Chapter 5 Climate Adaptation and Hazard Mitigation Strategy

June 2022

Climate Adaptation and Hazard Mitigation Strategy Development

Development of the mitigation and climate adaptation strategy included identifying and analyzing existing capabilities and available mitigation measures to achieve the vision and goals. Mitigation and adaptation strategies include those that were in the previous plan, suggestions from the State of California Hazard Mitigation Plan, the City's General Plan and Climate Action and Resiliency Plan, public input, staff input, board and commission input, and other sources. Additional mitigation measures will continue to be considered as future mitigation opportunities are identified, as data and technology improve, as mitigation funding becomes available, and as the Plan is maintained over time.

Capabilities Assessment

The City of Alameda has a variety of capabilities for reducing our long-term vulnerability to hazards, including planning and regulatory, administrative and technical, financial, education and outreach. Our mitigation and adaptation strategy draws from and builds on these existing capabilities. The following capabilities are already in place and informed the City's climate adaptation and hazard mitigation planning process.

Planning and Regulatory

The following ordinances, policies, local laws, plans and programs guide and manage growth and development in Alameda.

- **General Plan (2021):** The General Plan is a statement of goals, objectives, policies and actions that describe the community's priorities for the next 20 years. California State law requires that every city adopt and maintain an up to date, internally consistent general plan. Alameda is in the process of updating its General Plan. The General Plan addresses climate change, affordable housing, equity and inclusiveness, safe streets, open space and park funding priorities, and disaster preparation.
- **Zoning Ordinance.** The Zoning Ordinance (Alameda Municipal Code Chapter 30) is a set of regulations that promote and protect the public health, safety, and general welfare of Alameda by guiding, controlling, and regulating future growth and development that occurs in the city. Zoning regulations apply to all new construction, building alterations, property line changes and most site construction work including some tree cutting and landscaping. The Zoning Ordinance will be updated following update of the City's General Plan.
- **Alameda Building Code.** All construction in California is regulated by building codes set forth by the California Department of Housing and Community Development. In addition, construction in Alameda must also comply with the Alameda Building Code (Alameda Municipal Code Chapter 13).
- **Capital Improvement Program (FY 21-23).** Alameda's Capital Improvement Program (CIP) aims to maintain and improve the City's aged public infrastructure as best it can with the resources available.

- **Storm Drain Master Plan** (Conveyance and Pump Stations): The City's recently completed master plans specifically address lack of capacity during 10-year and 25-year storms. While the plans were completed before the new preliminary FEMA floodplain maps were issued, they do address 18-inch and 55-inch sea level rise adaptations, which impact the same areas identified by FEMA as flood-prone. Rising groundwater levels are intricately linked with the City's storm drain system and lagoon operations. Future updates to this plan could consider the potential for a rising groundwater table, with increased investments on identifying areas with groundwater infiltration.
- **Sewer Master Plan:** This plan updates all pump stations to meet current capacity and prioritizes rehabilitation of aging sewer pipes with more flexible material known to withstand seismic and flooding hazards.
- **Transportation Master Plans** (transportation plans addressing transit, bicycle, pedestrian, signals, goods movement, air quality, and other transportation needs): The City Council approved the Transportation Choices Plan in 2018, which is a multimodal plan to improve access and safety, and is in the process of completing the Vision Zero Action Plan and the Active Transportation Plan. These plans encourage the flexibility of transportation by diversifying both routing and conveyance means. This will be useful during times when regular transportation is disrupted. These plans are updated on a five-year cycle. The next updates will specifically plan for resiliency and recovery during and after hazard events.
- **Master Infrastructure Plan for Alameda Point**: This document established the requirements and standards for the backbone infrastructure to support re-development and reuse of Alameda Point (the old Navy Base). The infrastructure improvements will create a seismically stable site that can adapt to the potential impacts of climate change such as sea level rise with initial development requirements at 36 inches elevation.
- **Emergency Operations Plan.** The 2019 City of Alameda Emergency Operations Plan (EOP) is the foundation for disaster response and recovery operations for the City of Alameda. The plan outlines how the City of Alameda government complies with and implements the requirements of the California Emergency Services Act to protect the lives and property of the community of the City of Alameda.
- **Floodplain Management Ordinance:** The ordinance includes provisions for residential and commercial construction in flood prone areas. The flood prone areas are generally defined by the FEMA Flood Insurance Rate Maps and base flood elevations. These provisions can be extended to include areas projected to be exposed by sea level rise and/or emergent groundwater.

Administrative and Technical

The city employs a professional staff of 470 (not including Alameda Municipal Power staff) that includes engineers, planners, attorneys, building officials and inspectors, administrative analysts, first responders, enforcement officers, and technicians who can all help to advance Alameda's mitigation and adaptation strategy. Staff coordinates across departments and agencies to implement to advance mitigation and adaptation planning efforts on behalf of the City.

In addition, several staff have within their job descriptions the specific responsibility for climate adaptation and hazard mitigation.

- In 2020, the City hired a full-time Sustainability and Resilience Manager to oversee implementation of the Climate Action and Resiliency Plan and Climate Adaptation and Hazard Mitigation Plan.
- The Fire Department employs a full-time Disaster Preparedness Coordinator/Emergency Manager to coordinate citywide disaster preparedness, response and recovery efforts.
- A staff engineer within Public Works is designated to act at the Flood Plain Manager.
- All inspectors, code enforcement officers, and planners have received Post Disaster Assessment Certification.

Fiscal

The City of Alameda has a variety of financial resources available to help fund mitigation activities. In addition, Alameda regularly pursues State, Federal and other grant opportunities to implement identified mitigation and adaptation projects. As a municipal agency, Alameda also has the ability to place revenue measures on the ballot to fund specific climate adaptation and hazard mitigation projects.

- **General Fund.** Sources of revenue for Alameda's General Funs include property taxes, property transfer taxes, sales taxes, transient occupancy taxes (hotel tax), utility users' tax, franchise fees, business license taxes, and departmental fees and charges for services. General funds are used to fund the day to day operations of the city.
- **Capital Budget.** The capital budget implements the Capital Improvement Program. The Capital Improvement Program totals approximately $31.8 million and $35.2 million for FYs 2021-22 and 2022-23, respectively. The capital budget is funded almost exclusively from restricted funds. The Sewer Fund is restricted to maintenance and replacement of City sewers. Transportation funds include Measure B/BB, Gas Tax and Vehicle Registration Fee. Transportation projects also are supplemented by the Development Impact Fee funds, which are paid for by new residential and commercial development, and an assortment of grant funding. The Urban Runoff and Water Quality and Flood Protection fees are for the maintenance and enhancement of the City's stormwater infrastructure and various efforts to make stormwater pollution-free before it enters the Bay. The General Fund, though a small contributor to the overall capital budget historically, is one of the only funding sources that is not restricted and can support any public infrastructure expense.
- **HOME Program Special Revenue Fund.** The HOME program is a federal grant that finances housing projects in partnership with government, nonprofit, and private organizations. Home funding supports several programs that advance hazard mitigation.
  - **Soft Story Structural Assessment Grant.** The Soft Story Structural Assessment Grant for Rental Units Program to provide financial assistance to residential rental property owners to assess their soft story structure without passing the costs through to tenants. At least 51% of the units in the building must be occupied by low- and moderate-income households. Grants of up to $5,000 are available to offset engineering fees required to produce a report acceptable to the Building Department for review.
  - **Rental Rehabilitation Program.** The Rental Rehabilitation Program provides loans at 2% interest to landlords who rehabilitate rental property in Alameda, including seismic retrofits. The majority (at least 51%) of the households in the structure must be low income, and the majority of the units must be two-bedrooms or larger with rents not in excess of HCD Payment Standards.

- **Housing Rehabilitation Program**. The Housing Rehabilitation Program helps low-income Alameda homeowners repair and improve their homes with low-interest loans that can be used to correct substandard and/or health and safety conditions (including lead-based paint hazards), to extend energy conservation, or to repair or replace major systems in danger of failure, including seismic retrofits. The maximum loan amount is $50,000.

Education and Outreach

Alameda educates and informs the public about hazards and climate impacts and actions that can be taken to reduce their impacts in a variety of ways.[1]

Alameda community members can opt in to AC Alert to receive important or emergency notifications from the City and County of Alameda. A total of 12,500 people in Alameda have subscribed to AC Alert as of April 2021. Regardless of opt-in, the City also has access to all AT&T and Comcast landline phone numbers and can send automated voice messages to those numbers. The City can also send, via Alameda County, Wireless Emergency Alerts (WEA) or IPAWS - Emergency Alert System (EAS) message that pushes the notification to all cell phones in the range of a selected wireless tower.

The City's Public Information Officer also maintains official social media accounts on Facebook, Twitter, Nextdoor and Instagram to educate and inform residents. In an emergency, important information may also be broadcast via public access television, channel 15 and the low power city radio notification for system, 1280 AM.

Alameda conducts a variety of education and outreach to community members on disaster preparedness, including:

- **Community Emergency Response Team (CERT).** The CERT program provides training to Alameda residents and employees of Alameda businesses to increase self-sufficiency in a disaster. Participants learn skills that will enable them to provide emergency assistance to their families, colleagues, and neighbors.
- **Tsunami awareness.** Alameda has conducted a number of community meetings focused on tsunami preparedness and evacuation in recent years with a special focus on the waterfront community and boaters and has installed tsunami hazard zone signs at the City's key gateways.

National Flood Insurance Program (NFIP) Participation

The City is a National Flood Insurance Program (NFIP) participant and intends to continue its participation. City of Alameda Municipal Code Chapter XX – Floodplain Management includes an automatic adoption clause for "all subsequent amendments and/or revisions" to the Flood Insurance Study (FIS) for Alameda County, California, and Incorporated Area dated August 3, 2009, with accompanying flood insurance rate maps (FIRMs) and flood boundary and floodway maps (FBFMs), dated August 3, 2009. In 2016 the City requested that the NFIP Specialist in Region 9 review the City's Municipal Code Chapter XX – Floodplain Management. On March 19, 2016, an email was sent to the City by the NFIP Specialist stating that she "reviewed your code and see no major problems with it. It has all

[1] see: https://www.alamedaca.gov/Departments/Fire-Department/Disaster-Preparedness

the minimum requirements. Your City will automatically adopt the new FIRMs when they officially become effective." The provisions of Municipal Code Chapter XX as such apply to the revised Areas of Special Flood Hazard issued by FEMA in the 2018 FIRMs.

The City continues to educate residents about the FIRMs, flood insurance and flood preparedness. The City regulates new construction in Special Flood Hazard Areas, per Municipal Code Chapter XX – Floodplain Management, and administers any local requests for map updates, gives community assistance, and monitors activities. All residential buildings constructed, substantially improved, and/or reconstructed due to substantial damage within Alameda are required to be built in conformance with a 1-foot freeboard requirement above Base Flood Elevation, meaning to a minimum Elevation of 11 ft NAVD88 or higher. The City also continues to work with Homeowner Associations regarding shoreline dike improvements.

Community Rating System (CRS) Participation

In response to the 2018 FIRM release, the City joined FEMA's voluntary Community Rating System (CRS) in 2019 - which encourages communities to go above and beyond minimum NFIP requirements. In exchange for participation in the CRS, communities receive an automatic discount on flood insurance premiums. Alameda is currently designated as a Class 8 community within CRS and homeowners receive a 10% discount on flood insurance accordingly. The City has investigated the possibility of participation as a Class 7 community and found that the level of outreach, documentation, and points required for the upgrade exceeds available staff capacity at this time.

Strategies for Location-Based Priority Flooding

Flooding is one of the greatest climate threats that Alameda faces. The CARP vulnerability assessment identified priority assets based on the risk posed by both temporary flooding due to storm surge/overland flooding and permanent inundation from sea level rise. Strategies and associated actions are presented in CARP and reproduced in **Tables 5-1 to 5-11** with the following time horizons: short- (< five years), mid- (five to 10 years), and long-term (> 10 years). Alameda is actively working to implement the strategies outlined below.

Specific information for each priority asset includes:

- Recommendations for short-, mid-, and long-term actions;
- Barriers and limitations to implementation;
- Site-specific considerations; and
- Case studies and examples, if available.

Recommendations are built on analyses of previous City studies, review of activities implemented in other municipalities, and guidance from state and federal entities on designing adaptation strategies for coastal flooding. The order of actions presented for each asset does not indicate higher or lower ranking. The City should identify the preferred approach(es) for each priority asset and proceed with feasibility and engineering studies to develop more detailed project designs. Strategies for location-based priority

flooding are outlined in the tables that follow. Additional site-specific considerations, case studies, limitations to implementation, and costs and benefits of adaptation are detailed in **Appendix H**.

Table 5-1 Adaptation Planning: Crown Beach

Short-Term (<5 years)	ALL	• **Coordinate with EBRPD on master planning for the site**, including the public process.
	ALL	• **Study the geomorphology** of the beach. Study sand movement to predict where/how beach elevation will change over time and refine future strategies.
	1	• **Study opportunities for Elsie Roemer salt marsh to migrate with sea level rise.** Consider purchase of property as they become available. Fund native plant restoration to support long-term marsh health.
	2	• **Increase current dune management.** Dunes stabilize the beach and provide additional protection to the road. Strengthen and build existing dunes by further establishing native plants. Limit vehicular access to promote plant growth on the beach.
	ALL	• **Continue current practice of annually redistributing sand down the beach** (as needed).
Mid-Term (5–10 years)	3	• **Widen shoreline into the Bay.** Consider opportunities to move the shoreline into the Bay at a more gradual slope to protect against erosion.
	ALL	• **Develop long-term monitoring and trigger thresholds plan.** After 2 to 3 feet of sea level rise, additional strategies may need to be considered and 10 years of lead time will be needed (for feasibility studies, funding, etc.). Thresholds can be developed to trigger exploration of additional strategies, such as adding jetties/groins, oyster reefs (integrated into existing eel grass), or cobble berms to further control erosion.
Long-Term (>10 years)	4	• **Allow the beach to move inland.** If the beach erodes, there may be opportunities to simply allow it to move inland given the amount of open space available in the park.

CROWN BEACH

Crown Memorial State Beach is a 2.5-mile sandy beach, owned by California State Parks and the City of Alameda. Operated and managed by EBRPD, the beach is a popular spot for recreation and provides wildlife habitat. It also serves as shoreline protection for Shoreline Drive, the adjacent community, and important infrastructure such as stormwater outfalls. Sand is not naturally transported to the beach, so it must be periodically redistributed and replenished as it erodes slowly over time or suddenly in a large storm.

Table 5-2 Adaptation Planning: Eastshore Drive

Short-Term (<5 years)	1	• **Hydrodynamically model the mudflats and future impacts of sea level rise.** Assessing the full benefits that mudflats provide and their ability to adapt as water levels rise is needed to fill current information gaps.
	2	• **Integrate adaptation between public pathway improvement projects and private parcels.** Several public pathways are under consideration for improvement in this area. Selection criteria for park improvement projects could include potential for project to be integrated into broader flood protection improvements.
	2	• **Build higher barriers that can be further built up over time.** The City and homeowners should collaborate to clarify responsibility for maintenance of flood protection given parcel and jurisdictional boundaries, then begin developing barriers that protect against mid-century sea level rise and a 100-year flood.
Mid-Term (5–10 years)	1	• **Mudflat augmentation.** Add additional dredged sediment to the existing mudflats to help them maintain necessary elevation and structure as waters rise, ensuring they continue providing benefits. Support submerged aquatic vegetation in San Leandro Bay.
	ALL	• **Develop long-term monitoring and trigger thresholds plan.** Develop thresholds that trigger construction of higher levels of flood control.
Long-Term (>10 years)	ALL	• **Tidal neighborhoods.** If property ownership changes in the coming decades in this area (transfer to developer or City), evaluate potential for floating neighborhoods proposed by the Resilient By Design "Estuary Commons" project.
	2	• **Consider property purchase for migration/ enhancement of mudflats for flood protection,** pending findings of hydrodynamic model of mudflats with sea level rise. Extensive outreach and engagement would be conducted well in advance of implementing this strategy if it were to occur.

EASTSHORE DRIVE

Eastshore Drive is the easternmost road on Alameda Island. It runs north-south, providing access to the Eastshore and Fernside residential neighborhoods. Though there are several public pathways leading to the water along Eastshore Drive, the eastern waterfront as a whole primarily consists of private homes. The shoreline is currently protected by a combination of sloped riprap (pilled rock) and vertical bulkheads (walls) running along backyards. There are existing mudflats along the east side of Alameda Island. Mudflats provide many benefits, including wave attenuation and reduced erosion, and they serve as vital habitat for shore and water birds. FEMA recently determined that sections of the Eastshore neighborhood are within the 100-year flood zone. Inundation maps representing sea level rise and storm surge also indicate flood risk within this area.

