Notes to Reviewers:

- Footnotes are to aid in review and will be removed from the document before adoption.
- Language in red is from the Coastal Act
- Language in purple is from the 2040 General Plan (GP)
- Language in green is from the existing certified LUP (the 1997 Coastal General Plan).

5. COASTAL ZONE HAZARDS

This chapter provides policies related to potential hazards within the City's coastal zone, including, but not limited to, fire, geologic instability, tsunamis, episodic and long-term shoreline retreat and coastal erosion, storm surge and wave uprush, tidal and storm flooding, and exposure to hazardous materials, and their cumulative impacts, as impacted by climate change and sea level rise. Policies in this chapter are organized into the following sections:

- General Hazard Policies
- Seismic and Geologic Hazards
- Tsunamis
- Flooding and Erosion with Sea Level Rise
- Hazardous Material Contamination

Coastal Act Policies

The following Coastal Act policies are most relevant to hazards in Eureka's coastal zone, and the language of Coastal Act Section 30235 and 30253 has been directly incorporated into LUP Policies CZH-1.2, 1.3 and CZH-4.21:

Section 30235. Construction altering natural shoreline. Revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes shall be permitted when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fishkills should be phased out or upgraded where feasible.

Section 30253. Minimization of adverse impacts. New development shall do all of the following:

a. Minimize risks to life and property in areas of high geologic, flood, and fire hazard.

b. Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs…

Section 30270. The commission shall take into account the effects of sea level rise in coastal resources planning and management policies and activities in order to identify, assess, and, to the extent feasible, avoid and mitigate the adverse effects of sea level rise.

GENERAL POLICIES

Background

This section of the Coastal Zone Hazard Chapter includes general policies relevant to a variety of hazards. Hazards are events or physical circumstances which can result in risks to people and property, interruptions of economic activity, disruption to essential services, and environmental damage. Assessing hazard risk involves considering the likelihood or probability of a certain hazard event combined with the magnitude of the resulting consequences from the event.

Vulnerability is the degree to which a person, area, asset, or natural system can withstand or recover from a hazardous event. Vulnerability depends on the amount of exposure to a hazard, sensitivity to exposure and adaptive capacity.

Resilience is the capacity of individuals, communities, institutions, businesses, and systems to survive, adapt, and grow, no matter what kinds of chronic stresses and acute shocks they experience.

Fire Hazards

It is important to note there is not a separate section of this chapter dedicated to fire hazards, but fire hazards are covered by the general policies in this section. CalFire has modeled and mapped moderate, high and very high fire hazard severity zones. Ratings are derived from a combination of fire frequency and expected fire behavior under severe weather conditions. As shown in **Figure LUP 5-1**, there are no high or very high fire hazard zones within Eureka's coastal zone. Moderate fire hazard zones include open space areas along Eureka's western waterfront, Woodley Island, portions of Tuluwat Island, and vegetated areas in the northeast portion of the City. Eureka's coastal zone is under local fire department responsibility, served by Humboldt Bay Fire.

Goal CZH-1

Resiliency to natural and human-induced hazards and the effects of climate change.

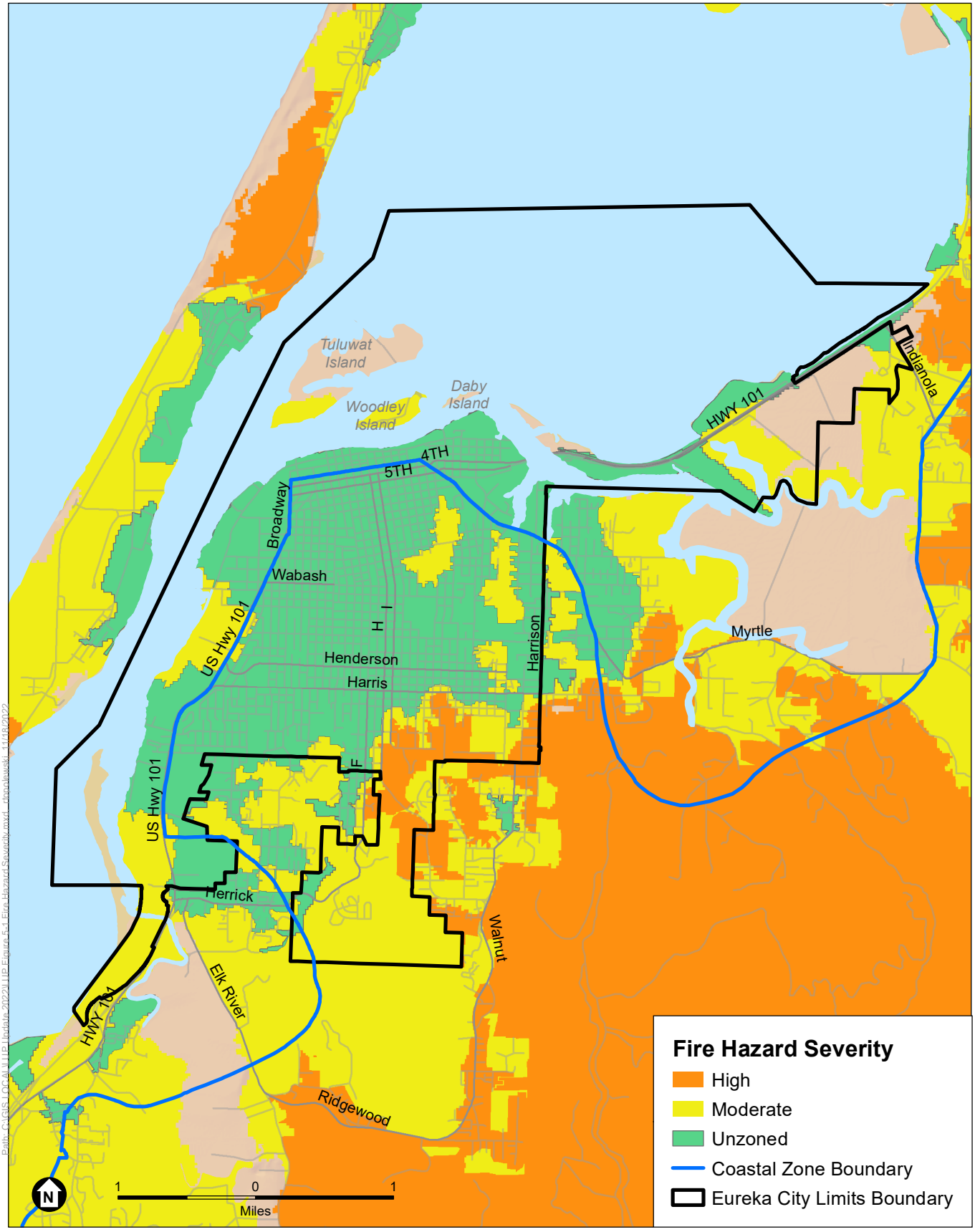
Policies

CZH-1.1. **Evaluation of Risk.** Evaluate hazard risk using the current best available scientific information at the time of coastal development permit application, accounting for projected sea level rise over the anticipated life of the development, and considering multiple risk scenarios, including a worst-case scenario. Consider potential impacts of hazards on the proposed development, as well as foreseeable effects the development may have on coastal resources over time, as a result of exposure to hazards, such as release of contamination or adverse impacts on natural shoreline processes.

CZH-1.2. **Minimization of Risk.** Require new development to minimize risk to life and property in areas of high geologic, flood, and fire hazard.[1] Consider project alternatives and incorporate mitigation measures, as needed, to minimize risk over the anticipated life of the development, including minimizing impacts to the development itself, and impacts of the

[1] Part of Coastal Act Section 30253.

Figure LUP 5-1: Fire Hazard Severity



development on the surrounding area. Avoid transferring risk from one property to another, except through mutual agreement.

CZH-1.3. **Design Standard.**[2] Require development to assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area, or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.

CZH-1.4. **Assumption of Risk.** Condition coastal development permits for new development and substantial improvements to existing development in high hazard areas to require acknowledgement and:

a. Assumption of risks from applicable hazards;
b. Agreement the permit does not authorize otherwise unauthorized encroachment onto public trust lands when development is located on or near the shoreline;
c. Agreement the development does not have any rights/entitlement to shoreline protection when the development is not entitled to shoreline protection under LUP Policy CZH-4.21; and
d. Agreement the development may require future adaptation to address hazard risks, up to and including removal of the site improvements, when the development may not remain safe from hazards for its anticipated design life.

CZH-1.5. **Updating Information.**[3] Periodically review and update hazard mapping, risk analysis and mitigation plans based on best available science and data.

CZH-1.6. **Education.**[4] Work with community partners, property owners, and managers of assets at risk to enhance local understanding of hazards and sea-level rise and identify best management practices to reduce vulnerability and risk.

CZH-1.7. **Collaboration.**[5] Collaborate with stakeholder groups, other agencies, local tribes, and the public to develop local and regional strategies to collectively improve the community's ability to address hazards and adapt to sea-level rise in ways which advance or maintain economic prosperity, social equity, and environmental protection.

CZH-1.8. **Hazard Mitigation Planning.**[6] Continue to collaborate with the County of Humboldt and other participating jurisdictions, and participate in the regular updates to the Humboldt Operational Area Hazard Mitigation Plan, to address hazards, and resilience and adaptation to climate change.

CZH-1.9. **Emergency and Disaster Preparedness.**[7] Continue to cooperate with Humboldt County and other relevant agencies in conducting disaster-preparedness exercises, and developing and operating a coordinated response program for major emergencies or disasters.

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[2] Part of Coastal Act Section 30253.
[3] Language from 2040 GP Policy SL-1.8 (SL-1.8 just focused on SLR).
[4] 2040 GP Policy SL-1.14.
[5] 2040 GP Policy SL-1.15.
[6] 2040 GP Policy CC-1.1.
[7] 2040 GP Policy HS-4.2.

CZH-1.10. **Evacuation Routes.**[8] Continue to work with Humboldt County, and appropriate state and federal agencies, to identify major emergency transportation corridors for use during disasters and emergencies. In particular, the City should ensure safe access routes to communication centers, hospitals, airports, staging areas, and fuel storage sites.

