



ALAMEDA

Climate Adaptation and Hazard Mitigation Plan

September 2021 DRAFT

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Executive Summary

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The City of Alameda is a low-lying island community in the San Francisco Bay that is highly vulnerable to climate hazards from rising seas and earthquakes as a result of its older building stock and proximity to two major faults, as well as other hazards. That a disaster will strike Alameda in its future is a certainty, what is not certain is the extent to which the hazards will damage buildings and infrastructure and disrupt life for Alameda's residents and businesses. By understanding our risks and taking proactive action now, Alameda can be prepared for future disasters and reduce their impact.

The purpose of the Climate Adaptation and Hazard Mitigation Plan (Plan) is to help Alameda adapt to climate change, reduce the impact of future disasters and help us recover more quickly when disasters do occur.

The City of Alameda Climate Adaptation and Hazard Mitigation Plan:

- Meets the requirements of federal assistance grant programs, including FEMA's Hazard Mitigation Grant Program (HMGP) and Building Resilient Infrastructure and Communities (BRIC) funding.
- Works in conjunction with other plans, including the City's Climate Action and Resiliency Plan (CARP), General Plan and the City's Emergency Management Plan.
- Updates the adaptation chapter of the CARP.
- Establishes a basis for coordination and collaboration among community entities such as private and public agencies, key stakeholders, and residents.
- Identifies and prioritizes future mitigation and adaptation projects.

The Plan addresses natural and climate induced hazards that impact the City of Alameda. A hazard is an event or physical condition that has the potential to cause fatalities, injuries, property damage, infrastructure damage, damage to the environment, interruption of business, or other types of harm or loss. Hazard mitigation and climate adaptation refers to the actions taken to reduce or eliminate risk to human life and property from natural and climate change-induced hazards.

The Plan lays out Alameda's strategy for mitigating natural hazards and adapting to a changing climate. The success of this plan rests not only on our ability to implement the strategies laid out in this plan, but also on our ability to implement the City's Climate Action and Resiliency Plan (CARP). The goal of CARP is to reduce our greenhouse gas emissions (GHG) by 50% below 2005 levels by 2030 and become carbon neutral soon as possible. In 2019, the City of Alameda declared a climate emergency and called for an urgent and just citywide climate mobilization effort to reverse global warming and adapt as rapidly as possible to the growing global and local effects of climate change. In 2021, the IPCC's sixth assessment report observed that human-induced climate change is already causing more extreme weather patterns and that global surface temperature will continue to increase until at least the mid-century and global warming of 1.5°C and 2°C will be exceeded during the 21st century unless deep reductions in CO₂ and other greenhouse gas emissions occur in the coming decades.¹ By taking strong actions to reduce our GHG emissions, Alameda will do our part to achieve a climate safe path and avoid some of the most extreme climate effects we could face. The City of Alameda cannot avert global

¹ IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S. L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M. I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J. B. R. Matthews, T. K. Maycock, T. Waterfield, O. Yelekçi, R. Yu and B. Zhou (eds.)]. Cambridge University Press. In Press.

warming on its own. It will take an immediate and concerted effort on the part of community members, businesses, other cities and counties, the state, federal government and the world to come together and reduce our global emissions. Here in Alameda, we will do our part to reduce our emissions and prepare for the impacts that we will face. This Plan is our roadmap for adapting to the changes we anticipate today and for mitigating other hazards we face such as tsunamis and earthquakes.

Climate and Natural Hazard Risks in Alameda

Due to Alameda's proximity to major earthquake faults, our geography as a low-lying island community with older building stock, Alameda faces risks from a number of climate and natural hazards that have the potential to significantly disrupt daily life and cause damage to people and property.

Earthquakes, floods and sea level rise pose the greatest risk to people and property in Alameda. Combining all likely scenarios on nearby faults, Alameda has a 10 percent chance of experiencing "Very Strong" to "Violent" (MMI 8 to MMI 9) shaking in the next 50 years. This probability can also be expressed as a 0.2 percent chance per year, or a 500-year event, which could happen any time. A major earthquake would cause significant damage to Alameda's buildings and infrastructure, significant and prolonged disruption to the economy and would harm and displace residents.

