling results would help determine whether the airport closure risk can be reduced and maintained below the 20% threshold over time.

If further study shows that maintaining the current annual flood risk of 20% is not feasible over the long term, a secondary adaptation threshold would be to substantially reduce flood risk relative to the no-action scenario. Under the no-action scenario, the annual chance of flood-related airport closure is projected to increase to approximately 60% by 2076 with 2.5 feet of sea level rise. Under the secondary adaptation threshold, adaptation measures would aim to reduce the projected annual closure risk from approximately 60% to between 20% and 40% through 2076, equivalent to about a 5-year to 2.5-year flood event.

Northwest Quadrant adaptation threshold: In addition to the airport closure threshold, this CAP tracks flooding in the NW Quadrant as a separate adaptation threshold because it represents a distinct and more frequently occurring level of flood impact. The NW Quadrant is typically the first area of the airport to flood and can experience flooding without runway inundation or airport closure. Flooding in this area can affect airport operations and assets,

resulting in operational disruptions even when the airport remains open. Tracking NW Quadrant flood risk separately therefore provides an earlier indicator of increasing flood vulnerability and adaptation performance before conditions reach the airport closure threshold.

For the NW Quadrant, the adaptation threshold is to maintain or reduce the current flood risk of approximately 30%. However, by 2076, with 2.5 feet of sea level rise, the annual chance of flooding in the NW Quadrant is projected to increase to 100%, meaning flooding would be expected at least once per year. If maintaining the current flood risk is not feasible, a secondary threshold would be to reduce the NW Quadrant flood risk relative to the no-action scenario and maintain the annual flood risk between approximately 30% and 60% through 2076, equivalent to about a 3-year to 1.5-year flood event.

There are two primary ways to assess flood risk. First, flood modeling can be used to estimate current and future risk, both with and without adaptation. The CVARE estimates flood risk without adaptation. As a next step, the feasibility and effectiveness study (see Section 7.2) will quantify how much the identified adaptation measures could reduce flood risk over time. This analysis will help determine how long the measures are expected to keep flood risk within the adaptation thresholds.

Second, actual flood events can be documented and used to calculate the observed frequency, or annual chance, of flooding over time. ESA also used this approach to calculate historic flood frequency in the CVARE. This method is especially useful for tracking the effectiveness of adaptation measures for more frequent flood events, such as those with an annual chance of occurrence of 20% or greater. This CAP recommends using both methods to assess and track flood risk over time.

Importantly, the adaptation thresholds are not intended to require the City to rerun the CVARE or demonstrate a statistically significant change in recurrence intervals after each storm event. The annual-chance thresholds provide planning and performance targets, while implementation decisions should be guided by measurable monitoring triggers that can be tracked over time by City staff. The feasibility and effectiveness study should translate the modeled flood-frequency relationships into practical triggers, such as observed sea level rise increments, the number of flood-related airport closures or NW Quadrant flood events over a specified period, documented damage or repair frequency, measured water levels at key gages relative to design-event elevations, and sediment deposition limits that reduce flood conveyance. Reaching one or more monitoring triggers would initiate the next planned action, such as maintenance, additional evaluation, project design, updated modeling, or implementation of the next adaptation phase.

Feasibility and effectiveness study, design process, and threshold monitoring. The feasibility and effectiveness study should include hydrologic and hydraulic modeling to refine the existing and projected frequency of flooding and evaluate the near-term adaptation measures identified in this CAP. The analysis should use available precipitation gage data, the 16-year Goleta Slough water level record from Santa Barbara County Flood Control District's Goleta Slough water level gage (2493), ocean tide data from the NOAA tide gage at Santa Barbara Harbor, and watershed hydrology modeling for Carneros Creek, Tecolotito Creek, and San

Pedro Creek, which do not have stream gages. The study should establish frequency relationships that allow City engineers to estimate the annual chance of observed storm-driven water levels, recognizing that frequency estimates based on the available data record will be more reliable for more frequent events than for rarer events.

One approach would be to perform a model hindcast of significant storm events over the period of available Goleta Slough water level data. Modeled water levels at selected locations along Goleta Slough and the tributary creeks could then be analyzed using extreme value methods to establish water-level frequency relationships that reflect the combined effects of creek discharge and ocean tides. The hindcast could also be run with sea level rise scenarios to estimate future water-level frequency relationships and compare future flood risk with and without adaptation relative to the no-action scenario. Sediment deposition should be evaluated separately, including the effect of sedimentation on flood conveyance, the performance life of adaptation measures, and the maintenance limits needed to preserve their effectiveness.

The modeling would identify a suite of near-term adaptation measures that effectively reduce flood risk. The feasibility and effectiveness study and subsequent project design analyses would define the design flood event that the measures are intended to convey or store, such as a 20-year, or 5% annual chance, flood event. Future study should also estimate how long each measure is expected to maintain flood risk within the adaptation thresholds under sea level rise and sedimentation conditions.

Threshold monitoring should be developed as part of the feasibility and effectiveness study and incorporated into the design process. Monitoring may include sedimentation surveys, tracking observed sea level rise at the NOAA tide gage in coordination with the BEACON Regional Coastal Adaptation Monitoring Plan, documenting flood events and operational impacts, and comparing measured precipitation and/or Goleta Slough water levels to the established frequency relationships. The feasibility and effectiveness study should also evaluate whether additional permanent water level gages are needed in Goleta Slough and the tributary creeks to support adaptation performance tracking. These data would allow City staff to classify observed storm events using pre-established gage elevations and frequency relationships, rather than rerunning the CVARE after each event. If flooding associated with an event below the design event results in airport closure or other threshold-defined impacts, the City would evaluate whether the event indicates a maintenance issue, a design-performance issue, or the need for additional adaptation. Repeated flood impacts, observed sea level rise, sedimentation beyond maintenance limits, or measured water levels for storm more frequent than the design event produce water levels near design-event elevations would serve as practical triggers for initiating the next phase of adaptation planning or implementation.

4.2.1 Near-Term (5–20 Years), i.e., Now to 0.8 Feet SLR (2050)

Over the past decade, SBA has experienced a significant increase in flooding frequency when compared to previous years. Due to the increased frequency in flooding events, the threshold for near-term adaptation has already been reached. SBA has already implemented several adaptation measures and is currently planning immediate adaptation measures to address the recent increase in airport flooding frequency.

Near-term adaptation focuses on implementing measures that can be deployed in the near future to reduce current flood risk and improve understanding of future conditions. These measures are intended to maintain or reduce current flood risk levels while supporting continued airport operations and coastal resource protection.

During the near-term period, continued monitoring of flooding, groundwater conditions, storm events, and sea level rise will be important to assess the effectiveness of implemented measures and track changes in flood risk over time. Additional hydrologic and hydraulic modeling recommended in this CAP will further evaluate the effectiveness and feasibility of adaptation measures and help identify when additional adaptation actions may be needed.

4.2.2 Mid-Term (20–50 Years), i.e., 0.8 Feet (2050) to 2.5 Feet SLR (2080)

In the mid-term, progress and effectiveness of near-term adaptation measures will be reassessed and long-term planning will be advanced as sea level rise and changing storm conditions continue to increase flood risk. Mid-term adaptation planning will focus on advancing measures that may require additional coordination, design, permitting, environmental review, and funding.

As described in Section 2, flood risk is expected to increase over time due to sea level rise and changes in storm frequency and magnitude. Mid-term adaptation planning would be initiated when monitoring indicates that near-term measures are no longer expected to maintain flood risk within the identified adaptation thresholds. This may occur when observed sea level rise reaches the planning increment identified for mid-term measures, when flood-related airport closures or NW Quadrant flood events meet the event-count trigger established in the monitoring program, when measured water levels for storms more frequent than the design event produce water levels near design-event elevations, or when sediment deposition reaches maintenance limits that reduce flood conveyance. These monitoring triggers would allow the City to initiate mid-term planning and implementation before flood risk exceeds the identified thresholds, to the extent feasible.

4.2.3 Long-Term (50–60 Years), i.e., 2.5 Feet (2080) to 3.3 Feet SLR (2090)

In the long-term, progress and effectiveness of near- and mid-term adaptation measures will continue to be evaluated as sea level rise, and changing storm conditions further increase flood risk. Long-term adaptation planning will focus on evaluating and advancing measures that may require substantial coordination, environmental review, permitting, funding, and long-term implementation planning.

Long-term adaptation thresholds would be reached as flood risk under mid-term adaptation conditions begins to approach the identified adaptation thresholds. At that point, implementation of long-term adaptation measures would be needed to continue reducing flood risk relative to the no-action scenario and maintain airport functionality to the extent feasible.

Continued monitoring of flooding, groundwater conditions, and sea level rise will remain necessary to evaluate the effectiveness of implemented measures and support adaptive management and future decision-making over time. Monitoring may include documenting flood

events and operational impacts, collecting groundwater data where appropriate, and incorporating updated sea level rise projections and guidance as they become available. Periodic updates to flood modeling may also be warranted as new data become available or conditions change.

Section 5

ONGOING AND PLANNED ADAPTATION MEASURES

5.1 COUNTY CREEK SEDIMENT MANAGEMENT (ONGOING)

Over time, sediment tends to deposit and build up in the creek beds of the creeks adjacent to SBA due to flat topography and insufficient hydraulic gradient to maintain sediment transport equilibrium. This reduces the flood capacity of the creeks, making it more likely for the creeks to overtop their banks and cause flooding during storm events. Flood Control implements an Annual Routine Maintenance Program that includes the following sediment management approaches across creeks feeding into Goleta Slough. Flood Control's maintenance approach is designed to ensure unimpeded drainage through these low-gradient systems and to prevent sediment accumulation that could lead to flooding of critical infrastructure, including Highway 101, SBA, and surrounding industrial properties. **Table 2** describes the specific actions that pertain to each creek in the vicinity of SBA.

- **Channel discing:** Using a tractor to pull a blade over compacted sediment to loosen accumulated rocks and sediment, improving flow and facilitating transport to downstream collection points.
- **Desilting:** Removing accumulated sediment to restore channel capacity and improve flow, especially around culverts and bridges.
- **Revegetation:** Planting of native vegetation at restoration sites.
- **Debris removal:** Removing obstructive vegetation to reduce debris load that occurs with higher creek flows.
- **Debris basins:** Using widened creek sections as sediment collection points that can be more easily maintained.

The Maria Ygnacio debris basins are located within the watershed that drains to Goleta Slough. These basins were identified in the 2021 Updated Debris Basin Maintenance and Management Plan as Group 1 debris basins, which are required to be modified or have fish passage obstacles removed between 2016 and 2026. Both of the Maria Ygnacio debris basins were modified in 2019 (Flood Control 2021).

TABLE 2
MAINTENANCE ACTIVITIES IN CREEKS NEAR SBA

Creek Name	Primary Management Strategies	Specific Actions	Focus on Sediment Management
San Jose Creek	Revegetation, Debris removal	Channel repair (damaged in Winter Storms in 2017), bridge replacement (ongoing Hollister Avenue Bridge Replacement)	Maintenance of low flow channel, 100-foot transition basin at Hollister Ave bridge. Flooding within San Jose Creek resultant from a 100-year event is mostly contained within the riparian corridor upstream from Highway 101.
San Pedro Creek	Channel discing, Revegetation, Debris removal	Discing from Union Pacific Railroad (UPRR) Bridge to Matthews St (20–40-foot width), temporary diversion trenches	Primary focus with designated "sediment-retention basin" downstream of James Fowler Road. Regular discing to improve sediment transport through flat, low-gradient areas.
Las Vegas Creek	Vegetation management	Culvert beneath Highway 101 was recently modified to improve flood conditions at Fairview Avenue	Limited sediment management
Atascadero Creek	Revegetation, Debris removal	Removing downed trees/limbs. Debris management to prevent flow obstructions.	Limited current focus
Maria Ygnacio Creek	Revegetation, Debris removal	Removal of downed trees and obstructive vegetation to prevent obstructions and sediment buildup	Limited sediment management
Tecolotito Creek	Desilting, Revegetation	Sinkhole repair, concrete panel maintenance. Addressing areas prone to sedimentation due to low gradient	Removal of silt-trapping vegetation. Sediment management primarily through vegetation control
Carneros Creek	Vegetation maintenance	Native/invasive vegetation management	Limited sediment management

In addition to the sediment management activities described above, Flood Control is authorized to conduct periodic dredging of up to 200,000 cubic yards of sediment per year combined from San Pedro Creek, San Jose Creek, Atascadero Creek, and Goleta Slough and places dredged sediment in the surf zone at Goleta Beach (SLC 2023). When necessary, the County performs sediment removal as emergency operations under emergency permits.

Sediment removed from the five designated flood control channels surrounding Santa Barbara Airport is reused for beach nourishment, or taken to approved upland sorting and storage yards, and made available to contractors or the general public for fill material.

The following sections provide a more detailed description of sediment management in creeks adjacent to SBA.

5.1.1 Carneros Creek

In Carneros Creek, the County removes sediment from an approximately 0.1-acre in-channel basin south of Hollister Avenue. More recent sediment removal occurred in the 2025-2026

winter under an emergency permit waiver following extreme storm events and significant sediment buildup (CCC 2026), in 2023 and 2024 under emergency storm response permits, and during the regular maintenance program in 2021 (ESA 2025, CIWQS 2026).

5.1.2 San Pedro Creek

The 2023-2024 Flood Control Annual Routine Maintenance Plan Summary states the portion of the creek downstream of the Union Pacific Railroad track is relatively flat and prone to sedimentation. In addition, the area around Fairview and Hollister Avenue is prone to siltation and flooding. These areas are maintained nearly every year as standard practice to facilitate drainage. In 2023–2024, the management plan was to disc the channel bed through this reach and potentially to apply an herbicide register for aquatic use to silt trapping vegetation in the streambed to inhibit regeneration (Flood Control 2023).

San Pedro Creek is designated critical habitat for the Southern California Distinct Population Segment of steelhead (*Oncorhynchus mykiss*). As required by NMFS, Flood Control developed a Vegetation Management Plan in 2016. The Vegetation Management Plan describes Flood Control's approach providing flood protection while managing vegetation as it relates to the consideration of steelhead.

5.1.3 Tecolotito Creek

Based on the 2023-2024 Flood Control Annual Routine Maintenance Plan Summary, typical maintenance in Tecolotito Creek is conducted starting near where the creek passes under North Glen Annie Road and terminates upstream of Highway 101. Tecolotito Creek is prone to sedimentation and associated colonization by obstructive vegetation. Therefore, removing silt and silt trapping vegetation from the channel is important to maintain creek capacity. However, sediment is not regularly removed from Tecolotito Creek, as the creek does not accumulate as much sediment as San Pedro and Carneros Creeks (ESA 2025). Downstream of U.S. Highway 101 the creek has a well vegetated canopy that was restored by Flood Control and nearby developments between 2013 and 2023 (Flood Control 2023).

5.2 FIRESTONE ROAD INFLATABLE TIGER DAM FLOOD BERM (ONGOING)

In February 2025, SBA placed inflatable Tiger Dam flood berms along Firestone Road, as shown in **Figure 8**. Tiger Dams are modular flood barriers, typically in 50-foot sections, which use water-filled tubes to form temporary berms for holding back or redirecting floodwater. SBA placed 2,000 linear feet of Tiger Dams along the north side and 250 linear feet along the south side of Firestone Road adjacent to the flood-prone Firestone drainage channel (Lemar 2025a). The Tiger Dams are intended to be placed in anticipation of large storm events and removed afterwards.



SOURCE: Lemar 2025a

Figure 8. Inflatable Tiger Berm Deployed Along Firestone Road in 2025

5.3 FIRESTONE DRAINAGE CHANNEL MAINTENANCE (ONGOING)

SBA recently received permits for channel maintenance including roadside vegetation trimming, mowing, and channel bottom vegetation trimming as shown in **Figure 9**. The currently permitted maintenance is to maintain hydraulic function of the channel, clear overgrown vegetation on roads, and allow safe passage for pedestrians and cyclists.



SOURCE: Teria Solution, Storror Environmental Services 2024

Figure 9. Firestone Ditch Vegetation Maintenance Area

5.4 CARNEROS CREEK K-RAIL TEMPORARY FLOOD BARRIER (ONGOING)

In February 2025, SBA placed 3,000 linear feet of concrete K-rail barriers along the service road just south of Carneros Creek (City of Santa Barbara 2024). The barriers are 32 inches high and are interlocked and sealed to provide a watertight barrier that keeps water off the airfield in case of Carneros Creek overtopping its bank during large storm events; however, the interlocking joints have leaked some during storm events. This action was the second action of SBA’s short-term three-step flood prevention plan, following the placement of inflatable Tiger Dams along Firestone Road and preceding Carneros Creek dredging (Lemar 2025b) and is meant to be a temporary solution until more permanent solutions are found with Carneros Creek flood management and sedimentation and debris maintenance. A section of the K-rail barriers is shown in **Figure 10**.



SOURCE: Lemar 2025b

Figure 10. K-Rail Deployed Along the Service Road South of Carneros Creek in 2025

5.5 CARNEROS CREEK MAINTENANCE DREDGING (ONGOING)

In 2006, Carneros and Tecolotito Creeks were realigned with the extension of Runway 7. Significant flooding from Carneros Creek in recent years has led to plans to restore Carneros Creek to match the 2006 as-built conditions by removing sediment. CDFW has recommended a phased approach to sediment removal to limit potential biological impacts (Mead & Hunt 2025). However, phased approaches provide the least immediate flood reduction potential to SBA, and large rain events occurring between phases may reduce the effectiveness of a previous phase's sediment removal.

5.6 K-RAIL AND FENCE AT FIRESTONE ROAD BRIDGE OVER CARNEROS CREEK (PLANNED)

The security fence on the south side of Firestone Road bridge over Carneros Creek was previously damaged during flooding in which flows overtopped the bridge. SBA is currently designing K-rail barriers with security fence on top of the K-rail to replace and stabilize the fence (**Figure 11**). The K-rail will act as a flood barrier in future events.

5.7 STORM DRAIN IMPROVEMENTS (PER DRAINAGE MASTER PLAN UPDATE, PLANNED)

In 2001, SBA completed a Master Drainage Plan to assess overall airport drainage conditions. In 2024, SBA retained Mead & Hunt to prepare a Drainage Master Plan Update to guide drainage improvements. SBA will look to implement the following storm drain improvements

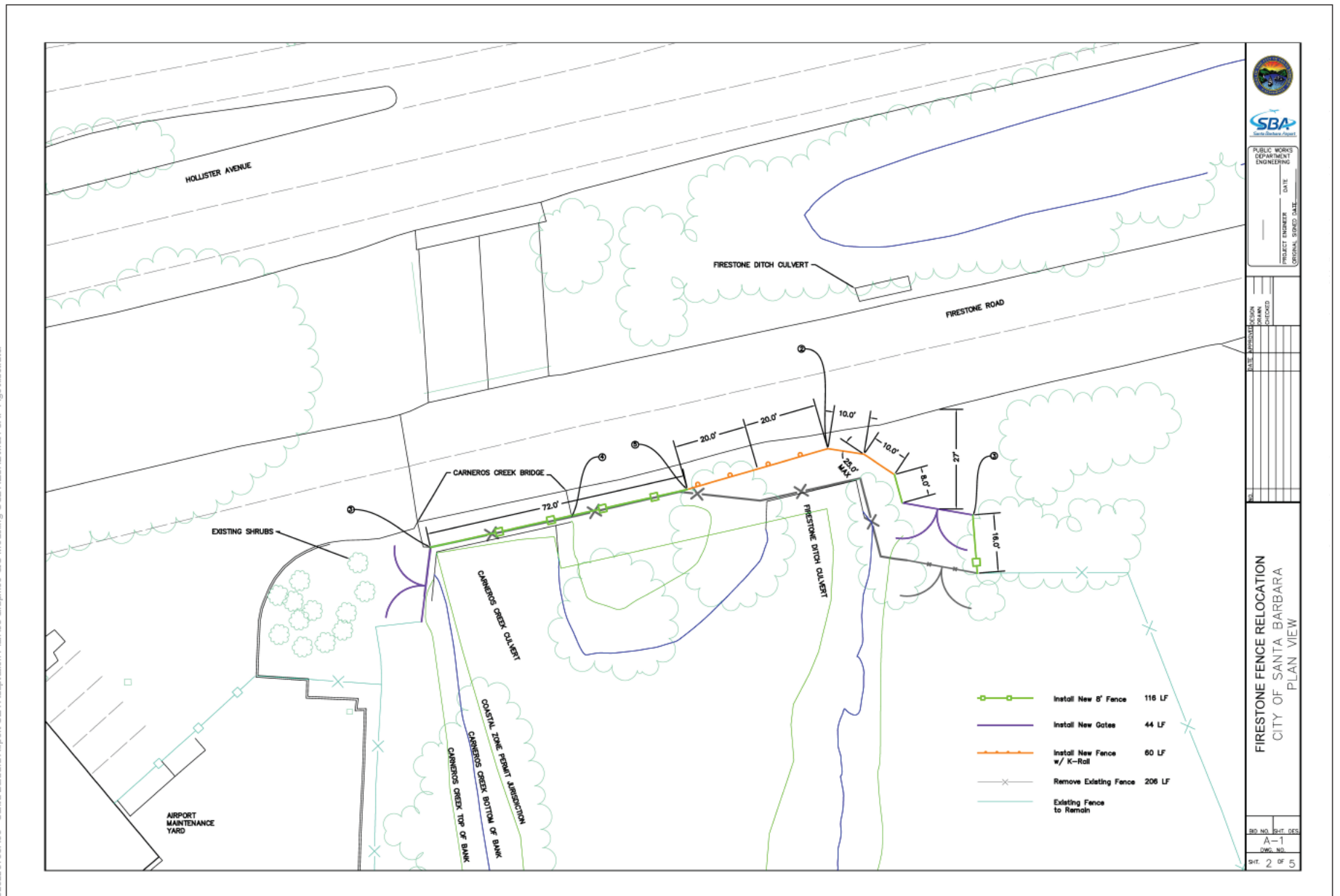
contained within 2024 SBA Drainage Master Plan Update as feasible through the airport's Capital Improvement Plan or other potential funding sources:

1. *“Replacement or lining of pipe sections based on the pipe conditions assessment;*
2. *Conveyance improvements associated with proposed development projects;*
3. *Grading modifications to allow additional temporary surface water storage to store water away from airfield pavements until water surface elevations at the outfalls recede;*
4. *Maintenance and sediment removal in portions of Carneros Creek and Goleta Slough to allow for lower offsite water surface elevations and improved airfield drainage; and*
5. *Studies of Tecolotito and San Pedro Creeks to evaluate creek conveyance improvements”* (Mead & Hunt 2024).