CZH-1.11. **Critical Facilities.**[9] Ensure the continued function of critical facilities following a major disaster to facilitate post-disaster recovery. If feasible, locate new critical facilities, and relocate existing facilities, outside of identified high hazard areas.

SEISMIC AND GEOLOGIC HAZARDS

Background

Eureka is located at the southern end of the Cascadia Subduction Zone, which is a tectonically active region with high seismic activity, where many earthquakes have produced discernible damage. Historic seismicity and paleoseismic studies in the area suggest sources of damaging earthquakes in the Eureka region can come from the Gorda Plate (a fragment of the Juan de Fuca plate); the Mendocino fault; the Mendocino Triple Junction; the northern end of the San Andreas fault; faults within the North American Plate (including the Little Salmon fault and the Mad River fault zone); and offshore faults from the Cascadia Subduction Zone. **Figure LUP 5-2** shows regional fault locations.

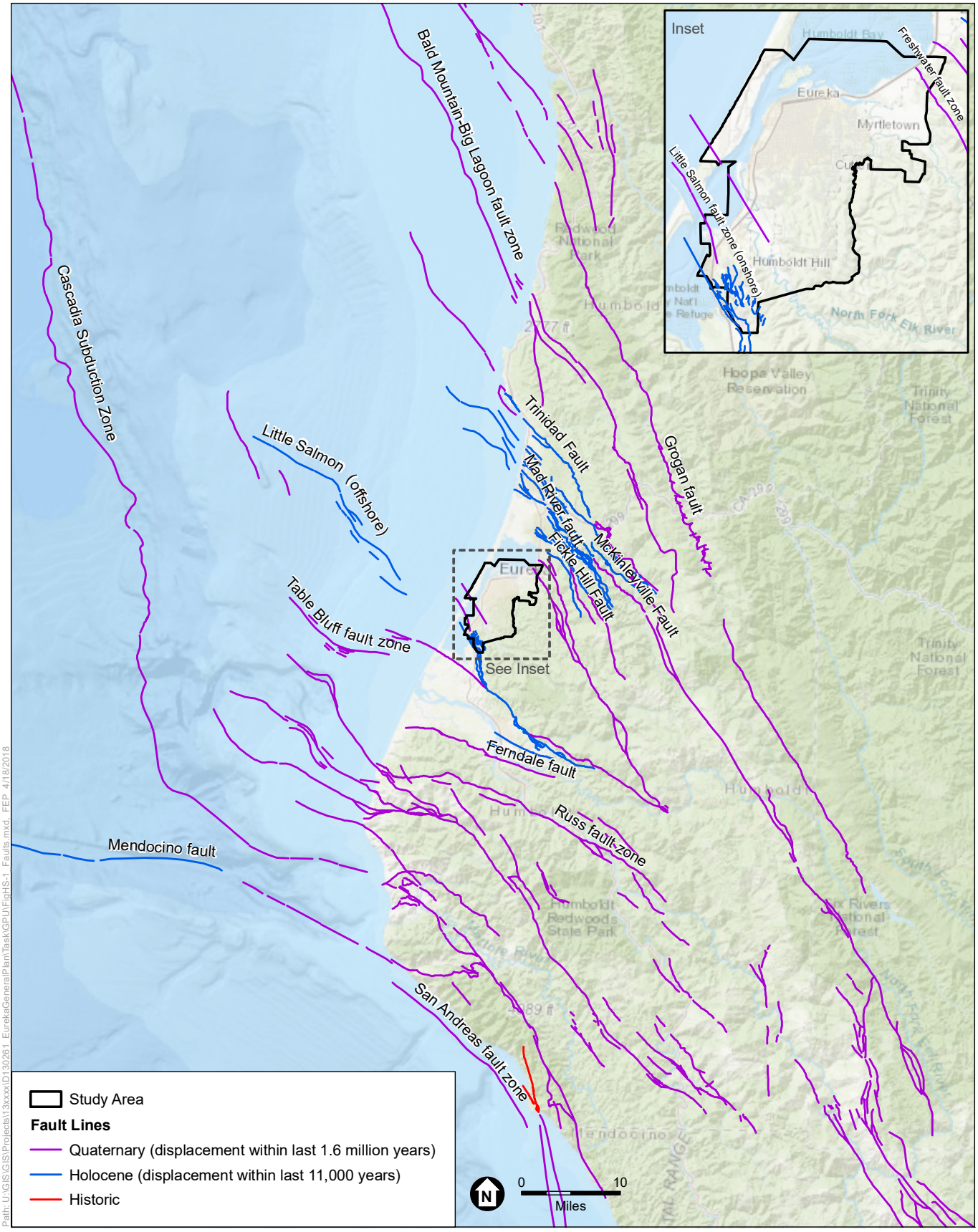
Geologists classify faults by their relative hazards. "Active" faults, which represent the highest hazard, are those which have ruptured to the ground surface during the Holocene period (about the last 11,000 years). The closest active faults to Eureka's coastal zone are the Fickle Hill Fault to the north in Arcata, and the Little Salmon Fault to the south in the Humboldt Hill area.

The Humboldt Bay area will likely experience a large regional earthquake within the operational life of this LUP, generating strong intensity ground shaking within the City's coastal zone. The primary and secondary effects of ground shaking could damage structural foundations, distort or break infrastructure, and place people at risk of injury or death. An earthquake along the Cascadia Subduction Zone could also generate a tsunami resulting in flooding along Eureka's shoreline; tsunamis are addressed in the next section of this chapter.

The intensity of any one earthquake event experienced at a project site in the City's coastal zone would depend on the causative fault and the distance to the epicenter, the magnitude, the acceleration, the duration of shaking, and the nature of the geologic materials underlying the project site.

Current geotechnical practices and adherence to seismic design criteria found in the current California Building Code can minimize the potential damage and injury from seismicity to less than significant levels. However, the majority of the building stock within Eureka's coastal zone was built prior to 1975, when seismic provisions became uniformly applied through building code applications. Specifically, unreinforced masonry buildings, which do not contain an internal reinforcing structure such as rebar in concrete or steel bracing for brick, pose a significant danger during an earthquake. The brittle composition of these buildings can break apart and fall away or buckle, potentially causing a complete

[8] 2040 GP Policy HS-4.5.
[9] Language from 2040 GP Policy HS-4.6.



SOURCE: City of Eureka, 2018; USGS, 2010; ESA, 2018

2040 Eureka General Plan

Figure HS-1
Regional Faults

collapse of the building. As of 2023, the City knows of four unreinforced masonry buildings in the City's coastal zone.

Another significant geologic risk in the City's coastal zone is soil liquefaction which occurs when water-saturated sands, silts or gravelly soils are shaken so violently the individual grains lose contact with one another and float freely in the water, turning the ground into a pudding-like liquid. Building and road foundations lose load-bearing strength and may sink into what was previously solid ground. Many areas within the City's coastal zone likely contain a relatively high groundwater table, and if loose alluvial sediments are present, could have a high potential for liquefaction.

Figure LUP 5-3 shows potential liquefaction hazard areas, from mapping published by the Humboldt County Planning and Building Department (2015). Site-specific geotechnical investigations can confirm the presence of liquefiable materials and can provide various foundation design criteria to mitigate the potentially damaging effects of liquefaction.

Goal CZH-2

Protection of property, critical facilities, and human life from seismic and geological hazards.[10]

Policies

CZH-2.1. **Appropriate Siting and Design.**[11] Ensure all new structures intended for human occupancy including new development and redevelopment of existing uses are sited and designed consistent with limitations imposed by seismic and geological hazards, constructed to minimize seismic risk, and constructed in compliance with the safety standards included in the Uniform Building Code.

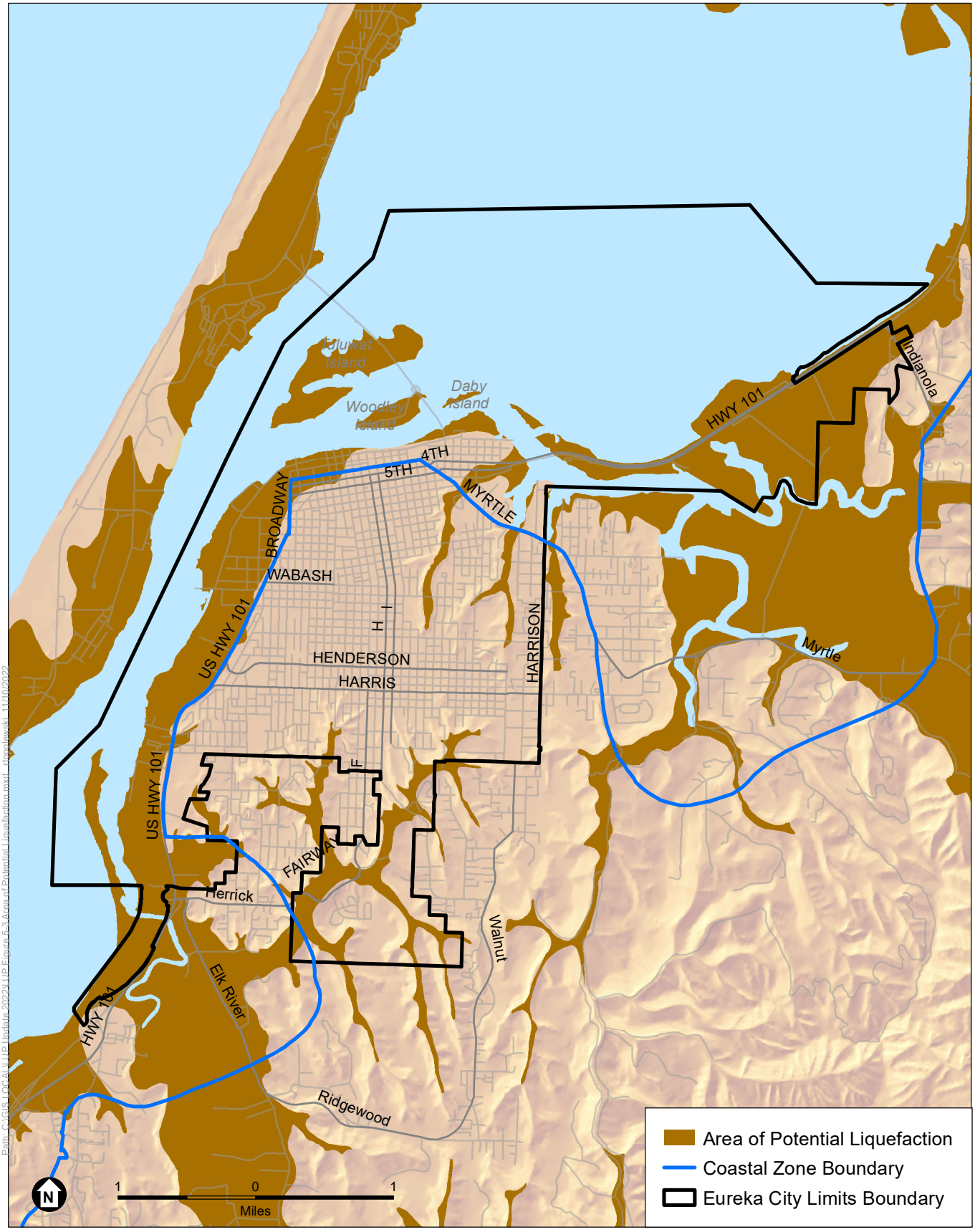
CZH-2.2. **Retrofit Program.**[12] Encourage property owners to seismically retrofit buildings that do not meet current building and safety code requirements, especially critical facilities susceptible to damage during seismic events.