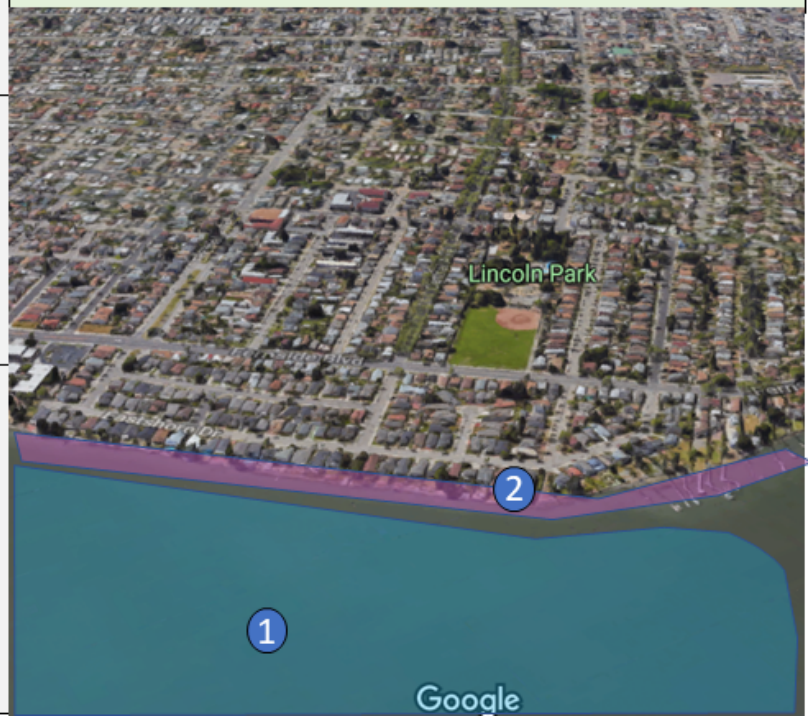

Table 5-3 Adaptation Planning: Shoreline Near Webster and Posey Tubes

Short-Term (<5 years)	1 2 ALL ALL	• **Design and implement levee and seawall expansions to protect from a 100-year storm event** using existing levees and seawalls. The City's initial conceptual drawings for this location identify areas that need to be raised/reconstructed. • **Compile a comprehensive geospatial record of land ownership shoreline.** • **Establish memoranda of understanding as needed with private landowners.** Ensure shoreline actions consider their needs and that they actively implement flood protection actions moving forward. • **Develop evacuation plan for senior centers and other care facilities in affected area.**
Mid-Term (5-10 years)	3 ALL 4	• **Require flood-proofing for critical inland facilities** like the Hazardous Materials Transfer Station. • **Investigate options to modify existing public trail and open space to accommodate temporary flooding.** Consider appropriate vegetation, stormwater management structures, and other natural water-tolerant features. • **Expand existing levees and seawalls to address longer-term water levels.** To address higher water levels beyond the FEMA 1% annual chance floodplain, the City should consider further elevating existing levees and seawalls to 13' NAVD88 and extending seawalls to the northwest. Public access for bicycles and pedestrians along the levee must be maintained or added.
Long-Term (>10 years)	ALL	• **Develop long-term northern waterfront shoreline strategy.** Investigate land use policy changes (zoning, building regulations, etc.), including "zoning overlays" in high-risk areas. Create regulations for new and redevelopment projects. Limit development within a certain distance from the shoreline.

SHORELINE NEAR WEBSTER & POSEY TUBES

A small segment of shoreline above the Webster and Posey Tubes at the north end of Mariner Square Drive is likely to overtop due to sea level rise at and beyond 36 inches. Overtopping at this location is linked to projected inundation that extends along Webster Street and nearby roads and into the Webster and Posey Tubes. The shoreline in this area is dominated by engineered levees and seawalls, as well as commercial buildings and residential facilities (e.g., the Oakmont Senior Center at Mariner Point), that occupy parcels very close to the current shoreline. Addressing shoreline overtopping in this location is likely to prevent flooding and inundation of critical roadways that provide access to/from Alameda Island.

Table 5-4 Adaptation Planning: Bay Farm Island Lagoon System 1 Outlet Gate and Seawall

Short-Term (<5 years)	1 1 1	• **Conduct a geotechnical study.** Determine the structural condition of the existing shoreline to better understand long-term modifications that may be necessary. • **Elevate existing seawall to provide immediate protection from storms and king tides.** Implement recommendations from previous stormwater system assessments. A new 2' retaining wall built behind the existing seawall will make shoreline protections level with tide gate structure platform and adjacent shoreline. • **Implement upgrades to HBI System 1 Pump Station** identified in previous storm drain master planning efforts and lagoon studies.
Mid-Term (5–10 years)	2 3	• **Investigate options for submerged aquatic vegetation (SAV) at this location.** Bay Area assessments for natural shoreline feasibility identified San Leandro Bay and the canal as potential locations for SAV. • **Begin design of large-scale shoreline modifications along the Bay Farm Island north shore.** After 2 to 3 feet of sea level rise, additional strategies may need to be considered and 10 years of lead time will be needed (for feasibility studies, funding, etc.). Thresholds can be developed to trigger exploration of additional strategies such as elevating the existing shoreline or expanding it outwards into the Bay, as well as converting it into a living or horizontal levee.
Long-Term (>10 years)	ALL	• **Coordinate the approach to flooding across Bay Farm Island.** Flooding on Bay Farm Island is connected to several locations of shoreline overtopping in both Alameda and Oakland. A coordinated approach to shoreline modifications is necessary to reduce the risk of flooding.

BAY FARM ISLAND LAGOON SYSTEM 1 OUTLET GATE & SEAWALL

At the north end of Bay Farm Island Harbor Bay Lagoon System 1 is a narrow, 100-foot long isthmus of land separating the lagoon from San Leandro Bay that can be considered a seawall. It is not a FEMA-certified seawall, and the underlying shoreline's structural competency is unknown. The seawall is not level with the adjacent shoreline, providing a conduit for floodwaters due to sea level rise and storm surge. Overtopping at this location has the potential to compromise the lagoon system, leading to flooding of neighborhoods throughout Bay Farm Island. The tide gate structure at this location is used to drain the lagoon system during low tide. A supplemental pump can also lower lagoon water levels if the tide gate is submerged.

Table 5-5 Adaptation Planning: Veteran's Court Seawall

Short-Term (<5 years)	1 2 3	• **Regrade and elevate road to convert Veteran's Court into a flood protection structure.** Initial City conceptual designs call for elevating the roadway and retreating the cul-de-sac to Veteran's Memorial Park. A small 3' to 4' earthen berm would tie into existing ground near Island Drive, preventing water from flowing along the roadway and impacting other areas. • **Repair/replace and elevate existing seawall.** Implement recommendations from Bay Farm Island Technical Study, including raising existing shoreline structure to provide greater flood protection. • **Enhance wave attenuation and erosion control features like submerged aquatic vegetation.** This may provide some additional protection to the existing seawall.
Mid-Term (5–10 years)	ALL 4	• **Integrate activities at Veteran's Court seawall into broader Bay Farm Island flood control strategies.** Flooding on Bay Farm Island originates from multiple locations, so any adaptations at an individual site should be part of a larger coherent approach for shoreline modifications across the island. • **Investigate options to convert Veteran's Court area into a living levee.** This would require either retreat away from Veteran's Court or encroachment into the canal, as well as a long-term management plan to maintain adequate levee elevation.
Long-Term (>10 years)	5	• **Consider further removal of impervious surfaces.** Short-term plans call for converting existing impervious surface into natural area to aid drainage. Long-term options could include converting Veteran's Court roadway into a shoreline park with pedestrian/bike access. Consider features like De-Pave Park as models for transitioning developed land to natural.

VETERAN'S COURT SEAWALL

A major source of potential flooding on Bay Farm Island is the Veteran's Court area. The shoreline along Veteran's Court is primarily a constructed seawall that is not engineered to meet FEMA requirements. Overtopping in this location may lead to inundation of adjacent neighborhoods at mid-century water levels—or inundation during very intense, current storm events—and will likely contribute to larger-scale flooding across Bay Farm Island at higher water levels. Addressing shoreline deficiencies at Veteran's Court is only part of a larger effort needed across Bay Farm Island, in both Alameda and Oakland.

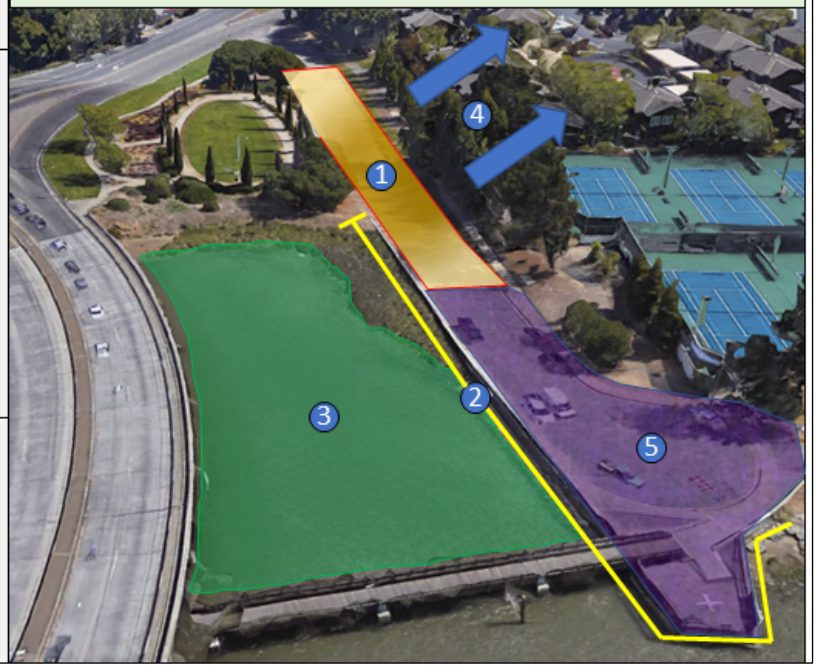

Table 5-6 Adaptation Planning: Bay Farm Island Touchdown and Towata Park

Short-Term (<5 years)	ALL	• **Conduct inventory of existing shoreline protection structures.** Determine ownership; where seawalls, riprap, and other protection structures are most deficient in elevation; and where repairs are most needed to guide immediate actions.
	ALL	• **Carry out engineering study to determine alternative conceptual designs for improved shoreline protection.** Study should include potential for beach creation along the fortified shoreline and expanded submerged vegetation restoration to reduce stress and wave runup on fortified shoreline.
	1	• **Conduct focused study on adaptation measures available at Towata Park.** Given that there is more space available at the park than along the homes, a design alternatives study may identify options besides a hardened shoreline in this area, such as a beach that integrates park improvements (e.g., kayak launch).
	2	• **Assess bridge vulnerability.** Include assessment of pilings, machinery rooms, motors, and vertical clearance.
	ALL	• **Repair/replace and elevate existing shoreline protection** (based on study outcomes). Provide 100-year flood protection plus protection to mid-century sea level rise projections.
Mid-Term (5-10 years)	ALL	• **Develop long-term monitoring and trigger thresholds plan.** Develop thresholds that trigger construction of higher levels of flood control.
Long-Term (>10 years)	ALL	• **Consider local ordinance requiring or encouraging flood retrofits in this neighborhood.**

BAY FARM ISLAND TOUCHDOWN AND TOWATA PARK

This stretch of shoreline provides flood protection to the adjacent residential area, Bridgeview Isle, and Krusi Park. The area of earliest concern is directly to the west of the bridge (on the Alameda Island side) by Towata Park, where overtopping begins at a total water level of 24 inches. At a total water level of 36 inches, homes in the Ravens Cove HOA and some nearby houses are impacted. At 48 inches, the flood area expands significantly. Today's shoreline is made up of seawalls and riprap. Towata Park is owned and managed by the City of Alameda Recreation and Parks Department. EBMUD has an easement in the area. The HOA appears to own part of the shoreline as well, though clarification is needed.

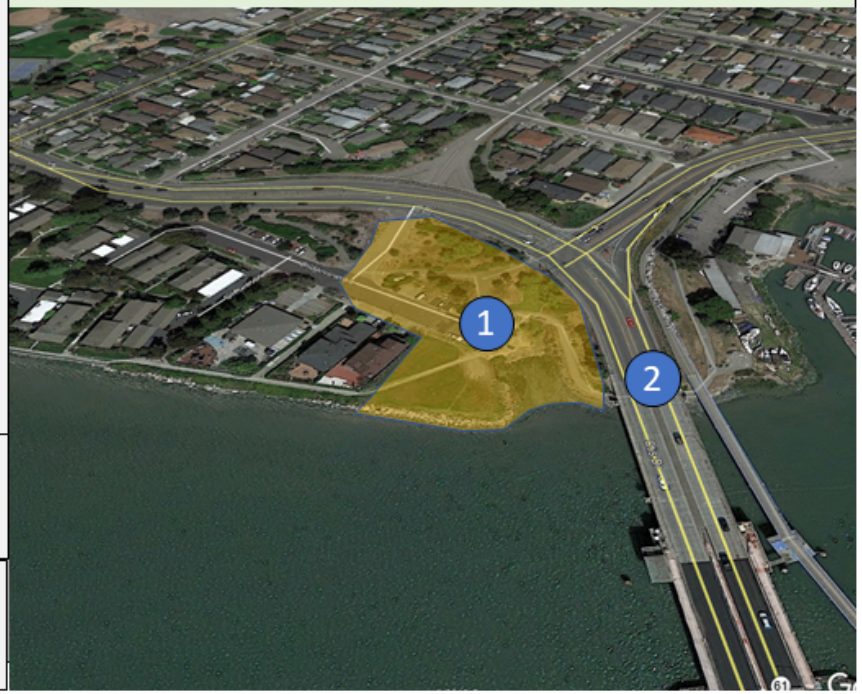

Table 5-7 Adaptation Planning: SR260, Including Posey and Webster Tubes

Short-Term (<5 years)	1 2 2	• **Address flooding at the Webster Tube exit and Posey Tube entrance.** Road grading and floodwalls along the ramps to the tunnels can block overland flooding and reduce disruptions to tunnels. • **Install saltwater-resistant pumps in the tubes.** Current pumps are designed for stormwater only and are likely to be compromised if sea level rise or storm surge results in saltwater in the tunnels. • **Implement flood-proofing for ventilation, electrical, and pumping infrastructure.** Ensure long-term sustainability of tubes by protecting critical infrastructure from flooding.
Mid-Term (5–10 years)	3 3	• **Implement results of West End Bicycle and Pedestrian Crossing Feasibility and Design Study** (Project 39 in TCP). The Caltrans District 4 Bike Plan (2018) lists a "new separated crossing" as a top tier project. • **Increase Transportation Redundancy.** The Alameda TCP outlines several projects, including water taxis, bike/pedestrian alternatives (Projects 37, 39), and other projects to increase transportation redundancy—e.g., a new BART connection (Project 35).

SR260 INCLUDING POSEY & WEBSTER TUBES

SR260, including the Webster and Posey Tubes, is a critical transportation corridor connecting Alameda and Oakland. It is owned and maintained by Caltrans. The City of Alameda has limited jurisdictional oversight of the roadway and tunnels but coordinates closely with Caltrans on tunnel projects. The route is used heavily by commuters and businesses, and it serves as a major commercial route connecting the Port of Oakland with storage facilities in Alameda. Despite the age of the Posey Tube (built in 1928; oldest underwater tunnel in the United States), seismic retrofits completed in 2004 helped rehabilitate the tunnel and increase its functional lifespan. Modifications to the tubes are likely necessary to protect them from floodwaters. Shoreline modifications in this area will be critical to preventing flooding in the tubes, but actions should still be implemented to prevent disruptions if shoreline flood protection structures fail.