5.8 TAXIWAY B EXTENSION (PLANNED)

The 2017 Santa Barbara Airport Master Plan includes a project to extend Taxiway B (“Bravo,” formerly Taxiway H “Hotel”) to the Runway 7 threshold to improve circulation efficiency and operational safety and comply with FAA standards. The project would involve relocating the glide slope antenna and removing excess pavement near the Taxiway C–runway intersection to create a right-angled access taxiway (Coffman Associates, Inc. 2017). Additionally, project actions include constructing a holding pad, installation of new drainage, regrading surrounding areas to FAA taxiway safety standards, and enhancing existing vegetated areas. **Figure 12** illustrates the location of the proposed extension. The project is currently in the design phase, with construction anticipated to begin in 2027/28 (SBA 2026b).

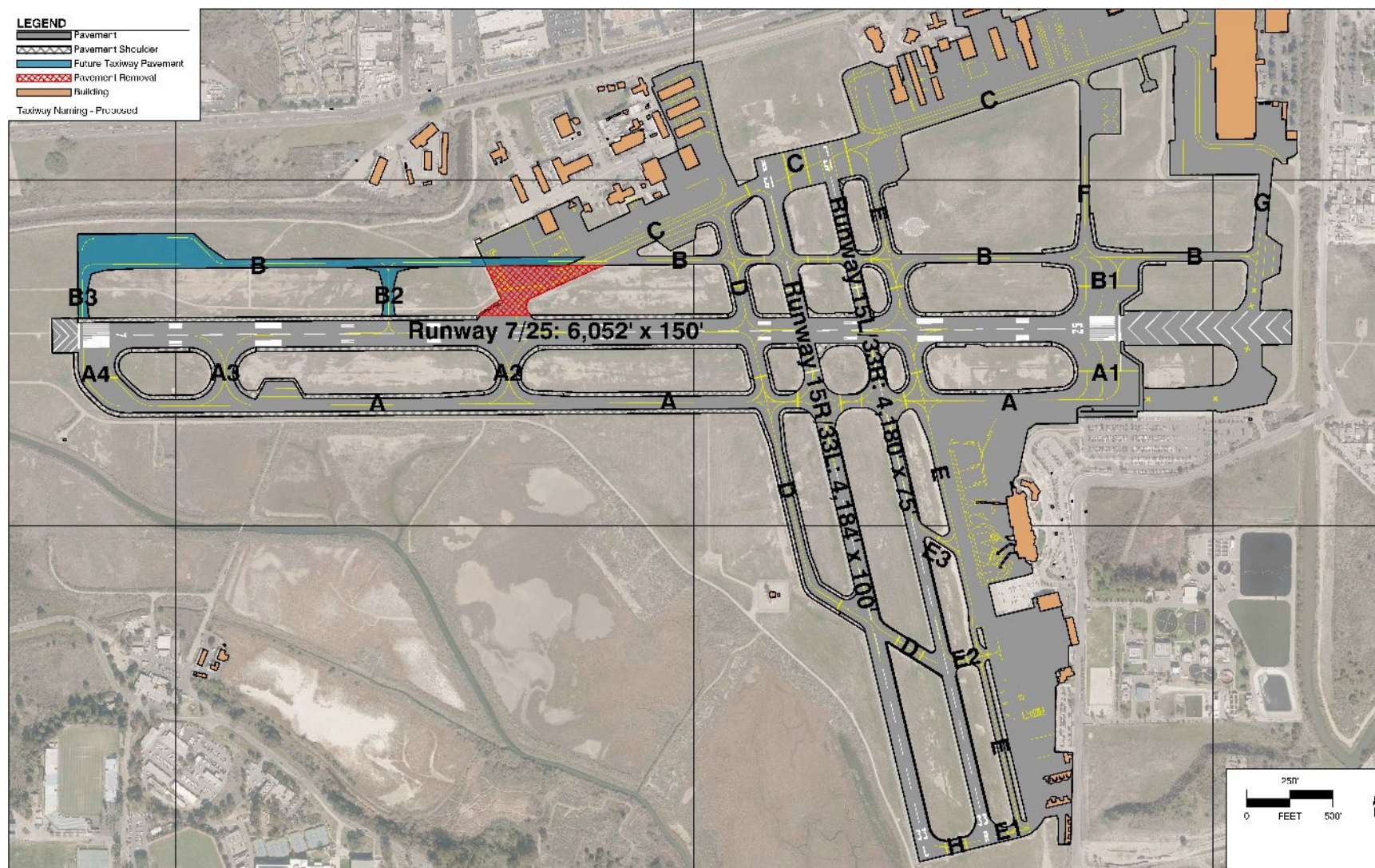
SBA has plans to offset or mitigate the Taxiway B Extension Project's potential effects on existing wetland habitat within the extension project area. SBA currently plans to offset or mitigate potential effects within the project area or Airport Operations Area (AOA).



SOURCE: SBA 2026

Santa Barbara Airport SLR Adaptation Plan

Figure 11
Firestone Fence Relocation



SOURCE: SBA 2026b

Figure 12. Proposed Taxiway B Extension

5.9 UCSB WESTERN GOLETA SLOUGH TIDAL RESTORATION (PLANNED)

The West Goleta Slough Tidal Restoration Project is a joint effort by UCSB and the City of Santa Barbara to evaluate the feasibility of restoring and expanding tidal flow to historic wetlands in the western Goleta Slough (UCSB 2026). Located immediately southwest of SBA, the project area encompasses approximately 62 acres of fragmented wetlands that were once part of the broader Goleta Slough system but became hydrologically isolated due to airport development and creek realignments. The project aims to assess whether reestablishing tidal connectivity is feasible and, if so, to evaluate alternatives for the extent and configuration of restoration (UCSB 2026). Restoring tidal connectivity could improve ecological function and habitat within Goleta Slough, while also potentially altering local hydrodynamics and water levels in ways that may have implications for airport infrastructure and flood management.

5.10 GOLETA SLOUGH RESILIENCY PROJECT (PLANNED)

The Goleta Slough Resiliency Project is a multi-agency planning effort aimed at improving the long-term resilience of the Goleta Slough system to climate change-driven hazards, including sea level rise, coastal erosion, and increased flooding (SCC 2024). This multi-agency project will develop an adaptation plan and plans to identify and advance nature-based and infrastructure-focused strategies to improve the slough's resilience and ecological function (RCC 2026). The project focuses on the broader Goleta Slough area and surrounding assets. Implementation of proposed strategies could improve flood attenuation and tidal function within the slough, with potential implications for water levels in the slough and flood pathways at SBA.

Section 6

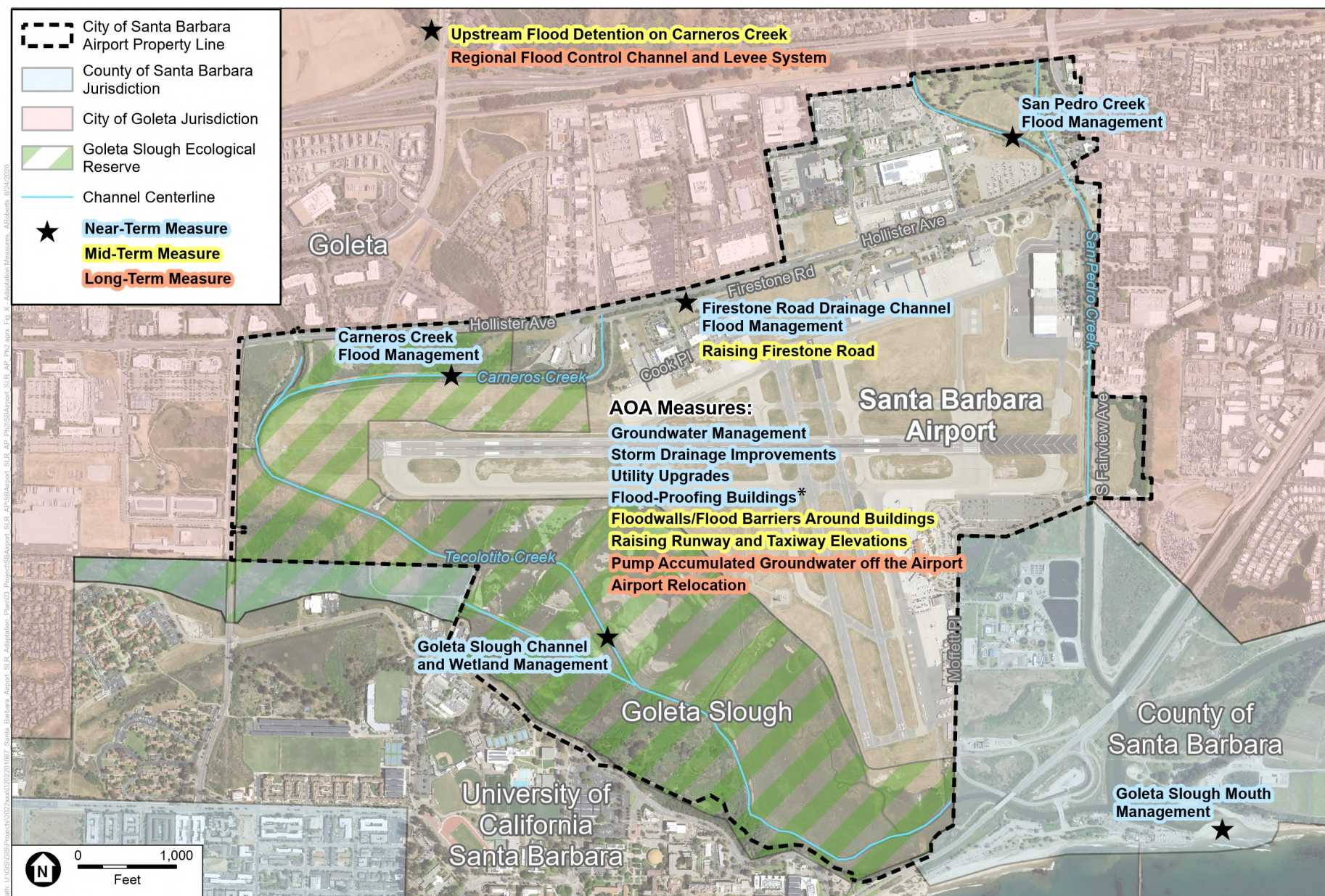
POTENTIAL FUTURE ADAPTATION MEASURES

The following sections describe potential adaptation measures for near-term, mid-term, and long-term timeframes. As the flooding threshold for near-term has already been reached, more focus and discussion is provided for the near-term adaptation measures. For each timeframe, adaptation measures are organized into offsite and onsite actions. Offsite measures would occur in Goleta Slough and the surrounding creeks, including Tecolotito Creek, Carneros Creek, and San Pedro Creek. Onsite measures would occur in the AOA. The locations of potential near-term, mid-term, and long-term adaptation measures are shown in **Figure 13**. Each adaptation measure description includes discussion of its benefits, constraints, permitting considerations, and relative costs. While the effectiveness of the adaptation measures has not yet been modeled, the measures are expected to be conceptually feasible and provide flood reduction benefits. Modeling of adaptation measure effectiveness will need to be performed in a future feasibility and effectiveness study to inform project prioritization, design, timing, and phasing. The following relative cost descriptors are used as initial planning-level indications of potential order-of-magnitude cost ranges:

- **Low:** below approximately \$2 million
- **Medium:** approximately \$2 million–\$10 million range
- **High:** approximately \$10 million–\$50 million range
- **Very high:** above approximately \$50 million

Detailed cost estimates were prepared for the following four potential adaptation measures and are included in Appendix A:

- Floodwall at Carneros Creek and Firestone Road
- Firestone overflow storage basin
- Permanent berm to replace K-rail along Carneros Creek
- Restore wetland floodplain habitat north of Carneros Creek



SOURCE: NOAA, 2020; ESA, SBA 2025

*also applicable outside AOA

Santa Barbara Airport Sea Level Rise Adaptation Plan

Figure 13
Adaptation Measures

6.1 NEAR-TERM: 0–0.8 FEET SLR (5–20 YEARS)

6.1.1 Near-Term Offsite Measures – Goleta Slough and Creeks

6.1.1.1 Carneros Creek Flood Management

During large storm events, most recently in December 2025 and January 2026, Carneros Creek overtopped its banks onto the airfield. Recent projects have been completed to reduce the frequency of Carneros Creek overtopping, including the installation of K-rail and emergency dredging.

Adaptation measures identified to address Carneros Creek Flood Management are discussed below.

This section includes a description of the following adaptation measures and their associated benefits, constraints, and permitting considerations:

- Construct a permanent berm along Carneros Creek;
- Restore wetland floodplain north of Carneros Creek;
- Restore wetland floodplain at the confluence of Carneros and Tecolotito Creeks;
- Restore wetland floodplain through removal/relocation of maintenance yard; and
- Enhance/expand Carneros Creek flood detention basin

Pending further feasibility and effectiveness study in a future step of adaptation planning, the preferred approach to Carneros Creek flood management is the construction of a permanent berm combined with floodplain restoration. **Figure 14** shows an overview of the potential permanent berm alignment, and **Figure 15** shows the areas where the channel could be expanded and wetland floodplain could be restored. These adaptation measures should be considered as components of an integrated multi-benefit habitat restoration and flood management approach for the Carneros Creek corridor. Constructing a berm on the south bank is a permanent flood reduction measure that is compatible with wetland floodplain restoration. The existing vehicle service road on the south side of the creek would be relocated onto the south bank berm. Wetland floodplain restored north of Carneros Creek would likely involve removing the existing berm and vehicle service road on the north side of the creek and replacing it with a setback berm and vehicle service road along Hollister Ave. Together, new berms on both sides of the creek with a wider restored wetland floodplain and channel corridor would provide both flood reduction and habitat benefits.

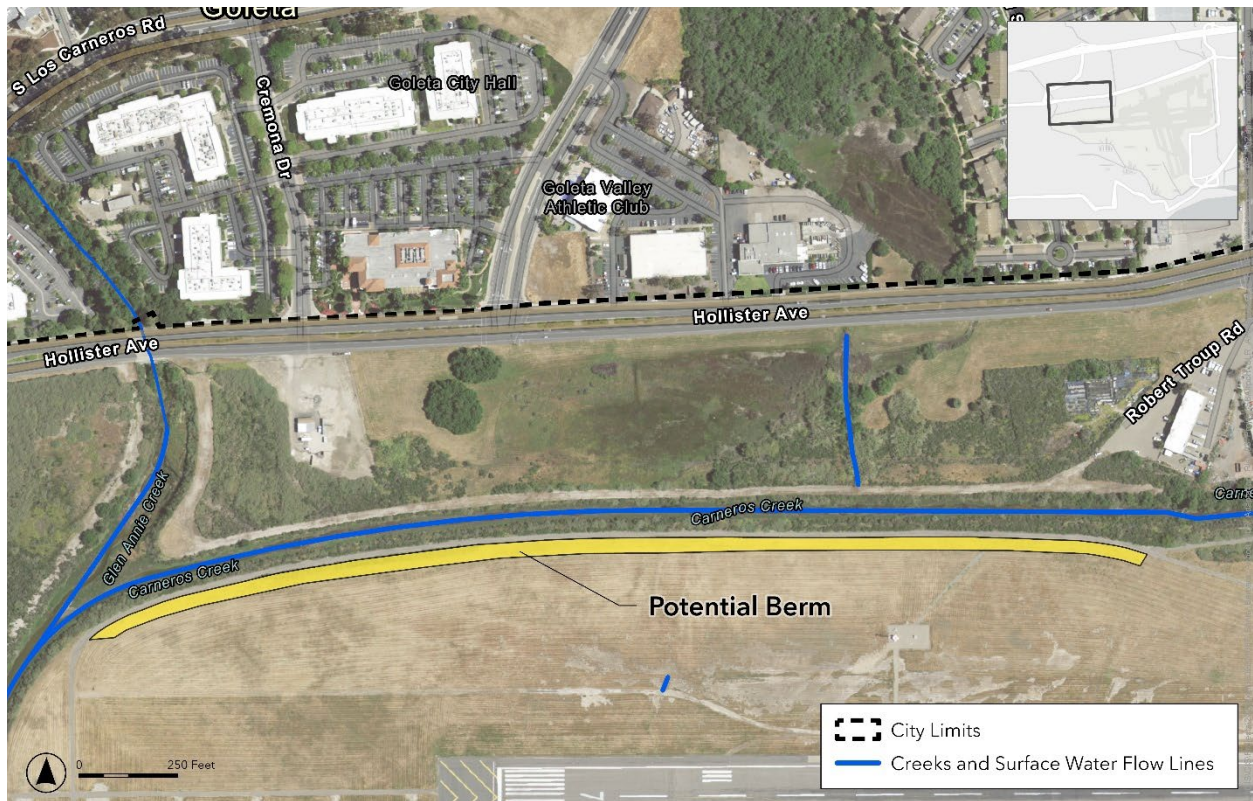


Figure 14. Overview of Permanent Berm Creation along Carneros Creek

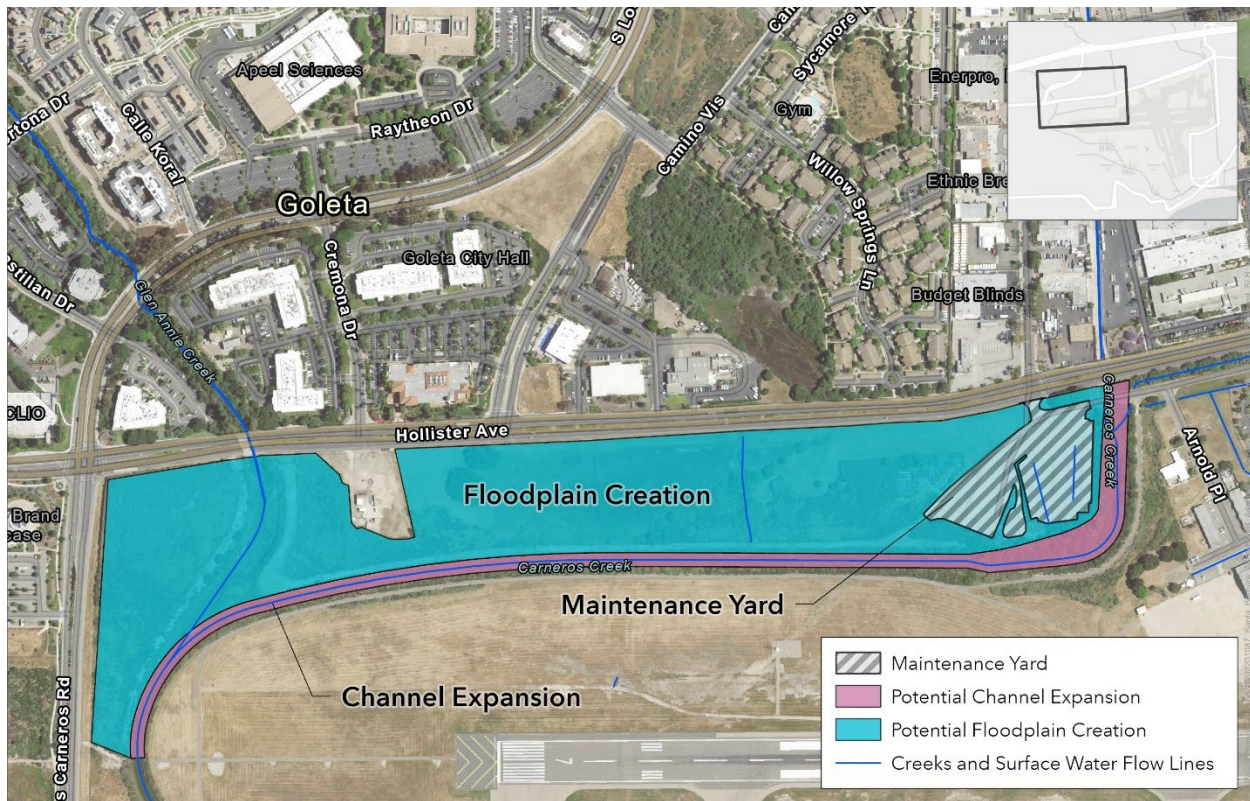


Figure 15. Overview of Channel Expansion and Floodplain Creation along Carneros Creek

An alternative approach could include the enhancement and expansion of the existing wetland detention basin on the north side of Carneros Creek (as shown in **Figure 16**). This approach could provide additional flood storage and sediment management capacity if this is determined to be a more effective flood management measure during future feasibility analyses. Hybrid options, including combining floodplain restoration with a smaller detention basin and/or an expanded sediment management area may also be considered.