CZH-2.3. **Unreinforced Masonry Buildings.**[13] Encourage and provide incentives, where feasible, for retrofit and rehabilitation of unreinforced masonry buildings that pose an earthquake risk.

CZH-2.4. **Geologic Hazard Report.**[14] Require a geology and soils report prepared by a qualified professional as part of coastal development permit applications for new structural development or redevelopment, unless information is already available for the site at a level of detail adequate to ensure project compliance with the LCP. The report shall analyze site-specific geological conditions and the potential effects of seismic forces resulting from a maximum credible earthquake, recommend mitigation measures for any potential impacts, outline alternative solutions, and express a professional opinion as to whether the project can be designed consistent with LUP Policy CZH-1.3.

[10] 2040 GP Goal HS-1.
[11] 2040 GP Policy HS-1.1.
[12] 2040 GP Policy HS-1.3.
[13] 2040 GP Policy LU-2.9.
[14] Existing LUP Policy 7.B.4

Figure LUP 5-3: Area of Potential Liquefaction



TSUNAMIS

Background

Eureka's shoreline is susceptible to damaging tsunamis from both local and distant sources. A tsunami is a series of waves generated by a rapid, submarine disturbance, such as from an underwater earthquake or landslide, which can flood or inundate low-lying coastal areas. The high waves, fast moving surge, and rapid currents of tsunamis pose a risk to people and property in their path. Aside from the tremendous hydraulic force of the tsunami waves themselves, floating debris carried or picked up by a tsunami can endanger human lives, batter inland structures, carry hazardous and flammable materials, and rupture gas lines. According to the National Tsunami Hazard Mitigation Program, tsunami events with runups of more than 1 meter (3.3 feet) are the most likely to be dangerous to people and property.

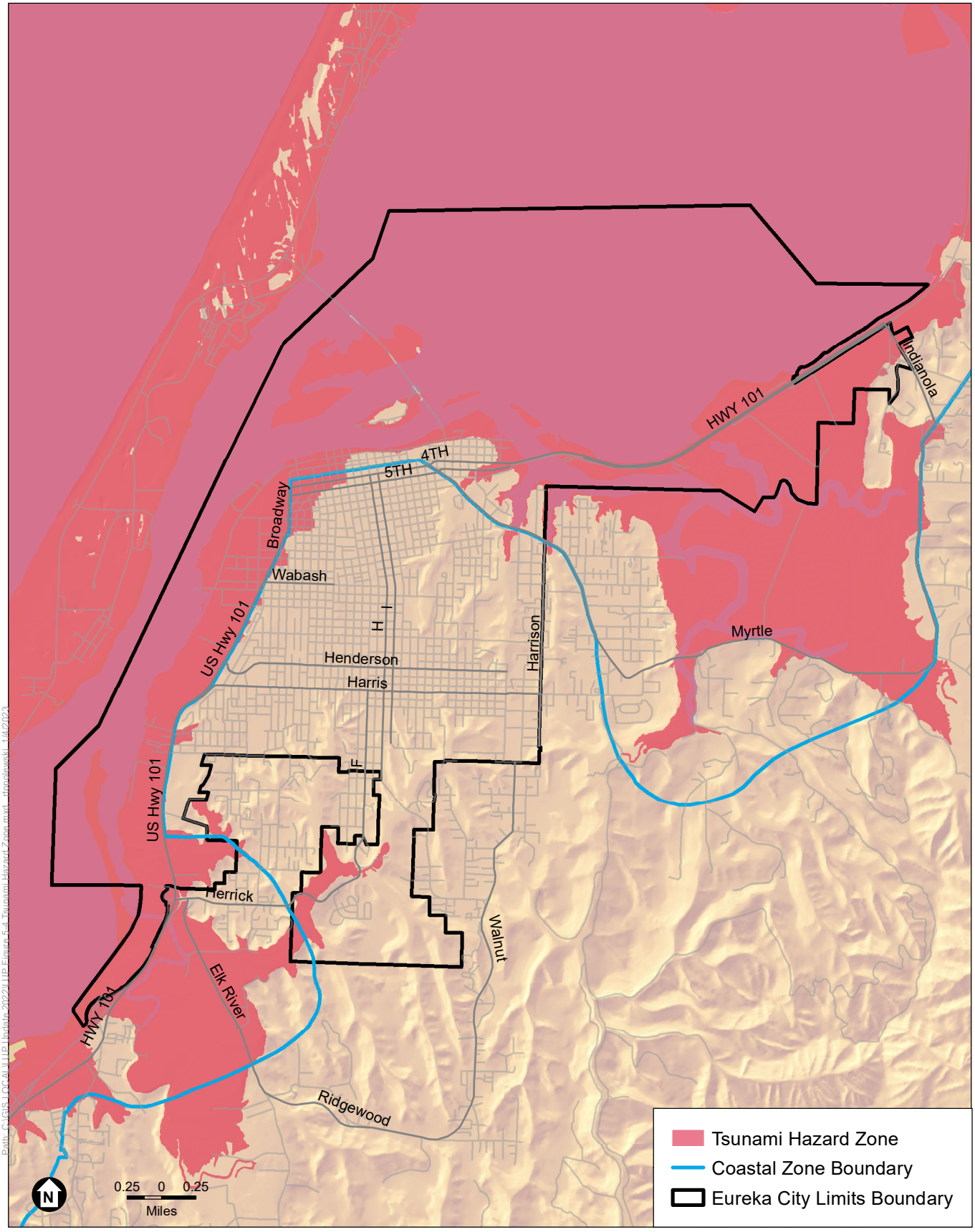
Figure LUP 5-4 shows the mapped tsunami inundation area on the California Tsunami Hazard Area Map for Humboldt County, produced by the California Governor's Office of Emergency Services and the California Geological Survey (2021). A 975-year average return period tsunami model (with a 5% probability of exceedance in 50 years) was used as a basis for the maximum inundation extent, in conjunction with data from an earlier 2009 mapping effort. The 2009 maps used a suite of tsunami source events for modeling, representing realistic local and distant earthquakes and hypothetical extreme undersea, near-shore landslides. The maximum inland inundation boundary has also been modified to coincide with geographic features or city streets.

If a large earthquake (magnitude 8.5+) occurred along the Cascadia Subduction Zone on California's northern coastline (inferred to occur every 300-800 years), it could generate a significant tsunami. The size of potential tsunami waves would correlate to the length of the rupture along the subduction zone, and the degree of secondary submarine landsliding. Tidal fluctuations in the north coast region may also affect the extent of tsunami inundation, with inundation risk greater at higher tides. As sea levels continue to rise, tsunami inundation areas will likely reach further into communities than current mapping indicates.

In the case of a local-source event along the Cascadia Subduction Zone, the first tsunami surges could arrive in as little as 10-15 minutes with little to no time for sirens to sound or other warning messages to be disseminated. However, more distant sources could allow for more warning and evacuation of high-risk areas. Effective evacuation planning requires identifying refuge areas and evacuation routes, coordinating closely with emergency service agencies and other planning partners, disseminating evacuation information, and providing public education, conducting regular drills, and maintaining the program for tsunami evacuation preparation over time.

Following the April 25, 1992, Cape Mendocino Magnitude 7.2 earthquake, which caused a minor tsunami along the north coast, language was added to the Seismic Hazard Mapping Act to address hazards related to tsunamis. Now, Section 2692.1 of the Act specifies the State Geologist may include maps of tsunami effects when the information "becomes available" and is "appropriate for use by local government." The California Geologic Survey is currently in the process of developing maps, regulations, and guidance documents to implement this section, to require projects in the mapped tsunami hazard area to evaluate and mitigate tsunami hazards, and to require real estate disclosure when property lies within the hazard area. When the tsunami hazard mapping and regulations are adopted under the Seismic Hazard Mapping Act, the City will update LCP mapping and policies accordingly.

Figure LUP 5-4 Tsunami Hazard Zone



Goal CZH-3

A community prepared for and able to respond to, recover from, and mitigate the effects of a significant tsunami event.[15]

Policies

CZH-3.1. **Tsunami Readiness.**[16] Continue to enhance the City's tsunami awareness program, in coordination with Humboldt County and other local agencies, to ensure that Eureka residents and visitors are informed about the threat of tsunami and inundation.

CZH-3.2. **Tsunami Evacuation Analysis.** Require coastal development permit applications for structures intended for human occupancy in the tsunami hazard zone to demonstrate there is adequate evacuation time, and a safe and accessible route, for occupants to get out of the zone by foot, and the proposed development will not obstruct an existing evacuation route, or result in a significant change to the evacuation time for the area.