Table 5-8 Adaptation Planning: SR61/Doolittle Drive

Short-Term (<5 years)	1 2 3 4	• **Work with model airplane field to adapt/regrade the field.** Some of the earliest flood risk to SR61 is at the intersection with Harbor Bay Parkway. The water would flow over the field before affecting the road. This could be prevented by regrading the field to prevent overtopping from Doolittle Pond. • **Support neighboring adaptation efforts.** Past adaptation design efforts have proposed extending Arrowhead Marsh southward into the seaplane canal, as well as relocating Doolittle Drive westward (toward Earhart Drive) and raising it onto a horizontal levee. While such strategies represent a long-term effort taking place in Oakland, they could significantly reduce Bay Farm's flood risk. The funding, multijurisdictional political will, and research to support this work need to start now. • **Study potential for mudflat augmentation or beach erosion** to reduce overtopping of Doolittle Pond.
Mid-Term (5–10 years)	5	• **Collaborate with Regional Water Quality Control Board on updates to the long-term flood protection plan contained within the Doolittle Landfill's Waste Discharge Requirements (WDRs).** WDRs are updates to ensure monitoring and management requirements remain appropriate to site conditions. A WDR update could provide an opportunity to discuss integration of site flood protection into broader shoreline adaptation efforts.
Long-Term (>10 years)	6 7	• **Explore opportunities to collaborate with the golf course on flood control.** • **Explore converting roadways on the east side of the Bay Farm community into levees.**

SR61/DOOLITTLE DRIVE

SR61 is a state highway owned and maintained by Caltrans. The route runs from the intersection with SR112 near the Oakland Airport across Alameda and terminates at the intersection of Webster Street in Alameda, operating as an important corridor from the island of Alameda to Bay Farm Island, and to the airport and the City of Oakland. The route includes the Bay Farm Island Bridge (connecting Alameda Island and Bay Farm Island). Multiple AC Transit bus routes, including several serving transit-dependent communities, use SR61. The City of Alameda has designated SR61 south of Otis Drive as a primary evacuation route. While isolated segments of SR61 within the City of Alameda are at risk of flooding (near Veteran's Court and the intersection of SR61 and Harbor Bay Parkway), major flood risk originates with overtopping of Doolittle Drive within the City of Oakland. There is a risk that water could overtop Doolittle Drive and then flood the airport, golf course, and finally nearby residential neighborhoods.

Table 5-9 Adaptation Planning: Critical and High-Use Roadways

Short-Term (<5 years)	ALL	• **Address culvert and road drainage issues in areas identified as vulnerable to sea level rise and storm drain flooding** (see maps to right). Expand consideration of transit-dependent communities in road project prioritization.
	ALL	• **Investigate options for green infrastructure in road design**, including permeable pavement, bioswales, and distributed small-scale stormwater best management practices where appropriate. Implement recommendations guidance and strategies in the City's Green Infrastructure Plan.
	ALL	• **Support expanded WETA service** at the Main Street Ferry Terminal and a new terminal in the Seaplane Lagoon.
	ALL	• **Work with AC Transit to install bus shelters** so riders are protected from the elements on rainy days or during heat waves.
Mid-Term (5–10 years)	ALL	• **Work with high-risk neighborhoods and AC Transit** to develop a dynamic routing and notification system for buses during storm events.
	ALL	• **Expand flood-proofing for bus stops,** including elevating high-use stops in areas where floodwaters are likely and work with AC Transit to develop a community messaging system for rerouting of buses during flood events.
Long-Term (>20 years)	ALL	• **Continue to implement shoreline modifications to prevent the flooding and disruption of key roadways and transit**. The City can work with key partners like AC Transit, leaders in socioeconomically disadvantaged communities, and neighboring jurisdictions to study and implement transit system alternatives such as a greatly expanded ferry service that could reduce reliance on surface streets.

CRITICAL & HIGH-USE ROADWAYS

These are bundles of important roads in Alameda that private vehicles and public transit use. They are also important routes for emergency services. These roadways are defined in part based on the location of AC Transit bus routes that serve transit-dependent populations in Alameda, including Line 96, which serves Alameda Point (and the planned location of a Bus Rapid Transit stop). Although many roads in Alameda may be exposed to sea level rise and/or storm drain flooding, transit routes enable the City to ensure social equity when building resilience in Alameda. Maintaining a functioning and accessible transit system across the island also serves all residents that use transit for commuting and errands. Strategies suggested here often apply to many roads across the city. However, the CARP process indicates the importance of addressing issues along these key roads, which provide important services for transit-dependent communities in Alameda.

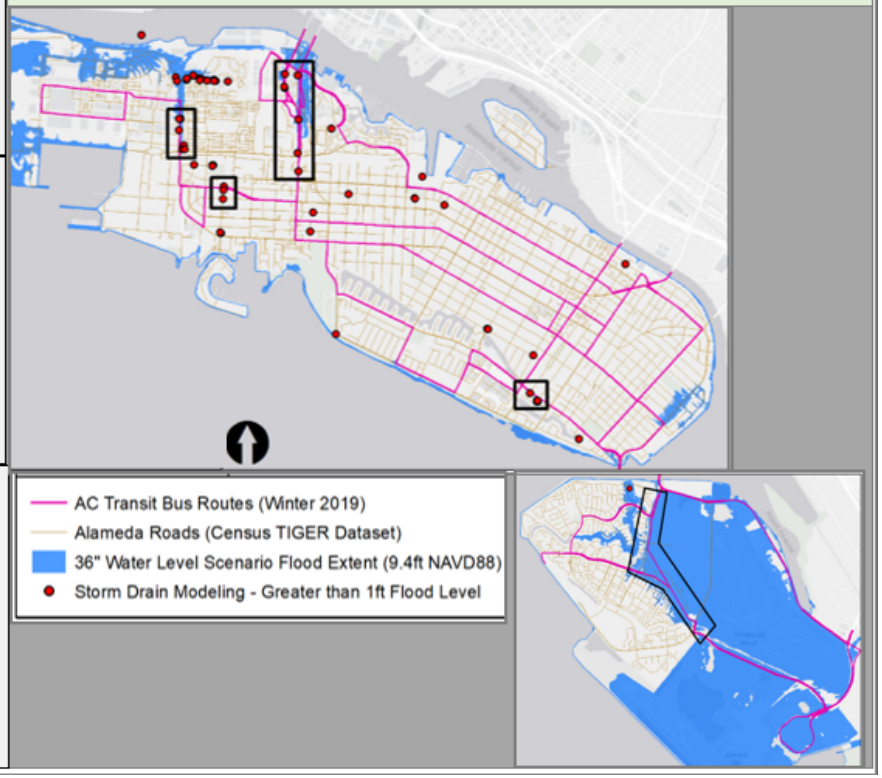

Table 5-10 Adaptation Planning: Storm Drain Pipes and Pump Stations

Short-Term (<5 years)	ALL	• **Implement recommendations in City's existing master planning efforts.** Projects include major efforts like lagoon dredging and capacity upgrades at priority pump stations, including Arbor Street, Webster Street, and Central/Eastshore.
	ALL	• **Consider projected future water levels when designing stormwater upgrades.** Storm pipe and pump station design should consider projected water levels at the end of the design lifespan for an upgrade. Additional elements like flood-proofing should be considered for infrastructure with long useful lifespans.
	ALL	• **Study groundwater and consider impacts on stormwater management.** Consider the impact of stormwater alternatives such as under-drained treatment on capacity requirements for pump stations and pumps. Study potential increases in flow if stormwater is managed through alternatives to infiltration and incorporate findings in stormwater improvements.
Mid-Term (5–10 years)	ALL	• **Continue to implement recommendations in City's existing master planning efforts.** Stormwater improvements beyond 5 years are tightly linked to shoreline improvements and other adaptation actions described throughout the CARP.
	ALL	• **Periodically update storm drain models.** At this time, it is unclear what capacity improvements or other upgrades might be needed beyond a 10-year planning horizon. Storm drain modeling will be revisited periodically and should begin to incorporate projected changes in storm intensity.
Long-Term (>10 years)	ALL	• **Comprehensive approach to shoreline and stormwater management.**

STORM DRAIN PIPES & PUMP STATIONS

Existing stormwater system planning has identified several important upgrades to the storm drain pipes and pump stations necessary to address current storms, which are likely to become more frequent with climate change. Without upgrading the system, runoff water may more frequently overtop the curb and threaten property and safety. It is crucial for the City to fund and implement stormwater pipe and pump stations projects already identified in master planning work. Sea level rise is likely to cause groundwater in Alameda to rise, exacerbating existing deficiencies in the stormwater system. At the same time, storm events and associated flooding can overwhelm stormwater infrastructure and lead to flooding throughout the system. A comprehensive approach to shoreline and stormwater system adaptation will ensure that Alameda is prepared for a future of increased flooding. Over the mid- and long-term, we will monitor groundwater levels and determine what impacts higher water levels have on stormwater management. We may need to consider large-scale efforts to manage groundwater levels.

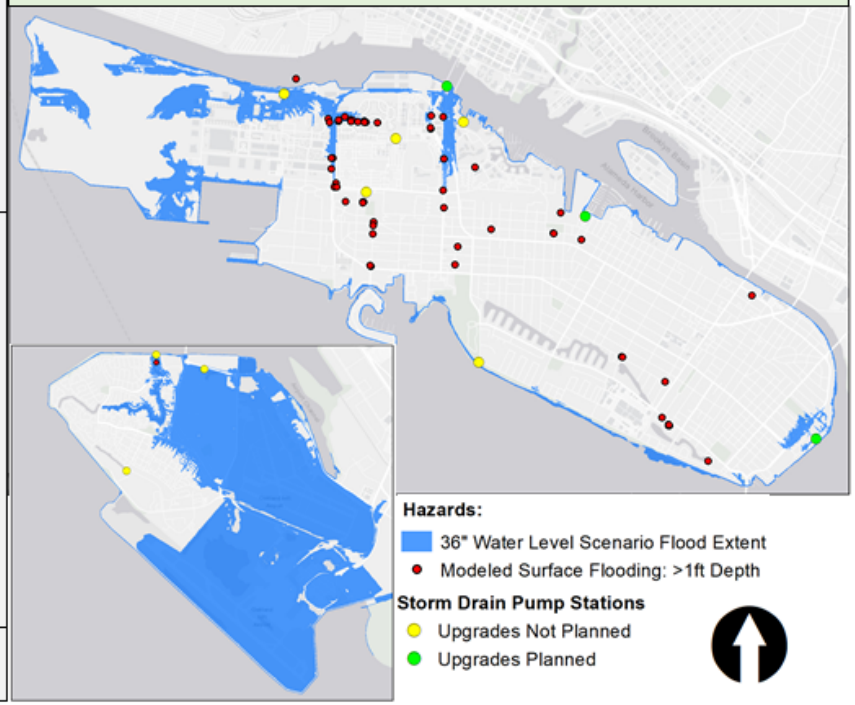

Table 5-11 Adaptation Planning: Bayview Weir and Outfall

Short-Term (<5 years)	ALL	• **Implement identified improvements from stormwater system master planning.** Master planning efforts have identified the need for upgrades, including dredging and new flap gates.
	1	• **Analyze the structure of the weir.** Determine the structural characteristics of the weir to better understand geotechnical conditions and gather information necessary to design a pump station.
	2	• **Monitor water levels at the outfall.** Establish a system to monitor water levels at the outfall to track the length of time the outfall is exposed. This information can help determine how soon a new pump station is needed.
Mid-Term (5–10 years)	1	• **Install a new pump station.** Begin planning, design, and permitting processes for a new pump station at the Bayview weir location. A pump station is needed at this site to ensure lagoon water levels can be maintained during storm events. Once the existing outfall is underwater for the majority of the day, it is no longer effective to control water levels through a gravity system.
	ALL	• **Integrate weir and outfall upgrades with other modifications along Shoreline Drive.** Implement recommendations from stormwater master planning efforts along Shoreline Drive to help better manage stormwater on the southern shore.
Long-Term (>10 years)	ALL	• **Address shoreline issues in nearby areas.** In the longer term, substantial inundation across Alameda Island could directly connect the Bay and the South Shore lagoon system. Shoreline modifications are necessary to prevent this inundation and maintain the long-term viability of the lagoon system.

BAYVIEW WEIR & OUTFALL

The Bayview weir and outfall are in need of repairs and/or replacement. The greatest vulnerability to the system is from sea level rise, which will eventually prevent the gravity-fed system from operating, necessitating the installation of an active pump station. Several information gaps need to be filled to determine the best approach to address deficiencies in the existing system. We can take a number of interim steps to address the vulnerability of the weir and outfall while securing funds for a new pump station. Over the longer term, it is necessary to fund and implement recommendations in existing master planning efforts for the stormwater system. Addressing vulnerabilities at this location is crucial to ensuring ongoing functionality of the lagoon system and to maintaining flood protection for homes adjacent to the lagoons.

Summary of Strategies

Completed and Ongoing Strategies

The City and community members have worked together for years to address certain aspects of risk such as strengthening structures and utilities, bolstering pre and post disaster communication systems and hiring City staff tasked specifically with increasing disaster readiness in Alameda. Accomplishments include:

- Building and Facilities
  - Require gas shut-off valves when a building is sold or a plumbing permit is obtained.
  - Require either fire sprinklers or smoke detectors in all developments.
  - Regulate construction in flood zones to comply with National Flood Insurance Program Community Rating System.
  - Retrofit or demolished 100% of Alameda's unreinforced masonry buildings.
  - Continuing implementation of the Soft-Story Ordinance requiring owners of soft-story apartment buildings to obtain a seismic evaluation of their building, notify all tenants and install an automatic gas shut-off valve.
  - Continuing implementation of the Wood Frame Buildings Ordinance to encourage the seismic retrofit of vulnerable single-family homes.
  - Require site-specific geotechnical investigations for development within liquefaction zones defined by the California Geological Survey.
  - Evaluated and retrofitted City buildings. The following buildings were either built to acceptable seismic standards, or retrofitted: City Hall, Police Station, Fire Station 1, 2, and 4, Main Library, West End Library, Bay Farm Library, Alameda Municipal Power Headquarters, Maintenance Service Center, Central Garage at City Hall, Parking Structure on Central/Oak, Godfrey Park Rec Center, Leydecker Park Recreation Center, Tillman Park Recreation Center, Carnegie Library, Bay Fairview Hall, and the Chuck Corica Golf Course Buildings.
  - Alameda Housing Authority completed a structural evaluation of its senior and low-income facilities and began implementation of the recommended projects
  - Replaced City-maintained landscaping with drought-tolerant, bay-friendly landscaping.
  - Continue to provide home upgrade grants to aid low-income owners and owners that rent to low-income tenants.
- Utility and Transportation Infrastructure
  - Seismic upgrade of Ballena Bridge
  - Repair of Veterans Wall and Walnut Street Retaining Wall.
  - 4X redundancy in emergency wi-fi communication systems.
  - Between FY15/16 and FY19/20, 14.7 miles of old clay sewer pipe was replaced with high-density plastic or PVC, materials demonstrated to better withstand shaking. 10.3 miles were replaced between FY10/11 and FY14/15
  - Storm culvert replacement and condition assessment of storm pipes for master planning purposes
- Networking, Planning, and Education
  - Developed tsunami inundation evacuation and emergency response plans.

- Mutual Aid Agreements and Compatibility with Fire and Police.
- Participation in Interoperable Communications System.

The following strategies have been completed since the 2016 Plan or are nearing completion:

- Constructed a new Emergency Operations Center and Fire Station #3 (Strategy I.A in 2016 Plan)
- Integrated Local Hazard Mitigation and other planning efforts and adopted CARP strategies into Local Hazard Mitigation Plan (Strategy III.C in 2016 Plan)
- Updated General Plan, including Health and Safety Element to align with the Climate Adaptation and Hazard Mitigation Plan (Strategy III.F in 2016 Plan)
- Conducted study of sea level rise impacts on water table in Alameda and potential contaminant mobilization (CARP strategy)
- Adopted and implemented new air quality / smoke response protocols for City staff and employees (CARP strategy)
- Raised stormwater fees to implement Storm Drain Master Plan (CARP Strategy)
- Upgraded air filtration system and installed A/C at the West End library to serve as a Cooling and Clean Air Center (strategy not previously identified)
- Developed draft Environmental Emergency Annex to the Emergency Operations Plan (strategy not previously identified)
- Purchased two water tenders are capable of drafting (pulling) water from the bay or other static water source to fill the tank or as a constant supply to fight fires (strategy not previously identified)
- Conducted awareness campaign on tsunamis, including Tsunami Preparedness week in March and to targeted groups such as the boating community and vulnerable community members (strategy not previously identified)
- Implemented additional drought mitigation measures to reduce municipal water consumption, including Increasing composting, reducing irrigation of decorative lawns (resulting in 3.6% reduction), turned off fish cleaning spigots at Encinal Beach (alternative fish cleaning methods being explored), converting decorative lawns at city facilities and some parks to drought tolerant landscape, prioritizing fixing pipe leaks, converting irrigation clocks to rain sensitive clocks (resulting in 15% reduction).
- Convened the San Leandro Bay/Oakland Alameda Estuary Adaptation Working Group with neighboring jurisdictions, agencies and community-based organizations to coordinate San Leandro Bay/Oakland-Alameda Estuary flood and adaptation projects to protect and restore water quality, habitat, and community resilience. Sub groups are focusing on adaptation of Doolittle Drive and Northern Shoreline near Posey/Webster Tubes (CARP strategies)

Strategies Provided by Key Partners

The table below shows owners of key infrastructure and facilities in Alameda and includes known mitigation actions. The individual agencies should be contacted directly for a complete list of hazard mitigation efforts.