Over 23 miles of shoreline surround both the main island of Alameda and Bay Farm Island. As such, the City of Alameda is vulnerable to flooding from both coastal storms where water enters the land along the lower elevations of the shoreline and overland from rainfall within the City during and after storm events. In the near term, both are likely to be temporary in nature, limited by high tide cycles and intensity of events, with flooding likely shallow - on the order of 2 feet or less in depth. Nevertheless, as climate change increases the intensity of storm events, sea levels, and groundwater levels, the depth and extent of flooding is expected to increase.

Other hazards also may have significant impacts but are less likely to occur, or the consequences may be more limited in duration or impact. These hazards include tsunamis, heat, drought, wildfire related hazards of smoky air and power outages, and dam breach inundation. Each of these hazards is evaluated in the plan.

Focus on Equity

Alameda recognizes that some members of the community will be more significantly impacted by natural disasters and may have a more difficult time recovering than others due to lack of stable housing, financial resources, and by zoning laws that have disproportionately placed people of color into areas of the city more vulnerable to natural hazards. Natural disasters disproportionately impact low-income residents, people of color, the young, the old and the disabled.

Social equity is critical to promoting healthy, resilient communities. Equity is the idea that one's race, ethnicity, gender, age, disability, sexual orientation should not determine their outcomes and should not have an effect on the distribution resources, including housing, access to jobs and education, food, and environmental exposure.

By explicitly addressing the needs of most impacted populations, the City seeks to undo historic and structural racism and contribute to building a healthy and diverse community, where everyone truly belongs. Given the interconnectedness of our ecosystems and the shared watershed of San Leandro Bay and the Oakland-Alameda Estuary, the City must work collaboratively to address equity not only for Alamedans but also for priority equity communities in adjacent jurisdictions such as Oakland and San Leandro. Working collaboratively with key stakeholders will help ensure more uniform protections exist for all, especially for under resourced communities, and will help establish a unified voice to expedite hazard mitigation and climate adaptation.

Climate Adaptation and Hazard Mitigation Strategy

Vision

The Plan's vision is that the City of Alameda will be better prepared for future hazards and climate impacts by reducing the impact of disasters and by being prepared to equitably recover from disasters.

Hazard Mitigation and Adaptation Goals

In addition to the vision statement, nine mitigation and adaptation goals were identified. These mitigation goals were developed in the 2016 Local Hazard Mitigation Plan (LHMP) and remain unchanged. The mitigation goals are broad statements that are achieved through implementation of the more specific mitigation actions. The mitigation goals are as follows:

- Reduce exposure to hazards where possible.
- Protect the health, safety and welfare of City of Alameda residents, workers and visitors.
- Minimize damage of public and private property.
- Minimize damage of the natural environment.
- Minimize disruption of essential services, facilities, and infrastructure.
- Timely and complete recovery.
- Increase understanding and awareness of hazards and hazard mitigation by City employees and the public.
- Participate in mitigation and resiliency by all stakeholders, as appropriate.
- Protect the City's character.

Hazard Specific Goals

The Climate Action and Resiliency Plan (CARP) identified hazard specific goals, which have been updated and adopted for this Plan. The hazard specific goals are as follows:

- **Sea level rise and storm surges:** Protect assets from sea level rise and storm surges, including community vitality and recreational opportunities, plan future land use to avoid impacts, and enhance natural shoreline habitat to mitigate impacts.

- **Inland flooding:** Increase the resiliency and capacity of the stormwater system to prevent flooding of assets during extreme precipitation events.
- **Drought:** Reduce water consumption and increase drought-resistant landscaping. **Extreme heat:** Reduce the heat island effect and protect vulnerable populations from heat impacts during heat waves.
- **Wildfires:** Protect public health from smoke impacts during wildfire events, especially among vulnerable populations.
- **Earthquakes:** Reduce property damage and loss of life in an earthquake, especially for areas at risk of liquefaction, and increase the ability for a timely restoration of service.
- **Tsunamis:** Reduce property damage and loss of life in a tsunami and prepare for the safe evacuation of people from the tsunami zone.
- **Effective implementation and capacity building:** Develop financial and human resources and increase transparency, community engagement, social resilience, and support for effective implementation of climate adaptation and hazard mitigation strategies.