CZH-3.3. **Tsunami Evacuation Plan.** Require preparation and implementation of a Tsunami Evacuation Plan for structures intended for human occupancy in the tsunami hazard zone, consistent with areawide evacuation plans, to ensure occupants are aware of the tsunami threat, warning signals, and evacuation route, and to ensure there is a plan to evacuate less-mobile occupants.

CZH-3.4. **Vertical Evacuation Structures.** Promote construction of vertical evacuation structures in areas where evacuation to high ground by foot would prove difficult in the event of a local-source tsunami. Require vertical evacuation structures necessary for safe evacuation to comply with building code requirements for such structures, and remain operable and accessible to the community they are intended to serve.

CZH-3.5. **Development Necessary for Recovery.** Require critical facilities and infrastructure in the tsunami hazard zone necessary for emergency response after a tsunami, including necessary access routes, to be designed to be functional and operable after the design tsunami event.

[15] Some language from 2040 GP Goal HS-4.
[16] 2040 GP Policy HS-4.4.

FLOODING AND EROSION WITH SEA LEVEL RISE

Background

Note: elevations discussed in this section are referenced to North American Vertical Datum, 1988 (NAVD88).

Flooding and erosion hazards have always been a concern to the City of Eureka and other communities with low-lying land around Humboldt Bay, but sea level rise will increase the future rates, magnitudes, and likelihoods of these hazards, beyond what has been experienced before.

Flood Hazard

There are different types of flood events capable of impacting Eureka's coastal zone, including coastal flooding (from daily tides, extreme tides, storm surge and wave uprush), urban flooding (when available stormwater conveyance systems are overwhelmed), riverine flooding, and tsunami flooding, all of which interact with each other and are impacted by climate change.

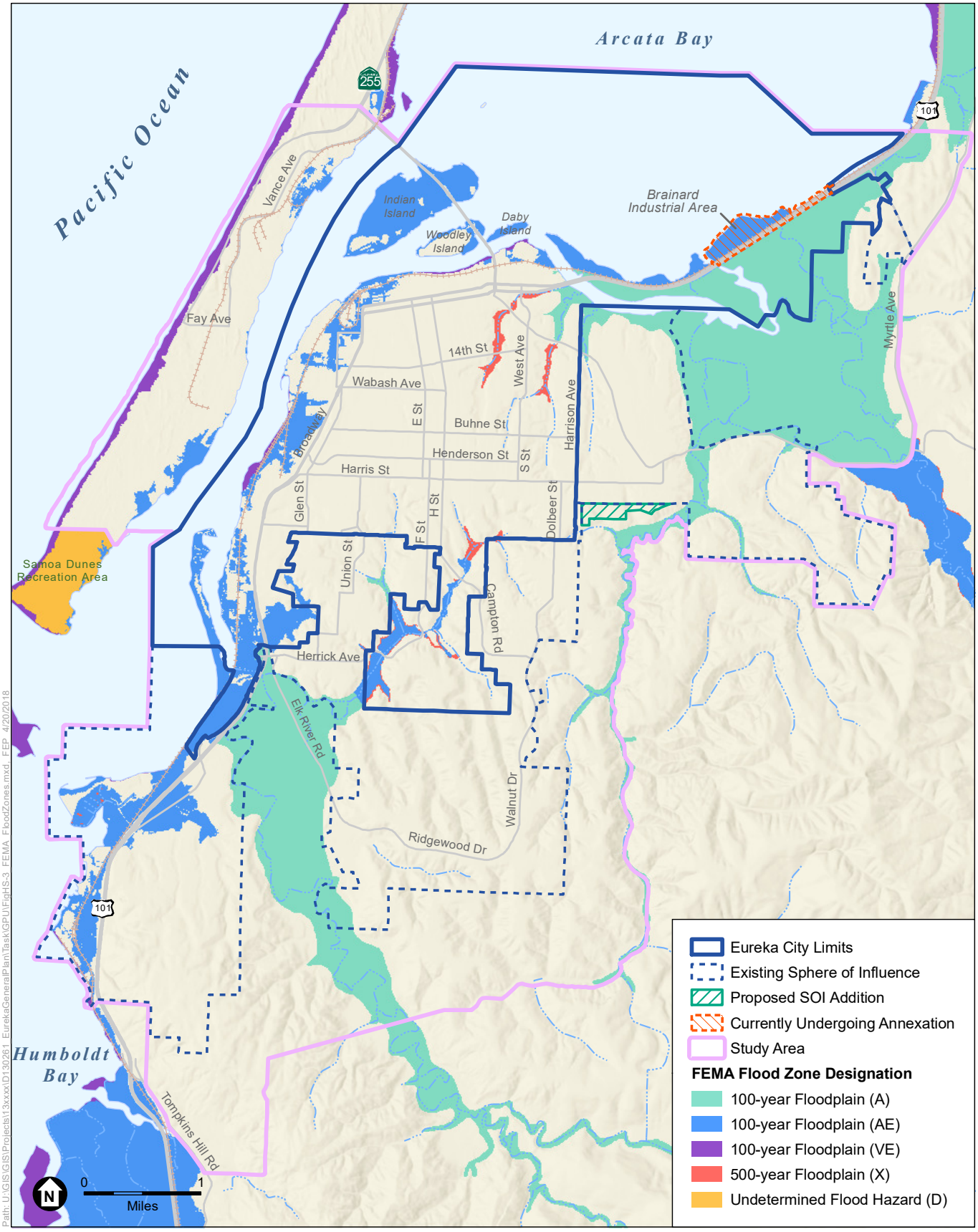
The City is located on a marine terrace between two low-lying alluvial areas: the Eureka Slough hydrographic area to the north and Elk River Slough hydrographic area to the south. Historically, these low-lying alluvial areas were predominately salt marsh with a network of tidal channels. The urban waterfront area west of Broadway and A Street was also historically salt marsh and windblown sand deposits overlaid on tidal mudflats or salt marsh. The City's three islands, Tuluwat, Woodley, and Daby, were also predominately salt marsh. Today, with some exceptions resulting from significant fill, these former regions of salt marsh and low-lying sand deposits are within the current floodplain, and vulnerable to increased extent, frequency, and severity of flooding in the future with sea level rise.

The Federal Emergency Management Agency (FEMA), through its Flood Insurance Rate Mapping (FIRM) designates Special Flood Hazard Areas where flooding could occur during 100-year and 500-year flood events. The FEMA mapping for Eureka, last updated in 2017, is shown in **Figure LUP 5-5**. A 100-year flood event has a 1% probability of occurring in a single year and a 26% chance of flooding over the life of a 30-year mortgage. A 500-year event has a 0.2 percent probability of occurring in a single year.

According to FEMA, the coastal high hazard area (or "V zone," where V stands for velocity wave action) is the most hazardous part of the coastal floodplain, due to its exposure to wave effects. **Table LUP 5-1** below describes the difference between the various FEMA Flood Zones shown on **Figure LUP 5-5**.

Table LUP 5-1.

FEMA Flood Zone	Description
A	Areas with at least a 1% annual chance of flooding. The elevation of the water surface for the 1% annual chance (100-year) event, known as the base flood elevation (BFE), is not specified.
AE	Same as the A Zone, except a BFE has been assigned based on detailed floodplain analysis. In Eureka's coastal zone, BFEs for AE Zones range from 10 to 12 feet.
V	Coastal areas with at least a 1% annual chance of flooding and also subject to high velocity waters, including coastal and tidal inundation or tsunamis. The BFE is not specified.



SOURCE: City of Eureka, 2018; FEMA, 2017; ESA, 2018

2040 Eureka General Plan

Figure HS-3
FEMA Flood Zones

VE	Same as the VE Zone, except a BFE has been assigned based on the total water level which includes the effects of storm surge and wave runup. In Eureka's coastal zone, BFEs for VE Zones range from 13 to 18 feet.

The FEMA mapping is based on detailed coastal engineering analysis to generate predictions for total water levels along the shoreline. It is important to note the FEMA mapping is based on historic flood risk and does not account for sea level rise or projected future changes in storm events as the result of climate change.

Coastal Erosion

Erosion is the process in which sediment, such as rock, gravel, soil and sand separate and move away from landforms. Coastal erosion is a complex response to many processes including marine (e.g., water levels, waves, sediment supply and transport, etc.), terrestrial (e.g., rainfall, runoff, wind, etc.), topographic/geologic conditions, and other instabilities, such as seismic shifts and biologic changes.

Humboldt Bay is subject to ocean tides, storm surge, locally generated wind waves, and propagation of long-period swell through the Humboldt Bay entrance. Wave-related runup and shoreline erosion was evaluated to inform the City's Sea Level Rise Vulnerability and Capital Improvement Project (CIP) Adaptation Plan (2023). According to the analysis, locally-generated wind waves and swell propagation through the Humboldt Bay entrance represent the most significant wave energy sources along Eureka's shoreline. However, these events are relatively infrequent, and are unlikely to be the primary drivers of coastal erosion. Continuous erosion of the shoreline may be attributed to more routine events, such as boat wakes and currents. When coupled with a high-water level event, wave action could increase the potential for erosion and flood damage along the shoreline.

Sea Level Rise

Global sea levels are rising, and the Humboldt Bay region's tectonically-driven downward vertical land motion is compounding the effects of sea level rise, resulting in the highest measured rate of local sea level increase along California's coast. While global average sea level is currently rising at a rate of 1.7 mm/year, the sea level measured at the North Spit tide gage is currently rising at 4.91 mm/yr, almost three times the global average rate.

Sea-level heights vary due to astronomical tides, storm surge, wind stress effects, changes in barometric pressure, seasonal cycles, and El Niño Southern Oscillation phases. This existing sea-level height variability can mask local sea level rise over the near term. As sea-levels rise into the future, the water levels associated with sea-level height variability described above will also increase, and the incidence of extreme high-water levels will become more common.

As of the adoption of this LCP, the Ocean Protection Council (OPC)'s 2018 update to the State of California Sea Level Rise Guidance provides the best available science on sea level rise projections, and includes localized probabilistic projections for tide gauge sites across the coast of California. Projections for Humboldt Bay's North Spit Tide Gauge are shown in **Table LUP 5-2**; these projections consider the combined effects of regional eustatic sea level rise and vertical land motion. Updates to the science are expected in the coming years, and what is considered current best available science will continue to evolve.