Table 5-12 Key Partner Mitigation Strategies

Owner/Manager	Infrastructure Within City	Known Hazard Mitigation Efforts
East Bay Municipal Utility District (EBMUD)	■ Potable, non-potable (irrigation), and fire suppression water supply system consisting of pipelines, pumping plants, flow/pressure control facilities, and storage tanks and reservoirs owned by EBMUD ■ Sanitary sewer transmission pipeline (wastewater interceptor) and pumping stations ■ Sewer and water connections under the Estuary and San Leandro Bay	■ Three new pipeline crossings are proposed to replace the existing pipeline crossings to ensure long-term reliability of the water distribution system, meet existing and future water needs, and facilitate repair and replacement of aging infrastructure. The environmental review process for the project is underway. Through this process, EBMUD will assess the impacts of the project and identify ways to reduce or eliminate the impacts with input from stakeholders and the community. ■ EMBUD has an ongoing program to replace aging and brittle water lines with more modern materials. ■ EBMUD is collaborating with the City on development of a Debris Management Plan and a Utility Staging Area. ■ EBMUD is bringing recycled water to the main island by 2023, enhancing our resilience to drought. ■ For more information about activities EBMUD is taking for earthquake readiness: https://www.ebmud.com/about-us/construction-and-maintenance/fire-safety-and-suppression/emergency-preparedness/
Pacific Gas and Electric (PG&E)	■ Natural gas distribution system, including main pipelines, lateral pipelines and meters. ■ Electrical power feeds to Alameda Island under the Estuary.	■ PG&E has an ongoing program to replace aging pipelines with more modern materials, and to install new valves and pressure regulation facilities. ■ PG&E is considering replacement of the power feeds under the Estuary. ■ As a consequence of the San Bruno rupture, the National Transportation Safety Board (NTSB) has issued a number of recommendations to State and federal administrations and institutions to improve the

		safety of pipeline networks as well as to upgrade the integrity management program and emergency response system. As a result, PG&E proposed a $2.2 billion Pipeline Safety Enhancement Plan to modernize its gas transmissions operations over the next several years. As part of this plan, PG&E has installed approximately 13 SCADA units to remotely monitor and manage the pressure in gas transmission lines in the City of Alameda. ■ Additionally, PG&E has created a First Responders Safety website, which provides secure access to maps and information about natural gas transmission lines, natural gas storage facilities, and shut-off valves.
AT&T, Comcast, and other telecoms	■ Telecommunications aerial and underground conduits. Switching facilities. Cell towers.	■ Improvements are ongoing.
Caltrans	■ Posey and Webster Tubes, Bay Farm Island (AKA San Leandro Channel) Bridge and Bike Bridge, Constitution Overpass, State Routes 61 and 260.	■ Seismic evaluation and retrofit of bridges — Posey and Webster Tubes – The tubes were retrofit to “no collapse” standard in 2003. Caltrans has no future plans for seismic upgrades or upgrading the facility other than current refurbishment of the ventilation system. — Bay Farm Island vehicular bridge – Built in 1953 and seismically retrofitted in 1997 to “no collapse” standard. City sent letter in 2007 requesting retrofit to “lifeline” standard; however, Caltrans has no future plans for retrofitting the bridge. — Bay Farm Island bike/pedestrian bridge – The bridge was built in 1996 and there are no plans for seismic retrofit work. — Constitution Way overcrossing – this bridge was built in 1985 and there are no plans for seismic retrofit work. ■ Temporary detour plans — Posey and Webster Tube: There is a current Traffic Management Plan that were used during the construction/refurbishment of the ventilation system, and when closing the tunnel. The detour plan may be

		utilized, subject to Incident Commander discretion when an incident occurs. — Roadway – State Routes 61 and 260: Detour plans may be activated as necessitated by an emergency, subject to Incident Commander discretion. Caltrans District Traffic Manager may be able to assists during the time of the incident. ■ Post-earthquake inspection of Caltrans bridges, roadways and tunnels will be conducted by Caltrans staff as necessary depending on the earthquake intensity and extent of damage.
County of Alameda	■ Miller-Sweeney (Fruitvale), Park Street, and High Street Bridges.	■ The County retrofit all three bridges to “no collapse” standard from 2008 to 2011, and continues to maintain, operate and monitor these bridges.
Federal Government – Army Corps of Engineers	■ Fruitvale Railroad Bridge	■ City staff is working with the United States Army Corps of Engineers (Army Corps) to address the public safety hazard posed by the abandoned rail bridge that is likely to collapse in a seismic event. In 2020, the Army Corps submitted a request for funding to prepare a "Disposition Study," which is a comprehensive analysis of the economic utility of the bridge, in light of federal purpose and benefit. Once funded and completed, the report would inform the Corps' decision on continued use, transfer or demolition. A subsequent funding request to execute that decision would then be submitted. City staff considered retrofitting the bridge; however, the construction, operation and maintenance costs of this former rail bridge exceed the City’s financial abilities. ■ The City of Alameda would like to have the hazardous structure replaced with a new crossing for transit, bicycles and pedestrians.
Federal Government – Coast Guard and Navy	■ Portions of Alameda Point, all of Coast Guard Island including bridge, Coast Guard Housing, Ready Reserve, Navy	■ The United States Coast Guard has completed a sea level rise vulnerability assessment and adaptation plan for Coast Guard Island, which looked holistically at the shoreline. The Coast Guard completed a design that segments the island into nine different adaptation areas with primarily

	Operations Reserve Center	natural measures on the east side and riprap/sheet pile replacement on the west side. The Coast Guard is completing the environmental process along with permitting.
East Bay Regional Park District (EBRPD)	■ The EBRPD manages the Robert Crown Memorial State Beach, the City's Shoreline Drive Park, and the Northern Territories area by the Veterans Affairs proposed building. EBRPD is responsible for major maintenance and upgrades; the City is responsible for storm drain maintenance.	■ EBRPD recently completed restoration of Crown Beach, which has the indirect effect of protecting Shoreline Drive from storm erosion. ■ EBRPD is currently (Late 2015) designing an inland extension of the groin at Park Street to decrease beach erosion there.
Housing Authority	■ The Housing Authority has 572 senior, disabled, and low income housing units.	■ The Housing Authority has recently completed a comprehensive needs assessment at all properties. A capital improvements plan has been prepared to reduce risks to vulnerable populations. The plan includes management training, waterproofing work, communications systems, backup generators and other features.
Alameda Unified School District (AUSD)	■ The AUSD has 19 schools in Alameda, serving K through 12 grades, plus a special education preschool and an adult school.	■ AUSD has completed seismic retrofits of the Historic Alameda High School and Kofman Auditorium. ■ Lum Elementary school was closed in 2017 because of concerns about liquefaction risk on the campus.
American Red Cross (ARC)	■ Tasked with providing shelter operations and feeding during disasters.	■ The ARC and the City are working on shelter agreements for sheltering locations within the City. ■ The ARC is also working on shelter agreements with other organizations, including schools and churches, for additional sheltering locations. ■ The ARC is working with other organizations to prepare for mass feeding needs. ■ The ARC has a warehouse at Alameda Point with supplies (cots, food, etc.) for Bay Area sheltering needs.

Medical Facilities	■ There are numerous medical facilities that provide services to vulnerable populations. — Alameda Hospital — Private Clinics — Alameda County Health — (Future) Veterans Administration Clinic — Pharmacies	■ Alameda Hospital is completing seismic retrofit of the west building, in compliance with SB1953.
Water Emergency Transportation Authority (WETA)	■ WETA operates ferries that travel to three terminals within the City of Alameda. The landside portion of the ferry terminals is operated and maintained by the City; the water side portion is operated and maintained by WETA.	■ WETA built a maintenance facility and new ferry terminal on Alameda Point. ■ WETA is replacing and expanding the Main Street ferry terminal float. This project will design and construct terminal refurbishments and upgrades to maintain it in a state of good repair. WETA received a $4,456,000 discretionary Federal Transit Administration Ferry Grant Program award in July 2020 to support this project.

Priority Climate Adaptation and Hazard Mitigation Strategies

The priority climate adaptation and hazard mitigation strategies below include those from the 2016 LHMP that were selected for continuation, adaptation strategies from the Climate Action and Resiliency Plan, strategies in the General Plan Safety Element, and new strategies identified by staff and community members. The strategies in the final Mitigation Plan are aligned with those in the General Plan Safety and Climate Conservation Elements. Each mitigation strategy listed in **Table 5-12** below is explained in greater detail at the end of this chapter.

Table 5-13 Climate Adaptation and Hazard Mitigation Strategies

Strategy	Hazard(s) Addressed	Lead Department	Related Policy/ Plan
Buildings			
B1. Solar Panels. Encourage installation of solar panels and energy storage equipment in existing and new development and on public property such as the former Doolittle Landfill.	Earthquake Ground Shaking Wind/Storms	AMP	General Plan Policy CC-14
B2. Water Efficiency and Conservation. Minimize water use in existing and new construction and landscaped areas to make Alameda more resilient to drought and generate less wastewater.	Drought	Planning, Building and Transportation Public Works Recreation and Parks	General Plan Policy CC-16
B3. Rising Groundwater. Prepare for the impacts of rising groundwater levels on private and public property.	Sea Level Rise	Planning, Building and Transportation Public Works	General Plan Policy CC-23, HS-35
B4. Seismic Retrofit for Private Buildings. Require owners of vulnerable structures, to the extent feasible, to retrofit existing structures to withstand earthquake ground shaking, and require retrofitting when such structures are substantially rehabilitated or remodeled	Earthquake Ground Shaking Earthquake Liquefaction	Planning, Building and Transportation	General Plan Policy HS-13, Municipal Code Section 13-80.1 to 13-80.16 and 13-70.1 to 13-70.6
B5. Flood Insurance. Continue the City's participation in the National Flood Insurance Program and the Community Rating System as a Class 8 community. Identify ways to increase Alameda's Community Rating to reduce flood insurance costs.	Flooding Sea Level Rise	Public Works	General Plan Policy HS-14, Municipal Code Section XX - Floodplain Management
B6. Flood Proofing for Existing Buildings. Implement programs to	Flooding	Planning, Building and Transportation	General Plan Policy HS-19

Strategy	Hazard(s) Addressed	Lead Department	Related Policy/ Plan
encourage flood-proofing retrofits to existing buildings and redevelopment in flood-prone areas.			
B7. Design for Flooding. Implement programs and amend regulations to require and incentivize flood-proofing retrofits to existing buildings in flood-prone areas, and require all new development to design for sea level and associated groundwater rise based on the most current regional projections.	Flooding Sea Level Rise	Planning, Building and Transportation	General Plan Policies HS-22, LU-30, CC-20, CARP
B8. Building Codes for New Development. Encourage existing properties to minimize the risks of fire and include adequate provisions for emergency access and appropriate firefighting equipment.	Earthquake Caused Fires Earthquake Ground Shaking	Planning, Building and Transportation	General Plan Policy HS-29
B9. Fire Prevention in Existing Properties. Encourage existing properties to minimize the risks of fire and include adequate provisions for emergency access and appropriate firefighting equipment.	Earthquake Caused Fires	Fire	General Plan Policy HS-29
B10. Building and Infrastructure Standards. Maintain up-to-date building codes and encourage or require new and existing buildings and infrastructure to be designed or retrofitted for timely restoration of service (functional recovery) following an earthquake, with particular attention on the effects of liquefaction on buildings and infrastructure.	Earthquake Ground Shaking Earthquake Liquefaction	Planning, Building and Transportation	General Plan Policy HS-10
B11. Cool/Green Buildings. Incentivize and consider requiring the installation of cool roofs, green roofs, and/or other energy-efficient cool building methods to mitigate heat impacts and reduce runoff.	Heat	Planning, Building and Transportation	General Plan Policy CC-34
B12. Sea Level Rise Protection. Reduce the potential for property damage and loss, and loss of natural habitat resulting from sea level rise.	Flooding Sea Level Rise	Planning, Building and Transportation Public Works	General Plan Policy CC-19

Strategy	Hazard(s) Addressed	Lead Department	Related Policy/ Plan
Infrastructure			
I1. Critical Public Assets. Ensure resilience and long-term functionality of critical public assets threatened by earthquakes, sea level rise or rising groundwater.	Earthquake Ground Shaking Liquefaction Flooding Sea Level Rise	Public Works AMP	General Plan Policy CC-22 and HS-12
I2. Water Retention. Develop and maintain large and small areas to retain water within the city that may serve as areas of "retreat" during large storm events.	Flooding Sea Level Rise	Public Works	General Plan Policy CC-24
I3. Urban Forest. Take actions to maintain and expand the number of trees in Alameda on public and private property to improve public health, reduce pollution, and reduce heat island effects.	Heat	Public Works Recreation and Parks	General Plan Policy CC-26, CARP
I4. Lagoons. Continue to preserve and maintain all lagoons as natural habitat as well as an integral component of the City's green infrastructure network and flood control system.	Flooding	Public Works	General Plan Policy CC-32
I5. On-Island Generation. Support development of on-island solar power generation and on-island wind power with appropriately sized generation, storage, and microgrid distribution infrastructure to be able to provide power for a range of uses, including essential functions. Permit renewable energy generation facilities by right in zones with compatible uses and remove financial disincentives associated with the installation of clean energy generation and storage equipment.	Earthquake Ground Shaking Wind/Storms	AMP	General Plan Policy CC-4
I6. Public Infrastructure Priorities. Identify public transportation, streets, electric facilities, stormwater and wastewater facilities, open space, shoreline assets, and other public assets vulnerable to sea level and groundwater rise and flooding hazards,	Earthquake Ground Shaking Flooding Liquefaction Sea Level Rise	Planning, Building and Transportation Public Works	General Plan Policy HS-17, CARP

Strategy	Hazard(s) Addressed	Lead Department	Related Policy/ Plan
and prioritize projects for adaptation funding.			
I7. Green Infrastructure. Require the use of "green infrastructure", landscaping, pervious surfaces, green roofs, and on-site stormwater retention facilities to reduce surface runoff and storm drain flooding during storm events.	Flooding Sea Level Rise	Public Works	General Plan Policy HS-23, CARP
I8. Underground Utilities. Require new development to underground utilities to minimize disruption by fire or other natural disasters.	Earthquake Caused Fires	AMP	General Plan Policy HS-30, Underground Utility District Policy
I9. Lifeline Standard Estuary Crossing. Work with Caltrans, Alameda County, and other regional agencies to retrofit and improve at least one estuary crossing to meet a lifeline standard to ensure access to the larger region for emergency access, equipment supplies, and disaster response and recovery shortly after a major seismic event.	Earthquake Ground Shaking Liquefaction	Public Works	General Plan Policy HS-11
I10. Collaboration. Work collaboratively with other jurisdictions and agencies to reduce fire hazards in Alameda, such as post-earthquake fire hazards, with an emphasis on mutual aid agreements.	Earthquake Caused Fires	Fire	General Plan Policy HS-27
Land Use			
L1. Groundwater Rise. Review remediation timelines for contaminated sites based on a groundwater model with projected sea level rise impacts. Work with applicable agencies to adjust remediation, as applicable.	Sea Level Rise	Public Works	General Plan Policy HS-35
L2. Land Development. Require that new development reduce the potential for property damage, and loss of natural habitat, which results from groundwater and sea level rise.	Sea Level Rise	Planning, Building and Transportation	General Plan Policy CC-20