Completed Strategies

Alameda has accomplished much towards increasing our community's disaster resilience since the development of the 2016 Plan, including:

- 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 Health and Safety Element of the General Plan, including key features of the Local 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)
- Adopted and implemented new air quality / smoke response protocols for City staff and employees (CARP Strategy)
- In the process of upgrading 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 to provide the capability to use Bay water to fight fires using a system compatible with the ones in nearby cities like San Francisco and Berkeley.

- 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)

Priority Climate Adaptation and Hazard Mitigation Strategies

The priority climate adaptation and hazard mitigation strategies include those from the 2016 LHMP that were selected for continuation, adaptation strategies from the Climate Action and Resiliency Plan, and new strategies identified by staff and community members.

*Items marked with an asterisk are programs already in place and will be continued.

Buildings and Facilities

- **B1. Soft-Story Buildings Program*** Expand the City's Soft Story Program to include 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 that remain on the City's inventory.
- **B2. Wood Framed Buildings Program*** Educate residents about the City's Wood Frame Building Program, which includes voluntary requirements for substantially improving the seismic performance of one- and two-story wood frame residential buildings with vulnerable "cripple walls". Encourage residents to take advantage of the California Earthquake Authority's Earthquake Brace and Bolt Program grants and other financial assistance programs.
- **B3. Resilient City Buildings*** Strengthen and rehabilitate City-owned buildings
- **B4. National Flood Insurance Program*** Continue the City's participation in the National Flood Insurance Program.
- **B5. Community Rating System*** Continue participation in Community Rating System (CRS) as a Class 8 community.
- **B6. Resilient Shoreline Facilities** Make shoreline facilities more resilient to earthquake, storm and sea level rise hazard to maintain functionality and to protect inland facilities, community vitality and recreational opportunities.
- **B7. Street Tree and Park Tree Trimming*** Trim trees to lessen storm-related utility and building damage.
- **B8. Concrete Buildings** Develop a program to identify, evaluate and require seismic retrofits of non-ductile concrete and tilt up residential and nonresidential buildings that are vulnerable to collapse in earthquakes.

Utility and Transportation Infrastructure

- **I1. Resilient Sanitary Sewer Service** Protect vulnerable wastewater systems and facilities to minimize disruption to the system following ground shaking and extreme weather events.
- **I2. Resilient Stormwater Conveyance Service** Rehabilitate the existing storm system conveyances and pump stations to increase capacity and resilience during storms, high tides,

sea level rise, seismic events, and power outages, thereby decreasing the chance of flooding of nearby streets, utilities, and buildings.