Figure 16. Potential Carneros Creek Flood Detention Basin

Permanent Berm along Carneros Creek

- **Description:** In 2025, the Airport constructed a temporary flood barrier consisting of 3,300 linear feet of 32-inch-tall K-rail along the south bank of Carneros Creek. During recent storm events, the Airport observed water seeping through the K-rail joints and beneath the barrier at locations where forklifts had placed it. This adaptation measure would replace the temporary K-rail with a permanent earthen berm, as shown in **Figure 17**. The berm would be outside the Runway Object Free Area (ROFA). The existing vehicle service road in this area could be relocated to the top of the berm, and the north-facing slope adjacent to Carneros Creek could be vegetated with native riparian and upland species to support habitat.

The proposed permanent berm would replace the temporary K-rail along the southern bank of Carneros Creek and connect to the berm constructed in 2006 along the Santa Barbara County Flood Control District Sediment Basin. From there, it would extend downstream to the Runway Protection Zone (RPZ), where FAA height safety restrictions limit construction options. With further coordination with the Airport and FAA, the berm could potentially continue beyond the confluence with Tecolotito Creek. Because an existing vehicle service road follows the proposed berm alignment, the project would raise that road as part of the berm construction. The conceptual design includes 2,500 linear feet of new vehicle service road, 20 feet wide and 6 inches thick, over a 1-foot-high, 30-foot-wide aggregate base, with berm side slopes graded at 3 horizontal to 1 vertical to tie into existing ground. Seeding and planting with native riparian and upland vegetation would be needed to stabilize the side slopes. The top of the road and berm is conceptually set at elevation 15.5 feet NAVD 88, approximately matching the height of the existing temporary K-rail and the berm at the County Sediment Basin. If necessary, the berm would be located to provide any required creek or wetland buffer.

- **Benefits:** A berm would provide a permanent flood reduction benefit and eliminate the seepage issues the K-rail has experienced and require less long-term maintenance and seasonal actions. While the berm slopes would be planted with native vegetation, the berm would not likely have significant ecological benefits due to its configuration and the access road.
- **Constraints:** A berm along Carneros Creek's south bank may send floodwaters north and potentially increase flooding to adjacent areas, including the existing maintenance yard south of Hollister Ave. and northwest of Carneros Creek, which has experienced flooding. Portions of the berm footprint are potentially jurisdictional wetland and may support sensitive plant species (southern tarplant) but are dominated by invasive grass (ripgut brome). A permanent berm may therefore have temporary and/or permanent habitat impacts; however, berm slopes supporting native vegetation could compensate for habitat impacts.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydrologic and hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. The potential need for habitat mitigation and jurisdictional wetland permitting would need to be evaluated. If federal wetlands are impacted it will require a Section 404 permit from USACE. The location near the creek could trigger the need for a Lake and Streambed Alteration Agreement depending on the location of the Ordinary

High-Water Mark. If this project's footprint is entirely within the City's LCP Jurisdiction, a CDP would need to be obtained from the City and the City's permit decision would be appealable to the CCC.

- **Cost:** Medium. A conceptual planning-level cost estimate of approximately \$4 million was prepared for this measure (see Appendix A).

Restore Wetland Floodplain North of Carneros Creek

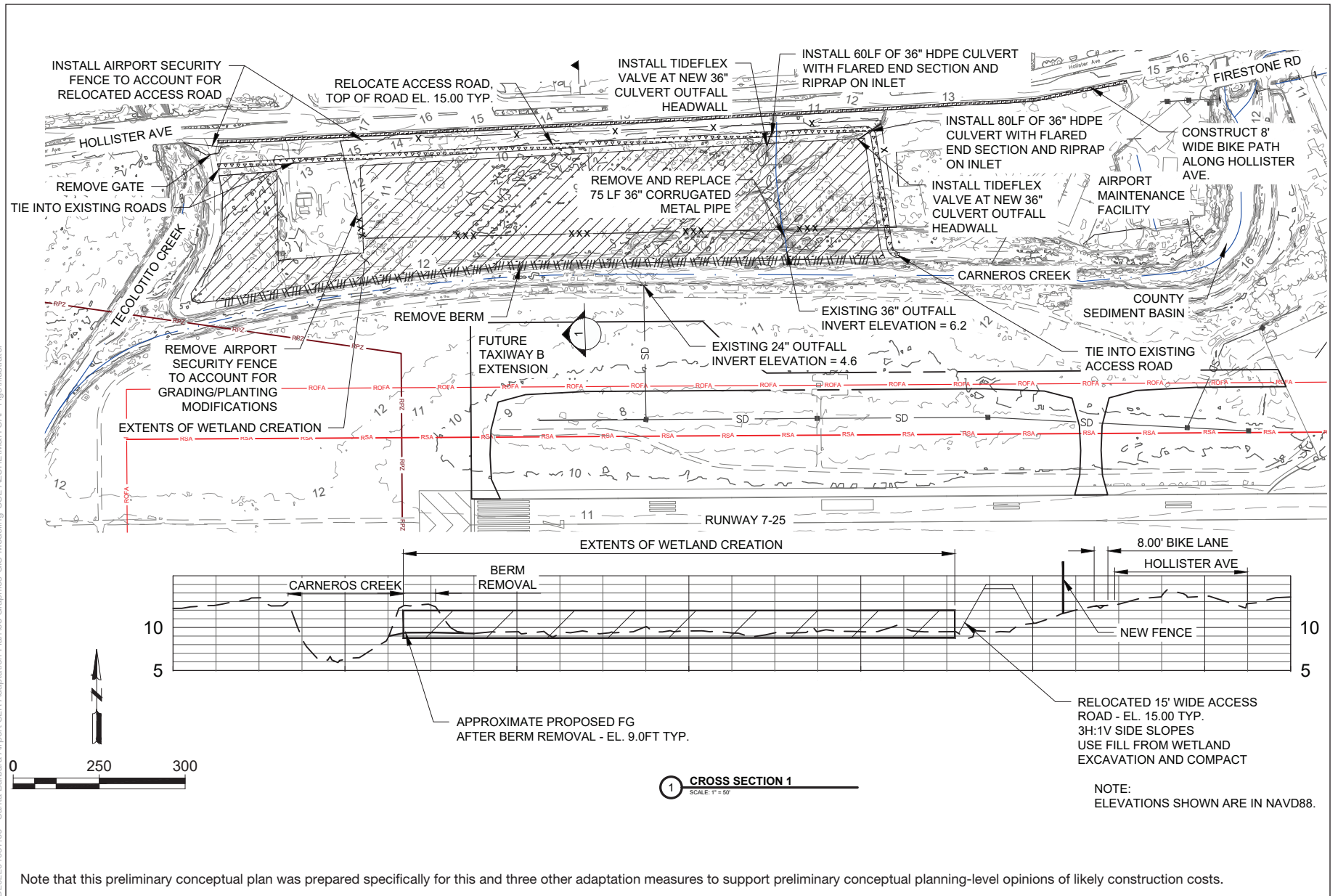
- **Description:** This adaptation measure would restore an area of riparian wetland floodplain between Carneros Creek and Hollister Ave., avoiding the FAA area (**Figure 18**). Restoration would require removing the berm and access road that is located along the north bank of Carneros Creek. As removing the berm could potentially increase flood risk to Hollister Ave., the berm may need to be reconstructed south of Hollister Ave. The existing maintenance road and fence could be relocated to the new berm south of Hollister Ave. A pedestrian and bike path along Hollister Ave. could also be incorporated into this adaptation measure. “Duck-bill” drainage valves (e.g., Tideflex Check Valves) may need to be installed on storm drain outlets on the south side of Hollister to address the potential for backwater flooding. The cost estimate for this measure includes the above components.

Restoring the wetland floodplain by removing the berm along the north bank of Carneros Creek will provide overbank storage of Carneros Creek floodwater and therefore would likely reduce airfield flooding. This creates approximately 13.4 acres of riparian wetland floodplain storage area. Grading and revegetation will be required to restore habitat in this area, taking into account restrictions on wildlife attractants. The project includes removing approximately 1,200 linear feet of existing berm along Carneros Creek, which is at an average elevation of 12 feet NAVD 88, by excavating the berm down to approximately 9 feet NAVD 88, which is 3 feet above the thalweg of Carneros Creek. The existing airport security fence will need to be removed and replaced for construction.

Note that adaptation measures for the area west of Tecolotito Creek (i.e., southeast of the Hollister Ave. and Los Carneros Rd. intersection) and removal/relocation of the maintenance yard are included as separate measures below. Adaptation measures for these areas include expanded wetland floodplain restoration and enhanced sediment management.

- **Benefits:** The restored floodplain would provide increased flood storage and conveyance, area for sediment deposition, and restored and enhanced wetland habitat. Benefits would depend on design details but might include increases in riparian habitat.
- **Constraints:** A portion of the floodplain area already serves as a stormwater detention overflow basin for the development on the north side of Hollister Ave. Hydrologic modeling would be required in future phases of planning to assess the effects that floodplain restoration may have on the existing stormwater detention facility. Hydrologic modeling would also need to be conducted to determine the downstream effects from floodplain restoration. Potential effects to sediment dynamics and sediment management would also need to be assessed.

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SOURCE: Mead & Hunt. 2026

Santa Barbara Airport SLR Adaptation Plan

Figure 18
Restore Wetland Floodplain North of Carneros Creek - DRAFT

- Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. This area includes prior mitigation areas (2002 Growing Solutions Restoration). More recent vegetation and habitat mapping (SBA GIS maps, Kevin Merk Associates 2023 Taxiway B (Formally H) Extension Project Biological Assessment) show opportunities for restoration as well as existing habitats that may be beneficial to avoid impacting, enhance, or restore elsewhere within the wetland floodplain restoration. If federal wetlands are impacted, it will require a Section 404 permit from USACE and since the work may occur in the creek then a 401 Certification through the RWQCB may be required if there is potential for discharge. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. Because the creek is within the CCC's retained permit jurisdiction and a CDP would need to be obtained directly from CCC. Depending on survey for listed species an Incidental Take Permit from CDFW and/or a Section 7 consultation with USFWS may be required. Depending on the setting a consultation regarding Essential Fish Habitat with NMFS may be required.
- Cost:** High. A conceptual planning-level cost estimate of approximately \$20 million was prepared for this measure (see Appendix A).

Restore Wetland Floodplain at the Confluence of Carneros and Tecolotito Creeks

- Description:** The wetland floodplain restoration described in the previous adaptation measure could be expanded to the area west of Tecolotito Creek (and southeast of the Hollister Ave. and Los Carneros Rd. intersection).
- Benefits:** The restored floodplain would provide increased flood storage and conveyance, area for sediment deposition, and restored and enhanced wetland habitat. Benefits would depend on design details but might include increases in riparian habitat.
- Constraints:** Hydrologic modeling would be required in future phases of planning to assess the effects that floodplain restoration and channel realignment may have on the channel downstream of the expanded floodplain. Potential effects to sediment dynamics and sediment management would also need to be assessed.
- Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. This area includes prior mitigation areas (2002 Growing Solutions Restoration). More recent vegetation and habitat mapping (SBA GIS maps, Kevin Merk Associates 2023 Taxiway H Extension Project Biological Assessment) show opportunities for restoration as well as existing habitats that may be beneficial to avoid impacting, enhance, or restore elsewhere within the wetland floodplain restoration. If federal wetlands are impacted, it will require a Section 404 permit from USACE and since the work will occur in the creek then a 401 Certification through the RWQCB may be required if there is potential for discharge. This location would likely trigger the need for a Lake and Streambed Alteration Agreement from CDFW. This project would be likely to bisect the City's LCP jurisdiction and the CCC's retained permit jurisdiction. A CDP would need to be

obtained from both the CCC and City unless the project sponsor requested permit consolidation. Depending on survey for listed species an Incidental Take Permit from CDFW and/or a Section 7 consultation with USFWS may be required. Depending on the setting a consultation regarding Essential Fish Habitat with NMFS may be required.

- **Cost:** High. Approximately \$10 million to \$20 million range based on the preliminary conceptual planning-level opinion of likely construction costs of approximately \$20 million for Carneros Creek Wetland Floodplain.

Restore Wetland Floodplain through Removal/Relocation of Maintenance Yard

- **Description:** The wetland floodplain restoration described in the previous two adaptation measures could be expanded with removal/relocation of the maintenance yard. As described in the 2017 Airport Master Plan, the Airport maintenance yard and associated buildings and equipment are located within the 100-year floodplain and will occasionally flood (Coffman Associates 2017). The alternatives described in the 2017 Master Plan consider moving the maintenance yard from its current location on the bank of Carneros Creek to new maintenance yard locations that are less susceptible to flooding. The relocation of the maintenance yard away from Carneros Creek could potentially provide space for additional flood and sediment management. Utilization of the maintenance yard area and the area west of Tecolotito Creek could provide expanded wetland floodplain restoration and enhanced sediment management (Figure 15, above).
- **Benefits:** Relocation of the maintenance yard provides an opportunity for channel realignment and expansion, which could reduce flooding risks. Benefits would depend on design details but might include increases in riparian habitat.
- **Constraints:** Relocation of the maintenance yard requires additional planning, coordination, and costs.
- **Permitting Considerations:** If federal wetlands are impacted, it will require a Section 404 permit from USACE and since the work may occur in the creek then a 401 Certification through the RWQCB may be required if there is potential for discharge. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This project would be likely to bisect the City's LCP jurisdiction and the CCC's retained permit jurisdiction. A CDP would need to be obtained from both the CCC and City unless the project sponsor requested permit consolidation. Depending on survey for listed species an Incidental Take Permit from CDFW and/or a Section 7 consultation with USFWS may be required. Depending on the setting a consultation regarding Essential Fish Habitat with NMFS may be required.
- **Cost:** High. Approximately \$10 million to \$50 million range based on the preliminary conceptual planning-level opinion of likely construction costs of approximately \$20 million for Carneros Creek Wetland Floodplain.

Carneros Creek Flood Detention Basin

- **Description:** This alternative would enhance and expand the existing wetland detention basin on the north side of Carneros Creek (Figure 16, above). This measure would function

by diverting high storm flows and suspended sediment from Carneros Creek through a water control structure and into the detention basin. Storm water stored in the detention basin would be discharged back to Carneros Creek after high flows recede. Water control structures could function passively by gravity drainage (e.g., culverts with gates) and/or a pump system could be used. As introducing more water to this area could potentially increase flood risks to Hollister Ave. and adjacent areas, a berm may need to be constructed south of Hollister Ave. Drainage control valves may need to be installed on drainage culverts out letting south of Hollister Ave. to prevent backwater flooding. A sedimentation basin could be constructed at the inlet to the detention basin to capture sediment that settles out from Carneros Creek inflow. Sediment could be periodically removed from the basin. Other areas could potentially be revegetated with riparian wetland.

- **Benefits:** Additional detention would provide increased flood storage and area for sediment deposition. Portions of the detention basin could be restored to wetland habitat. Benefits would depend on design details but might include increases in riparian habitat.
- **Constraints:** A portion of the floodplain area already serves as a stormwater detention overflow basin for the development on the north side of Hollister Ave. Hydrologic modeling would be required in future phases of planning to assess the effects that the expanded detention area may have on the existing stormwater detention facility. Hydrologic modeling would also need to be conducted to determine the downstream effects from detention basin expansion. Potential effects to sediment dynamics and sediment management would also need to be assessed. If substantial sediment accumulates in the basin, basin capacity could be reduced, and sediment removal may be desired to maintain capacity. This could limit the potential to support habitat in the detention basin.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. This area includes prior mitigation areas (2002 Growing Solutions Restoration). More recent vegetation and habitat mapping (SBA GIS maps, Kevin Merk Associates 2023 Taxiway B (Formally H) Extension Project Biological Assessment) show opportunities for restoration as well as existing habitats that may be beneficial to avoid impacting, enhance, or restore elsewhere within the detention basin. If federal wetlands are impacted, it will require a Section 404 permit from USACE and since the work may occur in the creek to connect to the detention basin then a 401 Certification through the RWQCB may be required if there is potential for discharge. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This project would be likely to bisect the City's LCP jurisdiction and the CCC's retained permit jurisdiction. A CDP would need to be obtained from both the CCC and City unless the project sponsor requested permit consolidation. Depending on survey for listed species an Incidental Take Permit from CDFW and/or a Section 7 consultation with USFWS may be required. Depending on the setting a consultation regarding Essential Fish Habitat with NMFS may be required.
- **Cost:** High. Approximately \$10 million to \$50 million range based on the preliminary conceptual planning-level opinion of likely construction costs of approximately \$20 million for Carneros Creek Wetland Floodplain.

6.1.1.2 Goleta Slough Channel and Wetland Management

This section includes a description of the following adaptation measures and their associated benefits, constraints, and permitting considerations:

- Remnant levee removal;
- Tidal restoration and flood storage; and
- Channel sediment management and wetland sediment augmentation

Remnant Levee Removal

- **Description:** Between Tecolotito Creek and the SBA runways, remnant levees have been breached to reconnect tidal wetlands to the creek channel. This alternative would remove the remnant levees (i.e., remove remnant levee fill) along the restored tidal areas to improve tidal connection and allow floodwater to spread into tidal basins more quickly than currently (**Figure 19**). The remnant levees could be lowered to near the elevation of the restored tidal wetlands and restored to vegetated wetland habitat or excavated to expand the open water Slough channel.
- **Benefits:** Removing remnant levees would improve flood conveyance, possibly lowering flood levels and reducing the frequency and duration of flooding in the AOA. Additionally, removing berms to improve tidal connection provides opportunities for restoring and enhancing tidal wetland habitat and improves habitat connectivity. Benefits would depend on design details but might include increases in area and function of salt marsh or open water habitat.
- **Constraints:** Prior mitigation has occurred on the north side of Tecolotito Creek, which this measure would modify. Hydrologic modeling would be required in future phases of planning to assess the effectiveness of removing the remnant levees on reducing flooding.
- **Permitting Considerations:** If federal wetlands are impacted, it will require a Section 404 permit from USACE and since the work may occur in a tidal creek then a 401 Certification through the RWQCB may be required if there is potential for discharge. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This project would be likely to be located in the CCC's retained permit jurisdiction and a CDP would need to be obtained from the CCC. Based on proximity to known Belding's savannah sparrow habitat, an Incidental Take Permit from CDFW is likely to be required. A Section 7 consultation with USFWS and a consultation regarding Essential Fish Habitat with NMFS may be required.
- **Cost:** Medium (approximately \$2 million to \$10 million range).

Tidal Restoration and Flood Storage

- **Description:** Several areas in Goleta Slough are disconnected from the main Tecolotito Creek channel by remnant levees. This alternative involves restoring tidal areas behind berms southwest of the Creek by either breaching or completely removing the remnant berms (**Figure 19**). The Goleta Slough Area Sea Level Rise and Management Plan (2015) identified the areas southwest of the Creek as significant opportunities for the creation and restoration of tidal wetland habitat by breaching the existing berms adjacent to the Creek. As

breaching or removing berms could potentially increase flood risk to adjacent developed areas, setback levees may need to be constructed to prevent flooding to those areas.

- **Benefits:** Breaching or removing remnant berms would likely improve flood conveyance, lowering flood levels and duration of flooding in the AOA. If a large-scale restoration effort were to occur that opened significant areas to tidal action, the Slough could shift towards more frequently open conditions (ESA 2015). When the Goleta Slough mouth is open, the Slough can drain more quickly following a storm event. Additionally, breaching and removing berms to reconnect tidal areas provides opportunities for enhanced tidal wetland habitat and improves habitat connectivity. Benefits would depend on design details but are expected to increase riparian and/or salt marsh habitat.
- **Constraints:** Prior mitigation has occurred in some of the areas south Tecolotito Creek. Hydrologic modeling would be required in future phases of planning to assess the effects that berm breaching, or removal may have on the existing mitigation areas.
- **Permitting Considerations:** If federal wetlands are impacted, it will require a Section 404 permit from USACE and since the work may occur in the creek then a 401 Certification through the RWQCB may be required if there is potential for discharge. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This project would be likely to bisect the City's LCP jurisdiction and the CCC's retained permit jurisdiction. A CDP would need to be obtained from both the CCC and City unless the project sponsor requested permit consolidation. Depending on survey for listed species an Incidental Take Permit from CDFW and/or a Section 7 consultation with USFWS may be required. Depending on the setting a consultation regarding Essential Fish Habitat with NMFS may be required.
- **Cost:** High (approximately \$10 million to \$50 million range)

Channel Sediment Management and Wetland Sediment Augmentation

- **Description:** As part of the CVARE, ESA performed a marsh habitat change analysis and habitat vulnerability assessment. Future habitat extents were mapped by relating tidal-marsh habitat types to inundation frequency, then adjusting the elevation ranges for each habitat type based on projected sea level rise and sediment accretion. The current and expected future extents of subtidal, mudflat, low marsh, mid marsh, high marsh, transition, and upland areas calculated in this assessment are shown in **Figure 20**. By 6.6 feet of sea level rise, subtidal and mudflat habitats are projected to expand substantially, while high marsh and transitional habitats are expected to decline because of limited upslope migration space, potentially affecting marsh plant communities, dependent wildlife, and water quality.