Table LUP 5-2. Sea Level Rise Projections (in feet) for Humboldt Bay*		
	Low Risk Aversion (ft.)	**Medium-High Risk Aversion (ft.)**
2040	1.1	1.6
2050	1.5	2.3
2060	1.7-1.9	2.8-3.1
2070	2-2.4	3.5-4
2080	2.4-2.9	4.4-5.1
2090	2.7-3.5	5.3-6.2
2100	3.1-4.1	6.3-7.6
*The low and high numbers within each individual cell represent low and high greenhouse gas emission scenarios, respectively. The world is currently on the high emissions trajectory and any cuts in emissions we make now are only going to have minor effects on sea level rise prior to 2050; therefore, only a high emission scenario is shown for the years 2040 and 2050.		

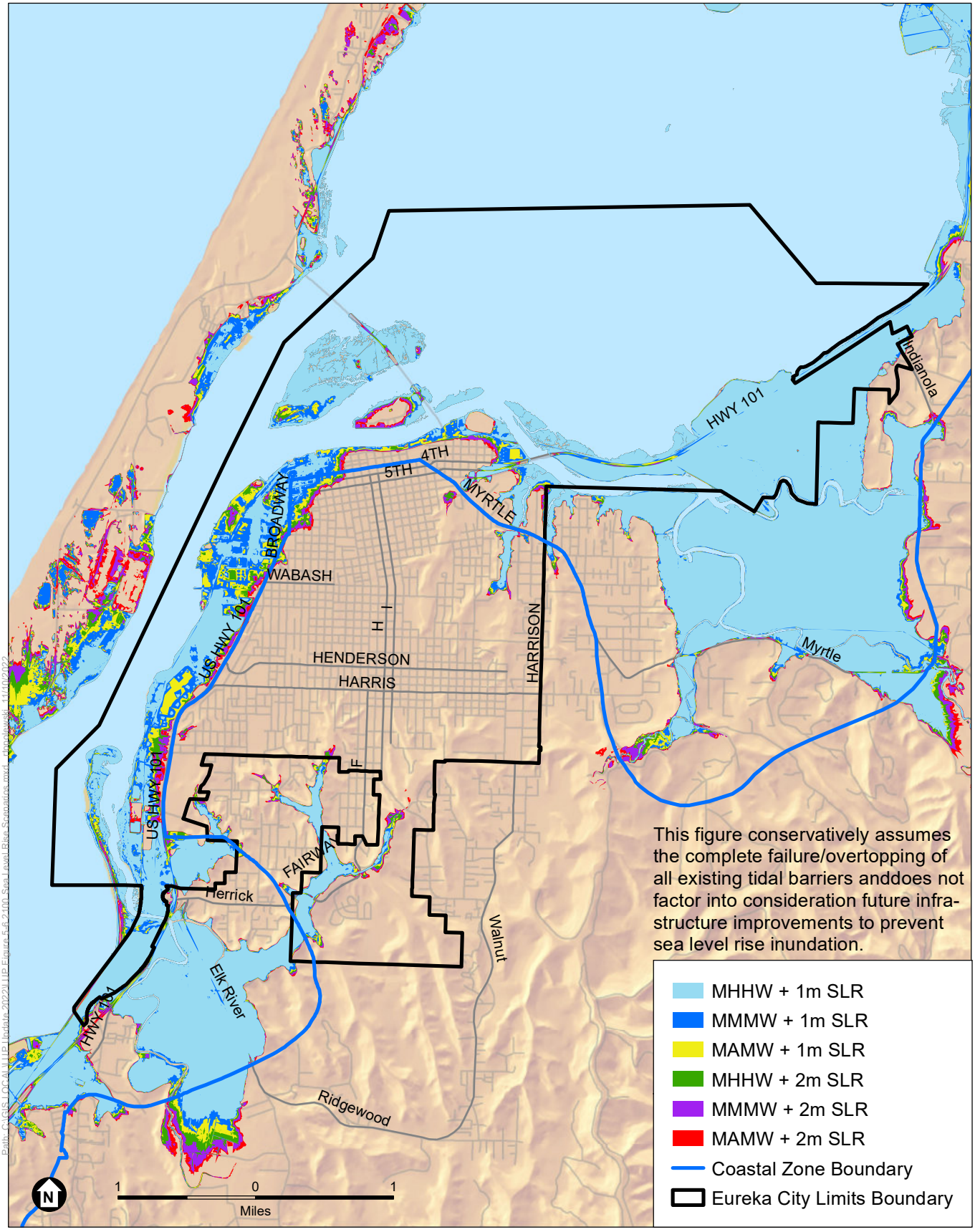
According to current best available science, the low-risk aversion scenario shown in **Table LUP 5-2** has an approximately 17% chance of being exceeded, and the medium-high risk aversion scenario has a 1 in 200 chance, or a 0.5%, chance of being exceeded. Before 2050, differences in sea level rise projections under different greenhouse gas emission scenarios are minor. After 2050, sea level rise projections increasingly depend on the trajectory of greenhouse gas emissions. For instance, if the world drastically cuts emissions (by about 70% between 2015 and 2050, to zero emissions by 2080, and below zero thereafter), the OPC report indicates there is a 66% probability the sea level at the North Spit tide gauge will rise between 1.7 and 3.1 feet by 2100. In contrast, under the business-as-usual emissions scenario, there is a 66% probability sea level at the North Spit tide gauge will rise between 2.3 feet and 4.1 feet.

The appropriate time horizon to use to evaluate sea level rise depends on the anticipated life of proposed development, after which such development is expected to be removed, replaced or redeveloped. New commercial and residential buildings are typically given a 75-year design life, with buildings constructed at the time of LUP adoption anticipated to survive to 2100. Therefore, while the 2040 General Plan planning period ends in 2040, coastal development permit analysis may need to consider a longer time horizon.

Figure LUP 5-6 shows areas of the shoreline lying at or below projected water elevations in 2100 with one and two meters (3.3 and 6.6 feet) of sea level rise, utilizing inundation maps produced from hydrodynamic modeling prepared by Northern Hydrology and Engineering (2015). The mapping conservatively reflects potential areas of tidal inundation if all existing tidal barriers are breached or overtopped and no future infrastructure improvements are made to prevent inundation. This mapping approach is useful as a generalized screening-level assessment, but does not give insight on actual flooding events, and has limited utility for planning and designing specific adaptation projects. More detailed analysis of flooding, which considers hydraulic pathways and responses of shoreline structures to various flooding scenarios, has been completed for various areas and projects within Eureka's coastal zone, including but not limited to the Eureka Slough hydrographic area (GHD, 2021) and the City's Elk River Wastewater Treatment Plant and collection system (ESA, 2019).

The current mean higher high water (MHHW; i.e., average daily highest tide) elevation on Humboldt Bay is 6.5 feet as measured at NOAA's North Spit Tide Gage; the mean monthly maximum water elevation

Figure LUP 5-6: 2100 Sea Level Rise Scenarios



(MMMW; i.e., mean monthly high-water level) is 7.7 feet; and the mean annual maximum water (MAMW; i.e., average king tide) elevation is 8.8 feet. **Figure LUP 5-6** shows projected MHHW, MMMW, and MAMW levels in 2100 with 3.3 and 6.6 feet of sea level rise, ranging from approximately 9.8 through 15.3 feet in elevation. For context, the highest observed water level on record at the North Spit Tide Gage is 9.6 feet, which occurred on December 31, 2005, and, combined with storm surge, resulted in significant shoreline erosion, overtopping, and flooding. With 3.3 feet of sea level rise, future average daily high tides (MHHW; 9.8 feet elevation) will exceed the current extreme tide of record.

The City's 2016 Adaptation Planning Report breaks the City into three discrete hydrographic units: the Eureka Slough unit, the urban waterfront, and the Elk River Slough unit. The two low-lying alluvial areas of Eureka Slough and Elk River Slough are vulnerable now to tidal inundation if dikes are breached with little expansion of the vulnerable footprint beyond the current mapped floodplain, due to confining topography inland of the low-lying diked lands. In contrast, in the urban core of the City, there is a significant expansion of the scope of the area vulnerable to flooding projected between the end of the planning period and the end of the century.

In rural Humboldt County, Eureka has a relatively high magnitude of consequences due to the number of people, structures and transportation facilities impacted by flooding. The City prepared a sea level rise assets vulnerability and risk assessment in 2016 which identified assets vulnerable to sea level rise in the city in 2050 and 2100. Some key assets vulnerable to the impacts of sea level rise by 2050 include segments of Highway 101 (as a regional transportation route and local evacuation route), segments of the California Coastal Trail, sewer collection mains and pump/lift stations, vehicular access to the Elk River Wastewater Treatment Plant, commercial fishing and recreational boating docks and launches, and buried cultural resources.

The focus of most sea-level rise research and vulnerability and planning studies has been on the impacts of tidal flooding and inundation from rising sea levels and higher storm surge. However, low-lying areas around Humboldt Bay are not only threatened by overtopping of shoreline barriers by tidewaters, but also by rising and potentially emergent groundwater, and by reduced stormwater drainage capacity, especially when rainfall events coincide with high ocean water levels. As a result, sea level rise adaptation will be more complex and varied than solely relying on elevation and fortification of tidal barriers.

Long-term sea level rise projections and vulnerabilities are significant, but there is time to plan, fund and implement adaptation strategies in response to these evolving hazards. An effective response to sea level rise will require a coordinated effort among private and public landowners and asset managers, City staff, elected officials, regional stakeholders and state and federal agencies. Adaptation will be an ongoing process for the Humboldt Bay region. Progress will be made through collaboration, advances in scientific understanding, innovation, experimentation, monitoring, and continuous learning.