Strategy	Hazard(s) Addressed	Lead Department	Related Policy/ Plan
L3. Resilient Rights-of-Way and Open Spaces. Design street rights-of-way, parks, other public spaces, street trees and landscaping to be resilient to temporary flooding.	Flooding	Planning, Building and Transportation	General Plan Policy HS-19
L4. Easements. Require the creation and maintenance of easements along drainage ways necessary for adequate drainage of normal or increased surface runoff due to storms.	Flooding	Planning, Building and Transportation Public Works	General Plan Policy HS-22
Emergency Response			
E1. Heat and Wildfire Smoke Emergencies. Create a network of clean air and cooling emergency shelters throughout Alameda.	Heat Wildfire Smoke	Library Public Works Recreation and Parks	General Plan Policy CC-25, CARP, Emergency Operations Plan
E2. Emergency Preparedness. Maintain emergency management and disaster preparedness as a top City priority.	All Hazards	Fire	General Plan Policy HS-1
E3. Tsunami Preparedness. Prepare Alameda for tsunamis and prepare for a timely evacuation with a focus of access and functional needs populations.	Tsunamis	Fire Planning, Building and Transportation	General Plan Policy HS-20
E4. Emergency Coordination. Emergency Management Agency, California Office of Emergency Services, Coast Guard, United States Maritime Administration Ready Reserve Fleet, the San Francisco Bay Area Water Emergency Transportation Authority, Alameda County, East Bay Municipal Utility District, the Port of Oakland, adjacent jurisdictions, CalWARN, the Alameda Unified School District, the various private schools in Alameda, local hospitals, housing facilities for seniors or individuals with disabilities, and other local and regional police, fire and public health agencies in preparation for natural and man-made disasters, and ensure that the City's disaster	All Hazards	Fire	General Plan Policy HS-3

Strategy	Hazard(s) Addressed	Lead Department	Related Policy/ Plan
response communication technologies are compatible with other agency communication technologies.			
E5. Wildfire Smoke. Prepare for future wildfire smoke events.	Wildfire Smoke	Fire	General Plan Policy HS-61
E6. Emergency Response and Disaster Preparedness. Preserve access for emergency response vehicles to people and property and for evacuation.	Earthquake Ground Shaking Liquefaction Tsunamis	Planning, Building and Transportation Public Works	General Plan Policy ME-9
Communication, Community and Coordination			
C1. Public Communication. Maintain and promote community programs to train volunteers, support vulnerable community members like seniors and individuals with disabilities, coordinate with food banks and other local aid organizations, and assist police, fire, and civil defense personnel during and after a major earthquake, fire, or flood.	All Hazards	City Manager's Office Fire Police	General Plan Policy HS-4, Emergency Operations Plan
C2. Air Quality Alerts. Continue to partner with BAAQMD to enhance awareness of air quality index alerts and related outreach and education to protect the health of residents.	Wildfire Smoke	Fire	General Plan Policy HS-65
C3. Regional Partnerships. Actively participate in regional discussions on groundwater and sea level rise mitigation, infrastructure improvements, and adaptation strategies.	Drought Sea Level Rise	City Manager's Office Planning, Building and Transportation Public Works	General Plan Policy HS-16
C4. Collaboration. Work collaboratively with other jurisdictions and agencies to reduce fire hazards in Alameda, such as post-earthquake fire hazards, with an emphasis on mutual aid agreements.	Earthquake Caused Fires	Fire	General Plan Policy HS-27
C5. Neighborhood Resilience Coordination. Consider piloting building electrification, water conservation and other climate initiatives at a block or neighborhood level to more cost effectively transition	All Hazards	City Manager's Office	General Plan Policy CC-15

Strategy	Hazard(s) Addressed	Lead Department	Related Policy/ Plan
to climate friendly energy, water, and resource use.			
C6. Social Vulnerability. Prioritize the needs of frontline communities when prioritizing public investments and improvements to address climate change.	All Hazards	All Departments	General Plan Policy CC-2
Studies and Plans			
S1. Adaptation Pathway Master Plan. Develop an adaptation pathway master plan. The plan will include additional vulnerability studies as needed, economic analysis, groundwater rise studies and other data collection as needed to identify the range of shoreline protection, groundwater management and adaptation strategies over time from short- to long-term as well as land use, building and infrastructure design standards needed to help Alameda adapt to rising sea and groundwater levels.	Sea Level Rise	City Manager's Office Community and Economic Development Planning, Building and Transportation Public Works	General Plan Policy CC-21, CARP
S2. Rising Groundwater. Prepare for the impacts of rising groundwater levels on private and public property.	Sea Level Rise	City Manager's Office Planning, Building and Transportation Public Works	General Plan Policy CC-23, HS-24, Groundwater Study
S3. Flood Hazard Maps. Prioritize the review and publishing for public discussion the latest and most up to date flood hazard and sea level rise forecasts from all trusted sources.	Flooding	Planning, Building and Transportation	General Plan Policy HS-15

Equity Review of Strategies

An equity review was conducted for each of the mitigation and adaptation strategies. The equity review provides initial assessment of opportunities to enhance equity in the implementation of the strategies to ensure that every action put forward in this plan has a positive equity benefit and actively seeks to dismantle past harms. At later stages of planning, as strategies become specific projects with plans and budgets of their own, an equity framework will be used to guide the development of project specific implementation plans.

Prioritization of Strategies

The third and final step selected and prioritized the specific mitigation actions. The mitigation actions represent an unambiguous and functional plan for action and are considered to be the most essential outcome of the mitigation planning process.

In general, all mitigation strategies considered by the Planning Team can be classified under one of the following seven broad categories

- Long Range Planning (for example: master plans, climate action plans)
- Land Use Planning (ex: general plan, specific plan)
- Capital Planning (ex: capital improvement plan)
- Operations (ex: annual budgeting)
- Emergency and Hazard Planning (ex: emergency operations)
- Project Planning and Design (ex: private and public development projects)
- New Initiatives (ex: legislation, ballot measure)

The City incorporated six key factors in the prioritization of mitigation actions. These criteria are described below:

- **Support of goals and objectives.** Actions that support multiple goals and objectives are prioritized.
- **Funding availability.** Actions with secured funding are prioritized.
- **Hazards addressed.** Actions addressing the Plan's hazards of greatest concern (earthquake and flooding) are prioritized.
- **Public and political support.** Actions with public and political support are prioritized.
- **Adverse environmental impact**. Actions with low environmental impact are prioritized.
- **Environmental benefit.** Actions that provide an environmental benefit are prioritized.
- **Timeframe**. Actions that are ongoing, or that can be completed in the short-term, are prioritized.
    - Ongoing: Currently being funded and implemented under existing programs
    - Short-term: To be completed in 1-2 years
    - Long-term: To be completed in more than 2 years
- **Equity.** Strategies that address equity issues or promote equitable outcomes are prioritized.

Assignment of Strategies

Each mitigation strategy has a mitigation action plan presented in table format. Every proposed action is assigned to a specific local department or agency to assign responsibility and accountability and increase the likelihood of subsequent implementation. In addition to the assignment of a local lead department or

agency, an implementation time period or a specific implementation date or window has been assigned to each mitigation action to help assess whether actions are being implemented in a timely fashion. Resource availability will strongly influence the pace of achievements for those actions noted as currently unfunded.

Detailed Adaptation and Mitigation Strategies

Detailed information for each of the climate adaptation and hazard mitigation strategies is presented below in greater detail, including:

- Description
- Hazard(s) addressed
- Responsible city department or agency
- Related plan or policy
- Partners
- Priority
- Actions and activities completed
- Future actions and activities
- Potential Funding source
- Timeframe
- Equity considerations for implementation

B1. Solar Panels

Category	Buildings
Hazards Addressed	Earthquake Ground Shaking Wind/Storms
Strategy Type	Admin/Tech
Strategy Description	Encourage installation of solar panels and energy storage equipment in existing and new development and on public property such as the former Doolittle Landfill.
Actions	
Lead Department	AMP
Related Plan/Policy	General Plan Policy CC-14
Key Partners	Planning, Building, and Transportation
Completed Actions	Distributed Energy Resources (DER) Plan • AMP has the ability and technology to safely integrate distributed energy resources into its distribution grid. Engineering staff has been evaluating various tools that lay the foundation to integrate software that will allow AMP to comprehensively determine the maximum amount of DER's on AMP's grid. This continuous process of development and implementation will last well into 2022. • Engineering and Operations (E&O) continuously approves, inspects, and interconnects new solar photovoltaic systems often coupled with battery storage.
Future Actions	AMP will develop an asset management plan to guide efficient expenditures. AMP is working on installing 2 MW solar facility at Doolittle Landfill interconnected into AMP's grid. Cost $9.15M over 20 years; Timeline: 2023.
Potential Funding Source	General Fund, AMP rebate program
Timeframe	Ongoing
Equity Considerations for Implementation	Connect with AMP list of people who need continuous power for electric medical devices or refrigerated medicines to prioritize solar and battery resources.

B2. Water Efficiency and Conservation

Category	Buildings
Hazards Addressed	Drought
Strategy Type	Plans/Policy
Strategy Description	Minimize water use in existing and new construction and landscaped areas to make Alameda more resilient to drought and generate less wastewater.
Actions	a. Water Efficient Landscape Requirements. Maintain up-to-date water-efficient landscaping regulations and ordinances to reduce water use in both private and public landscapes that include healthy, drought tolerant soils, diverse native plant species, non-invasive drought tolerant/low water use plants, and high-efficiency irrigation systems. b. Water-Efficient Buildings. Require low-flow fixtures, such as low-flow toilets and faucets in new construction. c. Recycled and Reclaimed Water. Promote the production and usage of recycled and reclaimed water (sometimes called “grey water”) for potable and non-potable uses. d. Pesticides, Herbicides, and Fertilizers. Limit the use of pesticides, herbicides, and fertilizers throughout the city by fostering healthy soil practices, which include organic carbon amendments (e.g. compost and mulch) on all non-turf planting areas. e. Soil Health. Encourage soil health by promoting and educating the public about the benefits of organic carbon soil amendments that improve water retention in local landscapes. f. EBMUD. Work with EBMUD to improve effectiveness of water conservation programs and increase drought awareness. g. City Buildings. Implement water-saving technologies at all City-owned buildings and post visible signage to educate visitors to those buildings.
Lead Department	Planning, Building and Transportation Public Works Recreation and Parks
Related Plan/Policy	General Plan Policy CC-16
Key Partners	EBMUD
Completed Actions	Increased composting, reduced irrigation of decorative lawns (resulting in 3.6% reduction), turned off fish cleaning spigots at Encinal Beach (alternative fish cleaning methods being explored), converted decorative lawns at city facilities and some parks to drought tolerant landscape, prioritized fixing pipe leaks, converted irrigation clocks to rain sensitive clocks (resulting in 15% reduction).
Future Actions	Converting City Hall’s lawn to drought tolerant landscape in 2022.
Potential Funding Source	EBMUD, HMGP, General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	Provide benefits for drought-resistant landscapes that support lower income communities.

B3. Rising Groundwater

Category	Buildings
Hazards Addressed	Sea Level Rise
Strategy Type	Plans/Policy
Strategy Description	Prepare for the impacts of rising groundwater levels on private and public property.
Actions	a. Infrastructure and Access. Develop plans and strategies to protect and/or relocate critical infrastructure and maintain access to impacted property. b. Building Codes. Prepare and adopt revised zoning and building codes to increase resilience of new buildings against the impacts of rising groundwater. c. Annual Review. Annually monitor groundwater levels and progress on specific strategies to mitigate impacts d. Data. Collect new data, add groundwater monitoring wells, analyze additional contaminants and potential landfill risks, update liquefaction zones and continue to refine the quality of the groundwater model.
Lead Department	Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy CC-23, HS-35
Key Partners	
Completed Actions	- Completed and published a report, titled “The Response of the Shallow Groundwater Layer and Contaminants to Sea Level Rise” - Incorporated groundwater rise in the 2022 Climate Adaptation and Hazard Mitigation Plan.
Future Actions	Collect new data, add groundwater monitoring wells, analyze additional contaminants and potential landfill risks, update liquefaction zones and continue to refine the quality of the groundwater model.
Potential Funding Source	General Fund
Timeframe	Short-term
Equity Considerations for Implementation	

B4. Seismic Retrofit for Private Buildings

Category	Buildings
Hazards Addressed	Earthquake Ground Shaking Earthquake Liquefaction
Strategy Type	Plans/Policy
Strategy Description	Require owners of vulnerable structures, to the extent feasible, to retrofit existing structures to withstand earthquake ground shaking, and require retrofitting when such structures are substantially rehabilitated or remodeled
Actions	a. Soft Story Program. Continue to implement and expand the City's Soft Story Program including mandatory requirements for substantially improving the seismic performance of multi-family wood frame residential buildings with open ground floor parking or commercial spaces known as soft stories. b. Wood Framed Building Program. Continue to implement and expand the City's Wood Framed Building Program, including requirements for substantially improving the seismic performance of one- and two story wood frame residential buildings with vulnerable "cripple walls". c. Non-ductile Concrete Buildings. Identify, evaluate and retrofit non-ductile concrete residential and nonresidential buildings that are vulnerable to collapse in earthquakes. d. Chimneys. Encourage owners to remove or rebuild masonry or stone chimneys vulnerable to collapse in earthquakes. e. Incentives. Develop incentives and assistance to help property owners make their homes and businesses more earthquake-safe. Pursue a variety of funding sources, such as grants, low-interest loans, tax credits and zoning waivers and density bonuses, to assist residents and businesses with seismic upgrades. Provide exemptions from City zoning requirements, such as off-street parking and/or common open space to facilitate the retrofitting of vulnerable privately-owned buildings. f. Shoreline Property Management. Require owners of shoreline properties, to the extent feasible, to inspect, maintain, and repair the perimeter slopes to withstand earthquake ground shaking, consolidation of underlying bay mud, and wave erosion. g. Cool/Green Buildings. Incentivize and consider requiring the installation of cool roofs, green roofs, and/or other energy-efficient cool building methods to mitigate heat impacts and reduce runoff.
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy HS-13, Municipal Code Section 13-80.1 to 13-80.16 and 13-70.1 to 13-70.6
Key Partners	Community and Economic Development
Completed Actions	Continue to implement and expand the 2009 soft-story ordinance outlining mandatory compliance requirements for substantially improving the seismic performance of certain residential buildings. The buildings targeted are wood frame condos and apartment buildings with 5 or more dwelling units, permitted for construction prior to December 17, 1985, in which the ground floor has a soft, weak, or open-fronted construction such as a carport. As a result of the ordinance, the City produced an inventory of potential soft story buildings and notified owners, owners were required to evaluate affected buildings and if found to be potentially hazardous, issue written and posted warnings to tenants, and install an earthquake-actuated gas shutoff valve. The ordinance does not require retrofitting of any structural inadequacies found, but did offer permit and inspection fee reductions timely response. As of March 2015, 63 of an original 222 buildings remain on the List of Potentially Hazardous Soft-Story Buildings. These 63 buildings contain nearly 1,000 housing units that could be lost in an earthquake and should now be required to be seismically retrofitted. Continue to implement 2006 wood framed buildings ordinance that outlines voluntary minimum standards to substantially improve the seismic performance of one- to four-unit wood framed residential buildings with: - one and two stories, - continuous perimeter concrete foundations, and - wooden cripple walls less than 4 feet high. The retrofits are voluntary. Incentives include waving the requirements for plans prepared by a licensed architect or engineer, and waiving of the requirement to

	simultaneously upgrade plumbing, mechanical, electrical and life/safety systems that are not a hazard to life or property, but which might be out of compliance with current building codes. Residential Seismic Strengthening Plans and building code guidance are posted on the City website at http://alamedaca.gov/community-development/building/seismic-retrofit. The California Earthquake Authority (CEA) also offers retrofit grants for these projects. The City should work to raise awareness about the need for
Future Actions	Seek funding to support retrofit of vulnerable soft-story buildings. Encourage residents through a variety of means to apply for CEA Brace and Bolt Program.
Potential Funding Source	HMGP, CEA Brace and Bolt Program, CDBG
Timeframe	Short-term
Equity Considerations for Implementation	Prioritize buildings that are most at risk for earthquake damage/pose a safety threat. Reach out to tenants and building owners through multiple channels and provide translated materials.