Goleta Slough channel sediment management and wetland sediment augmentation would involve excavating (e.g., dredging) sediment from the Goleta Slough channels to improve flood conveyance and spraying or similarly spreading excavated sediment on wetland areas. As described in *Towards Natural Shoreline Infrastructure to Manage Coastal Change in California* (Newkirk and others 2018) prepared by The Nature Conservancy, ESA, and others for California's Fourth Climate Change Assessment, sediment augmentation involves raising existing marsh elevations by placing a thin layer (e.g., 4 to 8 inches) of sediment so that marsh accretion can keep pace with sea level rise and existing vegetation and habitats can be maintained rather than being drowned out and converted to lower elevation mudflat and subtidal habitats with sea level rise. Sources of sediment can include beneficial re-use of dredged material from nearby channel dredging projects. The intent of sediment augmentation is for existing vegetation to grow through or re-seed in the placed sediment.

Sediment augmentation has been used in other coastal areas of the United States, including an experiment performed at Elkhorn Slough and a pilot project at the Seal Beach National Wildlife Refuge (NWR). The Seal Beach NWR pilot project included placement of approximately 8 inches of sediment to raise a vegetated marsh area. The Seal Beach NWR pilot project is described in detail in *Case Studies of Natural Shoreline Infrastructure in Coastal California: A Component of Identification of Natural Infrastructure Options for Adapting to Sea Level Rise* (California's Fourth Climate Change Assessment) (Judge et al. 2017). Generally, the results of experiments and pilot projects indicate that while there is an initial "drowning" of vegetation if the sediment layer is too thick, many marsh plants recover quickly and can benefit from the increased elevation (Raposa et al. 2020).

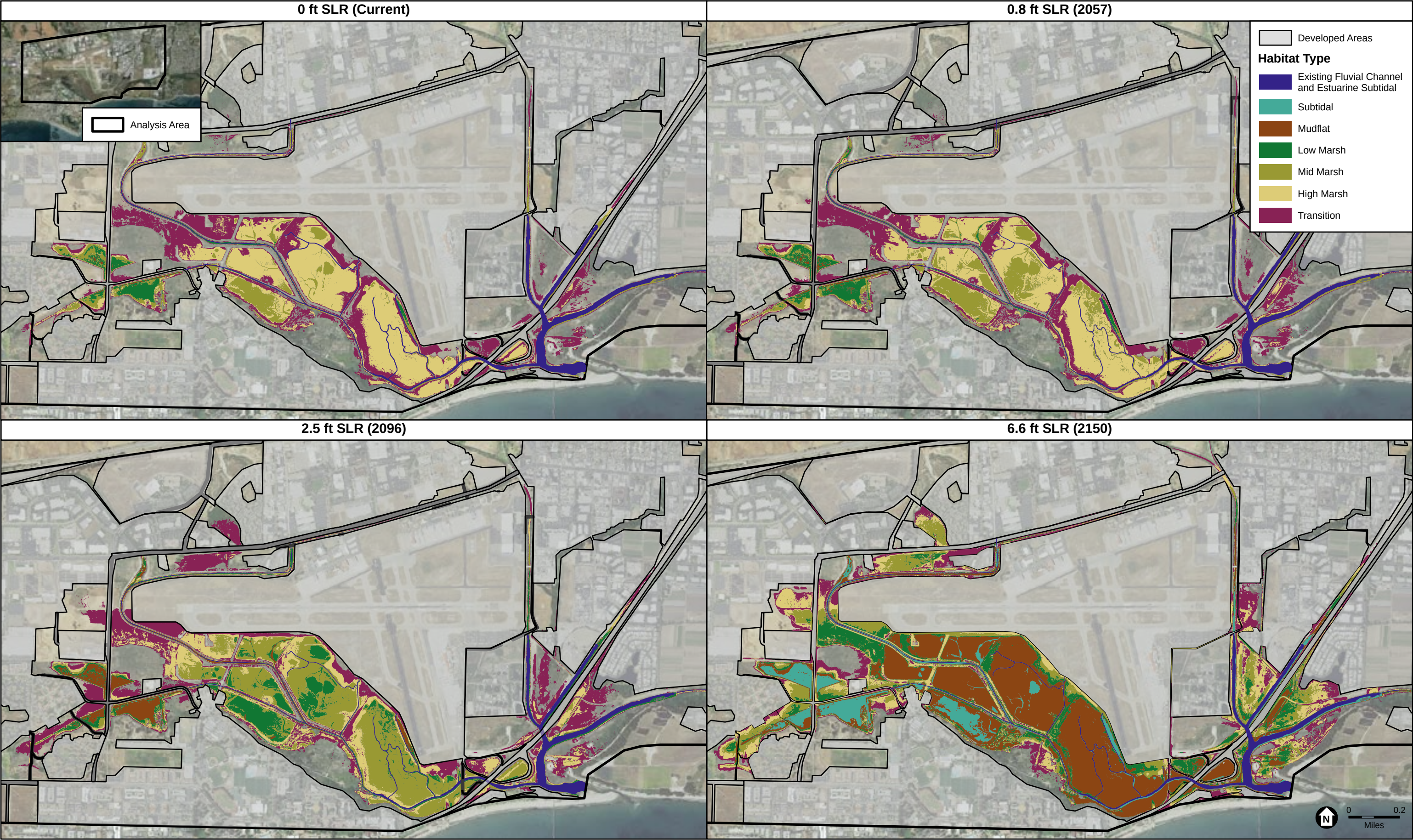
- **Benefits:** Sediment could be sourced from channel maintenance dredging, which would in turn reduce flooding by increasing flood conveyance. The placement of a thin layer of sediment could be a beneficial reuse of dredge material that aids marsh accretion to keep pace with sea level rise. Under proper conditions, added sediment may benefit marsh re-vegetation and increase marsh biomass (Raposa et al. 2020). Local beneficial reuse of dredged sediment would improve channel maintenance efficiency, sustainability, and cost-effectiveness.
- **Constraints:** Thin layer sediment placement is a new technique in California, though it has been implemented as a pilot project at the Seal Beach NWR and as an experiment at Elkhorn Slough. Pilot project success would need to be confirmed prior to large-scale

implementation at Goleta Slough. The availability and quality of sediment sources is an additional constraint. Sediment placement may compete with the benefit of additional flood storage volume in the Slough.

- **Permitting Considerations:** This would result in impacts via fill and discharge to both federal and state waters and wetlands. Therefore, this will require Section 404 and Section 10 permits from USACE along with a 401 Certification through the RWQCB. A Lake and Streambed Alteration Agreement will be required. This project would be likely to be located in the CCC's retained permit jurisdiction and a CDP would need to be obtained from the CCC. This project would likely require SLC leases. Depending on the exact location, an Incidental Take Permit from CDFW may be required. It is likely that a Section 7 consultation with USFWS and a consultation regarding Essential Fish Habitat with NMFS will be required.
- **Cost:** Medium (approximately \$2 million to \$10 million range) for each significant cycle of channel dredging and placement of sediment for wetland sediment augmentation.

6.1.1.3 Goleta Slough Mouth Management

Water levels in Goleta Slough are controlled by the presence and elevation of the beach berm at the inlet mouth at Goleta Beach (ESA 2015). Under natural conditions, the mouth seasonally cycles between open and closed inlet conditions. During summer months, when wave energy is significantly reduced, the beach accumulates sediment, building up and naturally closing the slough inlet. When the inlet mouth is closed, wave overtopping and creek inflows fill the slough. At a certain point, usually during a rainfall event, the water level of the slough overtops the berm, and the inlet breaches. As this happens, the breach scours a channel through the berm, opening up the mouth to tidal influences. As the streamflow lessens and sand reaccumulates, a sill forms that limits tidal effects. Over time this sill builds up, once again closing the inlet mouth, and the cycle repeats.



SOURCE: ESRI, CARI, SFEI, NOAA, ESA, 2024

Figure 20
Habitat Change with a 3.5 mm/yr Accretion Rate and 0, 0.8, 2.5, and 6.6 ft SLR

Closure of the slough mouth for extended periods of time can cause local flooding, fish kills, and provide habitat for mosquito breeding that impacts public health. Therefore, prior to 2012, Flood Control regularly breached the berm at the slough mouth within two weeks of mouth closure.

This practice was discontinued after 2012 when NMFS guidance regarding lagoon mouth breaching at Goleta Slough changed and County Flood Control stopped routine mechanical breaching in response. Emergency permits are now required for any mechanical breach of the mouth inlet. Since this change in mouth management, there has been a significant increase in migratory waterfowl such as Mallards, Canada Geese, Double-Crested Cormorants, and Great Blue Heron, potentially posing a hazard to airport operations. Santa Barbara County Vector Control also reported a hundredfold rise in mosquito population (Rincon 2015).

Emergency permits have been used to breach the slough mouth on three occasions. In fall 2012, the slough mouth was breached under emergency permit ahead of winter storms. In February 2014, water levels rapidly rose in the slough during a storm event, posing a flood risk to SBA, and the slough mouth was breached under emergency permit. Again, in December 2014, the mouth was breached with an emergency permit to abate flood risk caused by rapidly rising slough water levels in a precipitation event. In addition to the breaching, an attempt was made to siphon water out of the slough in May 2013 under an emergency permit, due to a large number of geese in Goleta Slough causing dangerous conditions for airport takeoffs and landings. Although a slow process, ultimately lagoon water levels lowered enough that the geese left Goleta Slough and the airport could operate more safely (Andrew Bermond, pers. comm. 2025); however, the siphon discharge pipe was subsequently damaged by waves and removed. In 2017, the last time the mouth was managed, the berm was lowered but not breached under an emergency permit to reduce potential environmental impacts including potential wildlife stranding due to draining the slough.

In 2015, SBA submitted a Biological Assessment (BA) to the USACE and NMFS which proposed maintenance strategies to address prolonged Goleta Slough mouth closure. The proposed strategies included mechanical breach of the slough mouth and siphon/pumping. Mechanical breaching was proposed when the WSE rises to 6.5 feet or greater between October 15 and March 30. Siphoning or pumping water from the slough and discharging to the Pacific Ocean was proposed at a slow rate of approximately 1.5 to 2 inches per day (Rincon, 2015). At that time, SBA did not move forward with the options set forth in the BA (Andrew Bermond, pers. comm. 2025). However, siphoning/pumping could be evaluated as part of the future feasibility and effectiveness study.

This section includes a description of the following adaptation measures and their associated benefits, constraints, and permitting considerations:

- Beach berm priming;
- Beach berm breaching; and
- Siphoning

Beach Berm Priming

- **Description:** Beach berm priming is a management technique in which the sand berm at the slough mouth is mechanically graded to lower the berm elevation prior to natural breaching. This pre-conditioning decreases the water surface elevation threshold required for the slough to fill, overtop the beach berm, scour a channel, and reconnect with the ocean, allowing smaller storm events or tidal forces to initiate mouth opening. The approach is intended to mimic natural breaching processes to reduce flood risk without fully mechanically breaching the slough mouth. Ormond Lagoon in Ventura County is an example of a lagoon system that is currently permitted for berm priming (VCWPD 2016).
- **Benefits:** High water levels during non-tidal conditions can control vegetation if the inundation lasts for months, for example by shifting wetland vegetation from salt marsh to brackish and freshwater marsh vegetation. Lowering the high ponded water levels could have benefits for salt marsh plants, invertebrates and other wildlife. This could also reduce the persistence of open water habitat that is present during closed mouth conditions and can support larger waterfowl. This could therefore reduce the risk of bird airstrike hazards.
- **Constraints:** Beach priming requires semi-regular maintenance and permitting. After priming, the beach berm may rebuild to higher elevations, requiring additional grading. Grading must be timed to occur before storms and during suitable tide conditions. High tides and large waves can interrupt or prevent safe equipment operations, which may make it infeasible to prime the breach before some storm events.
- **Permitting Considerations:** If federal wetlands are impacted, it will require a Section 404 permit from USACE. A Section 10 permit may also be required if the work takes place in a navigable water body. Since the work will occur in a tidal creek then a 401 Certification through the RWQCB may be required. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This project would be likely to bisect the City's LCP jurisdiction, the County's LCP jurisdiction and the CCC's retained permit jurisdiction. A CDP would need to be obtained from both the CCC, County and City, unless the project sponsor requested permit consolidation. This project would likely require SLC leases. Based on the previous finding in the City's Goleta Slough Mouth Management Biological Assessment, there is potential for impacts to listed fish species and therefore an Incidental Take Permit from CDFW and/or a Section 7 consultation with USFWS and NMFS will be required.
- **Cost:** Low (less than approximately \$2 million) for each breach priming action.

Beach Berm Breaching

- **Description:** The Goleta Slough mouth could be periodically breached when water levels reach a threshold that poses flooding risk or ecological concern. As described previously, County Flood Control historically conducted routine breaching within two weeks of mouth closure, but this practice was discontinued after the permit expired in 2012. Reestablishing a permitted breaching program would be consistent with approaches used at similar systems. For example, San Lorenzo River Lagoon, which is also a steelhead creek like Goleta Slough, is permitted for managed berm breaching (CCC 2021).

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- **Benefits:** If breach management can maintain the system in tidal conditions for a significantly greater portion of the year, there would be benefits for salt marsh species, their habitat and ecological functions. There might be water quality benefits as well.
 - **Constraints:** see Beach Berm Priming above as constraints for breaching are similar.
 - **Permitting Considerations:** See Beach Berm Priming above as permitting considerations for breaching are similar.
 - **Cost:** Low (less than approximately \$2 million) for each breach action.

Siphon

- **Description:** During closed slough mouth conditions, a siphon would convey water from the slough to the ocean through a pipe by gravity when the water surface elevation of the ocean is lower than the slough, driven by a difference in water surface elevation without continuous pumping (**Figure 21**). Other projects in intermittently open/closed lagoon systems have considered the implementation of a culvert and pipe lagoon discharge system, including the implemented siphon system in the San Lorenzo River Lagoon in Santa Cruz, which like Goleta Slough is a steelhead creek. This approximately \$2.5 million project features an experimental below-grade infiltration gallery intended to extract saltwater from the bottom of the lagoon without disturbing lagoon fauna.

At the Goleta Slough mouth, the siphon discharge pipe could potentially be positioned below the Goleta Beach pier. This could allow for the pipe outlet to extend further offshore, reducing the potential for sand and debris to enter and effect the pipe and potential visual impacts to beachgoers.

- **Benefits:** Lowering water levels during lagoon closure would reduce the risk of flooding during lagoon closure, for example in the fall when the beach berm and non-stormwater levels can be higher. Draining channel bottom water with low dissolved oxygen could benefit water quality. High water levels during non-tidal conditions can control vegetation if the inundation lasts for months, for example by shifting wetland vegetation from salt marsh to brackish and freshwater marsh vegetation. Lowering the high ponded water levels could have benefits for salt marsh plants, invertebrates and other wildlife. This could also reduce habitat for waterfowl, which could reduce the risk of bird airstrike hazards.
- **Constraints:** A siphon may not significantly reduce the risk of upstream creek flooding during rainfall runoff storm events and therefore may be a more effective flood risk reduction measure in the mid-term, when sea level rise is projected to increase the flood risk due to higher closed lagoon water levels during non-storm conditions. Some key considerations in project design include reducing potential visual and aesthetic impacts, fish entrainment, and the effects of discharge on beachgoers. The system will be subject to buoyancy, current, impact, debris, and wave loads. The system will also require regular maintenance.

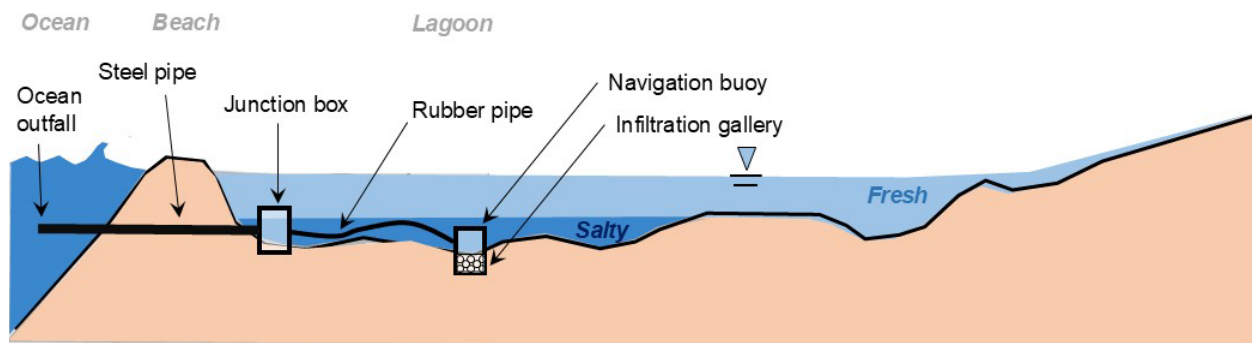


Figure 21. Potential Siphon System at Goleta Slough Mouth

- Permitting Considerations:** Regulatory agencies involved in the permitting of the San Lorenzo River Lagoon project, and likely to be involved in the implementation of this adaptation measure, include the USACE (Section 10 and Section 404), RWQCB (401 Certification), CDFW (Lake and Streambed Alternative Agreement and Incidental Take Permit), and the CCC. With Tidewater goby being present and the potential for steelhead, consultations with USFWS (Section 7) and NMFS (EFH) are likely. Habitat mitigation may be required depending on the approach to install the pipe and the location of the pipe. This project would also likely require SLC leases.
- Cost:** Medium (approximately \$2 million to \$10 million range)

6.1.1.4 San Pedro Creek Flood Management and Stormwater Detention Basin

This section includes a description of the following adaptation measures and their associated benefits, constraints, and permitting considerations:

- Construct a detention basin; and
- Raised bank/berm and/or temporary flood barrier

Detention Basin

- **Description:** A detention basin could be constructed between San Pedro Creek and existing development upstream of Hollister Ave (**Figure 22**). The detention basin would divert and detain stormwater from San Pedro Creek to reduce downstream flooding. The detention basin could also be used for sediment management.



Figure 22. Potential San Pedro Creek Stormwater Detention Basin

- **Benefits:** A detention basin is considered more effective than floodplain restoration in this location, as floodplain restoration would likely not have as great of a flood benefit downstream of the Hollister Ave. bridge. Hydrologic modeling would be necessary to confirm flood reduction benefits. Habitat benefits will depend on design details including topography, depth to ground water, ponding duration, and vegetation.
- **Constraints:** If the detention basin is managed for sediment, it may require occasional mechanical disturbance, and the ecological benefits will be constrained.

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- **Permitting Considerations:** If federal wetlands are impacted, it will require a Section 404 and permit from USACE. A Section 10 permit may also be required if the work takes place in a navigable water body. Since the work will occur in a creek then a 401 Certification through the RWQCB may be required. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This work would take place outside of the Coastal Zone and therefore a CDP would not be required.
 - **Cost:** High (approximately \$10 million to \$50 million range)

Raised Bank/Berm and/or Temporary Flood Barrier

- **Description:** Raising the banks, constructing a berm, and/or installing temporary flood barriers such as K-rail along San Pedro Creek downstream of Hollister Ave. would assist in confining storm flows to the creek and prevent flooding of adjacent areas of the AOA.
- **Benefits:** This measure could reduce flooding from San Pedro Creek onto the northeastern corner of SBA. Temporary flood barriers could provide an interim solution.
- **Constraints:** Raising the banks and constructing berms could result in increased flood levels in other adjacent areas and/or permanent impacts to adjacent habitat.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydrologic and hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. If federal wetlands are impacted, it will require a Section 404 and permit from USACE. A Section 10 permit may also be required if the work takes place in a navigable water body. Since the work will occur in a creek then a 401 Certification through the RWQCB may be required. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This work would take place outside of the Coastal Zone and therefore a CDP would not be required.
- **Cost:** Medium (approximately \$2 million to \$10 million range)

Floodplain Restoration near Historic Hangars

- **Description:** In the northeastern corner of the Airport, a portion of the area south of the historic hangars and north of the parking lot that is prone to flooding from San Pedro Creek could be restored to riparian floodplain habitat. A berm could be constructed around the floodplain restoration. Public access could potentially be provided around the restored floodplain and historic hangars; however, this would likely involve moving the Airport fence and providing a new entrance from Firestone Road.
- **Benefits:** This measure could reduce localized flooding from San Pedro Creek onto the northeastern corner of SBA and could provide ecological benefits.
- **Constraints:** This measure would likely need to be coordinated with use and access to the historic hangars and Flood Control's management of the San Pedro Creek channel.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydrologic and hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does

provide an equivalent amount of floodplain storage. If federal wetlands are impacted, it will require a Section 404 and permit from USACE. A Section 10 permit may also be required if the work takes place in a navigable water body. Since the work will occur in a creek then a 401 Certification through the RWQCB may be required. This location would likely trigger the need for a Lake and Streambed Alteration Agreement. This work would take place outside of the Coastal Zone and therefore a CDP would not be required.

- **Cost:** Medium (approximately \$2 million to \$10 million range)

6.1.2 Near-Term Onsite Measures – AOA

The CAP identifies and evaluates the following onsite near-term AOA adaptation measures.