The City is committed to encouraging, supporting and implementing actions to reduce risk and vulnerability, and build resilience to sea level rise. For instance, the City has worked to protect, enhance and restore wetlands within City watersheds for decades, most recently with the 114-acre Elk River Estuary and Tidal Wetlands Enhancement Project, which will significantly increase the City's flood capacity and aid in future habitat migration and resilience as sea levels rise. The City's work to increase

affordable and infill housing development outside of high hazard areas is also a critical component of the region's sea level rise adaptation response.

Shoreline Structures

A significant portion of Eureka's urban waterfront was created by placing fill in the bay, and almost all of Eureka's shoreline is composed of human-created structures, and features which have effectively "held back" and protected the City from the approximately eighteen inches of sea level rise which has already occurred over the last century. Eureka's shoreline protection includes, but is not limited to, salt marsh, the out-of-service railroad, road embankments, and privately- and publicly-owned levees.

Shoreline protective devices are constructed features such as seawalls, revetments, riprap, earthen dikes, and bulkheads used to protect shoreline development and other features from tidal inundation, erosion and other shoreline hazards. One consequence of shoreline protective devices is "coastal squeeze." Hard shoreline structures become barriers which fix the shoreline, reducing sources of sediment supply resulting from erosion, and impeding the ability of beaches and habitats to naturally migrate inland over time with sea level rise. Beaches, dunes, and wetlands which cannot migrate inland because of these barriers will eventually be squeezed out and lost, caught between rising tides and immovable shoreline structures. It is important to note, because Eureka is a city located on the inner shoreline of the bay without beach-fronting development, the City largely avoids the public access issues experienced by other coastal communities where beach access is threatened. Along Eureka's shoreline, coastal squeeze instead threatens the loss of saltmarsh and other vulnerable intertidal habitats.

Armored shores are, by definition, comprised of materials which are not natural and are configured into an unnatural shape, and thus affect nearshore processes and morphology. As a result, another typical consequence of hard armoring is increased wave reflection, scour and turbulence, resulting in shoreline erosion.

Shoreline protection methods vary along a spectrum from hard shoreline protective devices to natural solutions. Natural and nature-based shoreline protection methods, such as tidal marshes, levees with transitional ecotone habitat, oyster reefs, dunes, and sediment augmentation, can reduce wave energy and erosive forces and provide effective flood protection when sited properly. Natural and nature-based features can also provide additional benefits beyond shoreline protection, such as protection or expansion of habitat diversity and connectivity, ecosystem resilience, water quality improvement, carbon sequestration, recreation, and beneficial reuse of dredged sediment. In some instances, it may be possible to combine natural and nature-based methods, such as the restoration of saltmarsh habitat, with structural approaches to provide protection from flooding and control shoreline erosion, thereby minimizing the shoreline protection project's impact on natural resources, and maximizing other ecological benefits. The appropriate solutions, or combinations of solutions, depend on physical and biological characteristics of the site (e.g., geomorphic setting, current velocities, water depth, benthic substrate, salinity, etc.), in addition to other factors.

Recent studies have shown watersheds tributary to Humboldt Bay have the potential to supply adequate fine sediment to mudflats and salt marshes to accrete (elevate) at pace with sea level rise. Reducing wave exposure along the shoreline through use of living shorelines to trap and accrete sediment can reduce erosion potential and reduce future impacts from sea level rise.

Goal CZH-4

Current coastal flooding and erosion hazards and the anticipated effects of sea-level rise on those hazards, are understood, prepared for, and successfully mitigated.[17]

Policies

Flooding and Erosion

CZH-4.1 **Flood Hazard Mitigation.** Require new development and redevelopment vulnerable to flooding over its anticipated life to incorporate design measures to minimize, and where feasible, eliminate the risk of flood damage accounting for sea level rise, including: adequate anchoring; elevation of the finished floor of interior living areas and hazardous material storage areas above the flood level; floodproofing and allowing for automatic entry of flood waters below the flood level; and elevating or floodproofing mechanical and utility equipment. If elevation to account for sea level rise over the anticipated life of the development is not feasible or appropriate, require design for future accommodation of additional elevation or other adaptation strategies, or future removal.

CZH-4.2 **Flood Flows.** Prevent the construction of flood barriers and obstructions which would, individually or cumulatively, significantly increase flood heights and velocities within the floodplain and contribute to flood losses.

CZH-4.3 **Increase Flood Capacity.** Maintain and increase floodplain capacity, including by preserving and restoring stream corridors, tidal sloughs and other wetlands.

CZH-4.4 **Shoreline Hazard Report.**[18] Require a site-specific shoreline hazard report prepared by a qualified professional as part of coastal development permit applications for new structural development or redevelopment in areas subject to significant shoreline hazards, to ensure the project can be built in a manner consistent with applicable LCP hazards policies, unless information is already available for the site at a level of detail adequate to ensure compliance with the LCP.

Sea Level Rise Adaptation

CZH-4.5 **Selecting a Sea Level Rise Scenario.** Select a sea level rise scenario for siting and design of development based on the anticipated life of the development, the degree of risk to life and property, and potential for impacts to coastal resources as a result of exposure to sea-level-rise-related hazards. Use extreme risk-aversion scenarios for projects with little to no adaptive capacity which would be irreversibly destroyed or significantly costly to repair, and/or would have considerable public health, public safety, or environmental impacts should the potential level of sea level rise occur. In certain cases, it may be appropriate to implement sea level rise siting and design adaptations over time, initially siting and designing for lower sea level rise projections while identifying a plan to address vulnerabilities from high projections, if and when necessary.

[17] Language from 2040 GP Goal SL-1.
[18] Similar to existing LUP Policy 7.B.5.

CZH-4.6 **Adaptative Management Plan**. Where shorter-term adaptation is proposed, require an adaptive management plan which evaluates adaptation alternatives, identifies preferred strategies, and provides a plan to implement those strategies, including specific projects, phasing, and action triggers.

CZH-4.7 **Temporary Authorization**. Only permit new structural development and redevelopment in areas subject to increased flooding and/or erosion with sea level rise for as long as such development can minimize risk, consistent with the hazard policies of the LCP, requiring reassessment of risk at a future date or sea level rise trigger, and potential implementation of adaptation measures or removal of the development.

CZH-4.8 **Interim Uses.**[19] Allow shorter-term building and land uses, including interim uses, in areas potentially affected by sea level rise.

CZH-4.9 **Managed Retreat**. Evaluate potential mechanisms for long-term, managed retreat in highly vulnerable developed areas, such as through City acquisition and leaseback, and develop appropriate triggers for implementation of these programs.

CZH-4.10 **Unmanaged Retreat.** Proactively work to ensure any shoreline retreat is managed retreat, as unmanaged retreat could adversely impact coastal resources, such as through loss of buried cultural resources or release of contamination.

CZH-4.11 **Coordinated Approach**. Encourage landowners to develop coordinated adaptation strategies where contiguous properties are subject to the same hazard. Consider establishing an Assessment District to fund the maintenance and improvement of coastal flood protection measures.[20]

CZH-4.12 **Pilot Projects.** Promote innovative sea level rise adaptation pilot projects, such as creating living shoreline or relying on the beneficial reuse of dredged sediment. Study and monitor such projects over time and share lessons learned with other jurisdictions.

CZH-4.13 **Sea Level Rise Monitoring**. Support efforts to monitor and record sea level rise and its impacts.

CZH-4.14 **Continued Adaptation Planning.** Continue to update and improve sea level rise vulnerability assessments and adaptation plans, doing all of the following:

a. Conduct more area-specific vulnerability assessments with more detailed modeling and analysis, for instance, of interactions among tidal and storm flooding and groundwater change.
b. Seek solutions to shoreline hazards on a larger geographic basis (i.e., for a district, corridor, or hydrologic unit) to move away from a parcel-by-parcel approach to analyzing and addressing hazards.
c. Work towards a comprehensive, phased approach to sea level rise adaptation along Eureka's shoreline, with logical short-, mid-, and long-term adaptation triggers for vulnerable areas and assets, based on observed sea level rise thresholds.

[19] 2040 GP Policy E-3.7.
[20] 2040 GP Policy SL-1.7.

CZH-4.15 **Adaptation of City Infrastructure and Assets.** Adapt City infrastructure and assets to sea level rise by doing all of the following:

a. Consider sea level rise and associated hazards in the City's Capital Improvement Program planning process to ensure public investments in City-owned assets and infrastructure take advantage of opportunities to increase resilience to sea level rise. Integrate resilience to anticipated sea level rise impacts into City project designs when repairing and replacing aging infrastructure.[21]
b. Where possible, leverage public projects to help build adaptive capacity for other coastal assets and resources.
c. Prioritize adaptation of City assets and infrastructure based on remaining service life, timing of exposure to sea level rise impacts, sensitivity to expected impacts, adaptive capacity, and consequences of loss or impairment.
d. Seek sea level rise adaptation responses with multiple benefits.
e. Identify locations where natural or nature-based shoreline protection methods may be feasible and appropriate, including both "soft" non-structural and hybrid strategies.
f. Develop a phased adaptation plan, implementing specific adaptation measures once predefined triggers to action have been observed. Set triggers far enough ahead of identified impact thresholds to allow for adequate budgeting, planning, permitting, design and construction of the proposed project. Use more conservative triggers for assets and infrastructure components with higher sensitivity and criticality.
g. Where short-term adaptation measures are necessary to reduce immediate flood risk, ensure short-term measures do not preclude important long-term options.
h. Coordinate adaptation of vulnerable shoreline trail, road, and utility line segments, such as by relocating these facilities together in a more landward and/or elevated multi-use corridor.
i. Identify and reserve potential sites for relocated infrastructure and assets.

CZH-4.16 **Transportation Network Adaptation.** Coordinate with the California Department of Transportation and relevant regional and local transportation entities on long-term, corridor-wide planning for adaptation to sea level rise and associated hazards, to ensure the transportation network continues to meet the needs of the community. Provide consideration for maximum connectivity and continued functionality and utility of the California Coastal Trail in transportation adaptation projects.

CZH-4.17 **Trail Adaptation.** Study, identify and implement adaptation strategies for vulnerable segments of the California Coastal Trail, such as elevation in place, inland relocation, or installation of floating access. Consider the potential need for inland relocation of public accessways in siting and permitting adjacent, inland development.