- **I3. Reduced Stormwater Runoff** Modify urban landscaping requirements and increase permeable surfaces to reduce stormwater runoff, thereby decreasing the chances of flooding and system overloading.
- **I4. Resilient Electrical Service** Protect vulnerable electric systems and facilities and build resiliency so disruption to the system is minimized following ground shaking, extreme weather events and wildfires.
- **I5. Mutual Aid Utility Repair Agreements** Participate in and foster General Mutual Aid Agreements.
- **I6. Infrastructure Bond** Prepare an infrastructure bond for voters to include resilience and greenhouse gas (GHG) reduction projects.
- **I7. Northern Shoreline on Bay Farm Island Adaptation** Develop a shovel-ready shoreline project along the northern shoreline of Bay Farm Island including the Veterans Court seawall, the wooden bicycle/pedestrian bridge and the lagoon outfall.
- **I8. Doolittle Drive Adaptation** Work with Caltrans, Port of Oakland, City of Oakland, East Bay Regional Parks District and other key stakeholders create project concept to mitigate flooding and sea level rise, to provide additional capacity for tsunami evacuation, and to enhance adjacent shoreline habitat with nature-based solutions and recreational opportunities on the San Francisco Bay Trail.
- **I9. Northern Shoreline near Posey/Webster Tubes Adaptation** Work with Caltrans, City of Oakland and other key stakeholders to create a project concept that combats flooding and sea level rise in the Oakland-Alameda Estuary.
- **I10. Shovel-ready Adaptation Projects** Design and permit shovel-ready adaptation projects at areas of location-based priority flooding.
- **I11. Green Infrastructure Plan** Finalize, approve, and implement Green Infrastructure Plan and green infrastructure projects as components of adaptation or corridor improvement projects.
- **I12. Resilient Transportation Network** Implement improvements to protect critical transportation facilities threatened by sea-level rise or rising groundwater.
- **I13. Water Conservation Programs** Continue water conservation programs and drought-resistant landscaping programs.
- **I1. Alameda Point Master Infrastructure Plan** Update Alameda Point Master Infrastructure Plan for consistency with the CARP.

Networking, Planning, and Education

- **N1. Public Education and Outreach** Conduct education and outreach to the general community on hazard mitigation and disaster preparedness.
- **N2. City Employee Education and Training** Conduct education and training in disaster preparedness, response, recovery and mitigation.

- **N3. Disaster Debris Plan and Agreement** Complete the City's Disaster Debris Plan for review by the California Office of Emergency Services (CalOES), and establish relationships with contractors and haulers who will be able to bid on very short notice if needed.
- **N4. Emergency Fuel Agreements** Work with FEMA to arrange for emergency fuel delivery and generators at key locations. Work with local fuel suppliers to ensure fuel delivery during emergency events. Consider developing microgrids to provide some level of continuous power during outages and emergencies.
- **N5. Tsunami Inundation Zone and Evacuation Route Sign Placement** Reduce the risk tsunami inundation presents to Alameda community members with sign placement.
- **N6. Incorporate Groundwater Study in the Climate Action and Resiliency Plan** Include information about rising groundwater surface and the potential for contaminant mobilization into CARP analysis of priority locations for adaptation.
- **N7. Refine Groundwater Model** 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.
- **N8. Tsunami Evacuation Planning** Partner with City of Oakland and Port of Oakland to plan for tsunami evacuation.
- **N9. Tsunami Education** Conduct tsunami evacuation training and drills with schools.
- **N10. Tsunami Ready** Become a Tsunami Ready city.
- **N11. Emergency Transportation Planning*** Continue to work with AC Transit and WETA to ensure coordinated services in the event of the need for evacuation.
- **N12. Community Outreach during Emergencies*** Continue working with Alameda County on community outreach during weather and hazard-related emergencies.
- **N13. Citywide Sea Level Rise Adaptation Plan** Develop a comprehensive citywide sea level rise adaptation strategy for Alameda following the model of the Master Infrastructure Plan for Alameda Point. The plan will identify the range of shoreline protection, groundwater management, land use, and building and infrastructure design standards needed to help Alameda adapt to rising sea and groundwater levels and fill critical information gaps related to shoreline condition, jurisdiction and approach to ensure uniform protection for the city and to create additional shovel-ready adaptation projects or programs.

Implementation and Updates

The Climate Adaptation and Hazard Mitigation Plan is a living document that must be regularly reviewed and updated. Public participation is an integral component of the mitigation planning process and will continue to be essential as this Plan evolves and is updated over time.

The City Manager's Office will be charged with maintaining, evaluating and updating this Plan on an annual basis within the 5-year cycle. Progress on Plan implementation will be reported to City Council at a public meeting annually, coincident with the annual report of the Climate Action and Resiliency Plan.

Per federal regulations, this plan must be updated every five years. The City Manager's Office will ensure that a complete review and update of the Plan, including the hazard analysis and mitigation strategy, is

completed before the expiration of the current Plan. The plan update process will follow much the same process as followed in the 2021 update.

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