6.1.2.1 Firestone Road Drainage Channel Flood Management

Firestone Road borders the Airport on the north and travels east to west, south of Hollister Avenue. Firestone Drainage Channel is located on the north side of Firestone Road, between Firestone Road and Hollister Avenue. The drainage channel conveys offsite flows from north of the Airport westward and discharges into Carneros Creek via dual 5-foot by 5-foot concrete box culverts (**Figure 23**). Directly west and upstream of the Firestone Drainage Channel discharge culverts, Carneros Creek crosses southward under two bridges at Hollister Avenue and Firestone Road.



Figure 23. Firestone Road Drainage Channel Box Culverts under Firestone Road at Outlet to Carneros Creek

Water levels in Carneros Creek are high during storm events and restrict the discharge from Firestone Drainage Channel. During large storm events, most recently in December 2025 and January 2026, water from Carneros Creek was observed to overtop Firestone Road. Airport staff noted that Firestone Drainage Channel also overtopped the road and was joined by floodwater from Carneros Creek, which led to overtopping of the Firestone Drainage Channel banks at Firestone Road. The water flowed onto the airfield via Arnold Place, Burns Place, and Cook Place. The Airport has a temporary flood barrier that is placed along Firestone Road when storm events are anticipated (see Section 5.2). This flood barrier is 2,000 linear feet of an 18-inch-tall, water-filled bladder Tiger Dam, aiming to prevent water from Firestone Drainage Channel from spilling over Firestone Road.

This section includes a description of the following adaptation measures and their associated benefits, constraints, and permitting considerations:

- Firestone drainage channel maintenance to improve channel conveyance;
- Floodwall at Carneros Creek bridge;

- Extending K-rail along Carneros Creek up to Firestone Road or adding additional K-rail in the vicinity of Firestone Road; and
- Firestone overflow storage basin.

Firestone Drainage Channel Maintenance to Improve Channel Conveyance

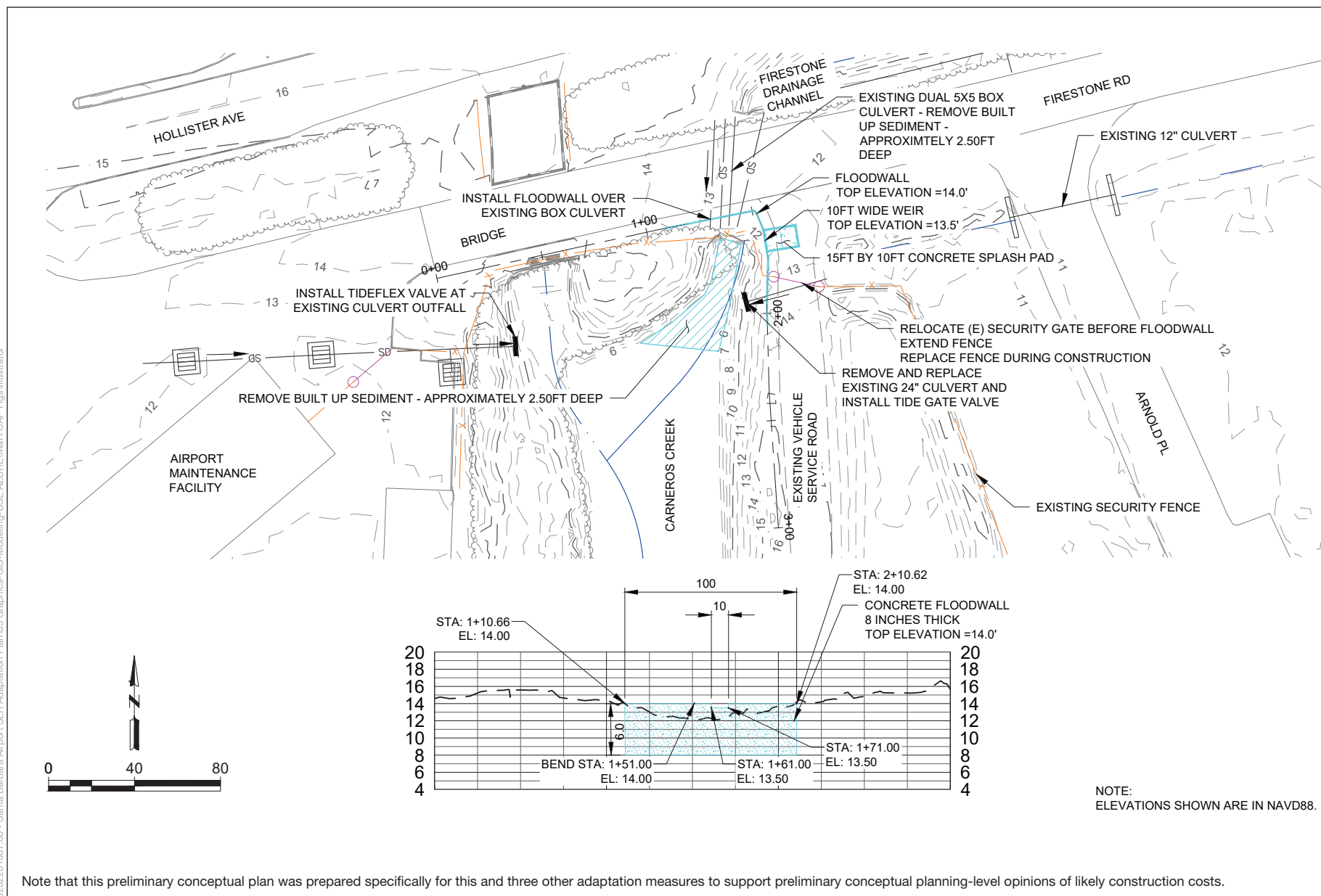
- **Description:** Firestone Drainage Channel has extensive vegetation along the channel banks that reduces conveyance capacity. SBA recently received permits for channel maintenance including roadside vegetation trimming, mowing, and channel bottom vegetation trimming (see Section 5.3 and as shown in Figure 11). The currently permitted maintenance is to maintain hydraulic function of the channel, clear overgrown vegetation on roads, and allow safe passage for pedestrians and cyclists.

This CAP's Firestone Drainage Channel maintenance adaptation measure would be to clear vegetation and further maintain the drainage channel to its design conditions to improve conveyance capacity.

- **Benefits:** Maintaining the drainage channel by removing vegetation and sediment would improve the conveyance capacity of Firestone Drainage Channel during storms.
- **Constraints:** The benefits of the maintenance may be limited at such times when Carneros Creek is in flood stage and impedes Firestone Drainage Channel from draining.
- **Permitting Considerations:** The western portion of the Firestone Drainage Channel is the prior Firestone Drainage Mitigation (see Figure 10). Clearing vegetation would likely require regulatory permits, additional coordination with regulatory agencies, and relocating the existing Firestone Drainage Mitigation. This process could significantly increase the complexity of regulatory permitting and mitigation as discussed in Section 3.4.1.1. Environmental mitigation may also be required due to existing Endangered Species Act-listed species in Firestone Drainage Channel. Impacting the vegetation will require coordination with USACE, CDFW, and RWQCB to determine if there are impacts to jurisdictional wetlands. Drainage channel maintenance would also require a CDP from the City of Santa Barbara.
- **Cost:** Medium (approximately \$2 million to \$10 million range) considering potential mitigation

Floodwall at Carneros Creek Bridge

- **Description:** The bridge over Carneros Creek is adjacent to a low point on Firestone Road. During recent storms, videos captured by Airport staff showed water overtopping the creek bank near the bridge and flowing down Firestone Road toward Arnold Place. To address this issue, a short floodwall is proposed at the low point near the bridge, as shown in **Figure 24**.



Note that this preliminary conceptual plan was prepared specifically for this and three other adaptation measures to support preliminary conceptual planning-level opinions of likely construction costs.

SOURCE: Mead & Hunt. 2026

Santa Barbara Airport SLR Adaptation Plan

Figure 24
Floodwall at Carneros Creek and Firestone Road - DRAFT

The proposed floodwall along the eastern bank of Carneros Creek at Firestone Road would serve as a localized flood barrier to reduce overtopping and help protect the airfield from flooding. The concept developed for cost estimating sets the top of the wall at elevation 14 feet NAVD 88, providing flood protection without affecting the bridge or traffic along Firestone Road. This measure as shown in Figure 24 includes an option for a 10-foot-wide cutout in the floodwall, set at elevation 13.5 NAVD 88, which could provide an outlet that conveys potential overtopping of the floodwall during high flow events. This option could reduce flood overtopping at this low point but still allow some overtopping during flood events. This could potentially avoid or offset increasing flood overtopping at other low points, including at the Carneros Creek bridge. The flood wall is not set to the elevation of the downstream perimeter road at 15.5 feet NAVD 88 because water levels higher than 14 NAVD 88 would overtop the Firestone Road bridge at Carneros Creek and flood Firestone Road and adjacent areas from behind the proposed floodwall and the perimeter road. Note that this option and other options would need to be analyzed further in future phases of adaptation to refine and detail the concept and design for this adaptation measure. Another option may be to extend, raise, and install flood walls along both sides of Firestone Road.

In addition to the floodwall, it is suggested that sedimentation in the box culverts and downstream in the channel be removed. Hydraulic modeling should be performed to further develop this measure, including evaluating whether backflow from Carneros Creek through the culvert is an issue. If backflow is determined to be an issue, an externally mounted tide gate or other drainage valve could potentially be installed at the culvert outlet south of Firestone Road to avoid increased flood levels in the Firestone Drainage Channel, however further studies should evaluate the re-accumulation of sediment and its potential effect on tide gate or drainage valve function.

For cost estimating, the wall was assumed to be concrete and sized at 6 feet deep, 100 feet long, and 8 inches thick. Construction would require relocation of the existing airport security fence and gate along the vehicle service road. The existing dual 5-foot by 5-foot box culvert would remain in place, and the floodwall footing would need to be designed around it. The sediment removal was estimated to be a 2.5-foot depth. It is recommended that the sediment removal be completed in conjunction with sediment removal from the sediment basin.

Note that the Airport is planning to install K-rail with a fence on top near this low spot as a temporary measure. The floodwall would likely be integrated with or replace the K-rail and fence.

- **Benefits:** The floodwall will reduce the potential of the creek overtopping onto the road up to a water surface elevation of 13.5 feet NAVD 88.
- **Constraints:** Construction of the floodwall must be designed so as to not impact the existing dual 5-foot by 5-foot box culvert between Firestone Drainage Channel and Carneros Creek. Tide gates for the dual box culverts may have operational issues due to sedimentation at the culverts and may require frequent maintenance. The maintenance yard south of Hollister Ave. and northwest of Carneros Creek has also experienced flooding. The floodwall could potentially make flooding of the maintenance yard more extensive.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydrologic and hydraulic modeling and permitting is required to

confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage.

- **Cost:** Low. A conceptual planning-level cost estimate of approximately \$830,000 was prepared for this measure (see Appendix A).

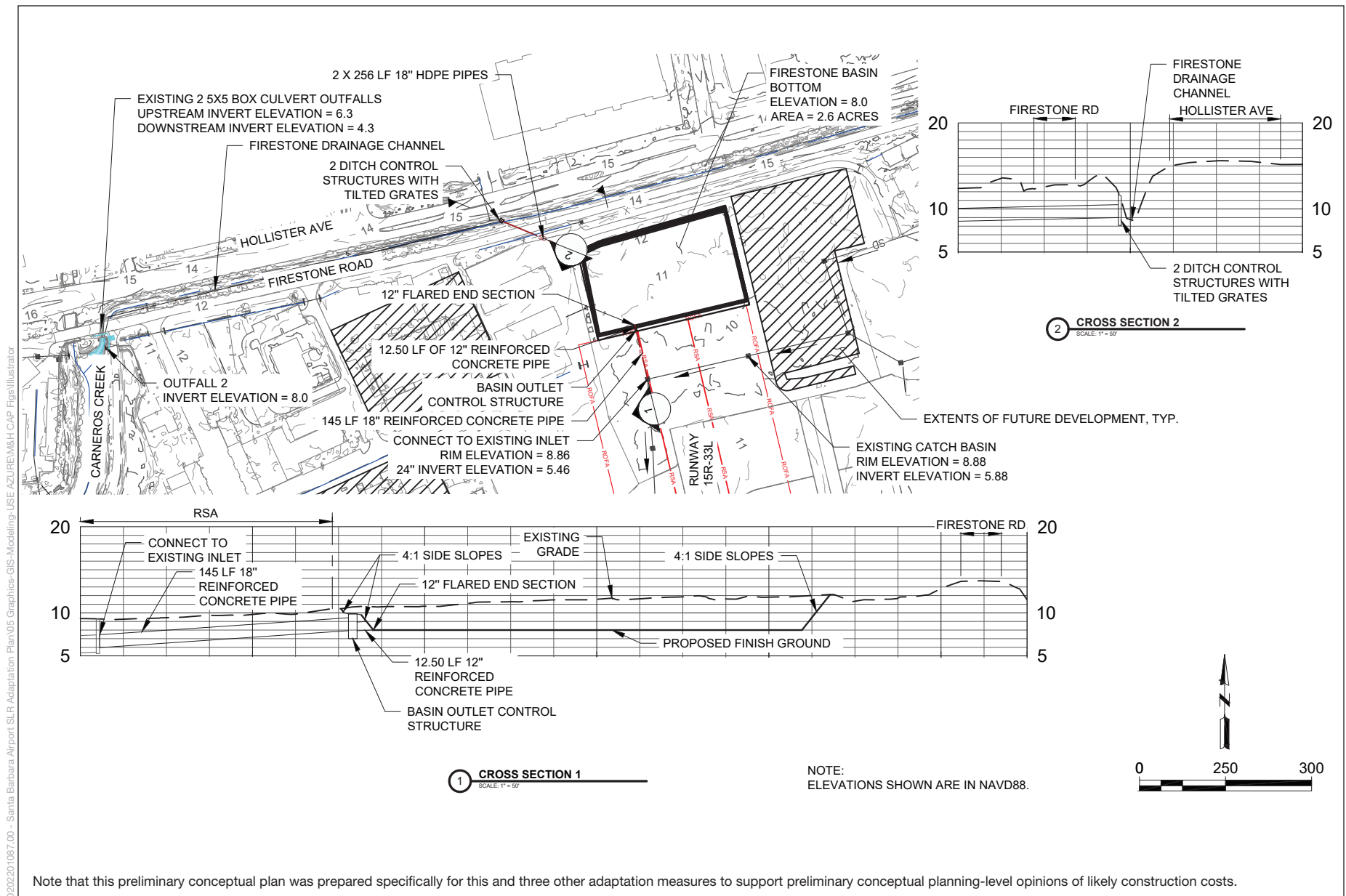
Extending K-Rail along Carneros Creek up to Firestone Road or Adding Additional K-Rail in the Vicinity of Firestone Road

- **Description:** The Airport installed a temporary flood barrier along a low portion of the south bank of Carneros Creek from the creek's confluence with Tecolotito Creek near the northwest corner of the airfield upstream to the County Sediment Basin. The temporary flood barrier was constructed of K-rail that was 32 inches in height. This measure would extend the temporary barrier to Firestone Road as a temporary alternative and/or extension of the floodwall measure discussed above.
- **Benefits:** There is already a K-rail along the southern bank of Carneros Creek on the north airfield side. During the January 2026 storm, the K-rail likely reduced the amount of water that overtopped the banks of Carneros Creek from reaching the airfield. Extending or adding K-rail may further reduce flooding.
- **Constraints:** The K-rail was tested during the January 2026 storm and revealed necessary improvements. The K-rail should be fortified by either sandbags or mortar/dry pack at the forklift points and joints to protect against erosion. New K-rail will need to be placed all the way upstream to Firestone Road to prevent water from going around the upstream end of the barrier or at least placed along the Carneros Creek bank's localized low point near Firestone Road.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydrologic and hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. If K-rail is placed in non-wetlands, no other permitting may be required.
- **Cost:** Low (less than approximately \$2 million).

Firestone Overflow Storage Basin

- **Description:** There is available space north of Runway 15R-33L to excavate an overflow storage basin to capture excess flows from the Firestone Drainage Channel, as shown in **Figure 25**. The overflow storage basin as shown in this concept figure is located outside of the RSA to avoid FAA grading restrictions. This area outside of the RSA for the proposed basin would only have vertical restrictions above ground in the airspace but would not restrict grades or grading below the existing grade. The depth of the basin is based on the potential ground water and the connection to the existing storm drainage network. An alternative to excavating an overflow storage basin could be to additionally remove sections of the road that are not necessary for airport access. The area where the road is removed could be used for additional flood storage.

As an alternative, the basin could be designed as underground detention; however, that option would require detailed analysis of the buoyancy effects of seasonal groundwater on the underground infrastructure. The basin could also be designed as a gravel-filled storage basin; however, gravel fill would reduce the storage volume.



SOURCE: Mead & Hunt. 2026

Santa Barbara Airport SLR Adaptation Plan

Figure 25
Firestone Overflow Storage Basin - DRAFT

The proposed Firestone Overflow Storage Basin would store a portion of elevated flows from the Firestone Drainage Channel that might otherwise spill over Firestone Road and onto the airfield. Hydrologic and hydraulic modeling will be needed to evaluate the measure's effectiveness and determine its storage capacity, as well as the location, elevation, and size of the inlet structure. Conceptually, overflow water would enter through an inlet control structure in the Firestone Drainage Channel with a tilted grate set high enough to allow normal flows to remain in the existing channel, but low enough to capture overflow from Carneros Creek before water levels reach or overtop Firestone Road. For cost estimating, the concept assumes two 2-foot by 2-foot grated inlets connected to the Firestone Basin by an 18-inch-diameter pipe. The basin is assumed to have a bottom elevation of 8 feet NAVD 88 and side slopes of 4 horizontal to 1 vertical, with a footprint located outside the runway safety area and future development areas. Near the southwest corner of the pond an outlet structure would be constructed with a flared end structure (FES) connected to a 12" pipe for lower flows, the top of the outlet structure would be around 1 foot below the top of the basin elevation and would have a grated top for overflows. The top of the structure would not exceed existing RSA elevations and would meet FAA requirements. The top of the structure would not exceed existing RSA elevations and would meet FAA requirements. Because the existing storm drain system is restricted during peak storms by tailwater in Goleta Slough, modeling may show that the basin cannot drain within 48 hours, as required by FAA criteria. If so, a pump system may be needed, although modifications to the pipe network to accommodate a pump were not included in the cost estimate. In addition, because the basin is located in an area that may experience increased groundwater emergence with sea level rise, a groundwater study will be needed to determine whether this storage basin is feasible.

- **Benefits:** This basin would contain some excess overflows from Firestone Drainage Channel in a designed storage basin to reduce the potential for overtopping of Firestone Road and to reduce the potential for stormwater encroachment of airfield pavements. The basin provides an area for some of the stormwater from Firestone Drainage Channel to temporarily pond, thus reducing the potential of the channel overtopping Firestone Road and flooding the airfield.
- **Constraints:** This area will require hydrologic and hydraulic modeling to evaluate if the basin has enough capacity to provide benefit to the Airport. Additionally, runoff from the existing GA apron into the basin, as well as future development adjacent to the area, could lead to an increase in runoff volume that could surpass the capacity of the basin. Due to the proximity to the Runway, grades will need to be designed to be within the slope requirements of the RSA. Modeling will be required to design the system's inlet structure at Firestone Drainage Channel and the facility's outlet control structure that would release water into the existing Airport storm system. The existing Airport storm system has limited capacity when water levels are high in Goleta Slough, causing high tailwater conditions for the system outfall. If the basin overtops, it will contribute to flooding of adjacent runways and GA aprons. Depending on the results of analysis and design, the basin may need to be pumped out if stormwater cannot be drawn down within 48 hours, as required to meet FAA standards. This area is also mapped as having high potential for groundwater emergence

with future sea level rise. Evaluation of groundwater trends in the area should be undertaken.

- **Permitting Considerations:** Coordination will be needed with various agencies to construct the inlet structure in Firestone Drainage Channel. These agencies may include USACE, RWQCB, CDFW, and CCC.
- **Cost:** Medium. A conceptual planning-level cost estimate of approximately \$3.8 million was prepared for this measure (see Appendix A).

6.1.2.2 Raise Grades Above Groundwater in Low Areas

Description: As sea level rise increases, groundwater emergence is expected to expand. There are already very shallow depths to groundwater across the Airport. A recommended next step to this CAP is to perform a site-wide groundwater monitoring study, which will help inform future Airport infrastructure planning and flood management. This section includes a description of raising grades in low areas to address groundwater management.

- For low areas that are not paved, this measure may include regrading. For areas like the northern end of Runway 15R-33L, incremental pavement elevation increases were considered. Incrementally raising pavement elevations up to 6 inches at a time during planned pavement restoration projects may be feasible and may help reduce pavement inundation in the short term. However, changes in grade to paved airplane travel paths would need to consider FAA requirements at all connection points. This measure would require careful planning and analysis of locations where pavement grades would taper in to match existing grades and maintain compliance. Additionally, this measure may need to be evaluated for impacts to the floodplain or floodway.
- **Benefits:** Raising grades in low areas increases the depth to groundwater, limiting the potential for groundwater emergence. This measure may be able to be implemented with other Capital Improvement Projects or runway pavement maintenance.
- **Constraints:** Raising grades can be challenging while meeting FAA requirements for grading primarily due to maintaining acceptable grades at the tie-in locations where raised pavement meets the existing pavement. Extensive planning needs to be completed to ensure that changes will not cause unacceptable grades at the taxiway and apron connectors. Raising the runway more than 6 inches would likely require replacing pavement and redesign of the runway shoulders and RSA area. The FAA requires minimum slopes, typically ranging from 1.5% and 5.0%, within runway and taxiway safety areas. In general, backslopes are not recommended within object free areas. If grades are raised in unpaved areas adjacent to paved areas (e.g., drainage areas), this measure would also likely decrease the potential quality of habitat for wetland species and benefit upland species.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydrologic and hydraulic modeling and permitting must be conducted to provide a complete project that does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. Permitting will depend on the location of the grading and if it impacts jurisdictional wetlands.
- **Cost:** Medium (approximately \$2 million to \$10 million range).