B5. Flood Insurance

Category	Buildings
Hazards Addressed	Flooding Sea Level Rise
Strategy Type	Financial
Strategy Description	Continue the City's participation in the National Flood Insurance Program and the Community Rating System as a Class 8 community. Identify ways to increase Alameda's Community Rating to reduce flood insurance costs.
Actions	
Lead Department	Public Works
Related Plan/Policy	General Plan Policy HS-14, Municipal Code Section XX - Floodplain Management
Key Partners	City Council Community and Economic Development FEMA Planning, Building, and Transportation
Completed Actions	City Council adopted the 2018 revised FEMA Flood Insurance Rate Maps following the appeal period. City widened enforcement of floodplain management requirements regulating new construction in Special Flood Hazard Areas to include the additional properties added to the flood zone as a result of the FIRM map revision. The Community Rating System (CRS) is a voluntary program implemented by FEMA that encourages cities to take certain steps to reduce flood exposure through public information, mapping, regulations, flood damage reduction, warning, and response. As an incentive, insurance rates for individual policy holders are decreased by a percentage for creditable activities. The City joined CRS in October 2019 as a Class 8 community.
Future Actions	The City must recertify its CRS status every year and provide supportive documentation. Maintain City participation in the National Flood Insurance Program, thereby allowing citizens benefits of reduced flood insurance rates. Work with HOAs concerning possible dike improvements. Continue to educate residents about floods and preparedness. Continue to enforce floodplain management requirements, including regulating new construction in Special Flood Hazard Areas, administer any local requests for map updates, give community assistance, and monitor activities.
Potential Funding Source	Urban Runoff Fund
Timeframe	City Council adopted the 2018 revised FEMA Flood Insurance Rate Maps following the appeal period. Ongoing implementation continues for building and construction standards for properties designated in flood zone.
Equity Considerations for Implementation	

B6. Flood Proofing for Existing Buildings

Category	Buildings
Hazards Addressed	Flooding
Strategy Type	Plans/Policy
Strategy Description	Implement programs to encourage flood-proofing retrofits to existing buildings and redevelopment in flood-prone areas.
Actions	a. Flood Proofing. Amend local codes and by-laws to mandate flood-proofing techniques in defined flood hazard zones and adjacent areas to protect them from future sea level rise. b. Risk Prioritization. Inventory and prioritize highest at-risk buildings, including those serving vulnerable populations, for resiliency upgrades. c. Assistance. Alameda should identify options to help low-income households and other vulnerable residents pay for flood retrofits. d. Building Code. Consider incorporating sea level rise into the flood management section of the Building Code to encourage, incentivize, or require compliance with base floor elevation and flood-proofing requirements to mid-century sea levels.
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy HS-19
Key Partners	
Completed Actions	Completed Alameda Master Infrastructure Plan which requires the Adaptive Reuse Area to be designed to address 24-inches of sea level rise (plus required freeboard) and additional sea level rise in future years beyond 24 inches through adaptive management strategies.
Future Actions	
Potential Funding Source	HMGP, BRIC
Timeframe	Long-term
Equity Considerations for Implementation	Consider the impact of floodproofing requirements on undeserved populations and identify options to help low-income households and other vulnerable residents pay for flood retrofits.

B7. Design for Flooding

Category	Buildings
Hazards Addressed	Flooding Sea Level Rise
Strategy Type	Plans/Policy
Strategy Description	Implement programs and amend regulations to require and incentivize flood-proofing retrofits to existing buildings in flood-prone areas, and require all new development to design for sea level and associated groundwater rise based on the most current regional projections. (See also Polices LU-30 and CC-20).
Actions	a. Waterfront Setbacks. Require new development to provide adequate setbacks along waterfront areas for the future expansion of seawalls and levees to adapt to sea level rise. b. Data. Update maps and publish open data that display these risks clearly as soon as new data or guidelines are created, such as a digital elevation model, sea level and groundwater risks, or the latest risk tolerance guidance provided by the State of California. c. Building Codes. Amend local codes to require flood-proofing techniques in defined flood hazard zones and adjacent areas to protect them from future sea level rise. Consider incorporating sea level rise into the flood management section of the Building Code to encourage, incentivize, or require compliance with base floor elevation and flood-proofing requirements to mid-century sea levels. d. Risk Prioritization. Inventory and prioritize highest at-risk buildings, including those serving vulnerable populations, for resiliency upgrades. e. Assistance. Adopt fee waiver or small grant programs to help low-income households and other vulnerable residents pay for flood retrofits.
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policies HS-22, LU-20, CC-20, CARP
Key Partners	
Completed Actions	Completed Alameda Master Infrastructure Plan which requires the Adaptive Reuse Area to be designed to address 24-inches of sea level rise (plus required freeboard) and additional sea level rise in future years beyond 24 inches through adaptive management strategies.
Future Actions	
Potential Funding Source	Private developers

Timeframe	Ongoing
Equity Considerations for Implementation	

B8. Building Codes for New Development

Category	Buildings
Hazards Addressed	Earthquake Caused Fires Earthquake Ground Shaking
Strategy Type	Plans/Policy
Strategy Description	Require new development to comply with the City’s current Electrification, Fire, Seismic, and Sprinkler Codes.
Actions	
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy HS-28
Key Partners	
Completed Actions	
Future Actions	City of Alameda continues to enforce the City's Building Code
Potential Funding Source	Private developers, General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	

B9. Fire Prevention in Existing Properties

Category	Buildings
Hazards Addressed	Earthquake Caused Fires
Strategy Type	Plans/Policy
Strategy Description	Encourage existing properties to minimize the risks of fire and include adequate provisions for emergency access and appropriate firefighting equipment.
Actions	a. Electrification. Encourage existing properties to convert natural gas fueled space heating, water heating, clothes drying and cooking appliances to electric to minimize the risk of fires and improve indoor air quality.
Lead Department	Fire
Related Plan/Policy	General Plan Policy HS-29
Key Partners	AMP
Completed Actions	Alameda Municipal Power provides rebates and incentives for building electrification and will will be rolling out new ones in the coming years.
Future Actions	In 2022, staff is planning to develop an equitable building energy efficiency and electrification roadmap.
Potential Funding Source	General Fund, HMGP
Timeframe	Long-term
Equity Considerations for Implementation	Ensure that the transition to all-electric buildings includes residents in multi-unit housing, renters and low income tenants.

B10. Building and Infrastructure Standards

Category	Buildings
Hazards Addressed	Earthquake Ground Shaking Earthquake Liquefaction
Strategy Type	Admin/Tech
Strategy Description	Maintain up-to-date building codes and encourage or require new and existing buildings and infrastructure to be designed or retrofitted for timely restoration of service (functional recovery) following an earthquake, with particular attention on the effects of liquefaction on buildings and infrastructure.
Actions	a. Functional Recovery Standard. Update the building code to ensure that all new buildings in Alameda are designed to a functional recovery standard so that they can continue to be used after an earthquake. b. No Collapse Standard. Ensure that all existing buildings meet a minimum no collapse standard.
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy HS-10
Key Partners	
Completed Actions	Included discussion of functional recovery in hazard mitigation plan update
Future Actions	Consider model codes and guidance on how to effectively implement functional recovery standards.
Potential Funding Source	General Fund
Timeframe	Long-term
Equity Considerations for Implementation	

B11. Cool/Green Buildings

Category	Buildings
Hazards Addressed	Heat
Strategy Type	Plans/Policy
Strategy Description	Incentivize and consider requiring the installation of cool roofs, green roofs, and/or other energy-efficient cool building methods to mitigate heat impacts and reduce runoff.
Actions	
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy CC-34
Key Partners	
Completed Actions	- The Alameda Point Stormwater Management Plan requires installation of green roofs at Alameda Point. - City Council approved revisions to the Design Review ordinance in 2019 exempting green roof, cool roofs, and similar roof treatments from design review, provided the installation does not require modifying the existing roof form or pitch.
Future Actions	Consider ways to support green roof installation on existing buildings
Potential Funding Source	General Fund
Timeframe	Long-term
Equity Considerations for Implementation	Consider prioritizing and incentivizing cool/green roofs in heat island areas.

B12. Sea Level Rise Protection

Category	Buildings
Hazards Addressed	Flooding Sea Level Rise
Strategy Type	Admin/Tech
Strategy Description	Reduce the potential for property damage and loss, and loss of natural habitat resulting from sea level rise.
Actions	a. Flood Protection Maps. Work with regional agencies to regularly update the Climate Action and Resiliency Plan with projected inundation zones for years 2070 and 2100 consistent with the most up to date guidance from the Ocean Protection Council (OPC) for sea level rise in California. b. Contaminated Lands. Identify and map contaminated lands at risk of inundation from rising groundwater and flood inundation and identify actions to mitigate the risk of mobilizing contaminants. c. Land Planning. Prioritize areas of little or no flood risk for new flood-incompatible development (i.e. housing and commercial development) in new plans or zoning decisions. d. Shoreline Habitat and Buffer Lands. Identify, preserve, and restore existing undeveloped areas susceptible to sea level rise to reduce flood risk, enhance biodiversity, and improve water quality. Maintain and restore existing natural features (i.e. marsh, vegetation, sills, etc.) between new development and the shore to allow for marsh or beach migration. e. Conservation Easements. Consider use of conservation easements to maintain private lands for shoreline and beach migration. f. Nature Based Flood Control Systems. When designing new flood control systems where none currently exist, prioritize use of nature based flood control systems, such as horizontal levees, marsh lands, or beach restoration.
Lead Department	Community and Economic Development Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy CC-19
Key Partners	Veterans' Administration (for Alameda Nature Reserve)
Completed Actions	- Hazard Mitigation Plan Update included the latest flood maps and OPC projections. - Completed "The Response of the Shallow Groundwater Layer and Contaminants to Sea Level Rise in Alameda" report which evaluates contaminated lands and groundwater rise projections - General Plan 2040 supports the development of the Nature Reserve and Government sub-district for wildlife habitat to preserve and protect the natural habitat in this area and protect endangered species and other wildlife and plant life that inhabit, make use of, or are permanently established within this area. - General Plan 2040 supports development of “DePave Park” to be consistent with the Public Trust and sensitive to the neighboring Alameda Nature Reserve. - General Plan 2040 considers establishment of a Marine Conservation Area within the submerged lands at the entrance of the Seaplane Lagoon.
Future Actions	Seek grants for concept design of DePave Park
Potential Funding Source	General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	

I1. Critical Public Assets

Category	Infrastructure
Hazards Addressed	Earthquake Ground Shaking Flooding Liquefaction Sea Level Rise
Strategy Type	Admin/Tech
Strategy Description	Ensure resilience and long-term functionality of critical public assets threatened by earthquakes, sea level rise or rising groundwater.
Actions	a. Stormwater System. Identify funding sources to improve the public stormwater infrastructure and ensure it meets current needs and is prepared for the effects of sea level rise and climate change. b. Sewer System. Protect vulnerable wastewater systems and facilities to minimize disruption to the systems following ground shaking and extreme weather events. c. Electric System. Ensure electrical infrastructure is flood-proofed or elevated. Where possible, move assets out of the hazard zone. d. Transportation. Work with Caltrans and the Alameda County Transportation Commission to identify funding to adapt the regional and local roadways in Alameda.
Lead Department	AMP Public Works
Related Plan/Policy	General Plan Policy CC-22 and HS-12
Key Partners	CaISO Northern California Power Agency PG&E EBMUD
Completed Actions	- Initiated planning efforts for: - Bay Farm Island Northern Shoreline Adaptation Project - Northern Shoreline near Posey/Webster Tubes Project - State Route 61/Doolittle Drive
Future Actions	- Model potential impacts to utility infrastructure under future sea level rise scenarios. Implement wastewater resilience best practices for the City-owned sewer system by incorporating sea level rise projections into the City's next Sewer Management Plan. - Conduct comprehensive visual and functional test monitoring and asset condition assessment. Model potential impacts to utility infrastructure under future sea level and groundwater rise scenarios. - Raise and strengthen the foundation of Cartwright substation, install new seismically approved bus structures and seismically retrofit bus structures of the existing substation, and replace major equipment to withstand earthquakes. Continue evaluating local energy storage and other resiliency improvements to the electric system. - Seek funding to complete concepts for these three high-priority locations. - Initiate planning efforts for the remaining critical transportation facilities that are threatened by sea level rise or rising groundwater. - Conduct thorough review of all City buildings to determine any needed structural, mechanical or electrical seismic weaknesses. - Identify deficits and protection needed for City buildings subject to coastal flood hazards and local storm hazards. - For all critical City Buildings, consider responses needed to the secondary hazards of fire, temporary utility loss, and temporary access loss. - Address appropriate seismic, fire, and flood safety analysis based on current and future use for all City-owned facilities and structures. - Strengthen or replace City buildings in the identified prioritized order as funding is available. - Evaluate Alameda Point buildings as they are turned over to the City from the Navy. Have a plan to demolish them or make them habitable.
Potential Funding Source	Facility Maintenance Fund 706, HMGP, BRIC, AMP and City Capital Improvement Programs
Timeframe	Ongoing
Equity Considerations for Implementation	Possibly focus on buildings that incur a lot of public use so that improvements can be enjoyed by the maximum number of residents.

I2. Water Retention

Category	Infrastructure
Hazards Addressed	Flooding Sea Level Rise
Strategy Type	Admin/Tech
Strategy Description	Develop and maintain large and small areas to retain water within the city that may serve as areas of “retreat” during large storm events.
Actions	a. Alameda Nature Reserve. Support use and development of the 550 acre former US Navy airfields and runways as a Nature Reserve and area of wetlands that may serve as flood water retention area during major storm events. b. Corica Park. Support the use and development of the 330 acre golf complex as a recreation area and lagoon system that currently serves as a flood water retention area during major storm events. c. Public Participation. Encourage the public’s use of small-scale green infrastructure design standards, guidance, and typical details, as presented in the City’s Green Infrastructure Plan, for residential and garden projects.
Lead Department	Public Works
Related Plan/Policy	General Plan Policy CC-24
Key Partners	Northern California Power Agency
Completed Actions	- General Plan 2040 supports the development of the Nature Reserve and Government sub-district for wildlife habitat to preserve and protect the natural habitat in this area and protect endangered species and other wildlife and plant life that inhabit, make use of, or are permanently established within this area.
Future Actions	Educate the public about small-scale green infrastructure design for residential and garden projects.
Potential Funding Source	General Fund, EBMUD
Timeframe	Ongoing
Equity Considerations for Implementation	Consider targeting neighborhoods with high exposure to heat island effect and high percentage of impervious pavement

I3. Urban Forest

Category	Infrastructure
Hazards Addressed	Heat
Strategy Type	Admin/Tech
Strategy Description	Take actions to maintain and expand the number of trees in Alameda on public and private property to improve public health, reduce pollution, and reduce heat island effects.
Actions	a. Tree Preservation. Continue to require and incent the preservation of large healthy non-invasive trees and vegetation. b. New Development and Parking Lots. Require ample tree plantings in new development and related parking lots. c. Strengthen Tree Replacement Requirement. Strengthen the tree replacement requirement for any protected trees removed due to new development or redevelopment. d. Prioritize Tree Planting. Invest in tree planting and maintenance, especially in low canopy areas and neighborhoods with under-served or under-represented communities. Resilient Urban Forest. Support the increase of the tree canopy in Alameda with drought tolerant, shade- producing, fire resistant tree species. f. Public Parks and Lands. Utilize public parks and public lands, such as Alameda Point, to significantly increase the urban forest. g. Maintain and Update the City's Master Tree Plan. Ensure an up-to-date, climate friendly Master Tree Plan that selects drought tolerant, shade-producing, fire resistant tree species adapted to Alameda's changing climate. This plan should include: » Design of new tree wells to allow better infiltration of stormwater; » Promotion of sidewalk gardens and other sidewalk landscaping; » Expansion of greenery in the public right-of-way and removal of impervious surfaces as feasible; » Strategies to reduce conflicts between trees, tree roots, and other public infrastructure such as sidewalks, overhead lines and street infrastructure; and » Identification of funding for both expansion and maintenance of the urban forest.
Lead Department	Public Works Recreation and Parks
Related Plan/Policy	General Plan Policy CC-26, CARP
Key Partners	PG&E
Completed Actions	Secured funding from Council to update and expand the Master Tree Plan as and Urban Forest Plan.
Future Actions	Develop RFP and scope of work and procure consultant
Potential Funding Source	General Fund
Timeframe	Short-term
Equity Considerations for Implementation	Focus on expanding urban forest in underserved neighborhoods and those with high social vulnerability.