CZH-4.18 **Stormwater System Adaptation.** Increase the capacity and climate change resilience of the City's stormwater drainage system, such as by upsizing and adding drainage structures, better managing flows through tide and flap gates, adding Low Impact Development

[21] 2040 GP Policy SL-1.12.

features (e.g., rain gardens) upstream of storm drains, adding storage capacity at the downstream end of the system (e.g., detention ponds), and installing pump stations.

CZH-4.19 **Tribal Cultural Resource Preservation with Sea Level Rise.** Support local Tribes' efforts to identify, document, and preserve tribal cultural resources threatened by the effects of sea level rise and coastal flooding.

CZH-4.20 **Beneficial Reuse of Sediment for Habitat Adaptation.** Facilitate the beneficial reuse of sediment to elevate sediment-limited habitats, such as subsided diked baylands, to keep pace with sea level rise, and to build transition zones, creating high tide refugia for species and allowing for habitat migration. Plan and implement such habitat adaptation projects to minimize adverse, near-term impacts, while providing substantial net benefits for native habitats and species in the long-term.

Shoreline Protection

CZH-4.21 **Shoreline Protection Entitlement.**[22] Permit revetments, breakwaters, groins, harbor channels, seawalls, cliff retaining walls, and other such construction that alters natural shoreline processes when required to serve coastal-dependent uses or to protect existing structures or public beaches in danger from erosion, and when designed to eliminate or mitigate adverse impacts on local shoreline sand supply. Existing marine structures causing water stagnation contributing to pollution problems and fish kills should be phased out or upgraded where feasible.

CZH-4.22 **Development Not Entitled to Shoreline Protection.** If new development and redevelopment is not entitled to shoreline protection under LUP Policy CZH-4.21, only allow reliance on a shoreline protective device if such armoring can be found consistent with all policies of this LUP.

CZH-4.23 **Critical Infrastructure Short-Term Protection.** Even if the conditions outlined in LUP Policies CZH-4.21 and 4.22 are not met, allow shoreline protection devices if necessary to protect coastal water quality and public health by preventing damage to existing wastewater and stormwater infrastructure, provided less environmentally damaging alternatives are infeasible, only temporary authorization is granted pursuant to LUP Policy 4.6, and an adaptive management plan is developed and implemented, pursuant to LUP Policy 4.7.

CZH-4.24 **Design of Shoreline Protection**. When new or redeveloped shoreline protective devices are allowed by the LCP, require:

a. Evaluation of alternatives, including, but not limited to, non-structural drainage and native landscape improvements, sediment nourishment, dune or wetland restoration, and inland relocation of the threatened development, and selection of the least environmentally damaging feasible alternative;
b. Evaluation of the use of natural and nature-based features, such as marsh vegetation and horizontal levees with transitional ecotone habitat, and incorporation of these features when feasible and appropriate for the context;

[22] Coastal Act Section 30235.

c. Siting and design to avoid, or mitigate if avoidance is infeasible, adverse impacts to coastal resources;
d. Siting and design for multiple benefits, including incorporation of public access features where feasible and appropriate for the context;
e. Engineering to ensure stability and structural integrity of the device over its anticipated life, given erosion, wave run-up and other shoreline hazards, and to minimize the potential for aggravating erosion in other shoreline areas;
f. Monitoring over the life of the structure for structural damage, excessive scour, and other impacts from shoreline hazards, as well as impacts of the device on coastal resources;
g. Maintenance and adaptive management to address issues; and
h. Limited-term coastal development permit authorization for shoreline protective devices, with reevaluation of the design and necessity of the device prior to re-authorization, or removal of the device, and restoration of the site upon permit expiration.

CZH-4.25 **Shoreline Protection Device Removal.** Only authorize a shoreline protective device until the time when existing principal structures protected by the device are no longer present, no longer require armoring, or are redeveloped. If an existing device is no longer authorized or necessary and is causing adverse impacts to coastal or public trust resources, require removal unless the device is needed to protect adjacent development which is still entitled to shoreline armoring, or there is a greater coastal resource benefit to leaving the device in place.

HAZARDOUS MATERIAL CONTAMINATION

Background

Hazardous material contamination is another major hazard and constraint to development in Eureka's coastal zone. California Health and Safety Code Section 25501(p) defines hazardous material as any material that, because of its quantity, concentrations, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment. In addition to the immediate risk of accidental release, long-term public health and environmental impacts may result from sustained exposure to certain substances.

Active hazardous materials sites are those sites currently under investigation by the North Coast Regional Water Quality Control Board (NCRWQCB) or the Department of Toxic Substances Control (DTSC). The investigations and cleanups are guided by the use of screening levels to determine when a given site has been cleaned up to within acceptable risk levels. Once achieved, a given site is typically issued a "no further action" letter or the equivalent, and the case is closed. Residual levels of contamination may remain in soil and/or groundwater at concentrations below the screening levels used to justify closing the site investigation.

The NCRWQCB and DTSC maintain websites, GeoTracker and EnviroStor, respectively, providing information on the location, status and investigation and cleanup reports for active and closed sites. **Figure LUP 5-7** shows sites in Eureka's coastal zone which have undergone, or are currently undergoing, investigation and/or remediation for contamination with hazardous materials. The majority of the sites are open or closed petroleum sites, where fuel and/or oil was released, often as the result of leaking underground storage tanks, and groundwater was, or is, at risk of being affected. It is important to note, just because a site is not listed, doesn't mean it is necessarily free of contamination; the presence of contamination may be unknown.

Buried contamination in the coastal zone could become mobilized as the result of rising groundwater and increased coastal erosion, flooding, and tidal inundation with sea level rise. Tidal inundation of contaminated sites could also make monitoring and clean-up activities much more difficult. According to the City's 2016 sea level rise vulnerability assessment, there are 23 open contaminated sites ranging in elevation between 4.3 feet to 12.1 feet, with four of those sites below 9.6 feet. There is also residual contamination at closed sites which may be susceptible to the impacts of sea level rise. Buried contamination must be considered in any plans for future shoreline retreat, as exposure could be detrimental to human health and the health of bay ecosystems.

Goal CZH-5

Safe production, use, storage, transport, treatment, and disposal of hazardous materials and hazardous waste.[23]

Policies

CZH-5.1 **Site Identification.**[24] Participate in efforts to identify former and current sites involving hazardous materials storage and disposal to reduce the risk of exposure.

[23] 2040 GP Goal HS-3.
[24] 2040 GP Policy HS-3.2.

CZH-5.2 **Remediation.**[25] Continue to work with property owners affected by toxic contamination to identify cost-effective approaches for remediation of contaminated soils and develop unified strategies to address the cleanup of large areas (e.g., the Westside Industrial Area).

CZH-5.3 **Known Areas of Contamination.**[26] Require the development of projects near or within known hazardous waste disposal or handling facilities, or known areas of contamination to perform comprehensive soil and groundwater contamination assessments. If contamination exceeds regulatory levels, require remediation procedures consistent with county, regional, State, and federal regulations, prior to any site disturbance or development.

CZH-5.4 **Disclosure.**[27] Require applications for discretionary development projects that will generate hazardous wastes or utilize hazardous materials to include detailed information on hazardous waste reduction, recycling, and storage, consistent with local, regional, and State regulations.

CZH-5.5 **Exposure Prevention.**[28] Require new industries that store and process hazardous materials to use siting and design methods to protect hazardous materials against unintentional releases, including in the event of flooding.

CZH-5.6 **Exposure Pathways with Sea Level Rise.** In evaluating risk of mobilization of soil and groundwater contamination, consider the potential effects of climate change and sea level rise, including as a result of increased coastal flooding and erosion and rising groundwater.

CZH-5.7 **Oil and Hazardous Substance Spills.**[29] Protect against the spillage of crude oil, gas, petroleum products, or hazardous substances associated with the development, or with transportation of such materials. Provide effective containment and cleanup facilities and procedures for accidental spills, if they occur.

[25] 2040 GP Policy HS-3.3.
[26] 2040 GP Policy HS-3.4.
[27] 2040 GP Policy HS-3.6.
[28] Similar to 2040 GP Policy HS-3.5 (Buffering).
[29] Coastal Act Section 30232.

GLOSSARY EXCERPT

Including terms applicable to the Coastal Zone Hazards Chapter.

Allowed Land Use. A land use permitted in a land use designation, either by right or with a Use Permit or Minor Use Permit.

Appropriate. Suitable and logical for a particular person, place, condition or context.

Armor. To fortify a structure or topographic feature to protect it from the effects of wave action, erosion and other natural forces.

California Coastal Trail. An integrated network of trails that, when completed, will provide a multi-modal opportunity to walk and bike the length of California's 1,230-mile-long coast from the Oregon border to Mexico.

Coastal Access. The ability of the public to reach, use or view the shoreline of coastal waters and coastal recreation areas.

Coastal-Dependent Development or Use.[30] Any development or use which requires a site on, or adjacent to, the sea to be able to function at all.

Coastal Development Permit.[31] A permit required pursuant to Coastal Act Section 30600(a) for development within the coastal zone.

Coastal Resource. Any resource afforded protection under the policies of Chapter 3 of the California Coastal Act, California Public Resources Code Section 30200 et seq., including, but not limited to, public access, visitor and recreational facilities, water-oriented activities, marine resources, biological resources, visual resources, environmentally sensitive habitat areas, agricultural lands, and archaeological and paleontological resources.

Coastal Zone, California. The area of land designated by the Coastal Act extending from the state's outer limit of jurisdiction in State waters, inland for a varying distance, ranging from a few hundred feet in certain urban areas to roughly five miles in certain rural areas.

Critical Facilities and Infrastructure. Facilities and infrastructure having a vital role in a potential emergency, the failure of which might prove catastrophic.

Cumulatively; Cumulative Effect.[32] The incremental effects of an individual project reviewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.