6.1.2.3 Storm Drainage Improvements

The existing storm drain network has limited capacity to drain the airfield when water levels are high in the receiving creeks and slough. This section includes a description of the following adaptation measures to improve the function of the storm drain network:

- Convert storm drain networks into a pumped system; and
- Construct stormwater detention systems

Convert Storm Drain Networks into a Pumped System

- **Description:** Four areas were considered as potential locations for modifying existing gravity-fed storm drainpipe systems by converting them to pumped, pressurized drainage networks. These areas were identified based on system capacity information from the SBA Drainage Master Plan Update related to excess onsite stormwater and did not consider flooding from creek overflows. Offsite adaptation measures discussed in Section 6.1.1 are intended to reduce flooding from creek overflows. However, because SBA is within the FEMA 100-year floodplain, some risk of creek flooding and overflow onto the airfield would remain, which could render portions of the storm drain system ineffective. The measure considered utilizing existing outfalls to reduce permitting needs for a new outfall. The proposed pump station locations (shown in **Figure 26**) are:
 - Combined Outfall and Pump Station Location 1 located at the southwest end of Taxiway X
 - Combined Outfall and Pump Stations 2 and 3 located southwest of the vehicle service road
 - Combined Outfall and Pump Station Location 4 located at the southern end of the Airfield, south of RWY 15L/33R

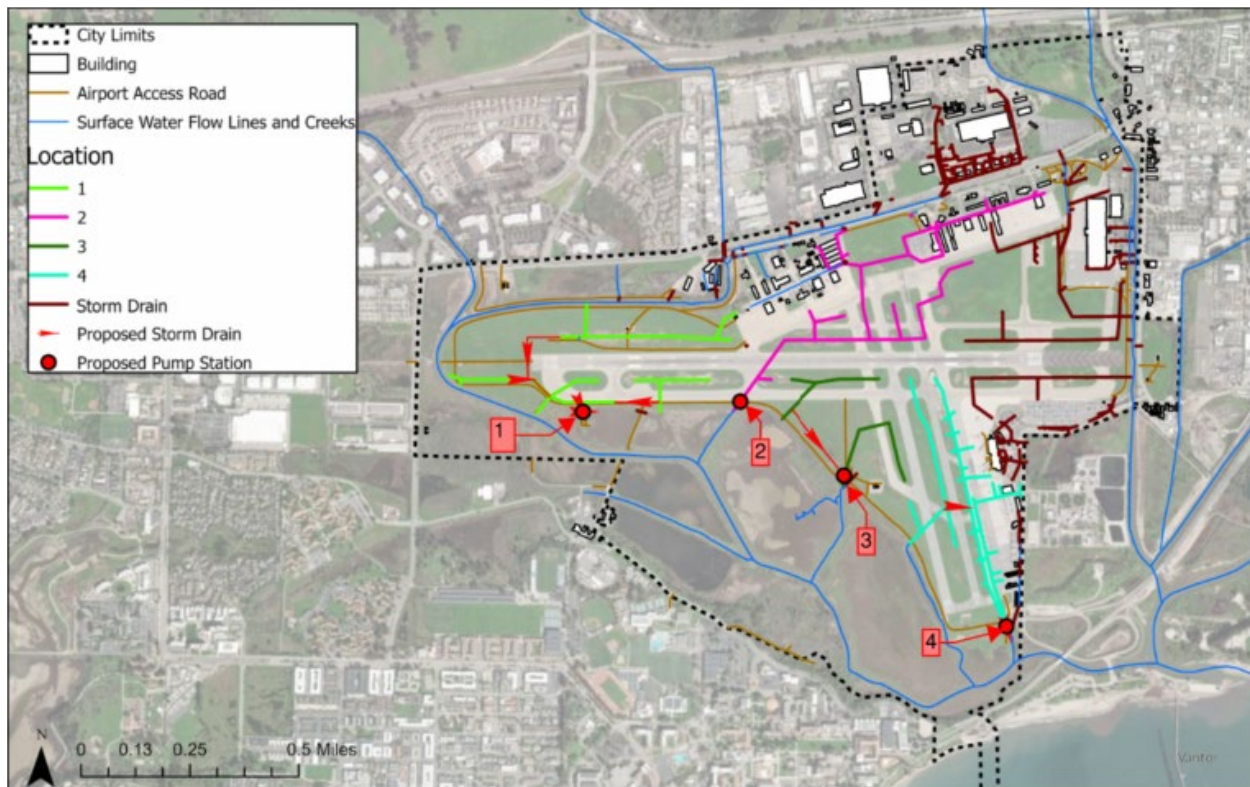


Figure 26. Pump Station Locations

- **Benefits:** Pumping stormwater off the airfield reduces onsite flooding and combats loss of capacity due to submerged outfalls. This allows for low-lying areas below the receiving water levels to drain prior to water levels receding from tides and/or storm events.
- **Constraints:** Pumps require electricity, instrumentation, and control, which increase system operation and maintenance costs. Pumps can fail, leading to additional flood risk, so redundancy through additional pumps will be required. Groundwater intrusion can result in excessive pumping. Existing gravity storm drain networks will need to be reconfigured to connect to the pumped system(s).
- **Permitting Considerations:** Depending on where the pumped water is being discharged this may require an NPDES permit. If there are any impacts to waters or wetlands of the United States or state, then permits from USACE and RWQCB may be required. A CDP may be required if the discharge is occurring into the CCC's permit jurisdiction.
- **Cost:** High (approximately \$10 million to \$50 million range).

Construct Stormwater Detention Systems

- **Description:** There are many types of underground stormwater detention systems. This measure was briefly considered, but due to the potential for high groundwater, it was not evaluated as a proposed measure.
- **Benefits:** To reduce stormwater inundation and flooding of airfield pavements, detention systems could store stormwater until the detained stormwater can be drained or pumped

out. Underground detention systems have the benefit of not becoming wildlife attractants. Detention systems are unlikely to produce a clear ecological benefit.

- **Constraints:** Detention systems located in areas of high groundwater will require studies and a more detailed design. Underground detention may not provide the same water quality benefits that above-ground detention systems can provide.
- **Permitting Considerations:** Permitting considerations were not evaluated due to this measure's low success likelihood.
- **Cost:** Medium (approximately \$2 million to \$10 million range)

6.1.2.4 Utility Upgrades

Airport utilities will experience increased inflow and infiltration (I&I) with climate change and sea level rise resulting from increased groundwater levels and storm flooding events. Upgrades to the existing utilities will be needed to prevent inundation and corrosion. A recent project constructed new electrical equipment above the floodplain. Future utility infrastructure elevations should be evaluated and located above the Base Flood Elevation, or waterproofed, where feasible, particularly for critical equipment like electrical equipment and pump stations should be evaluated for impacts due to inundation. Increased precipitation and sea level rise effects on Base Flood Elevation should be considered in project planning and design. Electrical conduits on the airfield are already floodproofed. A Wastewater I&I Study and a Pipe Material Inventory and Corrosion Risk Assessment are both recommended as next steps following this CAP to understand the locations and extents of utilities currently experiencing or at risk of I&I and/or corrosion.

Replace Pipes at Risk of Failure due to Corrosion

- **Description:** Pipes identified through an inventory and corrosion risk assessment, or other conditions assessment, as at risk of failure could be replaced. Replacement pipes could be constructed with materials resistant to corrosion to account for potential future groundwater due to sea level rise or salinity conditions. Priority could be given to pipes that are already at risk or are located in areas expected to experience increased groundwater levels or inundation.

Potential protection measures for SBA utilities identified as susceptible to corrosion could also include exposing and coating or wrapping pipes with bitumen tape or other appropriate materials, or installing cathodic protection with impressed current or sacrificial nodes. To prevent future corrosion risk, SBA could add a step to any asset planning processes to assess materials for utilities susceptible to corrosion when either constructing or modifying buildings or conducting other project work near the utility.

- **Benefits:** Replacing identified pipes would reduce the risk of pipe failure and leakage. Replacement also provides an opportunity to use materials better suited for future groundwater and salinity conditions.
- **Constraints:** Pipe replacement could result in temporary utility service disruptions. Construction may be more difficult in areas with high groundwater or limited access. The cost of replacement would depend on location, condition, material, and length of pipe.

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- **Permitting Considerations:** Replacement of pipes within previously disturbed areas may have limited permitting requirements. Replacement involving ground disturbance within or adjacent to wetlands, creeks, or other jurisdictional areas may require permits in coordination with USACE, RWQCB, and CCC.
 - **Cost:** Medium (approximately \$2 million to \$10 million range) depending on the extent of pipe replacement.

Rehabilitate Sanitary Sewer Pipes

- **Description:** Sanitary sewer pipes identified through an I&I study as susceptible could be lined or otherwise rehabilitated to reduce I&I impacts. Pipe lining generally allows existing pipes to be rehabilitated without requiring full replacement. This strategy could be prioritized for aging sewer lines in areas expected to experience increased groundwater levels or flooding. The Goleta Sanitary District Climate Adaptation Plan similarly identifies pipe lining or wrapping as an adaptation measure to reduce I&I associated with sea level rise (ESA 2022). SBA is already planning to replace and realign the sanitary sewer pipeline that serves the northwest quadrant of the Airport.
- **Benefits:** Lining sanitary sewer pipes would reduce groundwater and stormwater infiltration into the wastewater collection system, helping maintain system capacity and reducing additional wastewater flows associated with I&I. Trenchless lining methods may also reduce ground disturbance compared to full pipe replacement.
- **Constraints:** Lining pipes is generally performed only where the existing pipe is structurally suitable for rehabilitation. Pipes with substantial structural deterioration may require repair or replacement instead. The feasibility of lining would depend on pipe condition, material, configuration, and accessibility.
- **Permitting Considerations:** Permitting requirements would depend on the lining method and required access. Trenchless lining within the existing pipe would generally result in limited ground disturbance. However, work requiring excavation or disturbance within or adjacent to wetlands, creeks, or other jurisdictional areas may require permits in coordination with USACE, RWQCB, and CCC.
- **Cost:** Low (less than approximately \$2 million) depending on the extent of pipes requiring lining.

6.1.2.5 Flood-Proofing Buildings

- **Description:** This adaptation measure involves ensuring HVAC, electrical, and other sensitive equipment are raised above the base flood elevation where feasible. Buildings would need to be assessed individually to identify and catalog critical and sensitive equipment. Separately from this CAP, SBA is conducting a building and equipment inventory, including basements and faults, that will inform further assessment and flood-proofing efforts. HVAC equipment at ground level could be elevated on pedestals or structural supports or moved to rooftops. Electrical equipment could be elevated on pedestals or structural supports or racks. Although this measure is filed under “onsite measures,” this measure could be implemented for buildings outside the AOA as well. SBA

could add a step to any asset planning processes to look to raise sensitive equipment when either constructing or modifying buildings.

- **Benefits:** Prevents damage of sensitive equipment during flood events. The benefit of floodproofing is that if flood waters are allowed to enter the enclosed areas of the structure and to quickly reach the same level as the flood waters outside, the effects of hydrostatic pressure, including buoyancy, are greatly reduced. As a result, the loads imposed on the structure during a flood, and therefore the likelihood of structural damage, may be greatly reduced (FEMA 1998).
- **Constraints:** Some utilities and equipment may not be able to be relocated. The buildings may still experience flood damage.
- **Permitting Considerations:** N/A
- **Cost:** Low (less than approximately \$2 million).

6.2 MID-TERM: 0.8–2.5 FEET SLR (20–50 YEARS)

Mid-term adaptation measure planning should be refined during the near-term. Prior to implementing the following measures, conditions and improvements made during the near-term should be reassessed.

6.2.1 Mid-Term Offsite Measures – Goleta Slough and Creeks

6.2.1.1 Upstream Flood Detention on Carneros Creek

- **Description:** There may be opportunities for upstream flood detention in conjunction with other jurisdictions. Upstream of Highway 101, agricultural areas along Carneros Creek could potentially be repurposed for flood detention. Temporarily storing flows upstream could reduce downstream flooding impacts of peak storm events at the airport while also providing habitat benefits along the creek corridor. Repurposing these areas would require significant planning and coordination with landowners and/or land acquisition investment.
- **Benefits:** Primary benefits would include flood risk reduction and potentially improved sediment management. Ecological benefits will depend on the design of the system. There are potential opportunities for multi-benefit solutions such as integrated agriculture and flood management, floodplain habitat restoration, and flood detention basins that support habitat. The Napa River Restoration is a successfully implemented example of public and private agriculture partnership for salmonid habitat restoration and flood management. This project involves collaboration between ESA and Napa County, regulatory agencies, and local landowners and vineyard managers to develop, design, permit, and implement a 14-mile restoration plan for Napa River. The restoration plan involves setting back agricultural berms and creating a series of restoration nodes where the river can extend over new floodplains and into multiple channels and backwater alcoves.
- **Constraints:** Implementation would require significant coordination and planning with landowners, and feasibility is dependent on landowner interest and participation and costs. Land acquisition costs would likely be high.

-
- **Permitting Considerations:** If federal wetlands are impacted, it will require a Section 404 permit from USACE and since the work may occur in the creek then a 401 Certification through the RWQCB may be required. This would likely trigger the need for a Lake and Streambed Alteration Agreement.
 - **Cost:** High (approximately \$10 million to \$50 million range).

6.2.2 Mid-Term Onsite Measures – AOA

6.2.2.1 Floodwalls/Flood Barriers Around Buildings

- **Description:** This adaptation measure involves constructing temporary or permanent flood barriers to provide flood protection around buildings. Flood barriers may include temporary raised floodwalls (**Figure 27 (a), (b), (c)**) or permanent floodwalls (**Figure 27 (d)**). Some buildings may be developed by private developers that lease Airport property. Flood protection would fall to the developers but would still need to meet FAA and airport requirements.
- **Benefits:** Floodproofing buildings with temporary or permanent barriers provides flood protection when raising ground surface elevation is too extensive or not feasible. These infrastructure improvements are unlikely to have substantial ecological benefits.
- **Constraints:** There are height limitations when used near airfield pavements due to FAA restrictions. Stormwater may need to be pumped out to avoid accumulation in the barrier areas.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated floodway or floodplain, hydrologic and hydraulic modeling and permitting is required to confirm that the project does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage.
- **Cost:** Medium (approximately \$2 million to \$10 million range).



(a)



(b)



(c)



(d)

Figure 27. Flood Protection Barriers, Including (a) Temporary Raised Walls, Partially Raised Position, (b, c) Temporary Raised Walls, Raised Position, or (d, an example from SBA) Permanent Low Floodwalls

6.2.2.2 Raising Runway and Taxiway Elevations

- **Description:** To address long-term issues with sea level rise, runways and taxiways could be raised to reduce the hazard of overtopping.
- **Benefits:** Raising the runways and taxiways may reduce flood risks, potentially preventing airfield service disruption. These infrastructure improvements are unlikely to have substantial ecological benefits.
- **Constraints:** Raising the runway will be extremely costly. Raising the runway between 9 and 12 inches may be achieved without reconstruction of the main runway pavement; however, raising the runway more than 6 inches will likely require reconstruction of the shoulders and replacement of the electrical infrastructure along the runway. In addition to the runway and shoulder pavements, raising the runway will have a significant impact on the adjacent RSA elevation, which will need to be adjusted to the new runway elevation. As the RSA to be raised is approximately 54 acres, this will lead to a significant grading effort. The RSA adjustment will also impact the numerous Navigational Aids (NAVAIDs) that are associated with Runway 7/25, including the Runway 7 Medium-Intensity Approach Lighting System with Runway Alignment Indicator (MALSR-F&L), Localizer, Runway 7 Glideslope, Runway 25 Runway End Identifier Lights (REILs), and Runway 25 Precision Approach Path Indicator (PAPI). Depending on the extent of the increase in Runway 7/25 elevation, parallel Taxiway A may need to be raised as well to maintain compliant surface gradients on the taxiway connectors. To maintain air service, connections to taxiways and aprons will need to be maintained to provide access to the Terminal Building and other Fixed-Base Operations (FBOs) on the airport. For this reason, taxiways and aprons may need to be raised as well.

This long-term solution also poses a significant constructability challenge, as the airport generally does not allow interruption or alterations to commercial service for construction projects on the airfields. Raising the runway would translate into a multi-year, multi-phased project, which may eventually require temporary interruptions to commercial service. The elevations of existing buildings, including the terminal, also limit how much the runway could be raised while maintaining acceptable grades.

While raising the runways and taxiways may reduce local flood risks, analysis is needed to confirm that the project is completed in a way that does not increase flood levels to surrounding communities.

- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated Floodway or floodplain, hydrologic and hydraulic modeling and permitting must be conducted to provide a complete project that does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage.
- **Cost:** Very high (more than approximately \$50 million).

6.2.2.3 Raising Firestone Road

- **Description:** Firestone Road has frequently been overtopped by high flows in Firestone Drainage Channel. The Airport installs a temporary inflatable Tiger Dam low flood berm prior to anticipated flood events along the north side of Firestone Road (see Section 5.2). This measure of raising the road profile would reduce the need for the temporary flood barriers.

An alternative to raising Firestone Road could be to raise certain sections of the road and remove other sections that are not necessary for airport access. The area where the road is removed could be used for flood storage.

- **Benefits:** By raising Firestone Road east of the Carneros Creek bridge, the likelihood of water from Firestone Drainage Channel overtopping the road and entering the airfield via Arnold Place, Burns Place, and Cook Place will be reduced. Along with raising Firestone Road to reduce the potential of Firestone Drainage Channel flooding the airport, doing so allows the north end of the connecting Perimeter Road to be raised, thus reducing the potential for Carneros Creek overtopping on the eastern bank in the same vicinity.
- **Constraints:** Raising Firestone Road is very costly. The existing connection to the Carneros Creek bridge limits how high Firestone Road can be raised eastward unless the bridge is replaced and raised. Even with a raised road, the existing connections to other roads (Arnold Place, Burns Place, and Cook Place) would need to be modified to meet the raised surface. Bank modifications and/or retaining walls would be required along Firestone Drainage Channel, potentially causing habitat impacts.
- **Permitting Considerations:** With any permanent alterations affecting FEMA-designated Floodway or floodplain, hydrologic and hydraulic modeling and permitting must be conducted to provide a complete project that does not cause an increase in Base Flood Elevation and does provide an equivalent amount of floodplain storage. Environmental mitigation may be required due to existing Endangered Species Act-listed species in Firestone Drainage Channel. Impacting the vegetation will require coordination with USACE, CDFW, and RWQCB to determine if there are impacts to jurisdictional wetlands.
- **Cost:** High (approximately \$10 million to \$50 million range).

6.3 LONG-TERM: 2.5–3.3 FEET SLR (50–60 YEARS)

Long-term adaptation measure planning should be refined during the near-and mid-term. Prior to implementing the following measures, conditions and improvements made during the near-and mid-terms should be reassessed.

6.3.1 Long-Term Offsite Measures – Goleta Slough & Creeks

6.3.1.1 Regional Flood Control Channel and Levee System

- **Description:** A regional flood control channel and levee system could possibly be constructed to contain and convey flood flows downstream. To better convey flood flows, Carneros Creek and San Pedro Creek may need to be expanded. A levee system to protect the Airport would need to extend upstream and downstream along the creeks as a regional system. This is due in part to the fact that isolating the Airport (e.g., with a “ring” levee) would not likely be feasible as the Airport is in the FEMA floodplain and doing so would likely increase flooding in other adjacent areas.
- **Benefits:** This measure could possibly improve the existing level of flood risk management for the Airport and adjacent communities. This measure could address extreme flood risk

(e.g., the 100-year flood), whereas other measures are mostly intended to only address more frequently occurring flooding and do not address the 100-year flood.

- **Constraints:** Expanding the channels and constructing levee systems would likely require acquisition of adjacent developed areas and involve significant temporary or permanent impacts to existing creek habitats. The scale of land acquisition and repurposing and associated complexity and costs may make this measure infeasible. Raised levees adjacent to runways and the RSA may also conflict with FAA safety requirements, which could also make this measure infeasible.
- **Permitting Considerations:** This measure would likely require major FEMA, environmental permitting, and mitigation efforts.
- **Cost:** Very high (above approximately \$50 million)

6.3.2 Long-Term Onsite Measures – AOA

6.3.2.1 Pump Accumulated Groundwater off the Airport

- **Description:** Groundwater can be collected in subsurface trenches or wells for pumping to the Goleta Slough or other offsite discharge locations.
- **Benefits:** Reduces the elevation of subsurface and near-surface groundwater.
- **Constraints:** Pumps for seasonal or continuous pumping of groundwater require electricity, instrumentation, and controls, which add operation and maintenance costs. Pumping groundwater can also cause the migration and/or settlement of soil and the migration of salt or identified or unidentified contaminants. Pump systems may require expansion of electrical systems and construction of pump discharge locations. Pump stations can fail.
- **Permitting Considerations:** Depending on where the pumped water is being discharged this may require an NPDES permit. If there are any impacts to waters or wetlands of the United States or state, then permits from USACE and RWQCB may be required. A CDP may be required if the discharge is occurring into the CCC's permit jurisdiction.
- **Cost:** Medium (approximately \$2 million to \$10 million range) for implementation, not accounting for operating costs.