I4. Lagoons

Category	Infrastructure
Hazards Addressed	Flooding
Strategy Type	Admin/Tech
Strategy Description	Continue to preserve and maintain all lagoons as natural habitat as well as an integral component of the City's green infrastructure network and flood control system.
Actions	
Lead Department	Public Works
Related Plan/Policy	General Plan Policy CC-32
Key Partners	EBMUD
Completed Actions	The FY-19-21 Capital Improvement Program includes an item for lagoon maintenance and dredging of the lagoons
Future Actions	Future projects may consider additional maintenance needs for the lagoons and adaptation to address projected sea level rise.
Potential Funding Source	Capital Budget, HMGP
Timeframe	Ongoing
Equity Considerations for Implementation	

I5. On-Island Generation

Category	Infrastructure
Hazards Addressed	Earthquake Ground Shaking Wind/Storms
Strategy Type	Admin/Tech
Strategy Description	Support development of on-island solar power generation and on-island wind power with appropriately sized generation, storage, and microgrid distribution infrastructure to be able to provide power for a range of uses, including essential functions. Permit renewable energy generation facilities by right in zones with compatible uses and remove financial disincentives associated with the installation of clean energy generation and storage equipment.
Actions	
Lead Department	AMP
Related Plan/Policy	General Plan Policy CC-4
Key Partners	Planning, Building, and Transportation
Completed Actions	- AMP offers and Eligible Renewable Generation (ERG) plan, a special rate plan for new renewable generation customers that went into effect on December 31, 2016. - In 2021, 92 customers completed rooftop solar installations.
Future Actions	With City approval, the Doolittle community solar project will also start construction in 2022.
Potential Funding Source	AMP funds
Timeframe	Ongoing
Equity Considerations for Implementation	The elderly and disabled may rely on continuous power for medical devices and other uses and this project will help improve the reliability of the grid to protect those vulnerable populations.

I6. Public Infrastructure Priorities

Category	Infrastructure
Hazards Addressed	Earthquake Ground Shaking Flooding Liquefaction Sea Level Rise
Strategy Type	Admin/Tech
Strategy Description	Identify public transportation, streets, electric facilities, stormwater and wastewater facilities, open space, shoreline assets, and other public assets vulnerable to sea level and groundwater rise and flooding hazards, and prioritize projects for adaptation funding.
Actions	a. Shoreline Facilities Program. Implement a program for Resilient Shoreline Facilities, including performing appropriate seismic, storm, flooding and other safety analyses based on current and future use for all City-owned shoreline facilities, including dikes, shore protection (rip rap), lagoon sea walls, storm water outfalls, marinas and protective marshlands. b. Location-Based Priority Flooding. Design and permit shovel-ready adaptation projects at areas of location-based priority flooding. Include considerations of rising groundwater surface and the potential for contaminant mobilization into analysis of priority flooding locations.
Lead Department	Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy HS-17, CARP
Key Partners	Caltrans FEMA
Completed Actions	Posey/Webster Tubes: Initiated schematic design and project cost estimate for the Northern Shoreline Adaptation project near the Posey/Webster Tubes in coordination with Caltrans. Submitted a grant application to Caltrans' Sustainable Transportation Planning Grant in February 2021, which was not successful. Doolittle Drive: Initiated a recurring quarterly meeting with Caltrans and the Port of Oakland to coordinate State Route 61 improvements, which include Doolittle Drive. Requested Caltrans to add short-term adaptation strategies to its pavement preservation project, which is expected for construction in 2024. Requested the Port of Oakland to consider adaptation strategies that benefit not only its North Field but also State Route 61/Doolittle Drive, the SF Bay Trail and the adjacent shoreline habitat Bay Farm Island Northern Shoreline/Veterans Court Area: Partial funding of Vet's Ct project in FY2020-21 Budget Submitted a grant application titled "Bay Farm Island Northern Shoreline Adaptation Project" to the State Coastal Conservancy's Proposition 68 Climate Adaptation Funds in June 2021.
Future Actions	Bay Farm Island Northern Shoreline/Veterans Court Area: Secure grant funding to complete the concept phase for $500,000 to analyze existing conditions and alternatives and to develop a project concept with community member and stakeholder involvement that is approved by City Council, and includes up to 30 percent design drawings. Posey/Webster Tubes: Work with Caltrans, City of Oakland and other key stakeholders to create a project concept that combats flooding and sea level rise for the entire Oakland-Alameda Estuary, including this area near the Posey/Webster Tubes. Doolittle Drive: Coordinate with Caltrans, Port of Oakland, East Bay Regional Park District, the City of Oakland and ABAG/Bay Trail on both short-term and long-term adaptation solutions. Seek additional funding to implement adaptation projects for Doolittle Drive.
Potential Funding Source	Proposition 68 Climate Adaptation Grant, Caltrans Sustainable Communities Grant, HMGP, BRIC
Timeframe	Long-term
Equity Considerations	Working with the City of Oakland and all key stakeholders for the Oakland-Alameda estuary to ensure an equitable project solution in

for Implementation	that what happens in one part of the shoreline impacts other parts.

I7. Green Infrastructure

Category	Infrastructure
Hazards Addressed	Flooding Sea Level Rise
Strategy Type	Plans/Policy
Strategy Description	Require the use of “green infrastructure”, landscaping, pervious surfaces, green roofs, and on-site stormwater retention facilities to reduce surface runoff and storm drain flooding during storm events.
Actions	
Lead Department	Public Works
Related Plan/Policy	General Plan Policy HS-23, CARP
Key Partners	Planning, Building and Transportation
Completed Actions	GI Plan submitted to Water Board in September 2019. Performed active municipal oversight of development project planning approvals and permitting review to ensure Green Infrastructure features in necessary public and private projects. Met or exceeded GI Plan's 2020 Benchmark values for numbers of completed GI Projects and total redeveloped acres subject to GI features benefits. Promoted GI Plan as a community resource for small-scale project planning. Provided feedback to draft General Plan Update to strengthen Green Infrastructure-related Policies/Objectives.
Future Actions	Await Water Board's feedback and/or regulatory direction on modifications to City's GI Plan. Continue planning and permitting development project oversight to promote inclusion of Green Infrastructure project features in public and private projects.
Potential Funding Source	Capital Budget, Private Developers
Timeframe	Ongoing
Equity Considerations for Implementation	Ensure communities are on board with new upgrades and that green infrastructure benefits all communities in Alameda.

I8. Underground Utilities

Category	Infrastructure
Hazards Addressed	Earthquake Caused Fires
Strategy Type	Plans/Policy
Strategy Description	Require new development to underground utilities to minimize disruption by fire or other natural disasters.
Actions	
Lead Department	AMP
Related Plan/Policy	General Plan Policy HS-30, Underground Utility District Policy
Key Partners	Planning, Building and Transportation
Completed Actions	- AMP established the Underground Utility Districts (UUDs) through a City Ordinance. Any overhead utility facilities within the UUD must be converted to underground facilities. - The Otis/Broadway District is planned for construction 2022-2025
Future Actions	AMP plans to recommend that the City Council approve additional undergrounding projects from the list of recommendations received from the district nominating board (DNB).This list includes the following areas: - Webster Street - all crossings - Central Avenue to Pacific Avenue including Eagle Avenue - West of Constitution Way; and along Central Avenue from Eighth Street to Webster Street. - Broadway - Buena Vista Ave to Clement Ave - Fernside Boulevard from Encinal Avenue to High Street, including lines on Lincoln Park access road - Park Street - San Jose Avenue to Otis Drive
Potential Funding Source	2% of AMP's electric revenue are put into the Underground Utility District Fund (UUDF)
Timeframe	Ongoing
Equity Considerations for Implementation	

I9. Lifeline Standard Estuary Crossing

Category	Infrastructure
Hazards Addressed	Earthquake Ground Shaking Liquefaction
Strategy Type	Admin/Tech
Strategy Description	Work with Caltrans, Alameda County, and other regional agencies to retrofit and improve at least one estuary crossing to meet a lifeline standard to ensure access to the larger region for emergency access, equipment supplies, and disaster response and recovery shortly after a major seismic event.
Actions	
Lead Department	Public Works
Related Plan/Policy	General Plan Policy HS-11
Key Partners	Alameda County
Completed Actions	
Future Actions	- Work with Alameda County to upgrade the Miller-Sweeney Bridge to meet lifeline standards to ensure that the bridge can be used for the movement of supplies, evacuations and emergency vehicles and to support recovery efforts in the event of a major earthquake.
Potential Funding Source	Alameda County, HMGP, BRIC
Timeframe	Long-term
Equity Considerations for Implementation	

I10. Collaboration

Category	Infrastructure
Hazards Addressed	Earthquake Caused Fires
Strategy Type	Admin/Tech
Strategy Description	Work collaboratively with other jurisdictions and agencies to reduce fire hazards in Alameda, such as post-earthquake fire hazards, with an emphasis on mutual aid agreements.
Actions	a. Shutoff Protocol. Establish a local protocol to shut off natural gas supply through shutoff valves on gas meters in the highest risk neighborhoods. b. EBMUD. Develop emergency water storage facilities to provide drinking water to EBMUD customers as well as fight fires in the event an earthquake disrupts the water supply to Alameda. c. Portable Fire Fighting System. Acquire the capability to use Bay water to fight fires using a system compatible with the ones in nearby cities like San Francisco and Berkeley.
Lead Department	Fire
Related Plan/Policy	General Plan Policy HS-27
Key Partners	EBMUD PG&E
Completed Actions	- Owners of identified soft-story buildings were required to install an earthquake-actuated gas shut-off valve on the building to reduce the likelihood of natural gas fire ignitions in earthquakes. - Automatic gas shut-off valves are required any time a permit is issued for gas piping, whenever a property is sold or has a transfer of title. - To date, approximately 2,794 permits have been issued for gas shut-off valves in the city - Alameda has purchased two water tenders to use Bay water for firefighting.
Future Actions	Replace the water tenders every 8-10 years
Potential Funding Source	General Fund, Private Owners
Timeframe	Ongoing
Equity Considerations for Implementation	

L1. Groundwater Rise

Category	Land Use
Hazards Addressed	Sea Level Rise
Strategy Type	Admin/Tech
Strategy Description	Review remediation timelines for contaminated sites based on a groundwater model with projected sea level rise impacts. Work with applicable agencies to adjust remediation, as applicable.
Actions	
Lead Department	Public Works
Related Plan/Policy	General Plan Policy HS-35
Key Partners	
Completed Actions	Published "The Response of the Shallow Groundwater Layer and Contaminants to Sea Level Rise in Alameda" report in 2020.
Future Actions	Implement priority actions in the report.
Potential Funding Source	General Fund, HGMP, BRIC
Timeframe	Long-term
Equity Considerations for Implementation	Consider vulnerable communities exposed to contaminated sites for priority action.

L2. Land Development

Category	Land Use
Hazards Addressed	Sea Level Rise
Strategy Type	Plans/Policy
Strategy Description	Require that new development reduce the potential for property damage, and loss of natural habitat, which results from groundwater and sea level rise.
Actions	a. Assessment. Require new development proposed in areas of flood risk to assess flood risk and incorporate specific groundwater and sea level rise mitigation strategies. b. Mitigation. Require new development to incorporate design features to mitigate 50 years of the Ocean Protection Council's Medium-High Risk Aversion, high emissions scenario of sea level rise in addition to a 100 year storm in the initial design and funding mechanisms to pay for later adaptation improvements to address future sea level and groundwater increases above that level. Projects that include new seawalls where none currently exist shall evaluate the off-site impact of the new walls on adjacent and nearby communities. c. Nature Based Design. Require new development to incorporate low impact development design strategies and stormwater management systems, such as engineered landscapes, vegetated areas, or cisterns that mimic nature by soaking up and storing water, to manage and protect the quantity and quality of stormwater runoff.
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy CC-20
Key Partners	
Completed Actions	- Floodplain ordinance requires special design requirements for new construction in the floodplain and in coastal high hazard areas. - 2040 General Plan recommends following California's Ocean Protection Council 2018 Sea-Level Rise Guidance. - Green Infrastructure Plan includes requirements for low impact development
Future Actions	Future updates of the General Plan will explore and consider more fully this 50-year climate scenario and its implications for Alameda.
Potential Funding Source	Private developers
Timeframe	Ongoing
Equity Considerations for Implementation	

L3. Resilient Rights-of-Way and Open Spaces

Category	Land Use
Hazards Addressed	Flooding
Strategy Type	Admin/Tech
Strategy Description	Design street rights-of-way, parks, other public spaces, street trees and landscaping to be resilient to temporary flooding.
Actions	
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy HS-19
Key Partners	
Completed Actions	
Future Actions	
Potential Funding Source	Capital Improvement Program, General Fund
Timeframe	Long-term
Equity Considerations for Implementation	

L4. Easements

Category	Land Use
Hazards Addressed	Flooding
Strategy Type	Plans/Policy
Strategy Description	Require the creation and maintenance of easements along drainage ways necessary for adequate drainage of normal or increased surface runoff due to storms.
Actions	
Lead Department	Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy HS-22
Key Partners	
Completed Actions	
Future Actions	
Potential Funding Source	General Fund
Timeframe	Long-term
Equity Considerations for Implementation	

E1. Heat and Wildfire Smoke Emergencies

Category	Emergency Response
Hazards Addressed	Heat Wildfire Smoke
Strategy Type	Admin/Tech
Strategy Description	Create a network of clean air and cooling emergency shelters throughout Alameda.
Actions	a. Partnerships. Identify and partner with large HVAC equipped building owners to establish a network of facilities that are able to open to the public during heat waves and smoke events during the day. b. Incentives. Incentivize building owners to upgrade or install HVAC systems to provide more safe places during heat waves and times with dangerous air quality levels. c. City Facilities. Evaluate options to upgrade or otherwise retrofit HVAC systems and buildings to be able to maintain temperatures below 78 degrees Fahrenheit and adequately filter air pollutants when at capacity.
Lead Department	Library Public Works Recreation and Parks
Related Plan/Policy	General Plan Policy CC-25, CARP, Emergency Operations Plan
Key Partners	
Completed Actions	West End Library was upgraded in 2021 with new A/C and air filtration to serve as a Cooling and Clean Air Center in addition to the Main Library and Mastick Senior Center
Future Actions	Evaluate need for additional Clean Air and Cooling Centers
Potential Funding Source	General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	Ensure equitable access from all neighborhoods and populations, especially the homeless, elderly, disabled.

E2. Emergency Preparedness

Category	Emergency Response
Hazards Addressed	All Hazards
Strategy Type	Admin/Tech
Strategy Description	Maintain emergency management and disaster preparedness as a top City priority.
Actions	a. Update Emergency Operations Plan. Maintain and update the recommendations and standards established in the City of Alameda's Emergency Operations Plan as the guide for disaster planning in Alameda. b. Training. Maintain training programs to ensure that City personnel are sufficiently prepared to respond to an emergency and staff the Emergency Operations Center. c. Facilities. Identify and publicize essential emergency facilities in the City, including shelters, evacuation routes, and emergency operation staging areas, and take the necessary actions to ensure that they will remain operational following a disaster. d. Exercises. Conduct periodic emergency response exercises to test the effectiveness of local preparedness response, recovery, and mitigation procedures.
Lead Department	Fire
Related Plan/Policy	General Plan Policy HS-1
Key Partners	
Completed Actions	- Completed Environmental Emergency Plan Annex draft. Draft plan added as an Annex to the Basic Emergency Operation Plan (EOP) once approved. - EOC training exercises on a City, County, Regional and State level. Training for emergency repair, traffic control, evacuations, shelter in place, crowd control, emergency medical aid, grant reimbursement, etc. - Education of City Employees about personal emergency preparedness and mitigation.
Future Actions	
Potential Funding Source	General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	

E3. Tsunami Preparedness

Category	Emergency Response
Hazards Addressed	Tsunamis
Strategy Type	Admin/Tech
Strategy Description	Prepare Alameda for tsunamis and prepare for a timely evacuation with a focus of access and functional needs populations.
Actions	a. Awareness. Develop a public information campaign to educate the public about tsunami risks and evacuation procedures, with special emphasis on access and functional needs populations and maritime communities. b. Evacuation Emergency Annex. Include and maintain an Evacuation Emergency Annex in the Emergency Operations Plan that includes a strategy for tsunami evacuation. c. Signs. Place tsunami inundation zone and evacuation route signs. d. Vertical Evacuation. Assess vertical evacuation options. e. Drills. Conduct tsunami evacuation training and drills with schools. f. Partner. Partner with Caltrans, Alameda County, AC Transit, the City of Oakland and Port of Oakland to plan for tsunami evacuation. g. Tsunami Ready. Become recognized as a Tsunami Ready community by the National Weather Service.
Lead Department	Fire Planning, Building and Transportation
Related Plan/Policy	General Plan Policy HS-20
Key Partners	Caltrans Alameda County City of Oakland Port of Oakland AC Transit CGS CalOES NOAA National Tsunami Hazard Mitigation Program USGS
Completed Actions	Sign placement and general public tsunami education. With the number of marinas in Alameda, there will be a targeted component of the education program towards tsunami impacts in the maritime communities.
Future Actions	In 2022-23, staff is planning to: - Complete a tsunami emergency annex - Become a TsunamiReady city - Participate in Tsunami Preparedness week in March and encourage residents to sign up fro AC Alert - Create a special emergency contact list of marinas in Alameda
Potential Funding Source	USGS/CalOES and Public Works funds
Timeframe	Ongoing
Equity Considerations for Implementation	Provide education programs and signs in various languages depending on community need. Ensure education program outlines evacuation plan for those who do not have access to personal transportation.