Development.[33] On land, in or under water, the placement or erection of any solid material or structure; discharge or disposal of any dredged material or of any gaseous, liquid, solid, or thermal waste; grading, removing, dredging, mining or extraction of any materials; change in the density or

[30] Coastal Act Section 30101.
[31] Coastal Act Section 30101.5.
[32] Coastal Act Section 30105.5.
[33] Coastal Act Section 30106.

intensity of use of land, including, but not limited to, subdivision pursuant to the Subdivision Map Act (commencing with Section 66410 of the Government Code), and any other division of land, including lot splits, except where the land division is brought about in connection with the purchase of such land by a public agency for public recreational use; change in the intensity of use of water, or of access thereto; construction, reconstruction, demolition, or alteration of the size of any structure, including any facility of any private, public, or municipal utility; and the removal or harvesting of major vegetation other than for agricultural purposes, kelp harvesting, and timber operations which are in accordance with a timber harvesting plan submitted pursuant to the provisions of the Z'berg-Nejedly Forest Practices Act of 1973 (commencing with Public Resources Code Section 4511). As used in this definition, "structure" includes, but is not limited to, any building, road, pipe, flume, conduit, siphon, aqueduct, telephone line, and electrical power transmission and distribution line.

Ecosystem Services. Benefits people obtain from natural ecosystems, such as carbon sequestration, wave attenuation, stormwater retention, flood regulation, groundwater recharge, coastal protection, erosion control, sediment-related processes, water filtration, and nutrient removal.

Emergency.[34] A sudden, unexpected occurrence demanding immediate action to prevent or mitigate loss of or damage to life, health, property or essential public services.

Erosion. The process in which sediments, such as rocks, gravels, soil and sand separate and move away from landforms in a complex response to many processes including marine (e.g., water levels, waves, sediment supply and transport, etc.), terrestrial (e.g., rainfall, runoff, wind, etc.), topographic/geologic conditions, and other instabilities such as seismic shifts and biologic changes.

Feasible.[35] Capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, social, and technological factors.

Fill.[36] Earth or other substance or material, including piling placed for the purposes of erecting structures thereon, placed in a submerged area.

Goal. An ideal future end, condition or state related to the public health, safety or general welfare toward which planning efforts are directed. A goal is a general expression of community values and therefore is abstract in nature and not quantifiable, time-dependent, or suggestive of specific actions for its achievement.

Hazardous Material. Any material that because of its quantity, concentrations, or physical or chemical characteristics, poses a significant present or potential hazard to human health and safety or to the environment if released into the workplace or the environment.

Hazards. Events or physical circumstances which can result in risks to people and property, interruptions of economic activity, disruption to essential services, and environmental damage.

Hazards, Coastal Zone. Natural and human-induced hazards present in the City's coastal zone including, but not limited to, fire, geologic instability, tsunamis, episodic and long-term shoreline

[34] Title 14 California Code of Regulations Section 13009.
[35] Coastal Act Section 30108.
[36] Coastal Act Section 30108.2.

retreat and coastal erosion, storm surge and wave uprush, tidal and storm flooding, and exposure to hazardous materials, and their cumulative impacts, as impacted by climate change and sea level rise.

Hazard, Shoreline. Hazards along the shoreline created by winds, waves, currents, tides, storms, water, and geologic instability.

Infill Development. Development of vacant or utilized land within an existing urbanized area, surrounded by, contiguous with, or in close proximity to existing development.

Interim Use. An allowed land use permitted on a temporary "interim" basis.

Land Use Plan (LUP).[37] The relevant portions of the City's General Plan which are sufficiently detailed to indicate the kinds, locations, and intensity of land uses, and the applicable development and resource protection policies necessary to carry out the policies of Chapter 3 of the Coastal Act, included as part of the City of Eureka's certified Local Coastal Program.

Local Coastal Program (LCP).[38] A combination of documents, including the land use plan, implementation plan (zoning ordinance), and land use and zoning maps, adopted by the City and certified by the Coastal Commission, which, when taken together, meet the requirements of, and implement the provisions and policies of, the State Coastal Act at the local level.

Low Impact Development. An approach to stormwater management emphasizing preventative site design strategies (e.g., minimizing the building footprint, preserving vegetation, and protecting natural drainage features) supplemented by small-scale, distributed structural best management practices (e.g., permeable pavement surfaces, rain barrels and cisterns, and vegetated swales) to replicate the site's natural hydrologic balance through onsite retention (via infiltration, evapotranspiration, or harvesting for later on-site use) or detention of stormwater close to the source.

Managed Retreat with Sea Level Rise. Purposeful, planned and coordinated movement of people, development or ecosystems away from vulnerable shoreline areas and migration of the shoreline inland.

May. Indicates a permissive suggestion or guideline.

Minimize. To reduce or lessen, but not necessarily eliminate.

Mitigate. To avoid an impact altogether; minimize an impact by limiting the degree or magnitude; rectify an impact by repairing, rehabilitating or restoring what has been impacted; reduce or eliminate an impact over time by preservation and maintenance operations during the life of the action; or compensate for an impact by replacing or provided substitute resources or environments.

Native Species. Species native to California and the Eureka area, as listed by the California Native Plant Society.

Natural and Nature-Based Shoreline Protection Methods. The use of natural features, ecological systems or processes to provide flood and erosion protection, while increasing the long-term adaptive

[37] Coastal Act Section 30108.5
[38] Coastal Act Section 30108.6

capacity of shoreline areas by perpetuating or restoring ecosystem services. Can be naturally occurring or designed to mimic natural features, ecological systems, or processes. Can refer to "soft" non-structural strategies, such as natural or constructed tidal marshes, dunes, oyster reefs and other buffer habitat, or to "hybrid" strategies where natural or nature-based features are integrated with hard protection, such as revetment buried beneath sand and vegetated, or levees with transitional ecotone habitat.

Policy. A specific mandatory statement binding the City's action and establishing the standard of review to determine whether land use and development decisions, zoning changes or other City actions are consistent with the Coastal Element.

Public Access. The right or privilege of the general public to visit an area or resource.

Public Infrastructure and Services. Roads, sidewalks, bikeways, trails, water delivery systems, stormwater facilities, sewer systems, gas and electric, and other similar facilities, to serve the general public.

Public Utility.[39] A permanent structure or facility operated by a public or private agency, providing an essential commodity or basic service to the general public such as wastewater, solid waste, and stormwater collection, water supply, energy distribution, or transportation.

Public Trust Lands.[40] All lands subject to the Common Law Public Trust for commerce, navigation, fisheries, recreation, and other public purposes. Public Trust Lands include tidelands, submerged lands, the beds of navigable lakes and rivers, and historic tidelands and submerged lands that are presently filled or reclaimed and which were subject to the Public Trust at any time.

Redevelopment: Alteration, demolition, or replacement of 50 percent or more of the major structural components (including exterior wall, floor and roof framing, and foundation) of any structure or an addition of 50 percent or more to the floor area of such structure. Incremental changes that cumulatively amount to replacement of 50 percent or more over time shall also be considered redevelopment. Policies that apply to "new development" shall also apply to "redevelopment."

Resilience. The capacity of individuals, communities, institutions, businesses, and systems to survive, adapt, and grow, no matter what kinds of chronic stresses and acute shocks they experience.

River or Stream. A natural watercourse as designated by a solid line or dash and three dots symbol shown on the United States Geological Survey map most recently published, or any well-defined channel with distinguishable bed and bank that shows evidence of having contained flowing water as indicated by scourer deposit of rock, sand gravel, soil, or debris.

Sea.[41] Humboldt Bay and all harbors, channels, estuaries, salt marshes, sloughs, and other areas in the coastal zone subject to tidal action through any connection with the Pacific Ocean, excluding nonestuarine rivers, streams, tributaries, creeks, and flood control and drainage channels.

Shall. An unequivocal directive; obligatory.

[39] Combination of glossary definitions from the existing certified LUP and the Inland Zoning Code.
[40] Title 14 California Code of Regulations Section 13577(f).
[41] Coastal Act Section 30115.

Shoreline. Intersection of the sea with land, including the zone between the lines of mean high tide and mean low tide.

Shoreline Protective Device. Constructed features such as seawalls, revetments, riprap, earthen dikes, and bulkheads used to protect shoreline development and other features from tidal inundation, erosion and other coastal hazards. Also known as shoreline armoring.

Shoreline Protective Device, Hard. Shoreline protective devices without any incorporation of natural or nature-based features. Also known as hard shoreline armoring.

Shoreline Protective Device, Hybrid. Shoreline protective devices that integrate natural or nature-based features with conventional physical infrastructure. As a common example, a living shoreline can include an engineered interior composed of large rock armoring or compacted earthen material with exterior designed to support salt marsh and other natural habitats.

Should. A directive to be honored if at all possible; a less rigid directive than "shall" to be honored in the absence of compelling or contravening considerations.

Structure Intended for Human Occupancy. A structure expected to have a human occupancy rate of more than 2,000 person hours per year.

Substantial. Considerable in importance, value, degree or amount.

Tidelands. All lands between the lines of mean high tide and mean low tide.

Visitor. Any person visiting the coastal area for leisure and/or recreational purposes. Visitors to coastal areas include out-of-town guests and Eureka residents.

Vulnerability. The degree to which a person, area, asset, or natural system can withstand or recover from a hazardous event. Vulnerability depends on the amount of exposure to a hazard, sensitivity to exposure and adaptive capacity.

Wetland.[42] Lands within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens. Wetlands include land where the water table is at, near, or above the land surface long enough to promote the formation of hydric soils or to support the growth of hydrophytes. Wetlands also include land where vegetation is lacking and soil is poorly developed or absent as a result of frequent and drastic fluctuations of surface water levels, wave action, water flow, turbidity or high concentrations of salts or other substances in the substrate. Such wetlands can be recognized by the presence of surface water or saturated substrate at some time during each year and their location within, or adjacent to, vegetated wetlands or deep-water habitats. Areas with drained hydric soils that are no longer capable of supporting hydrophytes shall not be considered wetlands. Agricultural ponds and stormwater, wastewater, and hazardous-material-containment infrastructure are not considered wetlands if constructed and continuously maintained for their intended functions and not with the intent of creating a wetland or restoring a specific habitat.

[42] Coastal Act Section 30121 and 14 CCR Section 13577(b)(1). The 14 CCR portion is in the existing LUP Glossary as "Boundary of a Wetland."