6.3.2.2 Airport Relocation

- **Description:** With about 3.3 feet of sea level rise, tidal flooding of the airport is likely to occur on a biweekly basis, rendering the airport inoperable (ESA 2025). To address long-term issues with flooding and sea level rise, the Airport could be relocated to an area less susceptible to flooding.
- **Benefits:** Airport relocation provides the potential opportunity to relocate the airport to an area that is less susceptible to flooding, tidal inundation, and sea level rise. Other nearby regional airports could potentially be expanded; however, this would require substantial infrastructure modifications and investments. Relocating and decommissioning the Airport could potentially create the opportunity to restore the Airport to wetland habitat, however this would require a substantial effort and investment. Note restoring the Airport to wetland may

not have a major flood reduction benefit to adjacent areas as the Airport is already within the floodplain.

- **Constraints:** The City has significantly invested in the Airport and is not planning to abandon it. There are no areas within the City of Santa Barbara where the Airport could be located. Relocation would be extremely expensive, requiring Federal, State, regional, and other jurisdictional investments and coordination.
- **Permitting Considerations:** Permitting would depend on the relocation strategy.
- **Cost:** Very high (more than approximately \$50 million).

6.4 SUMMARY OF ADAPTATION MEASURES

Table 3 provides an inventory of the ongoing and planned adaptation measures at SBA. **Table 4** summarizes the potential future adaptation measures in the near-, mid-, and long-term. Each adaptation measure's location, benefits, constraints, permitting considerations, relative cost, and approximate implementation timelines are summarized. Implementation timelines represent the approximate timeframe required for a project to progress from planning to implementation, with consideration of the adaptation timeframe in which the measure may be needed. Actual timelines may vary depending on project-specific needs.

TABLE 3
SUMMARY OF ONGOING AND PLANNED ADAPTATION MEASURES

Adaptation Measure	Location
Ongoing Adaptation Measures	
County creek sediment management	Offsite – Carneros, San Pedro, and Tecolotito creeks
Firestone Drainage Channel inflatable Tiger Dam flood berm	South bank of Firestone Drainage Channel
Firestone Drainage Channel maintenance	Firestone Drainage Channel
Carneros Creek K-rail temporary flood barrier	South bank of Carneros Creek
Carneros Creek maintenance dredging	Carneros Creek downstream of Firestone Road
Planned Adaptation Measures	
K-rail and fence at Firestone Road Bridge over Carneros Creek	Firestone Road bridge over Carneros Creek
Storm drain improvements	AOA ^a
Taxiway B extension and north habitat restoration mitigation area	AOA
UCSB Western Goleta Slough tidal restoration	Offsite – Western Goleta Slough
Goleta Slough resiliency project	Offsite – Goleta Slough
NOTES:	
a. AOA = Airport Operations Area	

TABLE 4
SUMMARY OF POTENTIAL NEAR-, MID-, AND LONG-TERM ADAPTATION MEASURES

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Potential Near-Term (5–20 Years) Adaptation Measures						
Permanent berm to replace K-rail at Carneros Creek	Offsite – Carneros Creek	Eliminates seepage Reduced maintenance	May cause adjacent flood impacts Potential jurisdictional wetland impacts	FEMA floodplain study USACE Section 404 Permit LSA ^c Agreement CCC CDP ^d if outside of City's LCP	Medium	5-10 years
Restore wetland floodplain north of Carneros Creek	Offsite – Carneros Creek	Increased flood storage/ conveyance Sediment deposition area Wetland habitat restoration May increase riparian habitat	May impact development north of Hollister Ave. Potential downstream and sediment impacts May impact prior mitigation	FEMA floodplain study Prior mitigation area impacts USACE Section 404 Permit RWQCB Section 401 Certification LSA Agreement CCC CDP CDFW ITP ^e USFWS Section 7 consultation NMFS EFH ^f consultation	High	5-15 years
Restore wetland floodplain at Carneros and Tecolotito Creek confluence	Offsite – Carneros Creek	Increased flood storage/ conveyance Sediment deposition area Wetland habitat restoration May increase riparian habitat	Potential downstream and sediment impacts May impact prior mitigation	FEMA floodplain study Prior mitigation area impacts USACE Section 404 Permit RWQCB Section 401 Certification LSA Agreement CCC CDP CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	High	5-15 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Restore wetland floodplain through removal/relocation of maintenance yard	Offsite – Carneros Creek	Channel realignment/expansion Reduced flood risk May increase riparian habitat	Requires relocation coordination	FEMA floodplain study USACE Section 404 Permit RWQCB Section 401 Certification LSA Agreement CCC CDP CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	High	10-20 years
Carneros Creek flood detention basin	Offsite – Carneros Creek	Increased flood storage Sediment deposition area Wetland habitat restoration May increase riparian habitat	Existing basin drainage impact assessment needed Potential downstream and sediment impacts Sediment removal may reduce restored habitat opportunities	FEMA floodplain study USACE Section 404 Permit RWQCB Section 401 Certification LSA Agreement CCC CDP CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	High	5-15 years
Remnant levee removal	Offsite – Goleta Slough	Increased flood conveyance Wetland habitat restoration Improved habitat connectivity May increase salt marsh habitat	Modifies prior mitigation Modeling needed to assess effectiveness	USACE Section 404 Permit RWQCB Section 401 Certification LSA Agreement CCC CDP CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	Medium	5-15 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Tidal restoration and flood storage	Offsite – Goleta Slough	Increased flood conveyance Potential increased open Slough mouth conditions Wetland habitat enhancement Improved habitat connectivity May increase riparian and salt marsh habitat	May impact prior mitigation	FEMA floodplain study USACE Section 404 Permit RWQCB Section 401 Certification LSA Agreement CCC CDP CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	High	10-20 years
Channel sediment management and wetland sediment augmentation	Offsite – Goleta Slough	Increased flood conveyance through channel dredging for sediment source Supports marsh accretion with sea level rise	Pilot project validation needed Requires suitable sediment sources May reduce Slough flood storage and conveyance	FEMA floodplain study USACE Section 404 and Section 10 Permits RWQCB Section 401 Certification LSA Agreement CCC CDP SLC Leases CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	Medium	5-15 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Beach berm priming	Offsite – Goleta Slough mouth	Can benefit salt marsh plans, invertebrates, wildlife	Semi-regular maintenance Timing constrained by storms and tides Storms, high tides, and waves may impact safe equipment use	USACE Sections 404 and 10 Permits RWQCB Section 401 Certification LSA Agreement CCC CDP SLC Leases CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	Low	3-5 years
Beach berm breaching	Offsite – Goleta Slough mouth	Can benefit salt marsh species, habitat, function Can improve Slough water quality	Semi-regular maintenance Timing constrained by storms and tides Storms, high tides, and waves may impact safe equipment use	USACE Sections 404 and 10 Permits RWQCB Section 401 Certification LSA Agreement CCC CDP SLC Leases CDFW ITP USFWS Section 7 consultation NMFS EFH consultation	Low	3-5 years
Siphon	Offsite – Goleta Slough mouth	Offshore discharge possible via Goleta Beach pier alignment Can benefit salt marsh species, habitat, function	Limited rainfall-driven storm flood reduction Potential visual, habitat, beach use impacts Subject to buoyancy, current, impact, debris, wave loads Requires regular maintenance	USACE Sections 404 and 10 Permits RWQCB Section 401 Certification LSA Agreement CCC CDP SLC Leases USFWS Section 7 consultation NMFS EFH consultation	Medium	5-10 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Stormwater detention basin	Offsite – San Pedro Creek	Increased flood storage Downstream flood reduction potential Design-dependent habitat benefits	Modeling needed to assess effectiveness May require occasional sediment removal/ mechanical disturbance	FEMA floodplain study USACE Sections 404 and 10 Permits RWQCB Section 401 Certification LSA Agreement	High	5-15 years
Raised bank/berm and/or temporary flood barrier	Offsite – San Pedro Creek	Reduced creek overtopping	May increase flooding for adjacent areas	FEMA floodplain study USACE Sections 404 and 10 Permits RWQCB Section 401 Certification LSA Agreement	Medium	5-10 years
Floodplain restoration near historic hangars	Offsite – San Pedro Creek	Increased flood storage/ conveyance May increase riparian habitat	Coordination with use and access to historic hangars and Flood Control management of San Pedro Creek	FEMA floodplain study USACE Sections 404 and 10 Permits RWQCB Section 401 Certification LSA Agreement	Medium	5-15 years
Firestone drainage channel maintenance to improve channel conveyance	AOA ^a – Firestone Road Drainage Channel	Increased flood conveyance	Limited benefit during flood stage Existing mitigation	Coordination with USACE, RWQCB, CDFW	Medium	3-5 years
Floodwall at Carneros Creek bridge	AOA – Firestone Road Drainage Channel	Reduced creek overtopping	Must not impact box culvert	FEMA floodplain study	Low	5-10 years
Extending K-rail along Carneros Creek	AOA – Firestone Road Drainage Channel	Reduced creek overtopping	Requires fortification to protect against erosion	FEMA floodplain study	Low	3-5 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Firestone overflow storage basin	AOA – Firestone Road Drainage Channel	Increased flood storage Reduced Firestone Road overtopping Reduced airfield flood risk	Must meet RSA slope requirements May need occasional pumping Future groundwater emergence risk	Coordination with USACE, RWQCB, CDFW, CCC	Medium	5-10 years
Raise grades above groundwater in low areas	AOA – Raise Grades	Reduced groundwater emergence Potential implementation with other CIPs or maintenance	Must meet FAA grading requirements Potential pavement/RSA area modifications	FEMA floodplain study Additional permitting if within creeks or jurisdictional wetland areas	Medium	5-15 years
Convert storm drain networks into a pumped system	AOA – Storm Drainage Improvements	Reduced airfield flooding Maintains drainage during submerged outfall conditions	Power, controls, and O&M required Pump redundancy required Groundwater intrusion may increase pumping Requires storm drain reconfiguration	USACE Permit RWQCB Permit NPDES Permit CCC CDP	High	5-10 years
Constructing detention systems	AOA – Storm Drainage Improvements	Temporary stormwater storage Underground systems do not attract wildlife	Requires additional groundwater studies Underground systems have limited water quality benefits	N/A	Medium	5-10 years
Replace damaged or deteriorated pipes	AOA – Utility Upgrades	Reduces risk of pipe failure or leakage	May require temporary service disruptions Access may be difficult depending on location	USACE Permit RWQCB Permit CCC CDP	Medium	3-5 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Line sanitary sewer pipes	AOA – Utility Upgrades	Reduces I&I impacts Requires minor ground disturbance	Limited to structurally suitable pipes Feasibility depends on condition, material, access	USACE Permit RWQCB Permit CCC CDP	Low	3-5 years
Flood-proofing buildings	AOA – Floodproofing	Protects sensitive equipment	May have limited equipment relocation options Buildings may still experience flood damage	N/A	Low	3-10 years
Potential Mid-Term (20–50 Years) Adaptation Measures						
Upstream flood detention on Cameros Creek	Offsite – Goleta Slough and creeks	Increased flood storage Improved sediment management Integrated agriculture/flood management Floodplain habitat restoration	Requires landowner coordination and participation Likely high land acquisition cost	USACE Section 404 Permit RWQCB Section 401 Certification LSA Agreement	High	10-30 years
Floodwalls/flood barriers around buildings	AOA – Floodproofing	Flood protection where grade raising is infeasible	Height limitations near airfield pavements Potential stormwater pumping	N/A	Medium	10-30 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Raise runway and taxiway elevations	AOA – Airfield Modifications	May reduce flood risk and airfield service disruption	Potential shoulder and infrastructure reconstruction Requires raising RSA, impacting NAVAIDs May require raising taxiways and aprons Construction-related service disruptions Limited by existing building elevations	FEMA floodplain study	Very High	20-40 years
Raising Firestone Road	AOA – Firestone Road	Reduced airfield flood risk Reduced Carneros Creek overtopping	Limited by existing bridge elevation Requires roadway modifications Potential bank modifications/retaining wall impacts	FEMA BFE impacts Coordination with USACE, RWQCB, CDFW	High	10-30 years
Potential Long-Term (50–60 Years) Adaptation Measures						
Regional levee and flood control channel system	Offsite – Goleta Slough & Creeks	Improves level of flood risk management Could address extreme flood risk (e.g., the 100-year flood)	Likely requires acquisition of adjacent developed areas Significant temporary or permanent impacts to creek habitats May conflict with FAA safety requirements	FEMA floodplain study, FEMA BFE impacts Additional permitting for creeks or jurisdictional wetland areas	Very High	20-40 years

Adaptation Measure	Location	Benefits	Constraints	Permitting Considerations	Relative Cost	Approximate Implementation Timeline
Pump accumulated groundwater off the airport	AOA – Groundwater Management	Reduced groundwater elevation	Requires power, controls, and O&M Potential soil, salt, or contaminant migration Potential electrical expansion and discharge construction Pump failure risk	USACE Permit RWQCB Permit NPDES Permit CCC CDP	Medium (for implementation, not accounting for operation)	10-30 years
Airport relocation	AOA – Airfield Modifications	Eliminates tidal and sea level rise impacts May reduce or eliminate other flood risk	High cost Significant community investment Requires multi-agency investment	Dependent on relocation strategy	Very High	30-50+ years

NOTES:

- a. AOA = Airport Operations Area
- b. BFE = Base Flood Elevation
- c. LSA = Lake and Streambed Alteration
- d. CDP = Coastal Development Permit
- e. ITP = Incidental Take Permit
- f. EFH = Essential Fish Habitat

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Section 7

RECOMMENDED NEXT STEPS

7.1 LAND USE PLAN UPDATE

Following completion of the CAP, the City will develop new climate change and sea level rise policies based on the CAP and incorporate them into an update of the Airport and Goleta Slough Coastal LUP, as part of the LCP update for the Airport Segment. The LUP update will be presented to the City of Santa Barbara Planning Commission and City Council for approval and the CCC for approval. The LUP update is currently funded by the City and a grant from the CCC.

7.2 FEASIBILITY AND EFFECTIVENESS STUDY

The CAP focuses on laying out the adaptation planning process for the Airport and identifying a suite of potential adaptation measures based on the CVARE, which relies on available existing data and specific supplemental analyses. The next phase of adaptation planning is to conduct a feasibility and effectiveness study of potential future adaptation measures. The City will pursue additional funding for a feasibility study and public engagement process to further analyze adaptation options and select preferred near-term projects to advance to environmental review, design, and implementation. The public engagement process will help the City understand community concerns, identify the benefits and burdens that an adaptation project may provide, and consider whether an adaptation measure would disproportionately affect vulnerable or disadvantaged communities. The feasibility study will include hydrologic analysis and modeling of existing baseline conditions and adaptation measures under current and future sea level rise and storm scenarios to confirm and quantify flood reduction benefits and evaluate potential negative impacts to offsite flooding. The study will also develop conceptual plans and cost estimates to support selection of priority measures based on anticipated benefits and cost-effectiveness. Modeling the effectiveness of the adaptation measures is critical for prioritizing investments and ensuring they are directed towards measures that provide the greatest flood reduction benefits. This study is also required to inform project designs and phasing, enhancing their effectiveness and providing a better understanding of how long each measure remains effective under future climate conditions. The feasibility and effectiveness study will therefore bridge and progress adaptation from the CAP's planning phase to adaptation project design, as is typical for a phased project planning, feasibility, and design process.

7.3 SITE-WIDE GROUNDWATER MONITORING STUDY

A site-wide groundwater monitoring study is needed to understand seasonal variability of groundwater levels and establish base groundwater levels across the Airport. Current available groundwater data is limited and primarily anecdotal. As sea levels rise, groundwater emergence is expected to expand. As there are already very shallow depths to groundwater across the Airport, an understanding of the depths to groundwater is essential for evaluating future sea level rise mitigation alternatives at the Airport. Groundwater levels impact where detention basins can be located, where future airport facilities can be located, and the functionality of existing and future storm drain systems. Shallow groundwater can also support wetland and riparian vegetation.

7.4 SANITARY SEWER PIPE INFLOW AND INFILTRATION STUDY

Airport sanitary sewer pipes may experience increased inflow and infiltration (I&I) with climate change and sea level rise resulting from increased groundwater levels and storm flooding events. Upgrades to the existing utilities will be needed to prevent inundation and corrosion.

An I&I study is needed to determine if the wastewater pipe network or structures are watertight and if groundwater or stormwater can enter the system, reduce capacity, and potentially overwhelm the system. Climate change and sea level rise have the potential to exacerbate I&I impacts either through inundation or higher groundwater elevations. Understanding the current wastewater system condition for I&I is essential to informing mitigation measures in response to sea level rise, flooding, and increased groundwater. Results of the study can inform which segments of utilities need protective lining or coating to provide watertight performance.

7.5 UNDERGROUND UTILITY PIPE MATERIAL INVENTORY AND CORROSION RISK ASSESSMENT

Sea level rise may cause an increase in groundwater salinity, and as sea level rise increases, utility pipe networks may become submerged. Some pipe materials, such as ductile iron or steel, may be more susceptible to corrosion. As a next step, SBA should develop an inventory of underground utility pipe materials and assess their potential corrosion risk under existing and future groundwater conditions. Pipe materials could be identified through a combination of desktop records research, structure inspections, and, if needed, utility potholing.

Recently, Goleta West Sanitary District completed similar condition assessment work on two wastewater force mains that cross Goleta Slough and the Airport. The study included review of pipe age and materials, non-destructive acoustic and electromagnetic inspections, physical inspections of selected pipe segments, and soil corrosivity testing. The study identified significant corrosion and wall loss in its ductile iron force main and corrosive to severely corrosive soils along the alignment, leading to recommendations for rehabilitation or replacement and continued monitoring (MNS 2026). Because these force mains cross the Airport and corrosive soil conditions were identified along their alignment, similar conditions may affect other buried metallic utilities at SBA. These findings further support evaluating the materials and corrosion susceptibility of SBA's underground utility network.

7.6 IMPLEMENT ONGOING AND PLANNED ADAPTATION MEASURES

The CAP recommends continuing to implement ongoing and planned adaptation measures, as identified in Section 5. In addition to continuing to implement ongoing flood management projects as adaptation measures, a crucial immediate action is to implement the SBA Drainage Master Plan Update in the next 5 years.

7.7 FUTURE STEPS

After selecting adaptation measures for implementation, adaptation projects would advance through planning and design phases, including conceptual and preliminary design, environmental review and documentation, permitting, and final design.

Continued monitoring of sea level rise and flooding conditions, including updated projections and guidance, will also be necessary to inform future adaptation planning and implementation over time.

Section 8

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APPENDIX A

PRELIMINARY COSTS FOR ADAPTATION MEASURES

As defined in the scope of work, four adaptation measures were selected for costing; however, this selection does not indicate a preference for those measures over other near-term options. In the next phase of adaptation project planning, a feasibility study, including hydrodynamic modeling of potential flood and sediment management benefits and impacts, will be needed to support evaluation and selection of preferred adaptation alternatives for advancement into project planning and design.

The following tables contain planning-level opinions of probable implementation cost for the four near-term adaptation measures selected for cost estimating:

- Floodwall at Carneros Creek and Firestone Road;
- Firestone overflow storage basin;
- Permanent berm to replace K-rail along Carneros Creek; and
- Restore wetland floodplain habitat north of Carneros Creek.

For planning purposes, we have provided order of magnitude estimates to allow cost comparison of alternatives. These cost estimates are intended to provide an approximation of total project costs appropriate for the conceptual level of design. These cost estimates are considered to be approximately -30% to +50% accurate and include a 50% contingency to account for project uncertainties (such as unforeseen site conditions, permitting restrictions, bidding climate, and contractor means and methods). These estimates are subject to refinement and revisions as the design is developed in future stages of the project.