E4. Emergency Coordination

Category	Emergency Response
Hazards Addressed	All Hazards
Strategy Type	Admin/Tech
Strategy Description	Coordinate local emergency preparedness efforts with the Federal Emergency Management Agency, California Office of Emergency Services, Coast Guard, United States Maritime Administration Ready Reserve Fleet, the San Francisco Bay Area Water Emergency Transportation Authority, Alameda County, East Bay Municipal Utility District, the Port of Oakland, adjacent jurisdictions, CalWARN, the Alameda Unified School District, the various private schools in Alameda, local hospitals, housing facilities for seniors or individuals with disabilities, and other local and regional police, fire and public health agencies in preparation for natural and man-made disasters, and ensure that the City's disaster response communication technologies are compatible with other agency communication technologies.
Actions	
Lead Department	Fire
Related Plan/Policy	General Plan Policy HS-3
Key Partners	
Completed Actions	- Alameda Municipal Power is a signatory on two mutual aid agreements: California Utility Emergency Association (CUEA) and Northern California Power Agency (NCPA) - Maintain agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters. - Working Relationships and Lifeline Committee Meetings with Caltrans, County, Coast Guard, Ready Reserve, Port of Oakland, San Leandro, Utilities, FEMA, and Other Agencies. - Membership in CalWARN Mutual Aid for City-run and independent utilities that provide water and wastewater.
Future Actions	
Potential Funding Source	General Fund, Assistance provided or received during an emergency will be reimbursed with state or federal funding if it is a declared emergency.
Timeframe	Ongoing
Equity Considerations for Implementation	

E5. Wildfire Smoke

Category	Emergency Response
Hazards Addressed	Wildfire Smoke
Strategy Type	Admin/Tech
Strategy Description	Prepare for future wildfire smoke events.
Actions	a. Shelters. Work with local organizations and institutions to provide for public, clean air, temporary shelters, such as the Alameda Free Library, at locations throughout the City. b. Vulnerable Communities. Strengthen protocols and procedures for identifying and notifying the most vulnerable residents to wildfire smoke of shelter locations and other potential support. c. Indoor Air Quality. Facilitate and expedite efforts by local property owners and businesses to improve indoor air quality and filtration systems. d. Outdoor Air Quality. Continue to work with regional and local organizations and businesses to reduce local sources of air pollutants.
Lead Department	Fire
Related Plan/Policy	General Plan Policy HS-61
Key Partners	
Completed Actions	- Adopted and implement new air quality / smoke response protocols for City staff and employees. - West End Library was upgraded in 2021 with new A/C and air filtration to serve as a Cooling and Clean Air Center in addition to the Main Library and Mastick Senior Center. - Utilize AC Alert to notify residents about unsafe air quality.
Future Actions	
Potential Funding Source	General Fund, Capital Improvement Program
Timeframe	Ongoing
Equity Considerations for Implementation	Ensure equitable access from all neighborhoods and populations, especially the homeless, elderly, disabled.

E6. Emergency Response and Disaster Preparedness

Category	Emergency Response
Hazards Addressed	Earthquake Ground Shaking Liquefaction Tsunamis
Strategy Type	Admin/Tech
Strategy Description	Preserve access for emergency response vehicles to people and property and for evacuation.
Actions	a. Emergency Response Planning. Include emergency response needs in all transportation planning, the design of new facilities, and modifications to existing facilities. Establish and sign designated evacuation routes, and provide ongoing education and outreach to ensure that Alameda is evacuation ready. Continue to work with AC Transit and WETA to ensure coordinated services in the event of the need for evacuation. b. Outreach. Educate the community on disaster preparedness using an all-hazard approach to emergency response. c. Miller-Sweeney Bridge. Upgrade the Miller-Sweeney Bridge to meet lifeline standards to ensure that the bridge can be used for the movement of supplies, evacuations and emergency vehicles and to support recovery efforts in the event of a major earthquake. d. Fruitvale Rail Bridge Hazard. Remove or seismically upgrade the abandoned Fruitvale Rail Bridge which poses a seismic hazard to the city's Miller-Sweeney Bridge. Consider replacing the hazardous structure with crossing for transit, bicycles and pedestrians.
Lead Department	Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy ME-9
Key Partners	Alameda County Public Works Agency
Completed Actions	Coordinated with AC Transit on the locations of vulnerable populations in the City of Alameda including skilled nursing facilities, adult day care and child care facilities. Participated in Bay Area Urban Areas Security Initiative trainings.
Future Actions	Continue working with the United States Army Corps of Engineers (Army Corps) to address the public safety hazard posed by the adjacent abandoned Fruitvale rail bridge. Draft letter to Alameda County requesting upgrade to Miller-Sweeney Bridge. Continue coordination with WETA and AC Transit, and will participate in Bay Area emergency response training exercises.
Potential Funding Source	HMGP, BRIC, General Fund
Timeframe	Long-term
Equity Considerations for Implementation	Ensure continuity of service for transit- dependent populations.

C1. Public Communication

Category	Communication, Community and Coordination
Hazards Addressed	All Hazards
Strategy Type	Outreach/Education
Strategy Description	Maintain and promote community programs to train volunteers, support vulnerable community members like seniors and individuals with disabilities, coordinate with food banks and other local aid organizations, and assist police, fire, and civil defense personnel during and after a major earthquake, fire, or flood.
Actions	a. Volunteers. Maintain community based emergency preparedness training programs targeted to neighborhoods and business groups, such as Community Emergency Response Teams and outreach and coordination with Voluntary Organizations Active in Disasters (VOAD) and other community based programs. b. Education. Prepare and/or make available public education and awareness materials in multiple languages on all aspects of emergency preparedness, including the type and extent of hazards in the community, measures to reduce the likelihood of damage and injury, provisions for emergency supplies, steps to take immediately after a disaster, and the location of shelters and medical facilities. c. Targeted Communication. Engage Alamedans using a wide range of tools, languages and strategies to communicate about all types of health threats and planning, with a special emphasis on the most vulnerable people who are least likely to know about or be able to adapt to various threats. d. Resilience Hubs. Promote resilience hubs, community-serving facilities augmented to support residents, coordinate resource distribution and services before, during, or after a natural hazard event, and reduce carbon pollution while enhancing quality of life.
Lead Department	City Manager's Office Fire Police
Related Plan/Policy	General Plan Policy HS-4, Emergency Operations Plan
Key Partners	Alameda County
Completed Actions	The City of Alameda in partnership with Alameda County Office of Emergency Services (OES) uses AC Alert as the County-wide mass notification system to alert community members of weather related issues, as well as posting to social media, and the city website. Resilience Hub pilot with the MakerFarm at Alameda Point is underway.
Future Actions	Encourage the public to opt-in to AC Alert and follow the City on social media. Learn lessons from resilience hub pilot program and identify opportunities for new resilience hub locations. Consider connecting resilience hubs with CERT teams. Promote Cool Block program to neighborhood leaders.
Potential Funding Source	General Fund, Cool City Challenge
Timeframe	Ongoing
Equity Considerations for Implementation	Ensure that all community members, including those who are non-English speaking and those without cell phones, receive key communications from city/local officials before, during, and after a disaster event. Investigate options for disseminating emergency alerts through key community leaders to increase their reach in disadvantaged communities. Ensure participation by all neighborhoods in Alameda and that resilience hubs are rooted in the neighborhoods they serve.

C2. Air Quality Alerts

Category	Communication, Community and Coordination
Hazards Addressed	Wildfire Smoke
Strategy Type	Outreach/Education
Strategy Description	Continue to partner with BAAQMD to enhance awareness of air quality index alerts and related outreach and education to protect the health of residents.
Actions	
Lead Department	Fire
Related Plan/Policy	General Plan Policy HS-65
Key Partners	
Completed Actions	
Future Actions	- Continue to encourage residents to sign up for AC Alert to receive emergency notifications
Potential Funding Source	General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	

C3. Regional Partnerships

Category	Communication, Community and Coordination
Hazards Addressed	Drought Sea Level Rise
Strategy Type	Admin/Tech
Strategy Description	Actively participate in regional discussions on groundwater and sea level rise mitigation, infrastructure improvements, and adaptation strategies.
Actions	a. Funding and Partnerships. Develop partnerships with local, regional, and state agencies to expedite adaptation projects and ensure a healthy watershed that protects and restores water quality, habitat and community vitality along San Leandro Bay and the Oakland-Alameda Estuary.
Lead Department	City Manager's Office Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy HS-16
Key Partners	
Completed Actions	Convened the San Leandro Bay/Oakland Alameda Estuary Adaptation Working Group with neighboring jurisdictions, agencies and community-based organizations to coordinate San Leandro Bay/Oakland-Alameda Estuary flood and adaptation projects to protect and restore water quality, habitat, and community resilience. Sub groups are focusing on adaptation of Doolittle Drive and Northern Shoreline near Posey/Webster Tubes (CARP strategies)
Future Actions	Launch development of a coordinated and inclusive future-looking subregional organizational structure and action plan with shared vision and needs assessment to accelerate sea level rise adaptation in alignment with the BayAdapt Joint Platform.
Potential Funding Source	Regional, state and federal grants, General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	

C4. Collaboration

Category	Communication, Community and Coordination
Hazards Addressed	Earthquake Caused Fires
Strategy Type	Admin/Tech
Strategy Description	Work collaboratively with other jurisdictions and agencies to reduce fire hazards in Alameda, such as post-earthquake fire hazards, with an emphasis on mutual aid agreements
Actions	
Lead Department	Fire
Related Plan/Policy	General Plan Policy HS-27
Key Partners	
Completed Actions	
Future Actions	Maintain agreements with adjoining jurisdictions for cooperative response to fires, floods, earthquakes, and other disasters.
Potential Funding Source	General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	

C5. Neighborhood Resilience Coordination

Category	Communication, Community and Coordination
Hazards Addressed	All Hazards
Strategy Type	Outreach/Education
Strategy Description	Consider piloting building electrification, water conservation and other climate initiatives at a block or neighborhood level to more cost effectively transition to climate friendly energy, water, and resource use.
Actions	a. Electrification. Offer blocks or neighborhoods assistance in electrifying their homes through incentives that reflect the savings to taxpayers and ratepayers from being able to remove or shut off the natural gas infrastructure on their block. b. Flooding. Include tailored planning and support for communities testing various flooding adaptation strategies. c. Priorities. Prioritize block and neighborhood-driven priorities while selecting a broad range of interventions to test to maximize the City's ability to learn from each pilot project.
Lead Department	City Manager's Office
Related Plan/Policy	General Plan Policy CC-15
Key Partners	
Completed Actions	Resilience Hub pilot with the MakerFarm at Alameda Point is underway.
Future Actions	- Consider applying for Cool City Challenge, which awards $1 million to implement a climate moonshot strategy to become a carbon neutral city by 2030. As part of the application process, Alameda will commit to becoming carbon neutral by 2030 with no offsets, a moonshot team will recruit 25 partner organizations to partner in the Cool City Challenge and 200 cool block leaders who are ready to work with their neighbors to make positive change. The award could bring significant resources to help Alameda achieve its CARP goals around decarbonizing transportation and buildings. - Consider connecting resilience hubs with CERT teams. - Support the development of resilience hubs, community-serving facilities augmented to support residents, coordinate resource distribution and services before, during, or after a natural hazard event, and reduce carbon pollution while enhancing quality of life.
Potential Funding Source	General Fund, Cool City Challenge
Timeframe	Ongoing
Equity Considerations for Implementation	Ensure that resilience hubs exist in all neighborhoods in Alameda and they are rooted in the neighborhoods they serve.

C6. Social Vulnerability

Category	Communication, Community and Coordination
Hazards Addressed	All Hazards
Strategy Type	Outreach/Education
Strategy Description	Prioritize the needs of frontline communities when prioritizing public investments and improvements to address climate change.
Actions	a. Equity. Ensure opportunities for leadership and actions to benefit Alameda's low-income individuals, seniors, youth, people of color, gender, sexual orientation, people experiencing homelessness, individuals with disabilities, and socio-economically disadvantaged communities from environmental and climate change impacts. b. Environmental Justice. Ensure the equitable treatment and full involvement of all people when considering actions to reduce the adverse impacts of climate change on residents regardless of age, culture, ethnicity, gender, sexual orientation, race, socioeconomic status, or geographic location. Prioritize actions that will reverse historic policies of racial discrimination and exclusion. c. Assessments. Utilize Alameda's Social Vulnerability Assessment in the Climate Action and Resiliency Plan or similar tool to identify neighborhoods and specific groups with high levels of social vulnerability in order to prioritize locations for action and improvements.
Lead Department	All
Related Plan/Policy	General Plan Policy CC-2
Key Partners	
Completed Actions	Developed Social Vulnerability Assessment for CARP
Future Actions	- Update Social Vulnerability Assessment with 2020 Census - Develop equity toolkit to prioritize equity in the development and implementation of policies
Potential Funding Source	General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	Review equity considerations in the development of project and policy proposals.

S1. Adaptation Pathway Master Plan

Category	Studies and Plans
Hazards Addressed	Sea Level Rise
Strategy Type	Plans/Policy
Strategy Description	Develop an adaptation pathway master plan. The plan will include additional vulnerability studies as needed, economic analysis, groundwater rise studies and other data collection as needed to identify the range of shoreline protection, groundwater management and adaptation strategies over time from short- to long-term as well as land use, building and infrastructure design standards needed to help Alameda adapt to rising sea and groundwater levels.
Actions	Develop sea level and groundwater rise adaptive strategies for different areas of the City for public discussion and evaluation, including but not limited to: avoidance/planned retreat, enhanced levees, setback levees to accommodate habitat transition zones, buffer zones, beaches, expanded tidal prisms for enhanced natural scouring of channel sediments, raising and flood-proofing structures, and/or provisions for additional flood water pumping stations, and inland detention basins to reduce peak discharges.
Lead Department	City Manager's Office Community and Economic Development Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy HS-24, CARP
Key Partners	
Completed Actions	
Future Actions	Seek planning grants. Initiate and complete planning effort with City Council approval. Implement plan with future funding needed.
Potential Funding Source	General Fund, grants
Timeframe	Adaptation strategies that reduce the burden of sea level rise from impacted community members. Ensure sea level rise preventative measures do not disturb shoreline ecosystems Focus new housing developments away from shorelines Prioritize communities most at risk for effects of sea level rise
Equity Considerations for Implementation	Incorporate social vulnerability assessment into adaptation pathway considerations

S2. Rising Groundwater

Category	Studies and Plans
Hazards Addressed	Sea Level Rise
Strategy Type	Admin/Tech
Strategy Description	Prepare for the impacts of rising groundwater levels on private and public property.
Actions	a. Infrastructure and Access. Develop plans and strategies to protect and/or relocate critical infrastructure and maintain access to impacted property. b. Building Codes. Prepare and adopt revised zoning and building codes to increase resilience of new buildings against the impacts of rising groundwater. c. Annual Review. Annually monitor groundwater levels and progress on specific strategies to mitigate impacts. d. Data. Collect new data, add groundwater monitoring wells, analyze additional contaminants and potential landfill risks, update liquefaction zones and continue to refine the quality of the groundwater model.
Lead Department	City Manager's Office Planning, Building and Transportation Public Works
Related Plan/Policy	General Plan Policy CC-23, HS-24, Groundwater Study
Key Partners	
Completed Actions	
Future Actions	
Potential Funding Source	General Fund
Timeframe	Short-term
Equity Considerations for Implementation	

S3. Flood Hazard Maps

Category	Studies and Plans
Hazards Addressed	Flooding
Strategy Type	Admin/Tech
Strategy Description	Prioritize the review and publishing for public discussion the latest and most up to date flood hazard and sea level rise forecasts from all trusted sources.
Actions	a. Process. Create a regular process by which information is updated and released, identifying staff time and budget to ensure that this information is timely, accurate and accessible for all public and private decision-makers.
Lead Department	Planning, Building and Transportation
Related Plan/Policy	General Plan Policy HS-15
Key Partners	
Completed Actions	
Future Actions	
Potential Funding Source	General Fund
Timeframe	Ongoing
Equity Considerations for Implementation	