1. Floodwall at Carneros Creek and Firestone Road

Construction Cost:

Item	Description	Unit	Quantity	Unit Cost	Unit Total
1	Mobilization (10%)	LS	1	\$37,033	\$ 37,033
2	Traffic and Safety Control	LS	1	\$ 50,000	\$ 50,000
3	Erosion Control	LS	1	\$ 75,000	\$ 75,000
4	Clearing and Grubbing	AC	0.1	\$ 30,000	\$ 3,000
5	Structure Excavation (Floodwall)	CY	106	\$ 100	\$ 10,560
6	Aggregate Base (Floodwall and Splash Pad)	CY	8	\$ 240	\$ 1,920
7	5.5-foot-high Floodwall Concrete	CY	60	\$ 1,500	\$ 90,000
8	Floodwall Footing over Existing Box Culvert	LS	1	\$ 50,000	\$ 50,000
9	Backfill and Compact (floodwall, above footing)	CY	80	\$ 150	\$ 12,000
10	Sediment Removal (incl. haul)	CY	130	\$ 100	\$ 13,000
11	Install Tideflex	EA	1	\$ 22,000	\$ 22,000
12	Install Tidegate Valve	LS	1	\$ 25,000	\$ 25,000
13	Replace Security Fence and Gate	LS	1	\$ 25,000	\$ 25,000
Construction Total					\$ 414,513
Design			20%		\$ 82,903
Environmental Clearances			20%		\$ 82,903
Contingency			50%		\$ 207,257
Project Administration			10%		\$ 41,451
Total					\$ 829,030

2. Firestone Overflow Storage Basin

Construction Cost:

Item	Description	Unit	Quantity	Unit Cost	Unit Total
1	Mobilization (10%)	LS	1	\$ 170,140	\$ 170,140
2	Erosion Control	LS	1	\$ 50,000	\$ 50,000
3	Unclassified Excavation (incl. haul)	CY	14,600	\$ 100	\$ 1,460,000
4	Seeding	AC	2.6	\$ 6,000	\$ 15,510
5	12-inch RCP	LF	13.0	\$ 200	\$ 2,600
6	18-inch RCP	LF	151	\$ 300	\$ 45,300
7	18-inch HDPE	LF	512	\$ 250	\$ 128,000
8	18-inch Flared End Section	EA	1	\$ 3,000	\$ 3,000
9	Ditch Inlet Control Structure	EA	2	\$ 12,000	\$ 24,000
10	Basin Outlet Control Structure	EA	1	\$ 15,000	\$ 15,000
11	Connect to Existing Structure	EA	1	\$ 3,000	\$ 3,000
12	Riprap	CY	20.0	\$ 250	\$ 5,000
Construction Total					\$ 1,921,550
Design			20%		\$ 384,310
Environmental Clearances			20%		\$ 384,310
Contingency			50%		\$ 960,775
Project Administration			10%		\$ 192,155
Total					\$ 3,843,100

3A. Permanent Berm Along Carneros Creek

Construction Cost:

Item	Description	Unit	Quantity	Unit Cost	Unit Total
1	Mobilization (10%)	LS	1	\$ 183,360	\$ 183,360
2	Erosion Control	LS	1	\$ 75,000	\$ 75,000
3	Clearing and Grubbing	AC	2.2	\$ 30,000	\$ 66,000
4	Aggregate Base - Access Road	CY	940	\$ 240	\$ 225,600
5	3" Minus Rock - Berm	CY	3,090	\$ 200	\$ 618,000
6	Compacted Fill (incl. Haul)	CY	5,260	\$ 150	\$ 789,000
7	Seeding and Planting - incl. irrigation	AC	0.6	\$ 100,000	\$ 60,000
Construction Total					\$ 2,016,960
Design			20%		\$ 403,392
Environmental Clearances			20%		\$ 403,392
Contingency			50%		\$ 1,008,480
Project Administration			10%		\$ 201,696
Total					\$ 4,033,920

3B. Restore Wetland Floodplain north of Carneros Creek

Construction Cost:

Item	Description	Unit	Quantity	Unit Cost	Unit Total
1	Mobilization (10%)	LS	1	\$ 857,309	\$ 857,309
2	Erosion Control (10%)	LS	1	\$ 857,309	\$ 857,309
3	Clearing and Grubbing	AC	13.4	\$ 30,000	\$ 402,000
4	Unsuitable Material Excavation (incl. Haul)	CY	37,260	\$ 150	\$ 5,589,000
5	Remove Security Fence	LF	1,980	\$ 30	\$ 59,400
6	Install Security Fence	LF	2,020	\$ 120	\$ 242,400
7	Remove and Replace CMP Culvert	LF	75	\$ 400	\$ 30,000
8	Wetland Planting including irrigation	AC	13.4	\$ 100,000	\$ 1,340,000
9	Install Tideflex	EA	2	\$ 22,000	\$ 44,000
10	36-inch HDPE	LF	140.0	\$ 325	\$ 45,500
11	36-inch FES with riprap	EA	2.0	\$ 4,000	\$ 8,000
12	Culvert Headwall	EA	2.0	\$ 17,500	\$ 35,000
13	Compacted Fill (material on-site)	CY	10,690.0	\$ 35	\$ 374,150
14	Aggregate Base - 6" depth - Access Road	CY	637.0	\$ 240	\$ 152,880
15	Aggregate Base - 6" depth - Bike Path	CY	394.8	\$ 240	\$ 94,756
16	HMA - 4" depth - Bike Path	TONS	520.0	\$ 300	\$ 156,000
Construction Total					\$ 10,287,703
Design			20%		\$ 2,057,541
Environmental Clearances			20%		\$ 2,057,541
Contingency			50%		\$ 5,143,851
Project Administration			10%		\$ 1,028,770
Total					\$ 20,575,405

3C. Permanent Berm Along Carneros Creek & Restore Wetland Floodplain North of Carneros Creek

Construction Cost:

Item	Description	Unit	Quantity	Unit Cost	Unit Total
Permanent Berm Along Carneros Creek					
1	Mobilization (10%)	LS	1	\$ 183,360	\$ 183,360
2	Erosion Control	LS	1	\$ 75,000	\$ 75,000
3	Clearing and Grubbing	AC	2.2	\$ 30,000	\$ 66,000
4	Aggregate Base - Access Road	CY	940	\$ 240	\$ 225,600
5	3" Minus Rock - Berm	CY	3,090	\$ 200	\$ 618,000
6	Compacted Fill (incl. Haul)	CY	5,260	\$ 150	\$ 789,000
7	Seeding and Planting - incl. irrigation	AC	0.6	\$ 100,000	\$ 60,000
Restore Wetland Floodplain north of Carneros Creek					
1	Mobilization (10%)	LS	1	\$ 857,309	\$ 857,309
2	Erosion Control (10%)	LS	1	\$ 857,309	\$ 857,309
3	Clearing and Grubbing	AC	13.4	\$ 30,000	\$ 402,000
4	Unsuitable Material Excavation (incl. Haul)	CY	37,260	\$ 150	\$ 5,589,000
5	Remove Security Fence	LF	1,980	\$ 30	\$ 59,400
6	Install Security Fence	LF	2,020	\$ 120	\$ 242,400
7	Remove and Replace CMP Culvert	LF	75	\$ 400	\$ 30,000
8	Wetland Planting including irrigation	AC	13.4	\$ 100,000	\$ 1,340,000
9	Install Tideflex	EA	2	\$ 22,000	\$ 44,000
10	36-inch HDPE	LF	140.0	\$ 325	\$ 45,500
11	36-inch FES with riprap	EA	2.0	\$ 4,000	\$ 8,000
12	Culvert Headwall	EA	2.0	\$ 17,500	\$ 35,000
13	Compacted Fill (material on-site)	CY	10,690.0	\$ 35	\$ 374,150
14	Aggregate Base - 6" depth - Access Road	CY	637.0	\$ 240	\$ 152,880
15	Aggregate Base - 6" depth - Bike Path	CY	394.8	\$ 240	\$ 94,756
16	HMA - 4" depth - Bike Path	TONS	520.0	\$ 300	\$ 156,000
Construction Total					\$ 12,304,663
Design			20%		\$ 2,460,933
Environmental Clearances			20%		\$ 2,460,933
Contingency			50%		\$ 6,152,331
Project Administration			10%		\$ 1,230,466
Total					\$ 24,609,330

Notes on all Construction Cost Estimates

1. This opinion of probable construction cost is based on ESA's previous experience and bid prices from similar projects.
2. These estimates are subject to refinement and revisions as the design is developed in future stages of the project.
3. This table does not include estimated project costs for monitoring and/or ongoing maintenance.
4. Estimated costs are presented in 2026 dollars, and would need to be adjusted to account for price escalation for implementation in future years.

APPENDIX B

DISCLAIMER AND USE RESTRICTIONS

FUNDING AGENCIES

These data and this report were prepared for the City of Santa Barbara and were partially funded by the California Coastal Commission (CCC) through the LCP Local Assistance Grant Program. The data and report do not necessarily represent the views of the funding agencies; their respective officers, agents, employees, and subcontractors; or the State of California. The funding agencies, the State of California, and their respective officers, employees, agents, contractors, and subcontractors make no warranty, express or implied, and assume no responsibility or liability, for the results of any actions taken or other information developed based on this report; nor does any party represent that the uses of this information will not infringe upon privately owned rights. These study results are being made available for informational purposes only and have not been approved or disapproved by the funding agencies, nor have the funding agencies verified the accuracy, currency, completeness, or

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APPENDIX C

RELEVANT PLANS, PROJECTS, AND GUIDELINES

This Climate Adaptation Plan was informed by the following local and regional plans and projects.

AIRPORT-SPECIFIC PLANS, PROJECTS, AND GUIDELINES

Santa Barbara Airport Master Plan Update

The SBA Master Plan Update describes airport infrastructure, environmental conditions, and aviation activity to provide the community and public officials with guidance for future development. The plan identifies sensitive natural communities including southern coastal salt marsh in Goleta Slough, riparian corridors with arroyo willow thickets in creeks onsite, and federally designated critical habitat for southern California steelhead in San Pedro Creek. Also identified in the plan are recommendations for future airport improvements to accommodate the forecasted level of demand through 2041.

City of Santa Barbara Coastal Plan: Airport and Goleta Slough

The Coastal Plan for SBA and Goleta Slough (1982 and 2003) was prepared as a segment of the larger City of Santa Barbara LCP, separate from the contiguous City of Santa Barbara LCP document. The plan addresses the land use issue and policies unique to SBA and Goleta Slough, both of which are within the Coastal Zone south of Hollister Avenue. The plan identifies Goleta Slough as an environmentally sensitive habitat area. The LUP establishes parameters to maintain airport operations, while not having an adverse impact on Goleta Slough.

City of Santa Barbara Municipal Code

Title 29 of the City's Municipal Code (SBMC) establishes a Land Use Zoning Ordinance for SBA and Goleta Slough. Among other items, the ordinance aims to protect, maintain, and enhance Goleta Slough and other sensitive habitats. Additionally, the ordinance focuses on ensuring that SBA "continues to be a vital economic contributor to the region."

Title 28 of the SBMC establishes the Coastal Zoning Ordinance and implements the City's certified LCP within the Coastal Zone. The ordinance includes development standards and permitting requirements intended to protect coastal resources, public access, wetlands, creeks, environmentally sensitive habitat areas, and other coastal resources consistent with the California Coastal Act. These provisions establish the zoning and development regulations applicable to SBA and Goleta Slough within the Coastal Zone.

Santa Barbara Airport Drainage Master Plan Update

The SBA Drainage Master Plan Update, completed in 2024, includes assessments of existing drainage infrastructure, identification of areas with poor drainage, and proposed mitigation strategies to address these areas. The plan also identifies proposed projects at SBA and the resulting potential drainage impacts. Known drainage concerns and areas of interest were recognized throughout the airport including along runways, taxiways, and near the terminal and parking lots. Based on existing and proposed conditions, the plan provides recommended drainage improvements such as pipe replacements, outfall and channel maintenance, and surface storage improvements. For reference, the drainage project matrix from Appendix J of the Drainage Master Plan Update is included as an attachment to this appendix.

Carneros Creek Sediment Removal Permitting

SBA is working on a maintenance permit for the process of removing sediment from Carneros Creek. Permitting is scheduled to be completed in 2026/27, with construction to take place after.

Goleta Slough Mouth Maintenance

Water levels in Goleta Slough are controlled by the presence and elevation of a beach berm at the inlet mouth at Goleta Beach (ESA, 2015a). Under natural conditions, the mouth seasonally cycles between open and closed inlet conditions. Prior to 2012, the Santa Barbara County Flood Control and Water Conservation District (Flood Control) regularly breached the beach berm to mitigate for local flooding, fish kills, and mosquito breeding impacts. This practice was discontinued after 2012 when National Marine Fisheries Service (NMFS) guidance regarding lagoon mouth breaching at Goleta Slough changed and Flood Control stopped routine mechanical breaching in response. Emergency permits are now required for any mechanical breach of the mouth inlet. Since this change in mouth management, there has been a significant increase in migratory waterfowl which potentially poses a hazard to airport operations, as well as a significant increase in mosquito population (Rincon 2015). Emergency permits have been used to breach the slough mouth on three occasions: once in 2012 and twice in 2014. In 2013, an attempt was made to siphon water out of the slough, but it was ineffective. In 2017, an emergency permit was used to lower but not breach the berm to reduce potential environmental impacts.

Taxiway B

SBA proposes extending Taxiway B and constructing two new taxiway connectors to provide a full-length parallel taxiway to the north of Runway 7/25, in the northwest quadrant of the airport. These improvements would increase taxiway circulation safety and airport efficiency.

OTHER REPORTS AND ADAPTATION PLANS

Goleta Sanitary District

In 2022, the Goleta Sanitary District completed a Climate Adaptation Plan to assess the vulnerability of its Water Resource Recovery Facility (WRRF) to coastal hazards with future projected sea level rise (ESA 2022). The WRRF is located east of Moffett Place, across the street from the airport terminal. Several adaptation measures were identified that can increase the resilience of the WRRF and maintain treatment functionality. The adaptation strategies identified in this document were reviewed during preparation of this Adaptation Plan.

Goleta West Sanitary District

In January 2026, Goleta West Sanitary District completed a Force Main Inspection Summary and Recommendations aiming to mitigate the risk of failure for aging wastewater force mains based on inspections of the existing force mains and their surrounding environment (MNS 2026). The two existing force mains (one 18-in asbestos cement force main and one 24-in ductile iron force main) follow parallel alignments starting at the Goleta West Sanitary District and extend through Goleta Slough and SBA to the Goleta Sanitary District Wastewater Treatment Plant. In July 2005 a leak was repaired on the 18-in force main while in February and October 2024 the 24-in force main experienced failures that resulted in sanitary sewer spills. The report concludes that “the 24-in D.I.P force main is at the end of its 48-year service life and has a high risk of future failures” and “the life of the existing 18-inch pipe is nearly exhausted.” The report describes pipe lining/rehabilitation, pipe bursting, open-cut replacement, and horizontal directional drilling were proposed as potential approaches for rehabilitating the force mains but recommends that a qualified consultant evaluate alternatives and provide engineering recommendations for management of the force mains. As the project will take two to three years to complete, the existing force mains must remain active for three or more years.

Goleta Slough

ESA prepared a *Sea-Level Rise and Management Plan for the Goleta Slough Area* in August 2015 for the Goleta Slough Management Committee. The purpose of the plan is to help decision-makers, planners, and land managers identify and prioritize adaptation strategies, including infrastructure improvements, policy changes, and management actions to adapt to sea level rise related impacts. The adaptation strategies identified in this document were reviewed and considered for incorporation into this Adaptation Plan. For context in assessing ecological benefits in the area, both the Goleta Slough Ecosystem Management Plan (1997) and its update (2015) discuss resources and ecosystem functions.

University of California, Santa Barbara

University of California, Santa Barbara (UCSB) completed a *DRAFT Sea Level Rise Adaptation Strategy* report in 2022. The strategy assesses the vulnerability of UCSB's shoreline and applies an “adaptation pathway” approach of monitoring environmental and social change to anticipate and trigger future adaptation actions. One of the adaptation pathways considered the eventual removal and relocation of facilities near Mesa Road to allow for Goleta Slough wetland

expansion. This adaptation strategy, with the others identified in this report, were reviewed during the preparation of this Adaptation Plan.

City of Goleta

In 2015, the City of Goleta, which borders SBA, completed its *Coastal Hazards Vulnerability Assessment and Fiscal Impact Report* (City of Goleta, 2015). The report evaluates the community's vulnerability to sea level rise, estimates the fiscal impact on the city, and identifies adaptation strategies to prevent or minimize the vulnerabilities and reduce the fiscal impacts. The City is in the process of developing an adaptation plan that is informed by the findings of the vulnerability assessment.

City of Santa Barbara

ESA prepared the *City of Santa Barbara Sea-Level Rise Adaptation Plan*, which was adopted by the City Council in February 2021. The report includes portions of the City that are projected to be impacted by coastal hazards through the year 2100, with the exception of SBA and Goleta Slough. The Adaptation Plan prepared herein is a separate but supplementary document to the City's adaptation plan. The adaptation strategies identified in the City's adaptation plan were reviewed during the preparation of this document.

Transportation Resiliency Assessment

In 2019, Santa Barbara County Association of Governments developed a *Multi-Modal Transportation Network Resiliency Assessment* that identifies transportation assets in the county that are vulnerable to climate change impacts (including sea level rise) and resiliency solutions to mitigate those vulnerabilities (Energetics 2020).

GOLETA BEACH

County Parks Ongoing Emergency Maintenance

The Santa Barbara County Flood Control District performs emergency maintenance to remove sediment from debris basins, creeks, and flood control channels and places some of the suitable sediment at Goleta Beach. Channel dredging from Goleta Slough tributaries (San Pedro, Carneros, Tecolotito, and Atascadero Creeks) occurs as permitted for the County's Goleta Slough Management Program and Atascadero Creek Maintenance Project, and as needed for emergencies.

BeachSMART

The Santa Barbara County Flood Control District and State Coastal Conservancy, with support from other County departments, is preparing a multi-pronged project collectively entitled the Beach Sediment Management and Resilience Tactics (BeachSMART) project. The project goals are to synthesize existing data, collaborate with Tribal and community groups, and ultimately update the Regional Sediment Management Plan to incorporate modern sediment management practices and climate adaptation strategies.

BEACH EROSION AUTHORITY FOR CLEAN OCEANS AND NOURISHMENT

Regional Coastal Adaptation Monitoring Program

The Beach Erosion Authority for Clean Oceans and Nourishment (BEACON) is developing a Regional Coastal Adaptation Monitoring Program (RCAMP). The program aims to equip local management agencies with consistent information to be able to assess the need for new adaptation approaches and whether implemented coastal adaptation actions are resulting in positive or negative impacts. ESA, with input from BEACON members, a Science Advisory Committee, and stakeholders, is preparing an RCAMP Monitoring Plan that establishes recommended monitoring strategies and pilot projects, with the purpose of providing a roadmap for RCAMP implementation. The Monitoring Plan evaluates and prioritizes various monitoring parameters related to physical, ecological, socioeconomic, and Chumash cultural aspects based on the key objectives of the RCAMP.

Coastal Regional Sediment Management Plan

The 2009 Coastal Regional Sediment Management Plan (CRSMP, BEACON 2009) provides a detailed review of existing shoreline armoring and encroachment, shoreline trends, and shoreline processes within the Santa Barbara littoral cell, which spans from Point Conception to Point Mugu. In addition, the plan quantifies sediment sources from both riverine systems and episodic coastal bluff erosion within sub-littoral cell units. Four primary challenges have been identified in the document: coastal processes and sand sources, upland watersheds, development, and governance. Based on these challenges, the document identifies both general region-wide opportunities and specific sub-littoral cell recommendations for activities, studies, management strategies, policies, and capital projects or proposals. One of the opportunities recognized by the plan is to establish Goleta Slough tributaries as a regional sediment management source site, and to implement a long-term maintenance program to ensure that sediment that accumulates within the upstream traps is placed on the beach or nearshore zone to maintain the watershed's fluvial sediment delivery process.

TRIBES

In preparation of this Adaptation Plan, the project team consulted with local tribes.

Santa Ynez Band Initial Sea Level Rise Vulnerability Assessment and Ocean Protection Council Grant

In March of 2025, the California Ocean Protection Council (OPC) approved a SB1 grant of \$1.1 million to the Santa Ynez Band of Chumash Indians (SYBCI) for "A Coastal Hazard Assessment of Chumash Heritage at Risk from the Impacts of Sea Level Rise." The project seeks to complete a detailed vulnerability assessment of coastal hazards and risks to coastal Chumash village sites with a focus on areas near coastal wetlands; river and creek mouths; and Chumash-identified "cultural keystone places." This CAP recognizes proximity of coastal Chumash village sites and other cultural resources. This City is coordinating with the SYBCI on adaptation efforts.

REGIONAL AND STATE GUIDANCE

State of California Sea-Level Rise Guidance

The *State of California Sea Level Rise Guidance: 2024 Science and Policy Update* (OPC 2024) provides sea level rise projections along the California coast through 2150. The document provides 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 their planning decisions. The document presents a range of potential sea level rise scenarios and provides guidance on the appropriate types of projects for each scenario. For critical infrastructure, such as airports, the guidance recommends planning for the High Scenario using an adaptation pathways approach. Under this approach, near-term projects may be designed to address lower sea level rise scenarios (e.g., Intermediate or Intermediate-High Scenarios) while preserving the ability to implement additional adaptation measures in the future if higher sea level rise conditions occur. This Adaptation Plan and associated 2025 CVARE use the Santa Barbara–specific sea level rise projections provided by the guidance.

California Coastal Commission Sea-Level Rise Policy Guidance

The California Coastal Commission (CCC) adopted an update to its *Sea Level Rise Policy Guidance* in November 2024. The updated guidance reflects the new best available science presented in OPC 2024 and a description of the language and intent of SB 272, which requires local governments to develop sea level rise adaptation plans as part of new or updated LCPs. Additionally, the updated guidance better integrates environmental justice considerations, emphasizing the disproportionate impact of sea level rise on environmental justice communities and providing steps for identifying and engaging with these communities during the planning process. As a whole, the guidance document organizes current scientific, technical, and other information and practices into a single resource to facilitate implementation of the Coastal Act by coastal managers at the state and local levels. This Adaptation Plan was prepared in accordance with the document.

California Coastal Commission Critical Infrastructure Guidance

California Coastal Commission’s Sea Level Rise Guidance for Critical Infrastructure (2021) includes information to help inform sea level rise adaptation decisions for critical infrastructure that are consistent with the California Coastal Act. The Guidance addresses specific assets that fall within two main types of critical infrastructure: transportation and water. The Guidance also includes an appendix containing model language for policies related to transportation infrastructure and water infrastructure.